CORPADECO
CORPORACIÓN PARA EL DESARROLLO DE LA REGIÓN DE COQUIMBO

INFORME FINAL

"ESTUDIO DE FACTIBILIDAD ECONÓMICA PARA EL ALOE VERA EN LA IV REGIÓN"

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INECON Ingenieros y Economistas Consultores S.A.

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1. RESUMEN Y CONCLUSIONES

El presente documento corresponde al Informe Final del proyecto "ESTUDIO DE FACTIBILIDAD ECONOMICA PARA EL ALOE VERA EN LA CUARTA REGION", cuyo objetivo principal es determinar la rentabilidad de explotar cultivos de aloe vera en esa zona.

El proyecto financiado por la Fundación para la Innovación Agragaria (FIA) y ejecutado por la Corporación para el Desarrollo de la Región de Coquimbo (CORPADECO), denominado "Investigación para la producción de vegetales en zonas áridas y semi-áridas de la Región de Coquimbo", ha constituido un antecedente importante para llevar a cabo el presente estudio, en el sentido que se han estimado los coeficientes técnicos en base a los resultados de productividad allí observados, para calcular la rentabilidad de los diferentes proyectos evaluados.

A continuación se presentan las principales conclusiones del estudio, tanto en la etapa de Análisis del Mercado como en el Estudio Técnico-Financiero de los proyectos definidos.

1.1 Análisis del Mercado

Luego de identificar la gran diversidad de productos presentes en el mercado del aloe vera y sus derivados, se estimó conveniente enfocar el análisis hacia el conjunto de productos semi-elaborados. Estos productos son consumidos por la industria cosmética, farmacéutica y alimenticia, como insumos para la fabricación de productos de belleza, medicamentos y suplementos alimenticios. Adicionalmente, el proyecto considera la comercialización de hojas de aloe vera sin elaborar y plantas (hijuelos), para su propagación.

Considerando que las cantidades porcentuales de aloe vera utilizadas en la elaboración de productos cosméticos o farmacéuticos son del orden de apenas un 3% con respecto al peso total del producto y dado que, según lo investigado, los laboratorios con producción en Chile constituyen un número muy reducido, puesto que la mayoría importa productos terminados, se decidió orientar el estudio hacia el mercado de exportación de hojas de aloe vera y productos semi-elaborados, destinando solamente los hijuelos para venta en el mercado interno.

Por otra parte, dado que los volúmenes de aloe vera transados en el mundo, así como las superficies plantadas, son pequeños en comparación con otros cultivos o commodities del rubro agrícola, las bases de datos con información estadística mundial de productos no contemplan en forma aislada cifras asociadas a este cultivo, lo que impidió efectuar un análisis de mercado en base a volúmenes y tendencias de éste. Sin embargo, de los antecedentes recopilados fue posible inferir que este mercado presentará un importante crecimiento, debido esencialmente a los resultados obtenidos en investigaciones recientes, que han identificado una amplia gama de atributos y aplicaciones para el aloe vera y por otro lado, debido al fuerte auge que ha experimentado el consumo de productos naturales, especialmente en países desarrollados.

Dado lo anterior, estos consultores estimaron adecuado a los alcances del estudio, efectuar el análisis de factibilidad técnico-económica de la producción de:

Materias Primas

- Hojas de aloe vera
- Hijuelos

Productos semi-elaborados

- Pasta de Acíbar
- Gel líquido en su concentración más común, que es 10X
- Gel en polvo, obtenido por liofilización, en concentración 200X

La comercialización de hijuelos fue evaluada en forma conjunta con la ejecución de otros proyectos, dado que su producción es a todo evento e independiente del procesamiento posterior que se dé a las hojas de aloe vera.

Para una mayor comprensión del esquema que se utilizó para evaluar los proyectos, se presenta a continuación un diagrama que indica las principales etapas por las que atraviesan los subproductos obtenidos a partir del aloe vera.

ETAPAS DEL PROCESO DE OBTENCION DE SUBPRODUCTOS DE ALOE VERA

		Materias Primas		Productos semi-elaborados
Plantación de hijuelos de aloe vera	Cosecha →	Hojas (1) Hijuelos (*) ↓ Venta Mercado	Proceso →	Pasta de acíbar (2) Gel líquido 10X (3) Gel liofilizado 200X (4) ↓ Venta Mercado

*: en conjunto con 1, 2, 3 y 4.

Los rangos de precios manejados para los productos seleccionados fueron los siguientes:

PRODUCTO	UNIDAD	PRECIO		
		ALTO	MEDIO	BAJO
(Precios Miami-USA)				
Hojas de Aloe Vera	US$/hoja	0.60	0.50	0.40
Hijuelos de Aloe Vera *	US$/hijuelo	0.50	0.40	0.30
Pasta de Acíbar	US$/kg	14.00	12.00	10.00
Gel líquido 10X	US$/kg	16.00	14.00	11.00
Gel liofilizado 200X	US$/kg	200.00	180.00	160.00
Hojas de Aloe Vera *	US$/hoja	0.20	0.15	0.10

* Venta sólo en mercado interno

Para efectos de la evaluación financiera del proyecto, se consideró que los volúmenes de producción nacional de los productos seleccionados podrían ser colocados en el mercado internacional, dado el crecimiento previsto para éste, especialmente en el mercado norteamericano, que es el principal fabricante de productos relacionados con el aloe vera.

Finalmente, cabe señalar que se identificó el factor calidad como crítico para el éxito del proyecto, partiendo desde el tratamiento de los cultivos y pasando por los procesos productivos, hasta llegar a la etapa de envasado, almacenamiento y transporte de los productos.

1.2 Análisis Financiero

Para efectuar el análisis financiero del proyecto, se definió la unidad de producción, los rendimientos según tipo de producto, los precios internacionales a los cuales se transarán, los costos de producción y comercialización, la tasa de costo de capital y otros costos de producción asociados. Luego, a partir de la sensibilización de los parámetros indicados, se determinó la rentabilidad del negocio.

A continuación se presenta un resumen de los resultados obtenidos en las sensibilizaciones del proyecto[1], a partir de los cuales se elaboraron las conclusiones que le siguen.

Producto	Escenario	Inversión Inicial	VAN	TIR
Hojas de aloe vera	Precio alto - Aéreo	-1,366,340	-2,747,866	n/d
	Precio alto - Marítimo	-1,366,340	-700,400	n/d
Pasta de acíbar	Precio medio - Aéreo	-526,451	-86,176	n/d
	Precio medio - Marítimo	-524,626	-24,918	n/d
Gel líquido 10X	Precio alto - Aéreo	-536,573	2,012,047	65%
	Precio medio - Aéreo	-536,573	1,746,778	61%
	Precio bajo - Aéreo	-536,573	1,348,874	54%
Gel liofilizado 200X	Precio alto - Aéreo	-605,543	1,165,605	47%
	Precio medio - Aéreo	-605,543	1,032,971	45%
	Precio bajo - Aéreo	-605,543	900,336	42%
Hojas de Aloe Vera (Venta mercado interno)	Precio alto	-18,469	13,859	27%
	Precio medio	-18,469	4,648	19%
	Precio bajo	-18,469	-4,563	n/d

Elaborado por INECON.

De esta manera, respecto del análisis financiero de los diferentes proyectos evaluados, se puede concluir lo siguiente:

a) Los proyectos que arrojan resultados positivos, desde el punto de vista financiero, corresponden a la producción de gel líquido de concentración 10X y gel liofilizado de concentración 200X. En el escenario medio, se obtienen rentabilidades de un 61% y un 45%, respectivamente, lo que significa que corresponde a proyectos atractivos para un inversionista privado y que en consecuencia, estos consultores recomiendan bajo las siguientes consideraciones:

- La producción de gel fresco se recomienda que sea llevada a cabo si y sólo si se materializa en un plazo no superior a 3 años, ya que este mercado se encuentra en retroceso por la aparición del gel liofilizado.

[1] Valores en US$

Se estima que al cabo de 5 años, el gel liofilizado se podría convertir en el más importante de los productos seleccionados.

- Debido a que las inversiones requeridas, tanto en equipamiento como en instalaciones, no son menores, se estima que la implementación de estos proyectos debe estar necesariamente vinculada con contratos de venta de mediano plazo a objeto de disminuir los riesgos inherentes a este tipo de negocios. Para materializar contratos de este tipo, se estima necesario contactar previamente empresas con presencia en el mercado de productos derivados del aloe vera y que requieran de abastecimiento de terceros. Se sugiere en este sentido, ver la posibilidad de establecer una alianza estratégica con un cliente, de modo de obtener de éste el *know-how* necesario para la fabricación de los productos semi-elaborados.

- Se recomienda profundizar en los aspectos técnicos relacionados con la estabilización del gel y el proceso de deshidratación del mismo, factores considerados claves para el cumplimiento de las normas de calidad exigidas por los clientes, considerando que el uso de dichos productos corresponde a las áreas de cosmetología y salud, que son especialmente exigentes.

b) No resulta conveniente desarrollar proyectos vinculados a la producción de pasta acíbar, dados los bajos precios observados en mercados internacionales, los que son superados por los costos de producción y comercialización.

c) No se recomienda llevar a cabo proyectos de producción de hojas de aloe vera por la misma razón que el caso anterior, es decir, por cuanto los precios observados en mercados internacionales no son suficientes para recuperar los costos de producción y comercialización,

especialmente el costo de transporte, así como el costo de capital asociado.

d) Cabe mencionar que, como es lógico, mayores rendimientos productivos de las plantas y por hectárea, se correlacionan positivamente con mejores retornos para los proyectos. Lo anterior está directamente relacionado con la cantidad de riego recibido por los cultivos y por lo tanto, con la disponibilidad de agua en los terrenos donde se ubique finalmente el proyecto.

e) Finalmente, para el proyecto de producción de una hectárea de hojas de aloe vera, las que serían comercializadas en mercado interno, es decir, para ser vendidas a una planta procesadora de la Región, los resultados obtenidos indican que para precios de 0,15 y 0,20 US$/hoja, se obtienen resultados positivos para el agricultor dueño de 1 hectárea, con retornos que fluctúan entre US$5.000 y US$10.000 anuales, dados los supuestos del proyecto. Por lo tanto, estos datos deberán ser posteriormente comparados con el costo afinado de producción de hojas en forma industrial, para un tamaño definido de hectáreas, con el fin de analizar la conveniencia de abastecerse de hojas de aloe vera desde terceros.

2. INTRODUCCION

El proyecto ejecutado por CORPADECO, denominado "Investigación para la producción de vegetales en zonas áridas y semi-áridas de la Región de Coquimbo", que tuvo una duración de 25 meses y finalizó en diciembre de 1998, llegó a determinar como resultado principal, que las plantas de aloe vera importadas desde Venezuela tuvieron una excelente adaptación a los suelos y clima de la Región de Coquimbo, presentando un buen comportamiento de los indicadores de productividad.

Con estos antecedentes, CORPADECO contrató los servicios de INECON, Ingenieros y Economistas Consultores Ltda., para realizar el estudio de factibilidad económica de explotar cultivos de aloe vera en la Región de Coquimbo. Para ello, se efectuaron análisis de antecedentes de diversas fuentes de información, que permitieron concluir acerca de los siguientes aspectos:

- Identificar los productos derivados del aloe vera que tienen mayor demanda en el mercado nacional e internacional.
- Caracterizar la oferta nacional e internacional de productos derivados del aloe vera, así como también de las materias primas necesarias para su elaboración.
- Identificar la materia prima o productos semi-elaborados necesarios para producir los productos derivados indicados anteriormente.
- Identificar y caracterizar los procesos tecnológicos para la fabricación de productos semi-elaborados.

- Determinar los costos de inversión y operación asociados a la producción y comercialización de materia prima, entendiendo por tal las hojas de aloe vera y los hijuelos de las plantas.

- Determinar los costos de inversión y operación asociados a la producción y comercialización de productos semi-elaborados, entendiendo por tales a los compuestos que son usados como ingredientes para la elaboración de productos finales o derivados del aloe vera.

- Finalmente, a partir de los antecedentes recogidos, efectuar una evaluación económica del proyecto con diferentes indicadores, que permitan determinar la rentabilidad de éste.

3. ANTECEDENTES GENERALES

El aloe vera, cuyo nombre científico es Aloe Barbadensis Miller, constituye una de las 360 especies aceptadas de aloe en el mundo y es la más utilizada, por sus particulares características curativas. Todas las especies son perennes, suculentas y originarias de Africa, ahora extendidas a otras partes del mundo. No son cactus y no debe ser confundida con el aloe Americano, que es una especie de las Agavas.

Según su origen geográfico, algunas especies reciben un nombre propio, con el que son conocidas por la gente, incluso una especie puede ser conocida por más de un nombre. De esta forma, del aloe vera se obtiene "Aloe de Curazao" o "Aloe de Barbados", que se produce en las Indias Orientales (Curazao, Aruba, Barbados, Bonaire). Del Aloe Ferox y sus híbridos se obtiene el "Aloe del Cabo", que se produce en Cabo de Buena Esperanza, Sudáfrica. De otras especies se obtienen aloes de menor importancia, tal como Aloe Arborescens Miller, aunque esta última especie, ha tenido un fuerte auge en el mercado japonés, donde se le conoce con el nombre de Aloe Kidachi y tiene uso principalmente alimenticio.

Las plantas de aloe vera necesitan mucho sol, una pequeña cantidad de lluvia y terreno con buen drenaje. El aloe vera no necesita normalmente mucha agua, pero si el clima es muy seco la mayor parte del tiempo, necesitará algún tipo de riego. Las plantas no soportan climas fríos. Una helada destruye completamente una plantación.

Las plantas maduras tienen una altura de 80 a 100 cm, que está dada por el tallo de su flor y poseen alrededor de 12 a 15 hojas. La cosecha se efectúa removiendo las hojas exteriores de la planta y dejando las del interior para que maduren posteriormente.

Las hojas maduras de aloe vera tienen una altura promedio de 50 a 65 cm, con un ancho de 9 a 11 cm y un espesor de 2,5 cm en la base. Pesan desde 0,25 a 1,50 Kg. en su estado de madurez. Las hojas se cortan a mano por cosecheros, por debajo de la línea de gel, donde la hoja se torna de color blanco.

Según datos obtenidos del estudio de cultivos australianos, realizado por el Departamento de Industrias Primarias de Queensland, Australia[2], los cultivos son cosechados 3 a 4 veces al año, donde se seleccionan las hojas más maduras para ser cortadas. Los cultivos tradicionales están preparados para ser cosechados por primera vez a los 2 años y medio o tres años, es decir, dentro de 1 año y medio a 2 años desde que el campo es plantado. Los hijuelos hidropónicamente cultivados comienzan su producción al año de ser plantados. Una planta madura bien manejada produce alrededor de 10 hojas al año, dando cada una aproximadamente 0,3 litro de gel natural.

El gel de aloe vera es quizás uno de los remedios en base a hierbas más populares en el mundo. Se usa para aliviar quemaduras con fuego o de sol, para mejorar el proceso de cicatrización de heridas, para humectar y suavizar la piel, entre otras aplicaciones. Algunas investigaciones recientes sugieren que el aloe vera incluso puede estimular al sistema inmunológico. No obstante, la forma en que realmente trabaja el aloe vera aún no es del todo entendida por los científicos.

Actualmente existen dos productos básicos que se extraen del aloe vera, ellos son el **gel**, que se forma naturalmente al interior de las hojas y que es el producto conocido para aliviar quemaduras y heridas y por otra parte, el **acíbar**, que es un jugo amarillento que se sitúa bajo la delgada epidermis de las hojas y se obtiene al cortar las hojas de aloe vera en su

[2] Autor: G.I. Jamieson, Senior Horticulturist, Brisbane – ISSN 0155-3054

base y dejarlas escurrir. El acíbar es el componente básico para la fabricación de medicamentos para tratar el sistema digestivo, con efecto laxante. Si bien ambos elementos comparten una serie de componentes, son esencialmente distintos y no deben ser confundidos.

Existe un gran número de procesos de extracción y estabilización del gel, así como para la obtención de concentrados, los cuales están siendo continuamente patentados por las empresas del rubro. El gel de aloe vera comprende más de 75 compuestos, incluyendo polisacáridos (carbohidratos complejos), esteroides, ácidos orgánicos, enzimas, agentes antibióticos, aminoácidos y minerales.

De acuerdo un estudio realizado por el Dr. Peter Atherton, investigador de la Universidad de Oxford, publicado en un artículo denominado "Aloe Vera: ¿Mito o Medicina?", los componentes del aloe vera pueden ser divididos en los siguientes grupos:

1) **Vitaminas**: es rico en todas las vitaminas, excluyendo la vitamina D, especialmente la vitamina A (betacarotene) que es antioxidante, C, E e incluso B12 (es una de las pocas plantas en el mundo que posee esta vitamina).

2) **Enzimas**: muchos diferentes tipos de estos catalizadores bioquímicos, cuando son ingeridos, ayudan a la digestión eliminando grasas y azúcares. En particular la enzima Bradykinase ayuda a reducir la inflamación excesiva cuando se aplica sobre la piel y por lo tanto, reduce el dolor.

3) **Minerales**: calcio, sodio, potasio, manganeso, cobre, zinc, cromo y el antioxidante selenio. Aunque los minerales son sólo necesarios en pequeñas cantidades, son esenciales para el propio funcionamiento de varios sistemas enzimáticos.

4) **Azúcares**: son derivados de la capa mucilagenosa de la planta, que rodea al gel interior y son conocidos como mucopolisacáridos, los que fortalecen el sistema inmunológico. El aloe vera contiene mono y polisacáridos, pero los más importantes son los largas cadenas de azúcares que contienen glucosa y manosa o los gluco-mannans, los que una vez en la sangre son capaces de imponer su efecto inmuno-regulatorio.

5) **Antarquinonas**: hay doce de estos compuestos fenólicos, los cuales ayudan la absorción gastro intestinal y tienen efectos antibióticos. Las más importantes son la aloína y la emodina, las que actúan como eliminadoras de dolor.

6) **Lignina**: es una sustancia inerte, pero tiene características de absorción muy poderosas, lo que da a las preparaciones un singular efecto de penetración.

7) **Saponinas**: constituyen un 3% del gel de aloe vera y son capaces de limpiar, teniendo propiedades antisépticas. Actúan poderosamente como antibióticos; contra bacterias, virus y hongos.

8) **Acidos grasos**: colesterol, campesterol, β sisosterol y lupeol. Estos cuatro esteroides de planta son importantes agentes anti-inflamatorios.

9) **Acido salicílico**: un compuesto similar a la aspirina que posee propiedades anti-inflamatorias y antibióticas.

10) **Aminoácidos**: el cuerpo necesita 22 aminoácidos; el gel proporciona 20 de ellos. Lo más importante, proporciona 7 de los 8 aminoácidos esenciales que el cuerpo no puede sintetizar.

El gel de aloe vera contiene aproximadamente un 99,5% de agua en peso, lo que permite llegar a concentraciones de 1:199. Se prepara

comercialmente a través de varios métodos; la mayoría a través de presión, aunque algunos consideran extracción por solventes. Se considera que el gel obtenido mediante la acción mecánica de prensar las hojas conserva mejor las propiedades de aloe que el gel obtenido mediante extracción. Una vez que se extrae el gel, éste debe ser estabilizado rápidamente, lo que implica la utilización de preservantes dentro de las primeras 4 a 6 horas desde que se corta la hoja. De lo contrario, la probabilidad de oxidación es alta y se pueden perder las propiedades originales del gel.

Por otra parte, el almacenamiento y manejo del aloe es muy crítico; desde el lavado de las hojas hasta que se llenan las botellas con productos, hay numerosos lugares en los cuales se pueden introducir bacterias al gel y pueden destruirlo.

Los productos semi-elaborados de aloe vera están disponibles en dos formas, líquidos y sólidos. Los líquidos son concentrados en diferentes graduaciones (gel líquido); en cambio el sólido más común es el deshidratado por spray, seguido por el obtenido mediante congelamiento y posterior sublimación del gel natural, conocido como gel liofilizado; ambos tienen presentación de polvo.

Por otro lado, el acíbar, que se obtiene al dejar escurrir las hojas, una vez que son cortadas en la base, se somete a calentamiento para así evaporar el agua y el residuo pastoso de color café oscuro que queda es la denominada Droga Aloe o **Pasta de Acíbar**. La aloína comercial es la pasta de acíbar refinada, que contiene altas concentraciones de barbaloína, que es el principal componente laxante del aloe.

El acíbar se puede obtener de todas las especies de aloe mencionadas anteriormente. Sin embargo, el Gel de aloe sólo es posible obtenerlo del aloe vera.

4. ESTUDIO DE MERCADO

El Estudio de Mercado tiene como objetivo determinar la existencia actual y potencial de demanda y oferta para el producto definido, tanto en el mercado interno como externo, además de hacer las proyecciones para cada una de ellas.

4.1 Determinación del Producto

Actualmente en el mercado del aloe vera se comercializa una amplia gama de productos, tanto sin elaborar, semi–elaborados como productos terminados o derivados del aloe vera.

Dentro de los productos sin elaboración o materias primas y productos semi-elaborados, provenientes del aloe vera, figuran los siguientes:

Materias primas:

- Hojas completas o fileteadas.
- Hijuelos, que son plantas pequeñas de aloe vera, para propagación.

Productos semi-elaborados:

- Pasta de la hoja completa, filtrada y sin filtrar.
- Hoja completa concentrada (concentración 2X[3] a 8X).
- Gel líquido natural, filtrado y sin filtrar, regular o decolorado.
- Gel líquido concentrado (concentración 10X y 40X), regular o decolorado.
- Gel en polvo, deshidratado por spray (concentración 100X y 200X).

[3] Ver Cuadro N°4.1-1: Estándares de Concentración

- Gel en polvo, deshidratado congelado (liofilizado) (concentración 100X y 200X).
- Extracto, como líquido soluble en aceite.
- Pasta de Acíbar.

Cuadro N°4.1-1

Estándares de Concentraciones

Factor de Concentración	Designación Alfabética	Fórmula de Reconstitución
1X	Agua madre	Ninguna. Concentración nativa
2X	Potencia doble	1 parte de aloe por 1 de agua
4X	Potencia cuádruple	1 parte de aloe por 3 de agua
10X	Potencia 10ª	1 parte de aloe por 9 de agua
20X	Potencia 20ª	1 parte de aloe por 19 de agua
40X	Potencia 40ª	1 parte de aloe por 39 de agua
100X	Potencia 100ª	1 parte de aloe por 99 de agua
200X	Potencia 200ª	1 parte de aloe por 199 de agua

Fuente : IASC, International Aloe Science Council

Notas:

1. La reconstitución trae el concentrado de aloe a su nivel nativo de sólidos y otros constituyentes.
2. Dado el porcentaje de agua del gel natural (99,5%), los productos de gel pueden ser concentrados hasta 200X y los productos de hoja completa sólo pueden ser concentrados hasta 100X. Como guía para los fabricantes, el IASC ha definido el total de sólidos de aloe (aloe exclusivo sin aditivos ni excipientes) en un 0,5% en gel y 1% en la hoja completa. Estos son valores mínimos que deben ser alcanzados por cualquier producto de aloe elaborado por alguna compañía miembro del IASC.

A continuación se analiza los principales productos identificados anteriormente:

a) Hojas de aloe vera

Respecto de la hoja de aloe vera completa sin elaborar, es posible afirmar que tienen poca presencia en los mercados mundiales, ya que si bien aparecen algunos precios de transacción en mercados terminales de USA (Miami, Boston, Baltimore), según lo averiguado telefónicamente con la Srta. Holly Mozel, Market Reporter del mercado de Baltimore, las transacciones semanales son de aproximadamente 8 a 10 cajas de hojas.

No obstante lo anterior y con el fin de tener mayor conocimiento respecto del manejo de las hojas de aloe vera, INECON tomó contacto con la Fundación Chile, que desde hace algún tiempo ha estado desarrollando un proyecto encargado por una empresa alemana elaboradora de materias primas para la industria farmacéutica y cosmética, cuyo nombre es confidencial. El proyecto consiste en estudiar las características, el comportamiento y rendimientos de cultivos de aloe vera en Chile, con el fin de determinar un lugar óptimo para su explotación. El proyecto contempla el envío de hojas de aloe vera recién cortadas hacia Alemania, donde serían posteriormente elaboradas en los laboratorios de esta empresa.

Fundación Chile mantiene en la actualidad plantaciones experimentales de aloe vera en las siguientes localidades de Chile:

- Valle de Lluta (al interior de Arica – sin mantenimiento)
- Pica (al interior de Iquique - Oasis Esmeralda)
- Ovalle
- Salamanca

- Nogales
- Curacaví
- Santo Domingo

Las plantas fueron importadas de Texas y se está estudiando su adaptación al clima y suelo de cada una de estas localidades. Hasta la fecha de este informe, se habían hecho algunos despachos de hojas frescas a Alemania y éstas llegaron en buenas condiciones a su destino, lo que abriría la posibilidad de no descartar a priori esta modalidad de comercialización.

b) Pasta de Acíbar

Como se dijo en el capítulo de Antecedentes Generales, el acíbar, de donde posteriormente se obtendrá la aloína, tiene esencialmente efectos laxantes. Conforme a lo anterior y con el fin de entender mejor el mercado dentro del cual está inserto este subproducto del aloe vera, es necesario revisar brevemente el mercado de los productos laxantes.

Algunos laxantes actúan incrementando el volumen y proporción de agua del contenido intestinal, mediante el aporte de fibra. Constituyen los denominados laxantes por aumento de volumen, o voluminosos, como ejemplo de los cuales se puede mencionar el salvado. Estos laxantes se comercializan en forma de tabletas o granulos, aunque también pueden consumirse los propios cereales dentro de la dieta cotidiana y ofrecen la solución más inocua y natural.

El segundo grupo de laxantes, que no aumentan el volumen, comprende tres tipos diferentes de medicamentos, que actúan de distintas maneras y sólo deben administrarse bajo prescripción médica, debido a los efectos secundarios que ocasionan.

El primer tipo está constituido por los laxantes estimulantes, que comprenden ciertas sustancias vegetales como el aloe o los aceites de castor y de crotón, que actúan por estimulación de la mucosa intestinal, o bien sobre los nervios de la pared intestinal, aumentando la potencia y la frecuencia de los movimientos peristálticos, que son las contracciones musculares rítmicas producidas por las paredes intestinales.

Otros ejemplos de laxantes estimulantes son: Podophillun senna (el laxante natural a base de hierbas más vendido en Estados Unidos), fenolftaleina, bisacodil, ácido dehidrocólico y cáscara sagrada.

El segundo tipo lo forman los laxantes osmóticos, que actúan reteniendo líquidos en el interior del intestino; entre éstos se encuentran el fosfato y el sulfato sódico, varias sales de magnesio, como el sulfato y el hidróxido magnésico, diversas aguas minerales y la lactosa.

Por último, existen los laxantes reblandecedores o lubricantes, como la parafina, que se aplican por vía rectal en casos críticos.

Conviene hacer notar que la fabricación de aloína pura es realizada exclusivamente por laboratorios farmacéuticos reconocidos, ya que su proceso de elaboración considera estrictos parámetros de control de calidad.

En los siguientes párrafos se transcribe los principales aspectos que hacen referencia al acíbar de aloe vera, según la Real Farmacopea Española.

"Los Principios Activos del acíbar de aloe vera son: derivados hidroxiantraquinónicos (25-40%); aloínas A y B (aloína, barbaloína), aloerresinas A, B y C (glucosilcromonas). El contenido mínimo en

derivados hidroxiantracénicos expresados en barbaloína no debiera ser inferior al 28% de la droga desecada."

"La Acción Farmacológica del acíbar es la siguiente:

- A bajas dosis (10-60 mg/día), es tónico digestivo, colagogo.
- Dosis medias (100 mg/día) producen un efecto laxante.
- Dosis mayores (200 mg/día), purgante."

"Los derivados hidroxiantracénicos se transforman en el instentino en aloe-emodín antrona, que produce una acción irritante sobre las terminaciones nerviosas de la membrana intestinal, que comporta un incremento en la secreción mucosa y un aumento del peristaltismo, junto con una inhibición de la reabsorción de agua y electrolitos, especialmente potasio."

"De esta forma, las principal Indicación del acíbar es: estreñimiento ocasional. En cambio, sus Contraindicaciones son: embarazo, lactancia, niños menores de diez años, dolor abdominal de origen desconocido, abdomen agudo, obstrucción de las vías biliares, hemorroides, cistitis, prostatitis, enfermedad de Crohn, colitis ulcerosa, colon irritable, insuficiencia cardíaca o renal."

"Tanto el acíbar como la aloína o barbaloína, a dosis extraterapéuticas, pueden producir un intenso efecto emetocatártico, con diarreas sanguinolentas, dolores cólicos intestinales, vómitos, hipotermia, albuminuria, convulsiones y colapso. Sin embargo, el mayor peligro de los laxantes irritantes radica en la automedicación y en el uso (abuso) crónico: tomados de forma continuada producen una pérdida de electrolitos que altera el equilibrio sodio-potasio. La depleción de potasio produce finalmente una parálisis de la musculatura intestinal, que comporta una perdida de efectividad laxante y el estreñimiento se

perpetúa, lo que obliga a aumentar paulatinamente la dosis, originando a largo plazo daños irreversibles sobre la membrana y la musculatura intestinal."

En el documento "Medicinal HerbFAQ" publicado por la Universidad de Carolina del Norte, en Estados Unidos, en febrero de 1998, se afirma que "La popularidad del aloe vera se ha visto incrementada durante los últimos años y de hecho es una hierba maravillosa para uso externo sobre la piel. Pero, a causa de su uso, su nombre se está haciendo cada vez más conocido y algunas personas asumen que si resulta segura para un propósito, lo será para otros. ¡Pero no es así!"

El mismo documento citado en el párrafo precedente establece lo siguiente: "Muchos herbalistas occidentales no recomiendan el aloe como laxante porque es muy fuerte. Michael Castleman en su popular libro "Las Hierbas Curativas", tiene una recomendación bajo el título de Aloe; "Nunca como laxante". El dice que es el "más drástico" de los laxantes catárticos y que es el menos recomendado porque a menudo causa severas contracciones musculares del intestino y diarrea."

Por último, cabe señalar lo formulado en el "WHO Pharmaceuticals Newsletter" de septiembre-octubre de 1998, publicado por la Organización Mundial de la Salud, referente a laxantes que contienen aloe, bisacodyl, cáscara sagrada y senna: "En el contexto de la revisión de los ingredientes laxantes que son vendidos sin prescripción médica, la Food and Drug Administration ha propuesto reclasificar los ingredientes laxantes estimulantes: aloe, bisacodyl, cáscara sagrada y senna (incluyendo sennosidas) desde Categoría I ("generalmente reconocidos como seguros y efectivos") a Categoría III ("se necesita más datos"). La Agencia revisó los datos disponibles en relación a estos productos y concluyó que los datos cancerígenos son insuficientes".

De hecho, el senna había reemplazado hace poco, como ingrediente laxante, a la fenolftaleina química, a la cual se le comprobaron tendencias cancerígenas, lo cual obligó también a reclasificarla, pero en Categoría II, es decir, "No reconocida generalmente como segura y efectiva o erróneamente etiquetada".

Por lo anteriormente expuesto en esta sección, es posible concluir que el acíbar, como subproducto del aloe vera, no constituye un mercado promisorio y presenta una demanda en declinación; de hecho prácticamente ningún vendedor de gel de aloe vera ofrece acíbar o aloína en su lista de productos. No obstante, en virtud que el estudio anterior "Investigación para la producción de vegetales en zonas áridas y semi-áridas de la Región de Coquimbo" consideró en sus análisis el acíbar como un subproducto importante, se evaluará la rentabilidad de su producción y comercialización, haciendo el supuesto que los volúmenes a obtener podrán ser efectivamente colocados en los mercados externos.

c) Gel líquido de aloe vera

Respecto del gel (líquido) de aloe vera, de acuerdo a lo investigado, la modalidad de mayor presencia en el mercado es **10X**, es decir, el concentrado que para ser reconstituido requiere de 1 parte de gel por 9 de agua. La afirmación anterior es confirmada por lo explicado por la firma CAC Concetrated Aloe Corporation, quien afirma[4] "Después de años de experiencia en la elaboración y manejo de líquidos concentrados, 10X exhibe la mejor estabilidad y retiene la mayor parte de la identidad original de aloe que concentraciones más altas. Mientras más tiempo permanece el aloe en el evaporador, más se alteran sus propiedades naturales. El producto también puede ser filtrado más fácilmente y purificado en forma completa que un producto con mayor

[4] Artículo publicado en http://www.conaloe.com/newpage2.htm

concentración. El resultado es un concentrado que no solidifica a bajas temperaturas y cuando es restituido aún retiene el sabor y características del agua madre."

A continuación del gel de concentración 10X, aparecen con mayor frecuencia publicados el gel natural (1X) y el gel en concentración 40X. De acuerdo a los antecedentes recogidos de entrevistas a químico-farmacéuticos nacionales, el gel de aloe vera tiende a oscurecerse cuando permanece almacenado por períodos superiores a treinta días, aunque haya sido estabilizado. Esto puede alterar el color del producto final en cuya elaboración sea empleado el gel (shampoo, jabón, crema, etc.). Por este motivo, algunos laboratorios prefieren usar el gel en polvo.

d) Gel en polvo de aloe vera

Otro producto semi-elaborado, como se señaló anteriormente, lo constituye el gel con concentraciones más altas, es decir, en estado sólido y con presentación de polvo. Para producir el polvo de gel de aloe vera se utilizan dos métodos: deshidratación por spray (aerosol) o método tradicional y liofilización.

La liofilización da la oportunidad de evitar la desnaturalización causada por el calentamiento del producto, ya que lo mantiene congelado durante todo el proceso de secado. Esta es la ventaja más evidente sobre el método de secado por evaporación. Igualmente importante es que en la etapa de secado por evaporación o fase líquida hay una filtración y concentración no deseada de componentes activos que causan daño y se acumulan en la superficie del producto, obstruyendo el proceso de evaporación. Esto se elimina con el método de deshidratación por spray, pero tiene el inconveniente que necesita calentar el producto a temperaturas cercanas a los 100°C. Lo anterior ha convertido al gel

liofilizado en el producto preferido por la industria cosmética, aunque aún debe bajar sus costos de producción para poder ingresar con mayor facilidad al mercado, puesto que es un producto más caro que el gel en polvo obtenido por spray.

Según lo define Thomas A. Jennings, Ph. D., en su artículo de noviembre de 1998, "Revisión del proceso de liofilización", publicado por la empresa Phase Technologies en internet[5], el proceso de liofilización es "Un proceso de estabilización en el cual una sustancia es primero congelada y luego se reduce la cantidad de solvente (generalmente agua), primero por sublimación (conocido como el proceso de deshidratación primario) y luego por desorción (conocido como el proceso de deshidratación secundario) a valores que no permitirán actividad biológica o reacciones químicas.".

Sublimación es el proceso mediante el cual una sustancia, tal como hielo, va del estado sólido al estado gaseoso, sin pasar por la fase líquida. Para facilitar este proceso se somete el producto congelado a vacío.

Desorción consiste en sacar el agua restante, luego de la sublimación, desde la superficie del producto, lo cual se logra subiendo un poco la temperatura, pero manteniendo una presión baja.

En general la liofilización debiera ser usada cuando el producto cumple con uno o más de los siguientes criterios: inestable, vulnerable al calor, se requiere un tamaño mínimo de partículas, se requiere dosificación muy precisa, se requiere una completa re-hidratación y el producto tiene un alto valor.

[5] Ver dirección http://www.phase-technologies.com/html/vol._1_no._9.html

Las principales ventajas del proceso de liofilización son:

i) Mantiene la calidad del producto porque éste permanece a una temperatura por debajo del punto de congelamiento durante el proceso de sublimación.

ii) Los productos liofilizados generalmente se pueden almacenar sin refrigeración, lo cual lleva asociada una reducción significativa de costos de almacenamiento y transporte.

iii) La liofilización reduce el peso en forma importante, lo cual hace que los productos sean más fáciles de transportar.

iv) Ya que los productos liofilizados son porosos, resulta muy fácil re-hidratarlos.

Las principales desventajas del proceso de liofilización son:

i) Alto costo de los equipos (alrededor de tres veces más que los de otros métodos).

ii) Alto costo de energía (2 a 3 veces más que los métodos tradicionales).

iii) Largo tiempo del proceso (típicamente un proceso de secado dura 24 horas).

e) Productos derivados del aloe vera

A continuación se presenta un listado con los principales productos derivados del aloe vera que se comercializan en el mundo:

- Acondicionador para el cabello
- Crema para las manos
- Crema para el cuerpo

- Desodorante
- Gel de baño
- Jabón líquido
- Jalea
- Jugo – Néctar
- Loción para pies
- Loción para después de afeitarse
- Pañales
- Pasta de dientes
- Protector solar
- Protector labial
- Shampoo
- Suplemento dietético
- Té de flores de aloe vera
- Tabletas - Cápsulas
- Tonificador para el cuerpo
- Líneas de productos veterinarios

Particularmente, en Chile se comercializan algunos productos de la industria cosmética y de cuidado personal, como son los acondicionadores para el cabello, shampoos, cremas, desodorantes, protectores solares, jabones, pañales y protectores labiales. En el Cuadro N°4.1-2 se presenta un listado de los productos que se comercializan en los principales supermercados y farmacias de Chile, en cuyo contenido está presente el aloe vera.

Cabe señalar que muchos de los productos que aparecen mencionados en el Cuadro N°4.1-2 están presentes sólo en algunos locales del sector oriente de Santiago y según los encargados de las tiendas o sus secciones correspondientes, no es masiva su comercialización. Generalmente, los productos fabricados por la empresa Lever S.A.

tienen mayor presencia. Además, la mayoría de los productos en venta es importada.

Dados los antecedentes recogidos, considerando los productos con mayor presencia en el mercado y los alcances del presente proyecto, se ha considerado adecuado enfocar el estudio del aloe vera, en su calidad de materia prima y como producto semi-elaborado, es decir:

- Hojas de aloe vera
- Plantas pequeñas de aloe vera, para propagación (hijuelos)
- Gel Líquido (concentración a definir)
- Gel en Polvo (concentración a definir)
- Pasta de acíbar

Cuadro Nº4.1-2

Productos comercializados en supermercados y farmacias de Santiago de Chile que contienen Aloe Vera

Producto	Marca	Nombre - Descripción	Cont.	Precio [1]	Origen	Fabricante	Importador
				(US)			
Acondicionador	Clairol	Herbal Essences - Sábila, Manzanilla y Jojoba	340 gr	4.00	USA	Clairol, Inc.	Squibb & Sons - Durandin
Acondicionador	Sedal	Aloe Progressive	400 ml	2.60	Chile	Lever S.A.	
Acondicionador	Suave	Herbal Care Conditioner - Aloe Vera, Honeysuckle & Vit. E	444 ml	2.40	USA	Helen Curtis	SAGRA Ltda.
Crema	Atrix	Cuidado Activo Para Manos - Age Control Cream	100 ml	3.90	Chile	Beirsdorf S.A.	
Crema	Aloe & E Snip Caps	Crema en cápsulas	100 un	5.20	USA		Emproquim Ltda.
Crema	Hinds	Linea Natural - Emulsión con Aloe Vera		0.00	Argentina	n/d	Smith Kline Beecham Chile S.A
Crema	Jergens	Skin Care - Enriquecida con Aloe - Crema Para Manos y Cuerpo	300 ml	4.60	Argentina	Sintaryc S.A.I.C.	Cosmética Davis S.A.
Crema	Kadus	Loción Crema - Cuerpo y Manos - Enriquecida con Aloe y Lanoline	300 ml	3.50	Chile	Laboratorio Kadus S.A.	
Crema	Revlon	Natural Honey - Loción Humectante con Gel Aloe	210 ml	3.70	Chile	Laboratorio Davis S.A.	
Crema	St. Ives	Aloe Vera Therapy Lotion With Soothing Whole Leaf Aloe	532 ml	7.90	USA	St. Ives Laboratories, Inc	Key Company S.A.
Crema	St. Ives	Rehydrating Hand & Body Lotion	330 ml	3.50	USA	St. Ives Laboratories, Inc.	Key Company S.A.
Desodorante	Lady Speed Stick	Aloe Gel	65 gr	3.10	USA	Colgate-Palmolive	Colgate-Palmolive Chile S.A.
Jabón	Fami-Timotei	Jabón de Glicerina (liq.) - Hierbas y Aloe Vera	340 ml	1.90	Chile	Lever S.A.	
Laxante	Laxaloe	Cápsulas laxantes	40 un	4.20	USA		Arama Laboratorios
Pañales	Pampers	Premium con Aaloe Vera	14 un	6.20	USA	Procter & Gamble	Procter & Gamble S.A.
Protector Labial	Banana Boat	Aloe Vera Sunblock Lip Balsam	4,25 gr	1.90	USA	Sun Pharmaceuticals Corp.	Comercial Copari S.A.
Protector Labial	Chap Stick	Lip Balm	10 gr	2.60	USA	A.H. Robins Company Inc.	Labs. Wyeth, Inc. Chile
Protector Solar	Australian Gold	Aloe Freeze Gel	237 ml	12.40	USA	Australian Gold	VMS Comercial
Protector Solar	Australian Gold	Dark Tanning Dry Oil Spray	237 ml	10.70	USA	Australian Gold	VMS Comercial
Protector Solar	Australian Gold	Power Gel Biosine Complex	237 ml	11.60	USA	Australian Gold	VMS Comercial
Protector Solar	Australian Gold	Tan Extender moisture Lock - Aloe & Vitamin E	237 ml	10.60	USA	Australian Gold	VMS Comercial
Protector Solar	Baby Lee	Bloqueador Solar SPF-20 con Extracto de Calendula y Aloe Vera	180 ml	5.30	Chile	Colgate-Palmolive Chile S.A.	
Protector Solar	Banana Boat	After Sun Spray	236 ml	6.80	USA	Sun Pharmaceuticals Corp.	Comercial Copari S.A.
Protector Solar	Banana Boat	Sunless Tanning Lotion	110 ml	7.80	USA	Sun Pharmaceuticals Corp.	Comercial Copari S.A.
Protector Solar	Caribbean Breeze	All Day Sunblock Lotion - SPF 30	237 ml	8.40	USA	Caribbean Breeze Intl.	Sunrise S.A.
Protector Solar	Familand	Gel Solar - Zanahoria y Aloe Vera	170 ml	3.50	Chile	Laboratorio Durandin S.A.I.	
Protector Solar	Hawaian Tropic	30 Plus - Bloquador Solar	120 ml	9.10	USA	Tanning Research Labs.	Laboratorio Maver Ltda.
Protector Solar	Hawaian Tropic	Cool Aloe I.C.E. Burn Relief with Aloe Vera	240 ml	7.60	USA	Tanning Research Labs.	Laboratorio Maver Ltda.
Protector Solar	Johnson & Johnson	Sundown Aloe Gel - 95% Aloe	115 ml	8.60	Colombia	Johnson & Johnson	Key Company S.A.
Protector Solar	Nivea Sun	Tropical Milk	200 ml	7.30	España	BDF Nivea (S.A.)	Beirsdorf S.A.
Protector Solar	Rayito de Sol	Gel After Sun	200 ml	n/d	Chile	Laboratorio Petrizzio S.A.	
Shampoo	Alberto VO5	Tropical Dreams - Jenjibre Hawaino, Papaya y Aloe	444 ml	2.00	USA	Alberto Culver Co.	Key Company S.A.
Shampoo	Clairol	Herbal Essences - Sábila, Manzanilla y Flor de la Pasión	340 gr	4.00	USA	Clairol, Inc.	Squibb & Sons - Durandin
Shampoo	Fami-Timotei	Hierbas y Aloe Vera	600 ml	2.20	Chile	Lever S.A.	
Shampoo	Sedal	Aloe Progressive	400 m	2.60	Chile	Lever S.A.	
Shampoo	St. Ives	Swiss Formula - Aloe Vera	450 ml	2.60	USA	St. Ives Laboratories, Inc.	Key Company S.A.
Suplemento alim.	Arama Aloe	Cápsulas suplemento alimenticio	250 mg	2.70	USA		Arama Laboratorios

Fuente: Elaboración propia en base a visitas a supermercados Lider, Ekono, Jumbo, Unimarc, Almac y Farmacias Ahumada en Santiago.

(1) : Precios promedios a febrero de 1999. Tipo de Cambio utilizado: $500 / 1US$

4.2 Demanda

4.2.1 Caracterización de demandantes

Como se dijo en un principio, el mercado objetivo del presente estudio lo constituyen los demandantes de materias primas de aloe vera y productos semi-elaborados, quienes la utilizan para la fabricación de productos terminados pertenecientes a las industrias de productos naturales del área Cosmética y de Suplementos Alimenticios. Por ello, es importante revisar algunos antecedentes relativos a estos sectores industriales, a nivel mundial:

a) Industria cosmética

Según el estudio "U.S. Cosmetics & Toiletries Market: 1998/9 Edition" elaborado por la firma Market Studies, Inc., el mercado norteamericano de cosméticos y productos de cuidado personal alcanzó los US$23.900 millones en 1998. Las proyecciones sitúan el valor de este mercado en US$29.300 para el año 2003.

El mercado chileno mostró, por su parte, importaciones de productos cosméticos por un total de US$97,6 millones en 1998, principalmente de Estados Unidos (US$24,5 millones) y Argentina (US$22,3 millones). Las exportaciones chilenas fueron de US$28,9 millones, principalmente hacia Bolivia (US$8,5 millones), Perú (US$5,4 millones) y Argentina (US$4,6 millones).[6]

[6] Fuente: Cámara de la Industria Cosmética Chilena

Un estudio elaborado por Euromonitor, que se refiere específicamente a la venta de productos farmacéuticos sin receta durante el período 1994-1998[7], determinó que Chile es el país que tiene el gasto más bajo por habitante. Mientras el consumo de productos sin prescripción en Brasil alcanza a 18,4 US$/hab al año, en Chile se gastan US$4,1 por habitante al año. Entre los productos estudiados estaban remedios digestivos, tratamiento farmacéutico de la piel, vitaminas y complementos alimenticios.

El documento "Chile, un país para invertir en agroindustria", elaborado por Fundación Chile, afirma en su sección Hierbas Aromáticas y Medicinales: "Existe una tendencia mundial creciente hacia la elaboración de productos farmacéuticos, cosméticos y condimentarios a partir de elementos naturales de origen vegetal."

Un dato que resulta de gran interés para caracterizar a los demandantes de productos terminados y por lo tanto, de materias primas, dice relación con un estudio de mercado realizado por BCC-USA en julio de 1997, denominado "Drugs and Cosmetics for the Ageing Boomers". En este artículo se plantea que la generación que representa el poder económico en los Estados Unidos, conocida como los Baby Boomers, ya está cumpliendo los 50 años, lo que abre un camino de nuevos productos a ser comercializados para este grupo objetivo que comienza a envejecer, pero quiere seguir manteniéndose joven. Particularmente se vería favorecida la industria de cosméticos y productos de cuidado personal.

[7] Artículo publicado en suplemento Economía y Negocios del diario El Mercurio el 27/03/99.

Por otra parte, según lo determinó un estudio del mercado europeo ejecutado por Financial Times Pharmaceuticals, denominado "European Cosmetics & Toiletries: Maintaining Growth", en 1996, el mercado europeo de cosméticos y productos de cuidado personal en 1995 era de US$37.000 millones, considerando Bélgica, Francia, Alemania, Italia, Holanda, España, Suecia y el Reino Unido y se **estima seguirá creciendo**.

Finalmente, otro estudio de FT Healthcare, denominado "Global Pharma Markets", 1998, afirma que el mercado mundial de productos farmacéuticos, medido en ventas de todos los fármacos recetados, fue de más de US$250.000 millones en 1996. Las ventas en farmacias en los principales mercados nacionales (Estados Unidos, Japón, Alemania, Francia, España, Reino Unido, Canadá, Bélgica, Holanda e Italia) fueron de US$144.000 millones.

b) Industria de suplementos alimenticios

Con el fin de conocer algunas cifras que permitan dimensionar en mejor forma este sector industrial, a continuación se citan extractos de algunos artículos publicados en Nutrition Business Journal, que es una publicación especializada en alimentos naturales, vitaminas, hierbas, suplementos alimenticios y productos de cuidado personal.

Dic 98: "Las ventas de Nutracéuticos alcanzaron a US$91.700 millones en 1997 en el mundo. Se define Nutracéuticos como toda comida, bebida y suplemento alimenticio comprado principalmente por razones de salud, incluyendo la prevención y cura de enfermedades. Se aprecia un continuo crecimiento en

cada categoría y un persistente aumento de la participación de mercado de alimentos más saludables."

Oct/Nov 98: "Las ventas de suplementos/remedios, alimentos naturales y productos de cuidado personal naturales totalizaron US$65.000 millones en el mundo durante 1997. La industria de alimentos está floreciente en las economías desarrolladas y tiene un enorme potencial en las naciones emergentes."

Sep 98: "La industria de alimentos y productos de cuidado personal naturales **creció un 11%** en Estados Unidos, a US$23.200 millones en 1997, pero está en un proceso de transición desde un negocio emergente a uno consolidado."

Particularmente, un estudio de EuroConsult, Inc., empresa afiliada a la publicación Nutrition Business Journal, indicó que la industria mundial de suplementos alimenticios registró ventas por US$28.200 millones en 1995. De ese total, Europa tenía US$9.500 millones, Estados Unidos US$8.200 millones, Japón US$5.200 millones, otros países asiáticos US$3.200 millones y Canadá US$700 millones. Sin embargo, en Europa las ventas fueron más altas para los productos botánicos US$6.000 millones, seguidos por las vitaminas y minerales US$3.100 millones y productos nutritivos para deportes con US$400 millones.

En Estados Unidos se venden alrededor de 1500 a 1800 productos botánicos como suplementos alimenticios. De acuerdo a una encuesta del mercado de suplementos botánicos en Estados Unidos, los 10 productos "Top" en ventas eran: *equinácea*, ajo, sello de oro, ginseng, ginkgo, *saw palmetto*, aloe, ma huang, ginseng siberiano y cranberry.

En general, a nivel internacional, los demandantes de productos semi-elaborados de aloe vera son los laboratorios cosméticos, laboratorios farmacéuticos e industrias de suplementos alimenticios que fabrican productos que contienen aloe vera. A nivel nacional, no se ha identificado producción industrial de suplementos alimenticios que contengan aloe vera. Sólo existe una línea de productos importados, con venta directa, que comprende jugos bebestibles de aloe vera (Forever Living Products).

4.2.2 Estimación de demanda interna y externa

a) Demanda Interna

La demanda interna de productos semi-elaborados de aloe vera puede ser inferida a partir de los datos contenidos en el Cuadro N°4.1-2 presentado anteriormente. De aquí se desprende que de los 37 productos encontrados, sólo 10 son fabricados en Chile por 7 laboratorios diferentes. Ellos son:

- Lever S.A.
- Beirsdorf S.A.
- Laboratorio Kadus S.A.
- Laboratorio Davis S.A.
- Colgate Palmolive Chile S.A.
- Laboratorio Durandin S.A.I.
- Laboratorio Petrizzio S.A.

Teniendo presente que en Chile no existen productores industrializados de materia prima ni productos semi-elaborados de aloe vera, el siguiente paso fue investigar las estadísticas de

importación de la Cámara de Comercio de Santiago, manejadas por el Servicio de Información Comercial (SIC), dependiente de PROCHILE, desde enero de 1995 hasta diciembre de 1998, con el fin de identificar los demandantes nacionales y contrastar los datos obtenidos con el listado de oferentes nacionales de productos derivados del aloe vera.

En este contexto, se investigaron todas las posibles Glosas Arancelarias en las cuales podría ubicarse el producto en estudio. Particularmente, se hizo el seguimiento de las Glosas que se presentan en el Cuadro N°4.2-1 a continuación:

Cuadro N°4.2-1

Partidas Arancelarias Investigadas

Partida	Descripción
1302.19.00	Jugos y extractos vegetales
1404.00.00	Prod. Vegetales no exp. ni comprendidos en otras partidas
1404.90.00	Los demás Prod. Vegetales no exp. ni comp. en otras...
2106.90.10	Polvos para la fabricación de budines, cremas, gelatinas...
3301.29.00	Los demás aceites esenciales, excepto los de agrio
3301.90.00	Los demás extractos vegetales
3304.00.00	Preparaciones de belleza, de maquillaje o para el cuidado...
3304.91.00	Polvos, incluidos los compactos, de belleza, maquillaje o...
3304.99.00	Las demás preparaciones de belleza, de maquillaje y para...

En el Anexo N°1 se presentan las Estadísticas de Importación de aloe vera, obtenidas para cada glosa y por cada año, de los registros de la Cámara de Comercio de Santiago, procesados por PROCHILE.

De estas estadísticas se logró identificar a los principales importadores, entre los cuales destacan:

- Beirsdorf Chile S.A.
- Laboratorios Davis S.A.
- Colgate-Palmolive Chile S.A.
- Proaltec S.A.
- Reutter Ltda.
- Laboratorio Chile S.A.
- Representaciones de Materias Primas Industriales S.A. (MAPRIN)
- Forever Living Products de Chile S.A.
- Laboratorio Chile S.A. (muestras para ensayos)
- Cosméticos Avon S.A.

El resto corresponde a pequeñas partidas importadas por droguerías o particulares, algunas de ellas como muestras o con carácter experimental a menor escala.

De lo anterior se puede concluir lo siguiente:

i) Los laboratorios que fabrican productos que contienen aloe vera e importan directamente su materia prima desde sus casas matrices son:

- Beirsdorf Chile S.A.
- Laboratorios Davis S.A.
- Colgate-Palmolive Chile S.A.

ii) Los laboratorios que fabrican productos que contienen aloe vera y compran su materia prima a terceros en Chile son:

- Lever S.A.
- Laboratorio Kadus S.A.
- Laboratorio Durandin S.A.I.
- Laboratorio Petrizzio S.A.

iii) Por lo tanto, existe un tercer tipo de actor en el mercado chileno de productos semi-elaborados de aloe vera, éstos son representantes de firmas extranjeras de materias primas para la industria farmacéutica y cosmética; entre ellos destacan:

- Proaltec S.A.
- Reutter Ltda.
- Representaciones de Materias Primas Industriales S.A. (MAPRIN)

iv) Por otra parte, aparecen en los listados de importadores dos compañías que no son vendedoras de materias primas, productos semi-elaborados ni comercializan sus productos en canales de retail, ellos son:

- Forever Living Products de Chile S.A.
- Cosméticos Avon S.A.

La firma Forever Living Products tiene un esquema de comercialización basado en el esquema de Marketing de Multi Nivel (MMN) o piramidal. Es decir, funciona

con personas que organizan sus propios equipos de distribuidores y así sucesivamente, hasta conformar una pirámide en la cual cada uno gana un cierto porcentaje sobre las ventas de cada distribuidor que pertenece a su rama. Es el caso de la conocida empresa Amway, que comercializa productos de limpieza para el hogar. Por norma, ningún producto de estas empresas de tipo "MMN" puede ser ofrecido en tiendas ni expuesto en ninguna vitrina. Forever Living Products, el mayor productor y comercializador a nivel mundial de productos derivados del aloe vera, con ventas anuales de US$1300 millones, merece una especial mención en este estudio y sus antecedentes se presentan en el Anexo N°4. A modo de ejemplo, la pasta de dientes "Forever Bright – Sparking Aloe Vera Toothgel", en su envase de 130 gr, cuesta $4.076 (US$8,15). Forever Living Products importa los productos terminados directamente desde su casa matriz en USA.

Un caso similar ocurre con la compañía AVON, que mantiene una gran dotación de vendedoras puerta a puerta y que en sus catálogos presenta una serie de productos que contienen aloe vera, tales como:

- SHEEN – crema cosmética para el cabello con Aloe Vera, 55 gr, $1.800 (US$3,60).
- Línea Natural, Shampoo Aloe Vera, 400 ml, $1.290 (US$2,58).
- Línea Natural, Acondicionador Aloe Vera, 400 ml, $1.290 (US$2,58).

AVON, por su parte, importa la materia prima directamente desde su casa matriz en USA.

A partir de los antecedentes recogidos, se tomó contacto con algunos de los representantes de firmas extranjeras proveedoras de materias primas, con el fin de poder dimensionar con mayor precisión el tamaño del mercado nacional. Mediante entrevistas, donde se analizaron los datos de importaciones, se concluyó que existen muchos errores de digitación, ya sea en el documento original (declaración de importación), como en el traspaso de los datos a la Aduana. No es posible que un kg de polvo cueste del orden de US$10 (valor CIF), si su precio promedio en USA es aproximadamente 15 veces mayor. Por otra parte, aparecen unidades en kg, donde el precio corresponde a libras, lo que fue comprobado con el propio importador, etc.

En todo caso, según los antecedentes recogidos, se concluye que el tamaño del mercado nacional de materias primas de aloe vera, fluctúa entre 400 kg. y 600 Kg. de gel en polvo al año y por otro lado, entre 1.000 Kg. y 1.500 Kg. de gel líquido al año.

b) Demanda externa

Según lo investigado en las fuentes de información consultadas, específicamente en las bases de datos que contienen análisis de mercado y precios de transacciones de commodities a nivel mundial, tales como FAO, AGRIS, CAB, USDA, FAS, UN, no existen datos estadísticos a nivel internacional de volúmenes ni montos transados de aloe vera en el mundo, lo cual fue

confirmado por el Sr. Gene Hale, Director Ejecutivo del IASC (Ver Anexo N°5). Particularmente en Estados Unidos, los productos de aloe vera son clasificados dentro de las categorías de Alimentos o Cosméticos, lo que hace imposible conocer sus niveles de transacción. Tampoco aparecen datos específicos sobre plantaciones de aloe en el último censo agrícola de Estados Unidos, por el hecho que su porcentaje de participación en el total plantado es muy pequeño.

No obstante lo anterior, podemos considerar que la demanda externa de materia prima estará dada por grandes y medianos fabricantes de productos semi-elaborados o productos terminados que contienen aloe vera en Estados Unidos y Europa, cuyos mercados muestran tendencias de crecimiento.

En este sentido, cabe señalar, a modo de ejemplo, que la empresa Carrington Laboratories, Inc., una de las más importantes empresas en el mercado de materias primas de aloe vera en el mundo, señala en su Memoria Anual de 1997[8] que su filial Caraloe, Inc. posee en Costa Rica 84 Há plantadas con aloe vera y que las actuales necesidades de hojas de aloe vera exceden la capacidad de producción de las plantaciones propias, requiriendo por lo tanto la compra de hojas a terceros.

Similar es el caso de la firma Forever Living Products International, cuyo principal producto es el Jugo (Bebida) de aloe vera, que posee 2,000 Há de plantaciones de aloe vera, gran parte de estos cultivos están ubicados en Harlingen, Texas, USA, otra parte está en República Dominicana.

[8] Archivos de SECURITIES AND EXCHANGE COMMISSION de Estados Unidos.

También la firma CAC, Concentrated Aloe Corporation, una de los más grandes proveedores de productos semi-elaborados de aloe vera de Estados Unidos, posee plantaciones propias de 500 Há. Ambos se han visto en la necesidad puntual de comprar materia prima a terceros, debido a fuertes incrementos de la venta. No obstante, lo anterior no asegura que en un futuro no logren el autoabastecimiento.

Cabe hacer notar que CAC, Concentrated Aloe Corporation, en sus comienzos, sólo se dedicaba a producir y comercializar hojas y gel natural de aloe vera, 11 años después se inició en la fabricación de concentrados.

Finalmente, ocurre lo mismo con la empresa CRH International, Inc., productora y comercializadora de materias primas y productos terminados con aloe vera, que posee plantaciones en Texas y México, que suman en total 150 Há.

4.2.3 Estacionalidad de la demanda

En general, la demanda mundial de productos semi-elaborados no presenta estacionalidad, dada la naturaleza de los productos derivados (cosméticos, fármacos y suplementos alimenticios, fundamentalmente). Una excepción la constituyen los protectores solares, ricos en gel de aloe vera, que son altamente demandados en época de verano, principalmente en el hemisferio norte.

4.2.4 Niveles de Calidad exigidos por los demandantes

Pensando en convertirse en un potencial abastecedor de las industrias cosmética, farmacéutica y alimenticia, la calidad del

producto y de los procesos utilizados, será una **variable clave** para ingresar al negocio. De hecho, cuando se trata de laboratorios extranjeros, la materia prima, además de pasar todos los controles de calidad en Chile, tales como el Instituto de Salud Pública, debe pasar por un proceso de certificación y homologación en los laboratorios de control de calidad de las casas matrices. Sólo si se pasan estas pruebas, la casa matriz autoriza a sus subsidiarias a adquirir el producto a ese determinado proveedor. Lo que hace incluso que el precio pase a ser una variable de segundo orden.

En términos de lo que un consumidor pudiera esperar de la calidad de un producto derivado de aloe vera, se presentan como deseables atributos del producto, según lo formulado por la firma Aloe Falls, los siguientes:

1) Confiabilidad del contenido de aloe publicado en la etiqueta del producto: mediante exámenes de laboratorio se puede constatar la presencia de polisacáridos y glicoproteinas.

2) Calidad del aloe vera utilizado: debe haber sido cultivado sin pesticidas ni herbicidas, es decir mediante procesos orgánicos. Se debe haber procesado las hojas no más allá de 6 horas de cosechadas.

3) Presencia de preservantes: sólo se debe utilizar los preservantes autorizados y en la mínima medida necesaria. Algunos de los preservantes comúnmente utilizados son ácido sórbico, sorbato de potasio y benzoato de sodio.

4) Presencia de aloína: la aloína es un laxante poderoso. Algunas empresas no remueven adecuadamente la aloína de las hojas de aloe vera interfiriendo con las propiedades originales del gel.

De esta manera, si una empresa quiere entrar al mercado con buenas posibilidades de permanecer, lo deberá hacer prestando atención al cumplimiento de los parámetros anteriormente descritos.

4.2.5 Proyección de la demanda interna y externa

Según la información recogida de la literatura investigada, es posible inferir que el mercado de los productos con componentes naturales para tratamientos de belleza y alimenticios, está en pleno crecimiento en países desarrollados, como es el caso de Estados Unidos de Norteamérica. En países en desarrollo se encuentra en su etapa de introducción, pero se espera una rápida expansión, siguiendo la tendencia observada en otros países.

Para el caso particular de la demanda por aloe vera, se presenta a continuación un extracto de un artículo publicado en The Journal of the International Aloe Science Cuncil, Inc., en el ejemplar de Otoño 1994, denominado "Se incrementa el uso del Aloe en el Mundo". El artículo completo, en inglés, se incluye en el Anexo N°5.

"Korea es actualmente el mayor mercado internacional para el aloe, con Japón en un cercano segundo lugar. Esta tendencia se está expandiendo rápidamente a toda el área de la cuenca del Pacífico, particularmente en Singapur y Malasia. Las ventas están subiendo en Australia también, en parte debido a la gran población japonesa presente en Australia."

"Muchos expertos industriales creen que la clave para la expansión de las ventas en Europa es precisamente Estados Unidos. Lo que se hace popular en Estados Unidos, rápidamente es acogido por Europa, lo cual es una excelente noticia para el aloe. La creciente popularidad de los ingredientes "naturales" en los cosméticos norteamericanos también beneficia al aloe. De acuerdo a Allan Mottus, consultor de la industria cosmética, los cosméticos "naturales" cuentan ahora con un 4% de los US$16.000 millones del mercado norteamericano de productos cosméticos. Este segmento del mercado está creciendo a una tasa anual de 12% a 15%, **alrededor de tres veces más rápido que la industria como un todo."**

"Como bebida, los jugos de aloe han sido por mucho tiempo un producto común en las tiendas de alimentos naturales en Estados Unidos y a través de compañías de marketing directo. Ahora están dirigiéndose a los mercados masivos."

"Aunque los jugos de aloe han tenido una limitada aceptación en Alemania y el Reino Unido, la gente de ambos países han demostrado una notable aceptación del aloe en una amplia gama de cosméticos naturales, tales como cremas limpiadoras y humectantes, productos para el cuidado del cabello, depilatorios y desodorantes."

"El uso del aloe está creciendo a una tasa algo menor en los países escandinavos, Suiza, Italia y España, pero hay un sorprendente mercado nuevo para los productos de cuidado personal de aloe en varias naciones Africanas, según lo afirma

Jess Clarke, Jr.[9], quien comercializa su línea de productos "Miracle of Aloe" en esa región."

Por otra parte, existe un Estudio de Factibilidad de Exportar Productos de Aloe a Japón, desarrollado por Japan External Trade Organization (JETRO) en febrero de 1996, presentado en el Anexo N°2, donde se afirma que los cosméticos hechos en base a productos naturales han ganado mucho terreno en Estados Unidos, ya que están siendo cada vez más conocidos por el público; lo mismo está ocurriendo en Japón, donde el mercado de productos de aloe se estima en 23.500 millones de yenes, es decir, aproximadamente US$196 millones de dólares.

Por lo anterior, es posible concluir que el ciclo del negocio se encuentra en su etapa de desarrollo o crecimiento y por lo tanto, es razonable esperar que aumenten los niveles de demanda, tanto interna como externa.

4.3 Oferta

4.3.1 Identificación de oferentes

Actualmente en Chile existen 3 proveedores de aloe vera como materia prima para la industria cosmética y farmacéutica, es decir, para la terminología empleada en el presente estudio, como productos semi-elaborados. Estos proveedores son representantes de las marcas:

- Cosmetochem (Suiza)
- Dragoco (Alemania)
- Terry Laboratories, Inc. (USA).

[9] INECON tomó contacto directo con el Sr. Jess Clarke, quien nos hizo llegar este artículo.

Algunos laboratorios cosméticos con fabricación nacional, como Cosméticos AVON S.A. o Laboratorios Davis S.A., como se señaló anteriormente, importan la materia prima directamente desde sus casas matrices y están impedidos de comprar directamente en Chile, fundamentalmente por razones de aseguramiento de calidad.

A nivel mundial existe un número importante de proveedores de productos semi-elaborados, la mayoría está concentrada en Estados Unidos y Europa. Algunos de los precios que se presentan más adelante en este informe fueron obtenidos de ellos. Entre los principales proveedores destacan:

- Agro-Mar, Inc.
- AloeCorp
- Aloe Laboratories, Inc.
- Aloe Vera of California
- Aloe Vera Products
- Aloe World
- Bio-Botanica, Inc.
- Carrington Laboratories
- Cosmetochem
- CRH International
- Dragoco
- Florida Foods Products, Inc.
- Frutarom Meer Corp.
- Garuda International, Inc.
- International Sourcing, Inc.
- Lily of the Desert
- Madis Botanicals, Inc.
- Morse Chemical, Inc.

- Nuskin
- QBI, Inc.
- R.I.T.A. Corp.
- Terry Laboratories, Inc.

4.3.2 Estimación de la oferta nacional y externa

En Chile no existe oferta de materia prima o productos semi-elaborados fabricados en el país, ya que no hay producción industrial de aloe vera. La oferta, como se dijo anteriormente, está representada por los importadores de marcas extranjeras, quienes están en condiciones de satisfacer completamente la demanda nacional. Ellos actúan a pedido y prácticamente no se mantiene stock en Chile. El proceso de importación es bastante rápido, pudiendo durar aproximadamente 5 días en algunos casos.

Aunque no existen datos estadísticos de transacciones de aloe vera a nivel internacional, se tuvo acceso a una estimación de la superficie plantada de aloe vera en el mundo, realizada por el IASC en 1994, la que se presenta en el cuadro N°4.3-1, en la siguiente página. Esta estimación considera una visión pesimista y otra optimista de las superficies plantadas a esa fecha.

Según Gene Hale, director ejecutivo del IASC, para actualizar estas estimaciones a 1999, los valores debieran ser aumentados en un 15% a 20%, incluyendo eventualmente a algún nuevo país.

Cuadro N°4.3-1

Estimación de superficie plantada de aloe vera en el Mundo

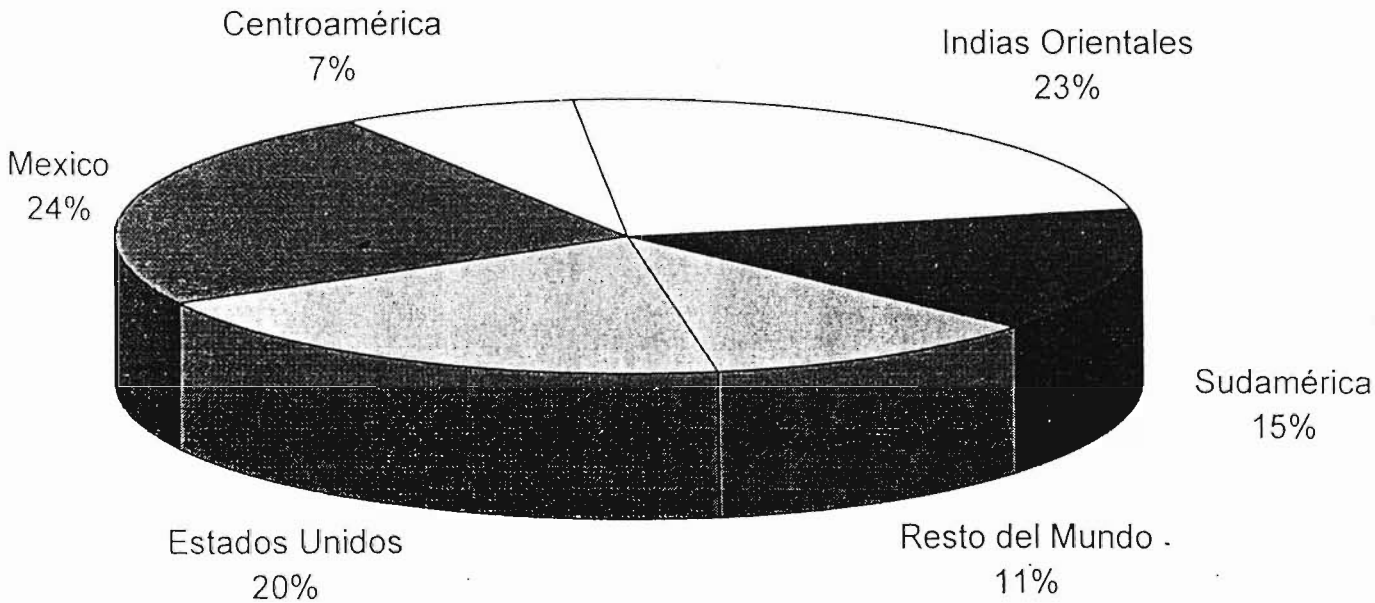
LUGAR	Estimación Baja (Há)	Estimación Alta (Há)
Estados Unidos	**624**	**1,076**
Texas	607	1,012
California	12	40
Florida	4	16
Oklahoma	1	8
Mexico	**1,214**	**1,295**
Centroamérica		**405**
Costa Rica	s/i	243
El Salvador	s/i	81
Guatemala	s/i	81
Indias Orientales	**238**	**1,274**
Rep. Dominicana	162	1,012
Puerto Rico	40	162
Dominica	36	40
Aruba	s/i	40
Haiti	s/i	20
Sudamérica	**324**	**809**
Venezuela	162	607
Brasil	162	202
Resto del Mundo	**56**	**585**
España	24	81
Australia	s/i	40
Israel	12	101
India	s/i	40
Tailandia	s/i	243
China	20	40
Corea	s/i	40
Totales	**2,456**	**5,039**

Fuente: IASC – 1994

Gráfico N°4.3-1

Distribución de superficie plantada de Aloe Vera en el mundo

Estimación alta - 1994



4.3.3 Oferta de los principales productos sustitutos

Por sus particulares características, prácticamente no existen sustitutos para el aloe vera. Sin embargo, se ha observado que se importan otros tipos de extractos de hierbas para la industria cosmética, como Manzanilla, Quilaya, Hamamelis y también Aceite de Jojoba, los cuales se ocupan principalmente en shampoos, jabones y cremas. Algunos de estos productos podrían comportarse incluso como complementarios, ya que hay algunos shampoos que, a modo de ejemplo, contienen, aloe vera y Aceite de Jojoba. No obstante, las cantidades observadas de estos extractos de hierbas son comparativamente pequeñas.

4.3.4 Estacionalidad de la oferta

Dado la diversificación geográfica de los cultivos de aloe vera y los diferentes laboratorios que ofrecen esta materia prima, no se observan estacionalidades en la oferta. Además, según lo informado por el IASC, los cultivos de Texas son cosechados cada 6 semanas, es decir 9 veces al año. En cambio, en Australia se han observado 3 a 4 cosechas al año aproximadamente.

4.3.5 Nivel de calidad de los productos ofrecidos

Según la información recogida, se ha generado un movimiento al interior de la industria del aloe vera, a nivel internacional, con el fin de establecer un conjunto de normas y parámetros de calidad para todos los productos derivados a partir del aloe vera. Este iniciativa está siendo liderada por el IASC y persigue evitar que se comercialicen productos con un contenido de aloe inferior al

indicado en la etiqueta o bien las materias primas utilizadas no hayan aprobado los controles de calidad correspondientes.

Un comité técnico integrado por miembros de universidades norteamericanas y del IASC definió un conjunto de parámetros que permitieran estandarizar la calidad de las materias primas y productos derivados del aloe vera (Ver Anexo N°5, Artículo "Current Status of Quality Control of Aloe Barbadensis Extracts" de los autores R.P. Pelley, Ying-Tung Wang[10] y T.A. Waller).

La obtención del Sello de Certificación emitido por el IASC, al cual pueden aspirar todos los fabricantes de materias primas o productos terminados de aloe de cualquier parte del mundo, implica que la compañía se ha sometido a una inspección y auditoría para verificar:

1) Que las operaciones son llevadas a cabo en condiciones sanitarias y que los productos son bacteriológicamente limpios.

2) Que la capacidad de la planta corresponde al volumen de producción obtenido.

3) Que el consumo de materias primas corresponde al volumen de producto obtenido.

4) Que los productos han sido sometidos a tests químicos para determinar que el contenido de aloe sea químicamente consistente con los parámetros generalmente aceptados.

[10] INECON tomó contacto con el profesor Wang, quien nos hizo llegar este documento.

Los parámetros establecidos para medir la calidad del contenido de aloe del gel líquido, son el contenido de Calcio, Manganeso y Acido Málico, el % total de sólidos y el grado pH, de acuerdo a lo presentado por el Cuadro N°4.3-2:

Cuadro N°4.3-2

Especificaciones de Calidad para gel líquido de aloe vera

TEST	RANGO ACEPTADO
pH	3.5 a 4.7
% de Sólidos	0.46 a 1.3
Calcio mg/l	98.2 a 448
Manganeso mg/l	23.4 a 118
Acido Málico mg/l	817.8 a 3427.8

Fuente: IASC (1999)

4.3.6 Proyección de la oferta

Se espera un crecimiento de la oferta acorde a las exigencias de la industria demandante, dado que está creciendo la superficie plantada en el mundo, las plantas van alcanzando un estado de madurez tal que les permite un mayor rendimiento y se ha mejorado la eficiencia de los procesos de obtención de materia prima y productos semi-elaborados.

Sólo en la medida que aumente explosivamente la demanda por productos alimenticios que contienen una alta concentración de aloe vera, como es el caso de los suplementos alimenticios, podría verse exigida la oferta mundial de materia prima, lo que incidiría favorablemente en los precios internacionales. Otro caso podría darse con una helada sobre los principales cultivos del mundo, como ocurrió en 1985 en Texas, donde se perdieron cientos de hectáreas de plantaciones de aloe vera y los

fabricantes de productos semi-elaborados o terminados debieron recurrir a terceros, en otros países, para abastecerse de materias primas.

4.4 Comercialización

4.4.1 Precio del producto

a) Precios de hojas de aloe vera

Existen mercados terminales de compra-venta mayorista y minorista de Hojas de aloe vera en Miami, Baltimore y Boston (USA), los cuales a la fecha presentan un precio promedio de US$10,8/caja[11] de hojas maduras de aloe vera, según información proporcionada por Departamento de Agricultura de Estados Unidos (USDA); no existe información de cantidades transadas en esos mercados.

No obstante, fueron obtenidos los precios de transacciones locales en los mercados terminales de Miami, Baltimore y Boston. En el Cuadro 4.4-1 se muestran los precios por cajas de hojas de aloe, obtenidos al día 26 de febrero de 1999.

[11] Una caja de hojas de aloe vera pesa aprox. 16 lbs.

Cuadro N°4.4-1

Precios de Cajas con Hojas de aloe en Mercados Terminales de USA
Datos al 26/02/1999

MERCADO TERMINAL	PRECIO PROMEDIO (US$/Caja)
Miami	8.50
Baltimore	12.00
Boston	12.00

Fuente: Federal-State Market News Service, USDA

b) Precios de productos semi-elaborados

Actualmente se tiene conocimiento de los precios CIF Chile de productos semi-elaborados importados vía aérea y marítima desde USA y Europa principalmente. Estos precios han sido obtenidos de las estadísticas de importación proporcionadas por la Cámara de Comercio de Santiago.

Al respecto es posible observar una gran variación de precios en productos aparentemente similares. A modo de ejemplo, según datos de 1998, 1 Kg. de polvo aloe vera, importado por Beirsdorf vía aérea desde Alemania, tiene un valor ex-fábrica de US$712.36, mientras que 1 Kg. de polvo de aloe vera, también importado de Alemania, aparece en otra importación con un valor FOB de US$76.76. Por lo tanto, fue necesario chequear estas cifras directamente con los importadores nacionales y con los exportadores en el extranjero.

En virtud de lo anterior, consultados los importadores nacionales de productos semi-elaborados, se concluye que se puede hablar de un valor CIF (Santiago de Chile) de gel en polvo 200X liofilizado, de buena calidad, del orden de US$180/Kg., aéreo, procedencia USA. El valor del gel en polvo en concentración de 100X no varía significativamente con respecto al 200X. La concentración 200X es la más utilizada en polvo.

El gel líquido de aloe vera de concentración 10X tiene un valor en Chile que fluctúa entre los US$10,00 y US$20,00 el kilogramo.

Los datos anteriores resultan consistentes con lo informado directamente por algunos proveedores norteamericanos, que hablan de valores entre US$150/kg y US$200/kg FOB Miami para el gel en polvo y entre US$11/kg y US$16/kg para el gel líquido de concentración 10X.

En el Cuadro N°4.4-2 se presenta las cotizaciones de precios para gel líquido, en polvo y aloína, efectuadas por algunos de los principales proveedores de productos semi-elaborados de Estados Unidos.

Cuadro N°4.4-2

Cotizaciones efectuadas por proveedores de productos semi-elaborados (valores FOB Miami)

Proveedor	Producto	Unidad	Precio U.	Tamaño de la orden
Bio-Botanica Inc.	Gel, 1X	US$/kilo	2.49	de 1 tambor (204kg)
	Polvo, 200X	US$/kilo	150.60	de 5 kg a 19kg
		US$/kilo	146.60	de 19 kg a 200 kg
		US$/kilo	145.00	sobre 201 kg
Florida Food Products, Inc.	Gel, 10X	US$/lb	5.20	
	Polvo	US$/kilo	250.00	
Morse Chemical, Inc.	Cosmetic grade 10X	US$/lb	6.00	de 40 lb a 450 lb
		US$/lb	5.00	de 450 lb a 4500 lb
	Food grade 10X	US$/lb	5.50	de 40 lb a 450 lb
		US$/lb	5.00	de 450 lb a 4500 lb
	Spray dried Polvo	US$/lb	85.00	de 1 lb a 9 lb
		US$/lb	75.00	de 10 lb a 49 lb
		US$/lb	65.00	de 50 lb a 200 lb
		US$/lb	55.00	sobre 200 lb
Frutarom Meer Corp.	Spray dried gel H200	US$/lb	62.00	50 lbs
		US$/lb	58.00	300 lbs
	Aloin	US$/lb	18.90	110 lbs
		US$/lb	18.60	550 lbs
International Sourcing Inc.	Gel 40X	US$/kilo	75.00	20-kg container
	Gel 10X	US$/lb	7.00	5-gallon container
	Gel liofilizado	US$/lb	125.00	
Madis Botanicals, Inc.	Polvo, 200X	US$/kilo	199.50	sobre 46 kilos
		US$/kilo	203.40	de 12 a 45 kilos
		US$/kilo	221.40	de 5 a 11 kilos
		US$/kilo	232.40	de 3 a 5 kilos
		US$/kilo	243.40	de 1 a 2 kilos
	Gel 10X	US$/kilo	17.96	de 1 a 206 kilos
		US$/kilo	17.35	de 207 a 420 kilos
		US$/kilo	17.15	de 421 a 2100 kilos
		US$/kilo	16.93	de 2101 a 3800 kilos
		US$/kilo	16.82	sobre 3800 kilos
R.I.T.A Corp.	Gel 1X	US$/lb	0.80	400-lb tambor
		US$/lb	1.80	40-lb tambor
	Polvo 200X	US$/lb	120.00	50-lb. tambor
		US$/lb	110.00	10-lb bags, sobre 50 lb
QBI, Inc.	Polvo 200X	US$/kilo	125.00	

Fuente: INECON, en base a contactos directos con los proveedores.

4.4.2 Distribución

La distribución del producto en el mercado nacional tiene básicamente dos modalidades: la primera consiste en que el laboratorio nacional importa directamente el producto desde un proveedor extranjero, en la mayoría de los casos lo importan desde la casa matriz, trayéndolo hasta sus propias bodegas. La segunda vía pasa por un intermediario nacional, que es quien lo importa y luego lo vende al laboratorio nacional.

La exportación de Hojas de aloe vera, en la medida que las pruebas de estabilidad lo permitan, se efectuaría directamente a fabricantes de productos semi-elaborados en el extranjero.

Para el caso de los productos semi-elaborados, por el lado de la exportación, se plantean dos alternativas: exportar directamente al laboratorio consumidor de este producto en el extranjero o bien, similar al caso de importación en Chile, exportar a un intermediario o distribuidor en el extranjero, quien se encarga de comercializar el producto en el país de destino. Para efectos de ingresar a algún mercado extranjero, es recomendable comenzar por la segunda alternativa, aunque los márgenes sean menores, para conocer y darse a conocer en el sector industrial. Una vez establecido, se puede pensar en una comercialización directa.

4.4.3 Análisis de las barreras arancelarias y no arancelarias de los mercados objetivo

Pensando en el mercado de Estados Unidos, no existen aranceles especiales ni cuotas arancelarias para el ingreso de aloe vera a esa nación. Según lo establecido por el Sistema Armonizado de

Tarifas Arancelarias de Estados Unidos, en su Capítulo 13 – Sección 1302, los productos de aloe vera que ingresen a Estados Unidos, deben pagar un arancel que va desde 0% a 1,2%, dependiendo de la clasificación final otorgada por los organismos contralores.

En todo caso, cabe señalar que las condiciones que enfrenta México, que es un importante productor de aloe vera, son de arancel cero, desde el 1° de enero de 1998, debido a su incorporación al Tratado de Libre Comercio de Norteamérica, NAFTA. Asimismo, los países del Caribe se encuentran adscritos al "Caribbean Basin Initiative (CBI o Iniciativa de la Cuenca del Caribe)", vigente desde 1984 y con término indefinido, el cual es un programa que libera de aranceles a la mercancía que ingresa a Estados Unidos, proveniente de 24 países del Caribe, entre los cuales está Aruba, Barbados, Costa Rica, República Domínicana, Jamaica, Trinidad y Tobago, todos ellos productores de aloe vera.

En términos de controles sanitarios el FDA - Food and Drug Administration – reconoce al aloe vera como un Jugo Vegetal, para uso externo solamente en cosméticos y para el tratamiento de quemaduras menores, irritaciones de la piel y quemaduras de sol. Al momento de llegar embarques a los puertos o aeropuertos, éstos son revisados por inspectores del FDA de acuerdo a procedimientos establecidos y controlados por el "Center for Food Safety and Applied Nutrition", dependiente del FDA. Dependiendo del producto, se puede requerir una muestra, la que es analizada en los laboratorios del FDA; el resultado es comunicado a la aduana y al importador. En el Anexo N°3 del presente informe se incluye el procedimiento completo de importación establecido por el FDA.

4.4.4 Características del envase

Según la procedencia del producto, se presentan básicamente dos tipos de envases:

Los productos importados de Europa vienen generalmente en bolsas de 25 Kg. y tambores de 200 Kg. . No obstante se puede comprar pequeñas cantidades desde 1 Kg.

Los productos importados desde Estados Unidos vienen en presentaciones de bolsas (doble pared de aluminio) y tambores, en galones o libras. Aunque también presentan envases en sistema métrico (kg).

4.5 Conclusión Del Estudio De Mercado

4.5.1 Evolución del mercado del aloe en el mundo

Dado lo expuesto anteriormente, el mercado de productos terminados o derivados del gel de aloe vera, se encuentra en una etapa de crecimiento a nivel mundial, especialmente en países desarrollados, donde el consumo de productos naturales ha tenido un fuerte auge los últimos 5 años. En países en desarrollo, el mercado se encuentra en una etapa de introducción y se visualiza un rápido crecimiento a un mediano plazo. Lo anterior, implica que una tendencia similar se aprecia para el mercado de materias primas y productos semi-elaborados de aloe vera, específicamente el mercado del gel de aloe vera, no así en el mercado de la pasta de acíbar y sus derivados. No obstante que el mercado de las materias primas ha sufrido grandes fluctuaciones de precio debido a que ha pasado por períodos de sobre-oferta. Un ejemplo de esta situación se produjo cuando Texas se convirtió en una de las principales zonas de cultivos del mundo a comienzos de los años ochenta, lo que hizo bajar los precios de la materia prima de tal forma que obligó a arrancar los cultivos en muchas partes del mundo.

4.5.2 Demanda actual y proyección futura en Chile

Si bien para Chile se espera un crecimiento del mercado del aloe vera, tanto de productos semi-elaborados para la industria cosmética y alimenticia, como también en su carácter de producto terminado, incluido en otros productos elaborados por estas industrias, el tamaño del mercado es relativamente pequeño. Hay que tener presente que muchos laboratorios

importan el producto de consumo masivo con aloe vera ya terminado.

4.5.3 Recomendaciones del estudio de mercado

Lo anterior indica que es el momento adecuado para ingresar al mercado internacional como proveedor de la industria cosmética o de suplementos alimenticios que fabrican sus productos a base de aloe vera, en la medida que los costos de producción y transporte sean tales que permitan llegar con un precio competitivo a mercados externos.

Por lo tanto, en la siguiente etapa del estudio, corresponderá contrastar los precios internacionales obtenidos con el costo de producción, transporte y comercialización de las materias primas y productos semi-elaborados que considere el estudio técnico. De esta manera, será posible determinar la rentabilidad del negocio.

De acuerdo a lo expresado anteriormente, se ha identificado el factor calidad como crítico para el éxito del proyecto, partiendo desde el tratamiento de los cultivos y pasando por el proceso productivo de gel líquido y en polvo, hasta llegar a la etapa de envasado, almacenamiento y transporte de los productos. Por lo tanto, este factor se tendrá presente en el desarrollo del estudio técnico y el análisis financiero del proyecto, en términos de incremento en los costos de producción.

5 ESTUDIO TÉCNICO-FINANCIERO

5.1 Procesos de Obtención de Subproductos de Aloe Vera y Costos Asociados

Para describir los procesos productivos para la obtención de los subproductos de aloe vera seleccionados, se utilizará la clasificación presentada en el estudio de mercado, es decir, materias primas y productos semi-elaborados.

Particularmente, se evaluará las siguientes alternativas:

Materias Primas

- Hojas de aloe vera
- Hijuelos

Productos semi-elaborados

- Pasta de acíbar
- Gel líquido en su concentración más común, que es 10X
- Gel en polvo, obtenido por liofilización, en concentración 200X

La comercialización de hijuelos será evaluada en forma conjunta con la ejecución de otros proyectos, dado que su producción es a todo evento e independiente del procesamiento posterior que se dé a las hojas de aloe vera. De esta manera, la producción y comercialización de hijuelos generarán ingresos y costos marginales que serán considerados simultáneamente en todas las evaluaciones.

Para una mayor comprensión del esquema que se utilizará para evaluar los proyectos, en la siguiente página se presenta un diagrama que indica las principales etapas por las que atraviesan los subproductos obtenidos a partir del aloe vera.

ETAPAS DEL PROCESO DE OBTENCION DE SUBPRODUCTOS DE ALOE VERA

		Materias Primas		Productos semi-elaborados
Plantación de hijuelos de aloe vera	Cosecha →	Hojas (1) Hijuelos (*) ↓ Venta Mercado	Proceso →	Pasta de acíbar (2) Gel líquido 10X (3) Gel liofilizado 200X (4) ↓ Venta Mercado

*: en conjunto con 1, 2, 3 y 4.

Teniendo presente que el estudio técnico es precisamente donde tiene más aceptación el uso de estándares por parte de los evaluadores de proyectos, los datos a utilizar fueron obtenidos en base a comportamientos previamente estudiados sobre otros productos agrícolas que se desarrollan bajo condiciones similares en la Región de Coquimbo, así como de fuentes de los mercados respectivos. No obstante ello, se debe tener presente, que tratándose éste de un proyecto de innovación tecnológica, las precisiones sobre estos valores deberán afinarse una vez que se toma la decisión de llevarlo a cabo.

Se determinará el costo de producción de cada materia prima a ser comercializada y cada producto semi-elaborado puesto en fábrica, con lo cual se podrá determinar la competitividad de los productos en función de los precios exhibidos en los mercados internacionales.

Para obtener lo anterior se trabajará en base a los costos directos de fabricación, de acuerdo a estándares técnicos que contemplan:

- Preparación de suelos
- Plantación
- Labores de cultivo
- Labores de cosecha
- Insumos
- Fabricación
- Transporte y comercialización

5.1.1 Descripción del proceso productivo y costos asociados para la obtención de hojas de aloe vera

La producción de hojas de aloe vera requiere principalmente de las labores propias de preparación de suelos, para posteriormente llevar a cabo la plantación de los hijuelos.

Se considerará un sistema de riego tecnificado que incluirá un pozo profundo con bomba capaz de abastecer 20 hectáreas de cultivos de aloe vera y una instalación de riego por goteo, cuya inversión se especifica en punto 5.2.

Se ha estimado requerimientos de riego cada 30 días, lo que considera el empleo de un jornal al mes, equivalente a $3.500 mensuales o bien $42.000 anuales por hectárea, por este concepto.

El proyecto establece explícitamente la NO utilización de insecticidas, fungicidas ni herbicidas de origen químico. Sólo se pueden emplear los insumos y fertilizantes autorizados para cultivos orgánicos, ya que el mercado así lo exige.

Dependiendo de la calidad inicial del suelo, se requerirán diferentes tratamientos de fertilización. Particularmente, para este caso, se ha estimado una fertilización anual de 1 tonelada de guano, con un costo de $30.000 por hectárea, en base a valores de mercado promedio. Alternativamente, podría considerarse una aplicación anual de ácido húmico (50lt/há), roca fosfórica (300 kg/há), guano rojo (1 ton/há), sulfomag (200kg/há) o nitrógeno (100kg/há).

Por otra parte, se ha estimado una obtención promedio de 6 hijuelos por planta al año, para lo cual se requiere la mano de obra necesaria para su extracción, que se estimó en 2 minutos por planta, considerando tiempos muertos, lo que multiplicado por 15.000 plantas por hectárea da 30.000 minutos o bien 500 horas. Es decir, se requerirán 60 JH al año para la obtención de hijuelos.

Para labores de cosecha de hojas se necesitará principalmente mano de obra para el corte de las materias primas desde el tallo y para su posterior embalaje. El corte de las hojas desde su base se realiza en forma manual con un cuchillo de gran tamaño. Se ha calculado que un trabajador puede cortar las hojas de cada planta y disponerlas en el bin correspondiente, en un minuto, considerando tiempos muertos. Esto significa 15.000 minutos por há, es decir 250 hr/há, o bien 30 jornales-hombre (JH). Entonces, para 3 cosechas al año, se requiere 90 JH de cosecha anual por hectárea.

Las hojas se ponen en bins, en una altura no superior a 70 cm, para su traslado a la planta de procesamiento, donde se someten a una limpieza. Luego, dependiendo del proceso escogido, las hojas serán embaladas o procesadas para la obtención de gel o

pasta de acíbar. El costo anual de limpieza y selección de hojas se ha estimado en $147.000, equivalente a 42 jornales-hombre.

En el caso de optar por los cultivos orgánicos, se deberá incluir el costo anual de certificación otorgado por Certificadora Chile Orgánico S.A. (CCO), dependiente de la Corporación de Investigación en Agricultura Alternativa (CIAL) o bien por el PROA. Se estima que dicho costo fluctúa entre los $150.000 y los $200.000 anuales por cultivo, que para efectos del tratamiento de los flujos de caja, se consideró incluido dentro de los gastos generales.

Los gastos generales, aparte de contemplar el ítem descrito en el párrafo anterior, incluyen los sueldos y salarios del personal administrativo, estimados en un Gerente, quien se encargaría de los aspectos comerciales, administrativos, financieros, de comercio exterior y de calidad del proceso productivo, entre otras funciones, más un asistente y los insumos de oficina necesarios para la operación. El costo promedio mensual equivalente de este ítem es de $1.200.000.

Para la posterior comercialización de las hojas se requerirá de un embalaje simple, tal como cajas de cartón, que minimice los efectos de golpes o roces, además de preservar las condiciones naturales después del corte. El proceso de embalaje considera un costo de $85 por kg, que incluye mano de obra y materiales (caja, etiquetas, cinta adhesiva, zuncho, pallet, timbres, etc.)

Los gastos de embarque, estimados en $375 por kg., consideran estiba-desestiba, inspecciones del Servicio Agrícola y Ganadero (SAG) y del United States Department of Agriculture (USDA),

certificados de origen, inspecciones de la Asociación de Exportadores y comisión de la agencia de carga.

El valor del flete terrestre del tramo La Serena-Santiago se estimó en $15/kg, el valor del flete aéreo para el tramo Santiago-Miami se estimó en US$1,25/kg y el valor del flete marítimo para el tramo Valparaíso-Miami (incluyendo el tramo Santiago-Valparaíso) fue estimado en US$0,55/kg. Todas las tarifas presentadas se obtuvieron del valor promedio aplicado por las empresas de transporte del rubro a empresas exportadoras de fruta nacionales en la temporada 98/99. El tipo de cambio empleado fue el utilizado para este estudio, de $500/US$.

5.1.2 Descripción del proceso productivo y costos asociados para la obtención de pasta de acíbar

Para la obtención de la pasta de acíbar en forma industrial, una vez cortadas las pencas, éstas son dispuestas con la parte cortada hacia abajo sobre canales de acero inoxidable que tienen cierta inclinación para facilitar el deslizamiento del jugo o acíbar que será recogido en el extremo inferior del canal en recipientes para su posterior transporte al sitio donde se realizará el proceso de cocción, a través de la utilización de una tecnología de lecho fluido horizontal, la cual está basada en la suspensión de material húmedo en aire caliente, realizada mecánicamente en un trayecto horizontal.

Para secar el producto se sitúa éste en la cabeza de un módulo cilíndrico horizontal donde un tubo agitador mantiene en centrifugación el material. En torno al módulo, hay una cámara cilíndrica coaxial, donde se efectúa el calentamiento con vapor o aceite térmico. En un intercambiador se precalienta el aire filtrado para ser enviado en la misma corriente con el material

húmedo. De este modo el material en turbulencia comienza a liberar el vapor que es extraído forzosamente por aspiración a través de una cavidad en el eje del turboagitador, obteniendo de este modo la pasta de acíbar de aloe vera.

Los costos asociados a la producción de pasta de acíbar son, en su primera etapa, los mismos que los asociados a la producción de hojas de aloe vera. A éstos hay que agregar todos los costos correspondientes al procesamiento industrial antes descrito, los que incluyen básicamente los ítems que a continuación se describen:

Se ha estimado un consumo mensual de insumos de producción de $8.000 por hectárea, lo que da un costo anual de $96.000 por Há. Este valor incluye costos de electricidad y combustibles, materiales de aseo y seguridad.

La mano de obra para el manejo de las hojas de las cuales se obtiene el acíbar, se ha estimado en 45 jornales-hombre al año por hectárea, a un valor unitario de $3.500, lo que da un total por este concepto de $157.500.

La mano de obra calificada para la operación de la maquinaria industrial, estimada en 45 días-hombre al año, a un valor unitario bruto de $30.000 por día, lo que da un total anual, para las 20 hectáreas, de $1.350.000.

El proceso productivo debe estar sometido a un control de calidad interno permanente, por lo que se considera 45 días-hombre de un laboratorista al año, con un costo de $15.000 por jornada. Es decir, $675.000 anuales.

Por otro lado, aparece un ítem de mantenimiento de maquinarias, contemplado en 30 horas al año a $14.750 por hora.

El proyecto contempla gastos administrativos, que corresponden al prorrateo de los gastos de administración y ventas, estimado en $14.400.000 al año, es decir, $1.200.000 mensuales.

Los gastos de embalaje suben a $185 por kilogramo, debido a que el embalaje de la pasta de acíbar requiere de cajas selladas, más resistentes que en el caso de los embalajes de hojas. Los gastos de embarque bajan a $125/kg, debido a que disminuyen los controles sanitarios a la salida del país.

A lo anterior se agrega un costo de certificación anual de calidad, otorgada por el IASC, la que es otorgada por producto elaborado, independiente de la cantidad de hectáreas utilizadas y tiene un valor estimado de US$5.000.

5.1.3 Proceso productivo y costos asociados para la obtención de gel líquido y liofilizado

Para la obtención de gel, una vez cortadas las pencas, se escurren (menos tiempo que para la obtención de acíbar) y se descortezan para posteriormente el gel resultante ser colocado en un túnel de congelación rápida, el cual consta de un compresor, batería, radiador, cinta transportadora y un control de mando.

El proceso se lleva a cabo lavando y desinfectando las hojas, para después realizar el cortado de la ligula, eliminando los lados de las hojas, extrayendo el gel, que una vez congelado y sometido al proceso de liofilización explicado anteriormente en

este informe, se obtiene como resultado un polvo de gel que mantiene en mayor grado sus propiedades originales.

Este proceso evita que un conjunto de reacciones sucesivas producto de la separación del vegetal madre de las hojas que luego de ser triturados, disgregados o tratados, al estar la pulpa expuesta al medio ambiente, provoque acciones químicas y bioquímicas en uno o varios compuestos susceptibles de oxidaciones, formando compuestos muy activos que reaccionan con compuestos que constituyen el fruto.

Similar al caso de la producción de pasta de acíbar, la producción de gel liofilizado contempla en una primera etapa los mismos costos que la producción de hojas de aloe vera. A lo anterior se debe agregar por lo tanto, los costos de producción del gel líquido o del gel liofilizado, según corresponda.

En el caso de la fabricación de gel líquido, con una concentración de 10X, los costos de producción consideran mano de obra para la sacar la cáscara de las hojas, estimados en 135 jornales por hectárea al año, lo que da un valor anual de $472.500 por hectárea.

Para la operación del evaporador se requiere 60 días-hombre de personal calificado, con un valor de $30.000 diarios, lo que da una suma anual de $1.800.000.

Los insumos de la producción de gel líquido consideran, electricidad, combustibles, materiales de seguridad, de aseo, insumos para el control de calidad y el uso de preservantes para lograr la estabilización del gel. Todo ello estimado en un valor

mensual promedio de $10.000, lo que da un valor anual de $120.000.

Se considera además los mismos valores para mantenimiento de equipos, control de calidad y gastos de administración que en el caso de fabricación de pasta de acíbar.

Los gastos de embalaje se estimaron en $135 por kilogramo. Los gastos de embarque se consideraron en $250/kg.

Los insumos de la producción de gel liofilizado consideran, electricidad, combustibles, materiales de seguridad, de aseo, insumos para el control de calidad y el uso de preservantes para lograr la estabilización del gel. Todo ello estimado en un valor mensual promedio de $14.000, lo que da un valor anual de $168.000 por hectárea.

Para fabricar gel liofilizado se requiere introducir el gel natural al equipo liofilizador, para lo que se debe considerar los costos de operación de este equipo, estimados en 90 días-hombre de mano de obra calificada, a una valor de $35.000 diario, da un total de $3.150.000 al año.

Se considera además los mismos valores para mano de obra para preparación de las hojas, mantenimiento de equipos, control de calidad y gastos de administración que en el caso de fabricación de gel líquido.

Los gastos de embalaje se estimaron en $185 por kilogramo; los gastos de embarque se consideraron en $125/kg, valores iguales al costo unitario empleado para la pasta de acíbar.

En el Cuadro N°5.1-1 se presenta un resumen de los coeficientes tecnológicos (transformaciones físicas de la producción) observados en la producción de hojas de aloe vera, hijuelos, acíbar en polvo, gel líquido y gel liofilizado, así como estimaciones de sus rendimientos. Esto último es importante por cuanto permite identificar ventajas comparativas en la producción y por consiguiente, fuentes de competitividad para la elaboración de productos semi-elaborados de aloe vera en la Región de Coquimbo.

Cuadro N º 5.1-1

COEFICIENTES TECNOLÓGICOS Y RENDIMIENTOS MEDIOS POR HECTÁREA

PROCESO PRODUCTIVO	ALTO	MEDIO	BAJO
Producción de hojas de aloe vera			
Número de plantas por héctarea	20,000	15,000	10,000
Número de hojas por cosecha por planta	3	3	3
Número de cosechas al año	3	3	3
Producción anual de hojas (unidades/Há)	*180,000*	*135,000*	*90,000*
Peso promedio de una hoja madura (kg)	0.400	0.400	0.400
Producción de Hijuelos de Aloe Vera			
Número de plantas por héctarea	20,000	15,000	10,000
Cosechas de hijuelos por planta	6	6	6
Número de cosechas al año	1	1	1
Producción anual de hijuelos (unidades/Há)	*120,000*	*90,000*	*60,000*
Producción de pasta de acíbar			
Rendimiento acíbar líquido (cc/planta)	14	14	14
Rendimiento acíbar líquido (litros/Há)	280	210	140
Coeficiente pasta de acíbar / acíbar líquido (kg/litro)	0.30	0.30	0.30
Rendimiento pasta de acíbar (kg/Há)	84	63	42
Producción anual de pasta de acíbar (kg/Há)	*252*	*189*	*126*
Producción de gel de aloe vera			
Rendimiento gel natural por hoja (90% rend) (kg/hoja)	0.36	0.36	0.36
Rendimiento gel natural por planta (kg/planta)	1.08	1.08	1.08
Rendimiento gel natural por hectárea (Kg/Há)	21,600	16,200	10,800
Producción anual de gel natural (kg/Há)	*64,800*	*48,600*	*32,400*
Producción anual de gel líquido 10X (kg/Há)	*6,480*	*4,860*	*3,240*
Coeficiente gel liofilizado (200X) / gel natural	0.005	0.005	0.005
Producción anual de gel liofilizado (kg/Há)	*324*	*243*	*162*

5.2 Determinación de la Inversión Necesaria Para Producir los Productos Seleccionados

5.2.1 Definición del perfil y tamaño de la empresa

Como no existe un mercado desarrollado en Chile, se supondrá que el proceso se llevará a cabo vía integración vertical hacia adelante, es decir, la empresa se hace cargo de la producción desde la siembra de los hijuelos de aloe vera hasta la comercialización de la materia prima y productos semi-elaborados para los mercados internacionales. De esta manera, se determinará un tamaño medio del predio, para efectos de evaluar los costos de explotación y la inversión inicial.

En la Región de Coquimbo, se presenta generalmente un clima mediterráneo árido, caracterizado por la concentración en invierno de las reducidas e irregulares precipitaciones. La irregularidad es la que ha hecho indispensable la construcción de embalses en la Región, para acumular importantes volúmenes de agua y garantizar estabilidad a una agricultura que aprovecha fundamentalmente las propicias condiciones climáticas locales. Se dice con razón, que el "Norte Chico" exporta clima, fundamentado en el hecho que a pesar de la pobre calidad de los suelos el disponer de un espacio climático muy benigno y escaso en el planeta favorece las condiciones de competitividad, tanto en mercados externos como internos.

En otro aspecto, la topografía influye en forma determinante en el clima, especialmente la incidencia de la proximidad del litoral marino que penetra profundamente los valles transversales, contribuyendo a regular las temperaturas y la humedad. En la medida que se avanza hacia el interior de los valles disminuye la

humedad, aumenta la luminosidad y las temperaturas medias, además de los diferenciales de temperatura entre día y noche, lo que influye favorablemente en el grado de azúcar y colorido de algunos frutos.

Respecto de la ocupación del suelo, la utilización de la tierra es extremadamente variable en función de la disponibilidad relativa de agua. Para la economía agrícola regional, los cambios provocados por la carencia de agua incide significativamente en la superficie cultivada y en su productividad, introduciendo factores de inestabilidad que impiden programar inversiones de mediano plazo que podrían incrementar su competitividad (infraestructura, plantaciones, maquinaria, etc.)

De acuerdo a ello es posible identificar en la Región de Coquimbo cuatro tipos de productores:

Empresario Moderno	Empresario Tradicional	Pequeño Productor con potencial agropecuario	Pequeño Productor sin potencial agropecuario
Se caracteriza por una buena gestión técnica de mercado y administrativa, altos niveles de productividad, flexibilidad en el uso de recursos, productor de rubros más rentables y dinámicos, tales como los productores hortofrutícolas.	Orientado básicamente a cultivos tradicionales con niveles tecnológicos de medios a altos, con baja capacidad de gestión y relación de mercados, poco flexibles en sus estructuras productivas, tales como los productores de cultivos anuales, especialmente la papa.	Principalmente vinculado a agricultores rezagados, parceleros o productores de riego y secano con potencial de recursos. Requieren de inversiones adicionales y apoyo tecnológico para integrarse a rubros más rentables.	Minifundistas localizados en los secanos interiores y costeros agrupados principalmente en comunidades agrícolas que desarrollan agricultura tradicional de subsistencia, cuyos ingresos son mayoritariamente de origen extrapredial.

La estratificación predial usualmente utilizada en encuestas a productores agrícolas los clasifica en cuatro estratos de riego:

Clasificación del Productor	Superficie en hectáreas
Rururbano	Menos de 1 Há
Pequeño	De 1 a 5 Há
Mediano	De 5 a 20 Há
Grande	Más de 20 Há

De acuerdo a la estructura anterior, y según datos proporcionados por la Dirección Regional de Riego; IV Región, el estrato más significativo en términos de la superficie que explota es el de los medianos. De esta manera para realizar las cuantificaciones y estimaciones antes señaladas, se tomará como base la producción de un productor clasificado como mediano, suponiendo que dispone la totalidad de sus hectáreas en esta actividad, es decir **20** hectáreas.

Si bien el objetivo del proyecto es inducir la productividad de suelos que en la actualidad no son explotados, y que por lo tanto están ociosos, el suponer que se utilizará toda la tierra disponible no persigue otra cosa que identificar el atractivo del mercado bajo análisis y en función de esta simulación entregar orientaciones para la implementación definitiva de éste.

5.2.2 Determinación de los montos de inversión en activo fijo

Esto implica cuantificar los ítems necesarios para generar las condiciones necesarias de producción, a saber: compra de terrenos, sistema de riego, maquinaria y herramientas, construcción de planta de producción y bodegas, etc.

Para determinar la Inversión Inicial, se recurrirá a la estimación de lo ítems más importantes usualmente utilizados para fines de evaluación comercial. Es preciso señalar, que aunque la localización del proyecto y sus instalaciones no se encuentre definida, el uso de indicadores promedios permite optimizar la decisión futura de ubicación de éstas. Del mismo modo, se debe tener presente que no es propósito de este estudio cuantificar estas inversiones, sino indicar magnitudes de ésta, puesto que el diseño definitivo corresponde al análisis de especialistas en cada materia. Los ítems a considerar son los siguientes:

- Construcción de planta de proceso
- Mano de obra de actividades de instalación.
- Maquinarias y herramientas
- Equipamiento y mobiliario
- Equipamiento instrumental

a) Inversión necesaria para producir hojas de aloe vera

La inversión inicial para producir y comercializar hojas de aloe vera estará dada por la preparación del terreno, lo que incluye esencialmente labores de aradura, estimada en $15.000 por hectárea, rastraje, estimada en $20.000 por hectárea y aplicación de fertilizantes orgánicos, estimada en 10 toneladas de guano, a $30/kg, es decir, $300.000.

Por otra parte, se debe considerar la adquisición de 16.500 hijuelos, 10% adicional de margen de seguridad con respecto a las 15.000 plantas por hectárea que contempla el proyecto, en su rendimiento medio. Los hijuelos tienen un costo unitario de $200, lo que da una inversión de $3.300.000 por Há.

La mano de obra requerida para la plantación es 2 jornales para riego y 30 jornales para la plantación de los hijuelos.

Se considerará un sistema de riego tecnificado que incluirá un pozo profundo con bomba capaz de abastecer 20 hectáreas de cultivos de aloe vera y una instalación de riego por goteo. Este sistema tiene un costo por hectárea de US$1.400, lo que da un costo total para las 20 Há de $14.000.000.

b) Inversión necesaria para producir pasta de acíbar

Además de la inversión agrícola definida anteriormente, el proyecto de producción de pasta de acíbar contempla la instalación de una planta procesadora, que considera la construcción de un galpón de 1000 m^2 a un valor de 5 U.F. por metro cuadrado, es decir, $73.750.000. Esta instalación contempla espacio para bodega de producto terminado, oficinas y un laboratorio de control de calidad, además de la planta procesadora.

Se considera la adquisición de un evaporador de una etapa, por un valor de US$20.000, es decir, $10.000.000. Además de equipamiento instrumental por US$10.000.

La adquisición de equipamiento mobiliario, computacional, de comunicaciones se calculó en $2.500.000 y la habilitación de oficinas y laboratorio se estimó en $1.500.000.

Para la determinación del tipo de maquinaria requerida se consultó con las empresas MOLDA, TELSTAR y LYO-SAN, seleccionándose una máquina de secado por presión de vacío para la producción de pasta de acíbar (sistema intermedio entre la liofilización y el secado por spray).

c) Inversión necesaria para producir gel líquido 10X

Similar al caso anterior, se requiere en forma adicional a la inversión agrícola la construcción de una planta procesadora y la adquisición de la maquinaria para la producción del gel líquido, similar a la utilizada para producir acíbar en polvo.

La inversión en infraestructura se estimó igual al caso de la pasta de acíbar. De igual forma, se consideró un evaporador de similares características. Por lo tanto, el valor de la inversión física de este proyecto es igual al obtenido para la producción de pasta de acíbar, estimado en $92.750.000.

d) Inversión necesaria para producir gel liofilizado 200X

A diferencia de los dos casos anteriores, se debe invertir en la adquisición de una máquina liofilizadora, que tiene un costo aproximado de US$83.000, es decir, $41.500.000. El resto de la instalación se consideró de iguales características que el proyecto de producción de gel líquido.

Para la producción de gel liofilizado se escogió un liofilizador LIOMEGA 400, de la firma TELSTAR, con capacidad de 800 litros en bandeja, con condensador con capacidad para 800 Kg de hielo, a temperatura de –75°C. Las especificaciones técnicas se adjuntan en el Anexo N°3.

5.2.3 Determinación de los montos de inversión en capital de trabajo

Se trata de determinar los recursos financieros necesarios para el normal funcionamiento del proceso productivo seleccionado (sueldos, materiales, inventarios, gastos de administración y venta, desfases, imprevistos, etc.). Esta es una variable crítica, pues la cosecha de hojas de aloe vera no se realiza sino antes de transcurrido 24 meses (en promedio) de realizada la plantación.

Para efectos de la determinación del capital de trabajo y su financiamiento, se consideró éste igual al monto determinado por el total de costos de explotación y gastos generales de los primeros tres años del proyecto, según lo indican los flujos de caja respectivos. Cabe señalar que recién al tercer año todos los proyectos evaluados presentan ingresos de explotación. Durante los dos primeros años de cada proyecto se contemplaron solamente costos de producción por concepto de mantenimiento de los cultivos.

De esta manera, con todo lo anterior se cuantifica la magnitud de la inversión necesaria para emprender esta actividad productiva y se podrán hacer estimaciones para determinar los rendimientos exigibles al proyecto para que éste sea conveniente de llevarlo a cabo.

En los Cuadros N°5.2-1 al N°5.2-4 se presentan los costos de inversión en terreno, instalaciones (para el tamaño del proyecto definido),

inversión agrícola, producción anual para 1 hectárea y comercialización (por kg), estimados para producir:

- hojas de aloe vera (hijuelos)
- pasta de acíbar
- gel líquido 10X
- gel liofilizado 200X

Adicionalmente, el Cuadro N°5.2-5 muestra la estructura de costos de producción de 1 hectárea de hojas de aloe vera. Lo anterior, con el fin de determinar el costo de producción desde el punto de vista de un pequeño agricultor, que vendería sus producción a una planta procesadora de la Región.

En este caso, se consideró los mismos costos de preparación de suelo, labores de plantación, labores de cultivo y cosecha que en el caso del cultivo de hojas para exportación, ver Cuadro N°5.2-1. En cambio se contemplan gastos de administración de $20.000 mensuales y un gasto de arriendo del terreno de $40.000 mensuales. El flete desde el predio a la planta procesadora se estimó en $3/kg.

A diferencia de los casos anteriores, donde el costo por hectárea de un sistema de riego por goteo fue avaluado en $700.000, en este caso, la inversión en riego por hectárea sube a $3.000.000, debido a que los costos de adquisición de una bomba y la construcción de un pozo profundo no se prorratean por 20 hectáreas, sino que es absorbido por una hectárea.

Cuadro N°5.2-1

ESTRUCTURA DE COSTOS PARA LA PRODUCCION DE HOJAS DE ALOE VERA

Labor o Actividad	Item	Cantidad	Unidades	Costo por Unidad ($)	Costo por Hectárea ($)	Costo total 20 Há ($)
Terrenos	Terreno	1	Há	800,000	800,000	16,000,000
Preparación de suelo	Riego	1	JH	3,500	3,500	70,000
	Aradura (2 operaciones)	0.5	JTA	30,000	15,000	300,000
	Rastraje (3 operaciones)	0.5	JTR	40,000	20,000	400,000
	Aplicación Fertilizantes	10	ton/Há	30,000	300,000	6,000,000
Labores de plantación	Riego	2	JH	3,500	7,000	140,000
	Plantación	30	JH	3,500	105,000	2,100,000
	Instalación sistema de riego	1	sist/Há	700,000	700,000	14,000,000
	Hijuelos	16,500	un/Há	200	3,300,000	66,000,000
				Inversión Agricola	**4,450,500**	**89,010,000**
Labores de cultivo	Riego (cada 30 dias)	12	JH	3,500	42,000	840,000
	Limpieza con azadón	24	JH	3,500	84,000	1,680,000
	Aplicación fertilizantes	1	ton/Há	30,000	30,000	600,000
	Derechos de Agua	1	D.A./Há	40,000	40,000	800,000
Cosecha	Deshijadura (1/año) (6 hij/pta)	60	JH	3,500	210,000	4,200,000
	Recolección hojas (3/año)	90	JH	3,500	315,000	6,300,000
	Limpieza y selección	42	JH	3,500	147,000	2,940,000
				Costo Operación	**868,000**	**17,360,000**
Gastos Generales	Gastos de administración	12	mes	1,200,000		14,400,000
Costo de flete y comercialización	Embalaje		$/kg	85		
	Gastos de embarque		$/kg	375		
	Flete terrestre (LS-Stgo.)		$/kg	15		
	Flete aéreo (Stgo-Miami)		$/kg	625		
	Flete maritimo (Stgo-Miami)		$/kg	263		
	Costo de flete aéreo		$/kg	1,100		
	Costo de flete maritimo		$/kg	738		

Cuadro N°5.2-2

ESTRUCTURA DE COSTOS PARA LA PRODUCCION DE PASTA DE ACIBAR

Labor o Actividad	Item	Cantidad	Unidades	Costo por Unidad ($)	Costo por Hectárea ($)	Costo total 20 Há ($)
Terrenos	Terreno	1	Há	800,000	800,000	16,000,000
Instalación planta procesadora	Construcción Planta	1000	m^2	73,750,000		73,750,000
	Máquina procesadora	1		10,000,000		10,000,000
	Equipamiento Mobiliario			2,500,000		2,500,000
	Equipamiento Instrumental			5,000,000		5,000,000
	Oficinas y administración			1,500,000		1,500,000
				Inversión Instalaciones		92,750,000
Preparación de suelo	Riego	1	JH	3,500	3,500	70,000
	Aradura (2 operaciones)	0.5	JTA	30,000	15,000	300,000
	Rastraje (3 operaciones)	0.5	JTR	40,000	20,000	400,000
	Aplicación Fertilizantes	10	ton/Há	30,000	300,000	6,000,000
Labores de plantación	Riego	2	JH	3,500	7,000	140,000
	Plantación	30	JH	3,500	105,000	2,100,000
	Instalación sistema de riego	1	20 Há	14,000,000	700,000	14,000,000
	Hijuelos	16,500	un/Há	200	3,300,000	66,000,000
				Inversión Agricola	4,450,500	89,010,000
Labores de cultivo	Riego	12	JH	3,500	42,000	840,000
	Limpieza con azadón	24	JH	3,500	84,000	1,680,000
	Aplicación fertilizantes	1	ton/Há	30,000	30,000	600,000
	Derechos de Agua	1	D.A./Há	40,000	40,000	800,000
Cosecha	Deshijadura (1/año) (6 hij/pta)	60	JH	3,500	210,000	4,200,000
	Recolección hojas (3/año)	90	JH	3,500	315,000	6,300,000
	Limpieza y selección	42	JH	3,500	147,000	2,940,000
Producción de acibar en polvo	Mano de obra	45	JH	3,500	157,500	3,150,000
	Insumos	12	mes	8,000	96,000	1,920,000
				Costo Operación	1,121,500	22,430,000
Gastos Generales	Mano de obra calificada	45	DH	30,000		1,350,000
	Control de calidad	45	DH	15,000		675,000
	Mantención Equipos	30	HH	14,750		442,500
	Gastos de administración	12	mes	1,200,000		14,400,000
				Gastos Generales		16,867,500
Costo de flete y comercialización	Embalaje		$/kg	185		
	Gastos de embarque		$/kg	125		
	Flete terrestre (LS-Stgo.)		$/kg	15		
	Flete aéreo (Stgo-Miami)		$/kg	625		
	Flete marítimo (Stgo-Miami)		$/kg	263		
	Costo de flete aéreo		$/kg	950		
	Costo de flete marítimo		$/kg	588		

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Cuadro N°5.2-3

ESTRUCTURA DE COSTOS PARA LA PRODUCCION DE GEL LIQUIDO 10X

Labor o Actividad	Item	Cantidad	Unidades	Costo por Unidad ($)	Costo por Hectárea ($)	Costo total 20 Há ($)
Terrenos	Terreno	1	Há	800,000	800,000	**16,000,000**
Instalación planta procesadora	Construcción Planta	1000	m^2	73,750,000		73,750,000
	Equipamiento Industrial	1		10,000,000		10,000,000
	Equipamiento Mobiliario			2,500,000		2,500,000
	Equipamiento Instrumental			5,000,000		5,000,000
	Oficinas y administración	1		1,500,000		1,500,000
				Inversión Instalaciones		**92,750,000**
Preparación de suelo	Riego	1	JH	3,500	3,500	70,000
	Aradura (2 operaciones)	0.5	JTA	30,000	15,000	300,000
	Rastraje (3 operaciones)	0.5	JTR	40,000	20,000	400,000
	Aplicación Fertilizantes	10	ton/Há	30,000	300,000	6,000,000
Labores de plantación	Riego	2	JH	3,500	7,000	140,000
	Plantación	30	JH	3,500	105,000	2,100,000
	Instalación sistema de riego	1	20 Há	14,000,000	700,000	14,000,000
	Hijuelos	16,500	un/Há	200	3,300,000	66,000,000
				Inversión Agricola	**4,450,500**	**89,010,000**
Labores de cultivo	Riego	12	JH	3,500	42,000	840,000
	Limpieza con azadón	24	JH	3,500	84,000	1,680,000
	Aplicación fertilizantes	1	ton/Há	30,000	30,000	600,000
	Derechos de Agua	1	D.A./Há	40,000	40,000	800,000
Cosecha	Deshijadura (1/año) (6 hij/pta)	60	JH	3,500	210,000	4,200,000
	Recolección hojas (3/año)	90	JH	3,500	315,000	6,300,000
	Limpieza y selección	42	JH	3,500	147,000	2,940,000
Producción de gel liquido 10X	Insumos - Preservantes	12	mes	10,000	120,000	2,400,000
	Mano de obra	135	JH/Há	3,500	472,500	9,450,000
				Costo Operación	**1,460,500**	**29,210,000**
Gastos Generales	Mano de obra calificada	60	DH	30,000		1,800,000
	Control de Calidad	45	DH	15,000		675,000
	Mantención Equipos	30	HH	14,750		442,500
	Gastos de administración	12	mes	1,200,000		14,400,000
				Gastos Generales		**17,317,500**
Costo de flete y comercialización	Embalaje		$/kg	135		
	Gastos de embarque		$/kg	250		
	Flete terrestre (LS-Stgo.)		$/kg	15		
	Flete aéreo (Stgo-Miami)		$/kg	625		
	Flete maritimo (Stgo-Miami)		$/kg	263		
	Costo de flete aéreo		**$/kg**	**1,025**		
	Costo de flete maritimo		**$/kg**	**663**		

Cuadro N°5.2-4

ESTRUCTURA DE COSTOS PARA LA PRODUCCION DE GEL LIOFILIZADO 200X

Labor o Actividad	Item	Cantidad	Unidades	Costo por Unidad ($)	Costo por Hectárea ($)	Costo total 20 Há ($)
Terrenos	Terreno	1	Há	800,000	800,000	**16,000,000**
Instalación planta procesadora	Construcción Planta	1000	m^2	73,750,000		73,750,000
	Máquina procesadora	1		41,500,000		41,500,000
	Equipamiento Mobiliario			2,500,000		2,500,000
	Equipamiento Instrumental			5,000,000		5,000,000
	Oficinas y administración	1		1,500,000		1,500,000
				Inversión Instalaciones		**124,250,000**
Preparación de suelo	Riego	1	JH	3,500	3,500	70,000
	Aradura (2 operaciones)	0.5	JTA	30,000	15,000	300,000
	Rastraje (3 operaciones)	0.5	JTR	40,000	20,000	400,000
	Aplicación Fertilizantes	10	ton/Há	30,000	300,000	6,000,000
Labores de plantación	Riego	2	JH	3,500	7,000	140,000
	Plantación	30	JH	3,500	105,000	2,100,000
	Instalación sistema de riego	1	20 Há	14,000,000	700,000	14,000,000
	Hijuelos	16,500	un/Há	200	3,300,000	66,000,000
				Inversión Agrícola	**4,450,500**	**89,010,000**
Labores de cultivo	Riego	12	JH	3,500	42,000	840,000
	Limpieza con azadón	24	JH	3,500	84,000	1,680,000
	Aplicación fertilizantes	1	ton/Há	30,000	30,000	600,000
	Derechos de Agua	1	D.A./Há	40,000	40,000	800,000
Cosecha	Deshijadura (1/año) (6 hij/pta)	60	JH	3,500	210,000	4,200,000
	Recolección hojas (3/año)	90	JH	3,500	315,000	6,300,000
	Limpieza y selección	42	JH	3,500	147,000	2,940,000
Producción de gel liofilizado	Insumos	12	mes	14,000	168,000	3,360,000
	Mano de obra	135	JH/Há	3,500	472,500	9,450,000
				Costo Operación	**1,508,500**	**30,170,000**
Gastos Generales	Mano de obra calificada	90	DH	35,000		3,150,000
	Control de calidad	45	DH	15,000		675,000
	Mantención Equipos	30	HH	14,750		442,500
	Gastos de administración	12	mes	1,200,000		14,400,000
				Gastos Generales		**18,667,500**
Costo de flete y comercialización	Embalaje		$/kg	185		
	Gastos de embarque		$/kg	125		
	Flete terrestre (LS-Stgo.)		$/kg	15		
	Flete aéreo (Stgo-Miami)		$/kg	625		
	Flete marítimo (Stgo-Miami)		$/kg	263		
	Costo de flete aéreo		$/kg	**950**		
	Costo de flete marítimo		$/kg	**588**		

Cuadro N°5.2-5

ESTRUCTURA DE COSTOS PARA PRODUCCION DE 1 HÉCTAREA HOJAS DE ALOE VERA - VENTA MERCADO INTERNO

Labor o Actividad	Item	Cantidad	Unidades	Costo por Unidad ($)	Costo por Hectárea ($)
Preparación de suelo	Riego	1	JH	3,500	3,500
	Aradura (2 operaciones)	0.5	JTA	30,000	15,000
	Rastraje (3 operaciones)	0.5	JTR	40,000	20,000
	Aplicación Fertilizantes	10	ton/Há	30	300,000
Labores de plantación	Riego	2	JH	3,500	7,000
	Plantación	30	JH	3,500	105,000
	Instalación sistema de riego	1	sist/Há	3,000,000	3,000,000
	Hijuelos	16,500	un/Há	200	3,300,000
				Inversión Agricola	**6,750,500**
Labores de cultivo	Riego	12	JH	3,500	42,000
	Limpieza con azadón	24	JH	3,500	84,000
	Aplicación fertilizantes	1	ton/Há	30	30,000
	Derechos de Agua	1	D.A./Há	40,000	40,000
Cosecha	Deshijadura (1/año) (6 hij/pta)	60	JH	3,500	210,000
	Recolección hojas (3/año)	90	JH	3,500	315,000
	Limpieza y selección	42	JH	3,500	147,000
				Costo Operación	**868,000**
Gastos Generales	Gastos de administración	12	mes	20,000	240,000
	Arriendo terreno	12	mes	40,000	480,000
				Gastos Generales	**720,000**
Costo de flete y comercialización	Flete a planta procesadora		$/kg		4

De estos cuadros es posible inferir que los costos de producción y de inversión para la obtención de hojas de aloe vera e hijuelos no difieren sustancialmente de los observados para otro tipo de cultivos que tradicionalmente se producen en la Región de Coquimbo. Sin embargo, cuando se observa los costos para los procesos industriales propiamente tal de obtención de pasta de acíbar, gel líquido 10X y gel liofilizado 200X, éstos se incrementan fuertemente, especialmente en lo relacionado con la implementación y construcción de la infraestructura física de las plantas procesadoras, así como la adquisición y operación de la maquinaria requerida para estos efectos.

De este modo, se llevaron a cabo estimaciones de los costos de explotación unitarios para los productos seleccionados, a modo de efectuar un primer análisis respecto de la conveniencia de comercializarlos. Para estos efectos, se analizaron los costos para cada producto puesto en Miami, E.E.U.U., tanto vía aérea como marítima. Los resultados se presentan en los Cuadros N°5.2-6 y N°5.2-7.

El Cuadro N°5.2-8 presenta los parámetros utilizados en las evaluaciones de los proyectos. Cabe señalar que las tablas de evaluación de los proyectos están completamente parametrizadas, de tal manera que es posible ir sensibilizando los resultados de acuerdo a diferentes valores que se asignen a los parámetros.

Cuadro N°5.2-6

COSTOS UNITARIOS DE EXPLOTACION SEGÚN RENDIMIENTOS[1]

Tamaño del predio: 20 há

PRODUCTO (Puesto en Miami, vía aérea)	UNIDAD	RENDIMIENTO		
		ALTO	MEDIO	BAJO
Hojas de Aloe Vera	US$/hoja	0.89	0.89	0.90
Hojas de Aloe Vera *	US$/hoja	0.60	0.60	0.61
Pasta de acíbar	US$/kg	10.80	13.77	19.70
Gel líquido 10X	US$/kg	2.50	2.65	2.95
Gel liofilizado 200X	US$/kg	11.21	14.32	20.52
Hojas de Aloe Vera - Mcdo interno	US$/hoja	0.01	0.01	0.02

* Costo estimado via transporte marítimo; el resto considera transporte aéreo

1: No considera costos de capital (inversión en activos fijos: equipamiento y terreno)

Cuadro N°5.2-7

PRECIOS UNITARIOS DE MERCADO

PRODUCTO (Precios Miami-USA)	UNIDAD	PRECIO		
		ALTO	MEDIO	BAJO
Hojas de Aloe Vera	US$/hoja	0.60	0.50	0.40
Hijuelos de Aloe Vera *	US$/hijuelo	0.50	0.40	0.30
Pasta de acíbar	US$/kg	14.00	12.00	10.00
Gel líquido 10X	US$/kg	16.00	14.00	11.00
Gel liofilizado 200X	US$/kg	200.00	180.00	160.00
Hojas de Aloe Vera *	US$/hoja	0.20	0.15	0.10

* Venta sólo en mercado interno

Cuadro N°5.2-8

PARAMETROS DE SIMULACION

ITEM	UNIDAD	VALOR
Superficie plantada	há	20
Valor del terreno	$/há	800,000
Vida útil planta procesadora	años	10
Certificación de Calidad IASC	US$	5,000
Tasa de descuento	%	14%
Tipo de cambio	$/US$	500
% venta de hijuelos a partir año 6	%	50%

Para el caso de la comercialización de hojas de aloe vera, el costo de transporte es altamente incidente en la posibilidad de acceder a mercados internacionales, ya sea vía aérea como vía marítima, al grado que no resulta factible la explotación de este subproducto para exportación. En todo caso, la factibilidad técnica de utilizar transporte marítimo deberá evaluarse en función del tiempo involucrado en el transporte del producto, por cuanto es sabido el mayor costo en tiempo a través de la vía marítima en comparación a la aérea y tratándose de un producto con características naturales, podría enfrentar deterioro en su calidad si el tiempo de traslado es excesivo.

Para el caso de los hijuelos, se ha supuesto que sólo se comercializan internamente. Si bien ello pudiera limitar la expansión del mercado, el atractivo margen observado podría justificar el desarrollo de un proyecto de este tipo, sumado al hecho que comparte el proceso y las técnicas de producción que se utilizan para la obtención de hojas de aloe vera. Esta situación permite la producción conjunta de ambos productos y con ello el aprovechamiento de las economías de escala presentes y con ello mejorar el retorno de la inversión que se requiera.

Para la pasta de acíbar se llega al mismo resultado negativo que para el caso de las hojas de aloe vera. Por lo tanto, este subproducto también queda descartado, en función de los resultados obtenidos. Ni siquiera con los mejores rendimientos alcanza un nivel de costos que le permita ingresar al mercado con ganancias.

El gel líquido 10X y el gel liofilizado 200X son quizás hoy en día los productos que han mostrado un mayor dinamismo y un gran crecimiento de su demanda y muestran la mejor relación precio

versus costo unitario. Sin embargo, debe tenerse en cuenta que la elaboración de estos productos se caracteriza por los altos niveles de inversión inicial, así como su dependencia a los rendimientos promedios de las plantas de aloe vera utilizadas en estos fines. No obstante ello, los márgenes de comercialización observados se convierten en un atractivo interesante de abordar, en especial a lo relacionado a la producción de gel liofilizado.

5.3 Evaluación del Proyecto, Sensibilizaciones y Definición de Escenarios de Ocurrencia

Con los datos obtenidos en los puntos anteriores, se realizará una evaluación económica del proyecto, determinando indjcadores tales como: VAN y TIR, que permitirán establecer un pronunciamiento respecto de si debe o no llevarse a cabo un determinado proyecto. Del mismo modo se identificará las variables más determinantes en la rentabilidad del proyecto.

Cabe señalar que para los años 3 al 5, se estimaron rendimientos bajos de plantas por há, dado la poca experiencia que se tiene en Chile con este cultivo, lo que supone que muchas plantas se pueden perder en un principio. A partir del año 6 hasta el año 10, se considera un rendimiento medio.

En el caso de los hijuelos, desde el año 6 en adelante, la comercialización de éstos se ha bajado al 50%, considerando que habrá más cultivos y se produciría una sobreoferta de hijuelos.

En los casos de fabricación de productos semi-elaborados se ha considerado una inspección anual del IASC, que otorga la certificación de calidad, valorada en US$5.000 anuales.

Las distintas evaluaciones se encuentran desde los Cuadros N°5.3-2 al N°5.3-11, y sus indicadores de rentabilidad se resumen en el Cuadro N°5.3-1, que se presenta a continuación.

Adicionalmente, los Cuadros N°5.3-12 al 5.3-14 presentan los resultados de las evaluaciones del proyecto de producción de 1 hectárea de hojas de aloe vera para ser vendidas a una planta procesadora local. Se emplean escenarios de precios bajo, medio y alto, estimados en 0,10; 0,15 y 0,20 US$/hoja, respectivamente.

Cuadro N°5.3-1

Resumen de evaluaciones de proyectos de subproductos de aloe vera

(US$)

Producto	Escenario	Inversión Inicial	VAN	TIR
Hojas de aloe vera	Precio alto - Aéreo	-1,366,340	-2,747,866	n/d
	Precio alto - Marítimo	-1,366,340	-700,400	n/d
Pasta de acíbar	Precio medio - Aéreo	-526,451	-86,176	n/d
	Precio medio - Marítimo	-524,626	-24,918	n/d
Gel líquido 10X	Precio alto - Aéreo	-536,573	2,012,047	65%
	Precio medio - Aéreo	-536,573	1,746,778	61%
	Precio bajo - Aéreo	-536,573	1,348,874	54%
Gel liofilizado 200X	Precio alto - Aéreo	-605,543	1,165,605	47%
	Precio medio - Aéreo	-605,543	1,032,971	45%
	Precio bajo - Aéreo	-605,543	900,336	42%
Hojas de aloe vera (Mcdo. interno)	Precio alto	-18,469	13,859	27%
	Precio medio	-18,469	4,648	19%
	Precio bajo	-18,469	-4,563	n/d

Elaborado por INECON.

Cuadro N°5.3-2

EVALUACIÓN PROYECTO PRODUCCIÓN HOJAS DE ALOE VERA - PRECIO ALTO - FLETE AEREO
(US$)

Tamaño del predio: 20 há

Item (US$)	Año 0	Año 1	Año 2	Año 3	Año 4	Año 5	Año 6	Año 7	Año 8	Año 9	Año 10
Producción anual de hojas (unidades)		0	0	1,800,000	1,800,000	1,800,000	2,700,000	2,700,000	2,700,000	2,700,000	2,700,000
Precio por hoja				0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Producción anual de hijuelos (unidades)		0	0	1,200,000	1,200,000	1,200,000	600,000	600,000	600,000	600,000	600,000
Precio por hijuelo				0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30
Ingresos por venta de hojas		0	0	1,080,000	1,080,000	1,080,000	1,620,000	1,620,000	1,620,000	1,620,000	1,620,000
Ingresos por venta de hijuelos		0	0	480,000	480,000	480,000	180,000	180,000	180,000	180,000	180,000
Total ingresos por ventas		0	0	**1,560,000**	**1,560,000**	**1,560,000**	**1,800,000**	**1,800,000**	**1,800,000**	**1,800,000**	**1,800,000**
Costos de Producción		7,840	7,840	34,720	34,720	34,720	34,720	34,720	34,720	34,720	34,720
Costos de flete y comercialización		0	0	1,584,000	1,584,000	1,584,000	2,376,000	2,376,000	2,376,000	2,376,000	2,376,000
Total costos de explotación		**7,840**	**7,840**	**1,618,720**	**1,618,720**	**1,618,720**	**2,410,720**	**2,410,720**	**2,410,720**	**2,410,720**	**2,410,720**
Gastos Generales		7,200	7,200	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800
Depreciación		0	0	0	0	0	0	0	0	0	0
Utilidad antes de impuesto		-15,040	-15,040	-87,520	-87,520	-87,520	-639,520	-639,520	-639,520	-639,520	-639,520
Utilidad acumulada		-15,040	-30,080	-117,600	-205,120	-292,640	-932,160	-1,571,680	-2,211,200	-2,850,720	-3,490,240
Impuesto (15%)		0	0	0	0	0	0	0	0	0	0
Utilidad después de impuesto		-15,040	-15,040	-87,520	-87,520	-87,520	-639,520	-639,520	-639,520	-639,520	-639,520
Depreciación		0	0	0	0	0	0	0	0	0	0
Terreno	-32,000										32,000
Inversión Agrícola	-178,020										
Inversión en Capital de Trabajo	-1,677,600										1,677,600
Flujo de Caja Neto	-1,887,620	-15,040	-15,040	-87,520	-87,520	-87,520	-639,520	-639,520	-639,520	-639,520	1,070,080

Valor Actual Neto, VAN	-2,747,866
Tasa Interna de Retorno (TIR)	n/d
Tasa de descuento	14%

Cuadro N°5.3-3

EVALUACION PROYECTO PRODUCCION HOJAS DE ALOE VERA - PRECIO ALTO - FLETE MARITIMO
(US$)

Tamaño del predio: 20 há

Item (US$)	Año 0	Año 1	Año 2	Año 3	Año 4	Año 5	Año 6	Año 7	Año 8	Año 9	Año 10
Producción anual de hojas (unidades)		0	0	1,800,000	1,800,000	1,800,000	2,700,000	2,700,000	2,700,000	2,700,000	2,700,000
Precio por hoja				0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60
Producción anual de hijuelos (unidades)		0	0	1,200,000	1,200,000	1,200,000	600,000	600,000	600,000	600,000	600,000
Precio por hijuelo				0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30
Ingresos por venta de hojas		0	0	1,080,000	1,080,000	1,080,000	1,620,000	1,620,000	1,620,000	1,620,000	1,620,000
Ingresos por venta de hijuelos		0	0	480,000	480,000	480,000	180,000	180,000	180,000	180,000	180,000
Total ingresos por ventas		**0**	**0**	**1,560,000**	**1,560,000**	**1,560,000**	**1,800,000**	**1,800,000**	**1,800,000**	**1,800,000**	**1,800,000**
Costos de Producción		7,840	7,840	34,720	34,720	34,720	34,720	34,720	34,720	34,720	34,720
Costos de flete y comercialización		0	0	1,062,720	1,062,720	1,062,720	1,594,080	1,594,080	1,594,080	1,594,080	1,594,080
Total costos de explotación		**7,840**	**7,840**	**1,097,440**	**1,097,440**	**1,097,440**	**1,628,800**	**1,628,800**	**1,628,800**	**1,628,800**	**1,628,800**
Gastos Generales		7,200	7,200	28,800	28,800	28,800	28,800	28,800	28,800	28,800	28,800
Depreciación		0	0	0	0	0	0	0	0	0	0
Utilidad antes de impuesto		-15,040	-15,040	433,760	433,760	433,760	142,400	142,400	142,400	142,400	142,400
Utilidad acumulada		-15,040	-30,080	403,680	837,440	1,271,200	1,413,600	1,556,000	1,698,400	1,840,800	1,983,200
Impuesto (15%)		0	0	60,552	125,616	190,680	212,040	233,400	254,760	276,120	297,480
Utilidad después de impuesto		-15,040	-15,040	373,208	308,144	243,080	-69,640	-91,000	-112,360	-133,720	-155,080
Depreciación		0	0	0	0	0	0	0	0	0	0
Terreno	-32,000										32,000
Inversión Agrícola	-178,020										
Inversión en Capital de Trabajo	-1,156,320										1,156,320
Flujo de Caja Neto	-1,366,340	-15,040	-15,040	373,208	308,144	243,080	-69,640	-91,000	-112,360	-133,720	1,033,240

Valor Actual Neto, VAN	-700,400
Tasa Interna de Retorno (TIR)	n/d
Tasa de descuento	14%

Cuadro N°5.3-4

EVALUACION PROYECTO PRODUCCION DE PASTA DE ACIBAR - PRECIO MEDIO - FLETE AEREO
(US$)

Tamaño del predio: 20 há

Item (US$)	Año 0	Año 1	Año 2	Año 3	Año 4	Año 5	Año 6	Año 7	Año 8	Año 9	Año 10
Producción anual de pasta de acibar (kg)		0	0	2,520	2,520	2,520	3,780	3,780	3,780	3,780	3,780
Precio unitario (US$/kg)				12	12	12	12	12	12	12	12
Producción anual de hijuelos (unidades)		0	0	1,200,000	1,200,000	1,200,000	600,000	600,000	600,000	600,000	600,000
Precio por hijuelo				0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30
Ingresos por venta de pasta de acibar		0	0	30,240	30,240	30,240	45,360	45,360	45,360	45,360	45,360
Ingresos por venta de hijuelos		0	0	480,000	480,000	480,000	180,000	180,000	180,000	180,000	180,000
Total ingresos por ventas		**0**	**0**	**510,240**	**510,240**	**510,240**	**225,360**	**225,360**	**225,360**	**225,360**	**225,360**
Costos de Producción		7,840	7,840	44,860	44,860	44,860	44,860	44,860	44,860	44,860	44,860
Certificación de calidad		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Costos de flete y comercialización		0	0	4,788	4,788	4,788	7,182	7,182	7,182	7,182	7,182
Total costos de explotación		**12,840**	**12,840**	**54,648**	**54,648**	**54,648**	**57,042**	**57,042**	**57,042**	**57,042**	**57,042**
Gastos Generales		8,434	8,434	33,735	33,735	33,735	33,735	33,735	33,735	33,735	33,735
Depreciación		18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550
Utilidad antes de impuesto		-34,824	-34,824	408,307	408,307	408,307	121,033	121,033	121,033	121,033	121,033
Utilidad acumulada		-34,824	-69,648	338,660	746,967	1,155,274	1,276,307	1,397,340	1,518,373	1,639,406	1,760,439
Impuesto (15%)		0	0	50,799	112,045	173,291	191,446	209,601	227,756	245,911	264,066
Utilidad después de impuesto		-34,824	-34,824	357,508	296,262	235,016	-70,413	-88,568	-106,723	-124,878	-143,033
Depreciación		18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550
Terreno	-32,000										32,000
Inversión Fisica	-185,500										
Inversión Agricola	-178,020										
Inversión en Capital de Trabajo	-130,931										130,931
Flujo de Caja Neto	-526,451	-16,274	-16,274	376,058	314,812	253,566	-51,863	-70,018	-88,173	-106,328	38,448

Valor Actual Neto, VAN	-86,176
Tasa Interna de Retorno (TIR)	n/d
Tasa de descuento	14%

Cuadro N°5.3-5

EVALUACION PROYECTO PRODUCCION DE PASTA DE ACIBAR - PRECIO MEDIO - FLETE MARITIMO
(US$)

Tamaño del predio: 20 há

Item (US$)	Año 0	Año 1	Año 2	Año 3	Año 4	Año 5	Año 6	Año 7	Año 8	Año 9	Año 10
Producción anual de pasta de acibar (kg)		0	0	2,520	2,520	2,520	3,780	3,780	3,780	3,780	3,780
Precio unitario (US$/kg)				12	12	12	12	12	12	12	12
Producción anual de hijuelos (unidades)		0	0	1,200,000	1,200,000	1,200,000	600,000	600,000	600,000	600,000	600,000
Precio por hijuelo				0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30
Ingresos por venta de pasta de acibar		0	0	30,240	30,240	30,240	45,360	45,360	45,360	45,360	45,360
Ingresos por venta de hijuelos		0	0	480,000	480,000	480,000	180,000	180,000	180,000	180,000	180,000
Total ingresos por ventas		0	0	510,240	510,240	510,240	225,360	225,360	225,360	225,360	225,360
Costos de Producción		7,840	7,840	44,860	44,860	44,860	44,860	44,860	44,860	44,860	44,860
Certificación de calidad		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Costos de flete y comercialización		0	0	2,964	2,964	2,964	4,445	4,445	4,445	4,445	4,445
Total costos de explotación		12,840	12,840	52,824	52,824	52,824	54,305	54,305	54,305	54,305	54,305
Gastos Generales		8,434	8,434	33,735	33,735	33,735	33,735	33,735	33,735	33,735	33,735
Depreciación		18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550
Utilidad antes de impuesto		-26,390	-26,390	443,866	443,866	443,866	157,505	157,505	157,505	157,505	157,505
Utilidad acumulada		-26,390	-52,780	391,086	834,953	1,278,819	1,436,324	1,593,829	1,751,334	1,908,838	2,066,343
Impuesto (15%)		0	0	58,663	125,243	191,823	215,449	239,074	262,700	286,326	309,951
Utilidad después de impuesto		-26,390	-26,390	385,204	318,624	252,044	-57,944	-81,570	-105,195	-128,821	-152,447
Depreciación		18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550
Terreno	-32,000										32,000
Inversión Fisica	-185,500										
Inversión Agricola	-178,020										
Inversión en Capital de Trabajo	-129,106										129,106
Flujo de Caja Neto	-524,626	-7,840	-7,840	403,754	337,174	270,594	-39,394	-63,020	-86,645	-110,271	27,209

Valor Actual Neto, VAN	-24,918
Tasa Interna de Retorno (TIR)	n/d
Tasa de descuento	14%

Cuadro N°5.3-6

EVALUACIÓN PROYECTO PRODUCCIÓN DE GEL LIQUIDO 10X - PRECIO ALTO - FLETE AEREO
(US$)

Tamaño del predio: 20 há

Item (US$)	Año 0	Año 1	Año 2	Año 3	Año 4	Año 5	Año 6	Año 7	Año 8	Año 9	Año 10
Producción anual de gel fresco (kg)		0	0	64,800	64,800	64,800	97,200	97,200	97,200	97,200	97,200
Precio unitario (US$/kg)				16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00
Producción anual de hijuelos (unidades)		0	0	1,200,000	1,200,000	1,200,000	600,000	600,000	600,000	600,000	600,000
Precio por hijuelo				0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30
Ingresos por venta de gel fresco		0	0	1,036,800	1,036,800	1,036,800	1,555,200	1,555,200	1,555,200	1,555,200	1,555,200
Ingresos por venta de hijuelos		0	0	480,000	480,000	480,000	180,000	180,000	180,000	180,000	180,000
Total ingresos por ventas		**0**	**0**	**1,516,800**	**1,516,800**	**1,516,800**	**1,735,200**	**1,735,200**	**1,735,200**	**1,735,200**	**1,735,200**
Costos de Producción		7,840	7,840	58,420	58,420	58,420	58,420	58,420	58,420	58,420	58,420
Certificación de calidad		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Costos de flete y comercialización		0	0	0	0	0	0	0	0	0	0
Total costos de explotación		**12,840**	**12,840**	**63,420**	**63,420**	**63,420**	**63,420**	**63,420**	**63,420**	**63,420**	**63,420**
Gastos Generales		8,659	8,659	34,635	34,635	34,635	34,635	34,635	34,635	34,635	34,635
Depreciación		18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550
Utilidad antes de impuesto		-26,390	-26,390	1,439,830	1,439,830	1,439,830	1,658,230	1,658,230	1,658,230	1,658,230	1,658,230
Utilidad acumulada		-26,390	-52,780	1,387,050	2,826,880	4,266,710	5,924,940	7,583,170	9,241,400	10,899,630	12,557,860
Impuesto (15%)		0	0	208,058	424,032	640,007	888,741	1,137,476	1,386,210	1,634,945	1,883,679
Utilidad después de impuesto		-26,390	-26,390	1,231,773	1,015,798	799,824	769,489	520,755	272,020	23,286	-225,449
Depreciación		18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550
Terreno	-32,000										32,000
Inversión Fisica	-185,500										
Inversión Agricola	-178,020										
Inversión en Capital de Trabajo	-141,053										141,053
Flujo de Caja Neto	-536,573	-7,840	-7,840	1,250,323	1,034,348	818,374	788,039	539,305	290,570	41,836	-33,846

Valor Actual Neto, VAN	2,012,047
Tasa Interna de Retorno (TIR)	65%
Tasa de descuento	14%

Cuadro N°5.3-7

EVALUACIÓN PROYECTO PRODUCCIÓN DE GEL LIQUIDO 10X - PRECIO MEDIO - FLETE AEREO
(US$)

Tamaño del predio: 20 há

Item (US$)	Año 0	Año 1	Año 2	Año 3	Año 4	Año 5	Año 6	Año 7	Año 8	Año 9	Año 10
Producción anual de gel fresco (kg)		0	0	64,800	64,800	64,800	97,200	97,200	97,200	97,200	97,200
Precio unitario (US$/kg)				14.00	14.00	14.00	14.00	14.00	14.00	14.00	14.00
Producción anual de hijuelos (unidades)		0	0	1,200,000	1,200,000	1,200,000	600,000	600,000	600,000	600,000	600,000
Precio por hijuelo				0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30
Ingresos por venta de gel fresco		0	0	907,200	907,200	907,200	1,360,800	1,360,800	1,360,800	1,360,800	1,360,800
Ingresos por venta de hijuelos		0	0	480,000	480,000	480,000	180,000	180,000	180,000	180,000	180,000
Total ingresos por ventas		0	0	**1,387,200**	**1,387,200**	**1,387,200**	**1,540,800**	**1,540,800**	**1,540,800**	**1,540,800**	**1,540,800**
Costos de Producción		7,840	7,840	58,420	58,420	58,420	58,420	58,420	58,420	58,420	58,420
Certificación de calidad		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Costos de flete y comercialización		0	0	0	0	0	0	0	0	0	0
Total costos de explotación		**12,840**	**12,840**	**63,420**	**63,420**	**63,420**	**63,420**	**63,420**	**63,420**	**63,420**	**63,420**
Gastos Generales		8,659	8,659	34,635	34,635	34,635	34,635	34,635	34,635	34,635	34,635
Depreciación		18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550
Utilidad antes de impuesto		-26,390	-26,390	1,310,230	1,310,230	1,310,230	1,463,830	1,463,830	1,463,830	1,463,830	1,463,830
Utilidad acumulada		-26,390	-52,780	1,257,450	2,567,680	3,877,910	5,341,740	6,805,570	8,269,400	9,733,230	11,197,060
Impuesto (15%)		0	0	188,618	385,152	581,687	801,261	1,020,836	1,240,410	1,459,985	1,679,559
Utilidad después de impuesto		-26,390	-26,390	1,121,613	925,078	728,544	662,569	442,995	223,420	3,846	-215,729
Depreciación		18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550
Terreno	-32,000										32,000
Inversión Física	-185,500										
Inversión Agricola	-178,020										
Inversión en Capital de Trabajo	-141,053										141,053
Flujo de Caja Neto	-536,573	-7,840	-7,840	1,140,163	943,628	747,094	681,119	461,545	241,970	22,396	-24,126

Valor Actual Neto, VAN	1,746,778
Tasa Interna de Retorno (TIR)	61%
Tasa de descuento	14%

Cuadro 5.3-8

EVALUACIÓN PROYECTO PRODUCCIÓN DE GEL LIQUIDO 10X - PRECIO BAJO - FLETE AEREO
(US$)

Tamaño del predio: 20 há

Item (US$)	Año 0	Año 1	Año 2	Año 3	Año 4	Año 5	Año 6	Año 7	Año 8	Año 9	Año 10
Producción anual de gel fresco (kg)		0	0	64,800	64,800	64,800	97,200	97,200	97,200	97,200	97,200
Precio unitario (US$/kg)				11.00	11.00	11.00	11.00	11.00	11.00	11.00	11.00
Producción anual de hijuelos (unidades)		0	0	1,200,000	1,200,000	1,200,000	600,000	600,000	600,000	600,000	600,000
Precio por hijuelo				0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30
Ingresos por venta de gel fresco		0	0	712,800	712,800	712,800	1,069,200	1,069,200	1,069,200	1,069,200	1,069,200
Ingresos por venta de hijuelos		0	0	480,000	480,000	480,000	180,000	180,000	180,000	180,000	180,000
Total ingresos por ventas		**0**	**0**	**1,192,800**	**1,192,800**	**1,192,800**	**1,249,200**	**1,249,200**	**1,249,200**	**1,249,200**	**1,249,200**
Costos de Producción		7,840	7,840	58,420	58,420	58,420	58,420	58,420	58,420	58,420	58,420
Certificación de calidad		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Costos de flete y comercialización		0	0	0	0	0	0	0	0	0	0
Total costos de explotación		**12,840**	**12,840**	**63,420**	**63,420**	**63,420**	**63,420**	**63,420**	**63,420**	**63,420**	**63,420**
Gastos Generales		8,659	8,659	34,635	34,635	34,635	34,635	34,635	34,635	34,635	34,635
Depreciación		18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550
Utilidad antes de impuesto		-26,390	-26,390	1,115,830	1,115,830	1,115,830	1,172,230	1,172,230	1,172,230	1,172,230	1,172,230
Utilidad acumulada		-26,390	-52,780	1,063,050	2,178,880	3,294,710	4,466,940	5,639,170	6,811,400	7,983,630	9,155,860
Impuesto (15%)		0	0	159,458	326,832	494,207	670,041	845,876	1,021,710	1,197,545	1,373,379
Utilidad después de impuesto		-26,390	-26,390	956,373	788,998	621,624	502,189	326,355	150,520	-25,314	-201,149
Depreciación		18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550	18,550
Terreno	-32,000										32,000
Inversión Fisica	-185,500										
Inversión Agricola	-178,020										
Inversión en Capital de Trabajo	-141,053										141,053
Flujo de Caja Neto	-536,573	-7,840	-7,840	974,923	807,548	640,174	520,739	344,905	169,070	-6,764	-9,546

Valor Actual Neto, VAN	1,348,874
Tasa Interna de Retorno (TIR)	54%
Tasa de descuento	14%

Cuadro N°5.3-9

EVALUACIÓN PROYECTO PRODUCCIÓN DE GEL LIOFILIZADO 200X - PRECIO ALTO
(US$)

Tamaño del predio: 20 há

Item (US$)	Año 0	Año 1	Año 2	Año 3	Año 4	Año 5	Año 6	Año 7	Año 8	Año 9	Año 10
Producción anual de gel liofilizado		0	0	3,240	3,240	3,240	4,860	4,860	4,860	4,860	4,860
Precio unitario (US$/kg)				200.00	200.00	200.00	200.00	200.00	200.00	200.00	200.00
Producción anual de hijuelos (unidades)		0	0	1,200,000	1,200,000	1,200,000	600,000	600,000	600,000	600,000	600,000
Precio por hijuelo				0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30
Ingresos por venta de gel liofilizado		0	0	648,000	648,000	648,000	972,000	972,000	972,000	972,000	972,000
Ingresos por venta de hijuelos		0	0	480,000	480,000	480,000	180,000	180,000	180,000	180,000	180,000
Total ingresos por ventas		**0**	**0**	**1,128,000**	**1,128,000**	**1,128,000**	**1,152,000**	**1,152,000**	**1,152,000**	**1,152,000**	**1,152,000**
Costos de Producción		7,840	7,840	60,340	60,340	60,340	60,340	60,340	60,340	60,340	60,340
Certificación de calidad		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Costos de flete y comercialización		0	0	0	0	0	0	0	0	0	0
Total costos de explotación		**12,840**	**12,840**	**65,340**	**65,340**	**65,340**	**65,340**	**65,340**	**65,340**	**65,340**	**65,340**
Gastos Generales		9,334	9,334	37,335	37,335	37,335	37,335	37,335	37,335	37,335	37,335
Depreciación		24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850
Utilidad antes de impuesto		-32,690	-32,690	1,042,810	1,042,810	1,042,810	1,066,810	1,066,810	1,066,810	1,066,810	1,066,810
Utilidad acumulada		-32,690	-65,380	977,430	2,020,240	3,063,050	4,129,860	5,196,670	6,263,480	7,330,290	8,397,100
Impuesto (15%)		0	0	146,615	303,036	459,458	619,479	779,501	939,522	1,099,544	1,259,565
Utilidad después de impuesto		-32,690	-32,690	896,196	739,774	583,353	447,331	287,310	127,288	-32,733	-192,755
Depreciación		24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850
Terreno	-32,000										32,000
Inversión Fisica	-248,500										
Inversión Agrícola	-178,020										
Inversión en Capital de Trabajo	-147,023										147,023
Flujo de Caja Neto	-605,543	-7,840	-7,840	921,046	764,624	608,203	472,181	312,160	152,138	-7,883	11,118

Valor Actual Neto, VAN	1,165,605
Tasa Interna de Retorno (TIR)	47%
Tasa de descuento	14%

Cuadro N°5.3-10

EVALUACIÓN PROYECTO PRODUCCIÓN DE GEL LIOFILIZADO 200X - PRECIO MEDIO
(US$)

Tamaño del predio: 20 há

Item (US$)	Año 0	Año 1	Año 2	Año 3	Año 4	Año 5	Año 6	Año 7	Año 8	Año 9	Año 10
Producción anual de gel liofilizado		0	0	3,240	3,240	3,240	4,860	4,860	4,860	4,860	4,860
Precio unitario (US$/kg)				180.00	180.00	180.00	180.00	180.00	180.00	180.00	180.00
Producción anual de hijuelos (unidades)		0	0	1,200,000	1,200,000	1,200,000	600,000	600,000	600,000	600,000	600,000
Precio por hijuelo				0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30
Ingresos por venta de gel liofilizado		0	0	583,200	583,200	583,200	874,800	874,800	874,800	874,800	874,800
Ingresos por venta de hijuelos		0	0	480,000	480,000	480,000	180,000	180,000	180,000	180,000	180,000
Total ingresos por ventas		**0**	**0**	**1,063,200**	**1,063,200**	**1,063,200**	**1,054,800**	**1,054,800**	**1,054,800**	**1,054,800**	**1,054,800**
Costos de Producción		7,840	7,840	60,340	60,340	60,340	60,340	60,340	60,340	60,340	60,340
Certificación de calidad		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Costos de flete y comercialización		0	0	0	0	0	0	0	0	0	0
Total costos de explotación		**12,840**	**12,840**	**65,340**	**65,340**	**65,340**	**65,340**	**65,340**	**65,340**	**65,340**	**65,340**
Gastos Generales		9,334	9,334	37,335	37,335	37,335	37,335	37,335	37,335	37,335	37,335
Depreciación		24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850
Utilidad antes de impuesto		-32,690	-32,690	978,010	978,010	978,010	969,610	969,610	969,610	969,610	969,610
Utilidad acumulada		-32,690	-65,380	912,630	1,890,640	2,868,650	3,838,260	4,807,870	5,777,480	6,747,090	7,716,700
Impuesto (15%)		0	0	136,895	283,596	430,298	575,739	721,181	866,622	1,012,064	1,157,505
Utilidad después de impuesto		-32,690	-32,690	841,116	694,414	547,713	393,871	248,430	102,988	-42,454	-187,895
Depreciación		24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850
Terreno	-32,000										32,000
Inversión Fisica	-248,500										
Inversión Agricola	-178,020										
Inversión en Capital de Trabajo	-147,023										147,023
Flujo de Caja Neto	-605,543	-7,840	-7,840	865,966	719,264	572,563	418,721	273,280	127,838	-17,604	15,978

Valor Actual Neto, VAN	1,032,971
Tasa Interna de Retorno (TIR)	45%
Tasa de descuento	14%

Cuadro N°5.3-11

EVALUACIÓN PROYECTO PRODUCCIÓN DE GEL LIOFILIZADO 200X - PRECIO BAJO
(US$)

Tamaño del predio: 20 há

Item (US$)	Año 0	Año 1	Año 2	Año 3	Año 4	Año 5	Año 6	Año 7	Año 8	Año 9	Año 10
Producción anual de gel liofilizado		0	0	3,240	3,240	3,240	4,860	4,860	4,860	4,860	4,860
Precio unitario (US$/kg)				160.00	160.00	160.00	160.00	160.00	160.00	160.00	160.00
Producción anual de hijuelos (unidades)		0	0	1,200,000	1,200,000	1,200,000	600,000	600,000	600,000	600,000	600,000
Precio por hijuelo				0.40	0.40	0.40	0.30	0.30	0.30	0.30	0.30
Ingresos por venta de gel liofilizado		0	0	518,400	518,400	518,400	777,600	777,600	777,600	777,600	777,600
Ingresos por venta de hijuelos		0	0	480,000	480,000	480,000	180,000	180,000	180,000	180,000	180,000
Total ingresos por ventas		**0**	**0**	**998,400**	**998,400**	**998,400**	**957,600**	**957,600**	**957,600**	**957,600**	**957,600**
Costos de Producción		7,840	7,840	60,340	60,340	60,340	60,340	60,340	60,340	60,340	60,340
Certificación de calidad		5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Costos de flete y comercialización		0	0	0	0	0	0	0	0	0	0
Total costos de explotación		**12,840**	**12,840**	**65,340**	**65,340**	**65,340**	**65,340**	**65,340**	**65,340**	**65,340**	**65,340**
Gastos Generales		9,334	9,334	37,335	37,335	37,335	37,335	37,335	37,335	37,335	37,335
Depreciación		24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850
Utilidad antes de impuesto		-32,690	-32,690	913,210	913,210	913,210	872,410	872,410	872,410	872,410	872,410
Utilidad acumulada		-32,690	-65,380	847,830	1,761,040	2,674,250	3,546,660	4,419,070	5,291,480	6,163,890	7,036,300
Impuesto (15%)		0	0	127,175	264,156	401,138	531,999	662,861	793,722	924,584	1,055,445
Utilidad después de impuesto		-32,690	-32,690	786,036	649,054	512,073	340,411	209,550	78,688	-52,173	-183,035
Depreciación		24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850	24,850
Terreno	-32,000										32,000
Inversión Fisica	-248,500										
Inversión Agrícola	-178,020										
Inversión en Capital de Trabajo	-147,023										147,023
Flujo de Caja Neto	-605,543	-7,840	-7,840	810,886	673,904	536,923	365,261	234,400	103,538	-27,323	20,838

Valor Actual Neto, VAN	900,336
Tasa Interna de Retorno (TIR)	42%
Tasa de descuento	14%

Cuadro N°5.3-12

EVALUACIÓN PROYECTO PRODUCCIÓN 1 HECTAREA DE HOJAS DE ALOE VERA - VENTA MERCADO INTERNO - PRECIO ALTO
(US$)

Tamaño del predio: 1 há

Item (US$)	Año 0	Año 1	Año 2	Año 3	Año 4	Año 5	Año 6	Año 7	Año 8	Año 9	Año 10
Producción anual de hojas (unidades)		0	0	90,000	90,000	90,000	135,000	135,000	135,000	135,000	135,000
Precio por hoja				0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Total ingresos por ventas		0	0	18,000	18,000	18,000	27,000	27,000	27,000	27,000	27,000
Costos de Producción		392	392	1,736	1,736	1,736	1,736	1,736	1,736	1,736	1,736
Costos de flete y comercialización		0	0	288	288	288	432	432	432	432	432
Total costos de explotación		392	392	2,024	2,024	2,024	2,168	2,168	2,168	2,168	2,168
Gastos Generales		360	360	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440
Depreciación		0	0	0	0	0	0	0	0	0	0
Utilidad antes de impuesto		-752	-752	14,536	14,536	14,536	23,392	23,392	23,392	23,392	23,392
Utilidad acumulada		-752	-1,504	13,032	27,568	42,104	65,496	88,888	112,280	135,672	159,064
Impuesto (15%)		0	0	1,955	4,135	6,316	9,824	13,333	16,842	20,351	23,860
Utilidad después de impuesto		-752	-752	12,581	10,401	8,220	13,568	10,059	6,550	3,041	-468
Depreciación		0	0	0	0	0	0	0	0	0	0
Terreno	0										0
Inversión Agricola	-13,501										
Inversión en Capital de Trabajo	-4,968										4,968
Flujo de Caja Neto	**-18,469**	**-752**	**-752**	**12,581**	**10,401**	**8,220**	**13,568**	**10,059**	**6,550**	**3,041**	**4,500**

Valor Actual Neto, VAN	13,859
Tasa Interna de Retorno (TIR)	27%
Tasa de descuento	14%

Cuadro N°5.3-13

EVALUACIÓN PROYECTO PRODUCCIÓN 1 HECTAREA DE HOJAS DE ALOE VERA - VENTA MERCADO INTERNO - PRECIO MEDIO
(US$)

Tamaño del predio: 1 há

Item (US$)	Año 0	Año 1	Año 2	Año 3	Año 4	Año 5	Año 6	Año 7	Año 8	Año 9	Año 10
Producción anual de hojas (unidades)		0	0	90,000	90,000	90,000	135,000	135,000	135,000	135,000	135,000
Precio por hoja				0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Total ingresos por ventas		0	0	13,500	13,500	13,500	20,250	20,250	20,250	20,250	20,250
Costos de Producción		392	392	1,736	1,736	1,736	1,736	1,736	1,736	1,736	1,736
Costos de flete y comercialización		0	0	288	288	288	432	432	432	432	432
Total costos de explotación		392	392	2,024	2,024	2,024	2,168	2,168	2,168	2,168	2,168
Gastos Generales		360	360	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440
Depreciación		0	0	0	0	0	0	0	0	0	0
Utilidad antes de impuesto		-752	-752	10,036	10,036	10,036	16,642	16,642	16,642	16,642	16,642
Utilidad acumulada		-752	-1,504	8,532	18,568	28,604	45,246	61,888	78,530	95,172	111,814
Impuesto (15%)		0	0	1,280	2,785	4,291	6,787	9,283	11,780	14,276	16,772
Utilidad después de impuesto		-752	-752	8,756	7,251	5,745	9,855	7,359	4,863	2,366	-130
Depreciación		0	0	0	0	0	0	0	0	0	0
Terreno	0										0
Inversión Agricola	-13,501										
Inversión en Capital de Trabajo	-4,968										4,968
Flujo de Caja Neto	-18,469	-752	-752	8,756	-- 7,251	5,745	9,855	7,359	4,863	2,366	4,838

Valor Actual Neto, VAN	4,648
Tasa Interna de Retorno (TIR)	19%
Tasa de descuento	14%

Cuadro Nº5.3-14

EVALUACIÓN PROYECTO PRODUCCIÓN 1 HECTAREA DE HOJAS DE ALOE VERA - VENTA MERCADO INTERNO - PRECIO BAJO
(US$)

Tamaño del predio: 1 há

Item (US$)	Año 0	Año 1	Año 2	Año 3	Año 4	Año 5	Año 6	Año 7	Año 8	Año 9	Año 10
Producción anual de hojas (unidades)		0	0	90,000	90,000	90,000	135,000	135,000	135,000	135,000	135,000
Precio por hoja				0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
Total ingresos por ventas		0	0	9,000	9,000	9,000	13,500	13,500	13,500	13,500	13,500
Costos de Producción		392	392	1,736	1,736	1,736	1,736	1,736	1,736	1,736	1,736
Costos de flete y comercialización		0	0	288	288	288	432	432	432	432	432
Total costos de explotación		392	392	2,024	2,024	2,024	2,168	2,168	2,168	2,168	2,168
Gastos Generales		360	360	1,440	1,440	1,440	1,440	1,440	1,440	1,440	1,440
Depreciación		0	0	0	0	0	0	0	0	0	0
Utilidad antes de impuesto		-752	-752	5,536	5,536	5,536	9,892	9,892	9,892	9,892	9,892
Utilidad acumulada		-752	-1,504	4,032	9,568	15,104	24,996	34,888	44,780	54,672	64,564
Impuesto (15%)		0	0	605	1,435	2,266	3,749	5,233	6,717	8,201	9,685
Utilidad después de impuesto		-752	-752	4,931	4,101	3,270	6,143	4,659	3,175	1,691	207
Depreciación		0	0	0	0	0	0	0	0	0	0
Terreno	0										0
Inversión Agrícola	-13,501										
Inversión en Capital de Trabajo	-4,968										4,968
Flujo de Caja Neto	-18,469	-752	-752	4,931	4,101	3,270	6,143	4,659	3,175	1,691	5,175

Valor Actual Neto, VAN	-4,563
Tasa Interna de Retorno (TIR)	n/d
Tasa de descuento	14%

5.4 Conclusiones y Recomendaciones del Estudio Técnico-Financiero

De los resultados obtenidos se puede concluir lo siguiente:

1. Los proyectos que arrojan resultados positivos, desde el punto de vista financiero, corresponden a la producción de gel líquido 10X y gel liofilizado 200X.[12] En el escenario medio, se obtienen rentabilidades de un 61% y un 45%, respectivamente, lo que significa que, dados los supuestos establecidos para estos proyectos, corresponde a proyectos atractivos para un inversionista privado y que en consecuencia, estos consultores recomiendan bajo las siguientes consideraciones:

   - La producción de gel fresco se recomienda que sea llevada a cabo si y sólo si se materializa pronto, ya que este mercado se encuentra en retroceso por la aparición del gel liofilizado. Se estima que al cabo de 5 años, el gel liofilizado será el más importante de los productos seleccionados.

   - Debido a que las inversiones requeridas, tanto en equipamiento como en instalaciones, no son menores, se estima que la implementación de estos proyectos debe estar necesariamente vinculada con contratos de venta de mediano plazo a objeto de disminuir los riesgos inherentes a este tipo de negocios. Para materializar contratos de este tipo, se estima necesario contactar previamente empresas internacionales con presencia en el mercado de productos derivados del aloe vera y que requieran de abastecimiento de terceros.

[12] Complementados con la venta de hijuelos.

- Se recomienda profundizar en los aspectos técnicos relacionados con la estabilización del gel y el proceso de deshidratación del mismo, de acuerdo a las normas de calidad exigidas por los clientes, considerando que el uso de dichos productos corresponde a las áreas de cosmetología y salud, que son especialmente exigentes.

2. No resulta conveniente desarrollar proyectos vinculados a la producción de pasta de acíbar, dados los bajos precios observados en mercados internacionales, los que son superados por los costos de producción y comercialización.

3. No se recomienda llevar a cabo proyectos de producción de hojas de aloe vera por la misma razón que el caso anterior, es decir, por cuanto los precios observados en mercados internacionales no son suficientes para recuperar los costos de producción, comercialización y capital asociado. Particularmente el costo de transporte internacional es incidente en el resultado de este proyecto.

4. Cabe mencionar que como es lógico, mayores rendimientos productivos de las plantas se correlacionan positivamente con mejores retornos para los proyectos. Lo anterior está directamente relacionado con la cantidad de riego recibido por los cultivos y por lo tanto, con la disponibilidad de agua en los terrenos donde se ubique finalmente el proyecto.

5. Finalmente, para el proyecto de producción de una hectárea de hojas de aloe vera, las que serían comercializadas en mercado interno, es decir, para ser vendidas a una planta procesadora de la Región, los resultados obtenidos indican que para precios de 0,15 y 0,20 US$/hoja, se obtienen resultados positivos para el agricultor dueño de 1 hectárea, con retornos que fluctúan entre US$5.000 y

US$10.000 anuales, dados los supuestos del proyecto. Por lo tanto, estos datos deberán ser posteriormente comparados con el costo afinado de producción de hojas en forma industrial, para un tamaño definido de hectáreas, con el fin de analizar la conveniencia de abastecerse de hojas de aloe vera desde terceros.

ANEXO N° 1

Estadísticas de Importación de Aloe Vera en Chile

PARTIDA ARANCELARIA : 1211.90.90 (SOLO ALOE VERA)

UNIDAD DE MEDIDA : KILOS NETOS (UNIDAD EN LA CUAL SE EXPRESA EL PRECIO UNITARIO Y LA CANTIDAD)

FECHA	RUT IMPORTADOR	NOMBRE IMPORTADO	MEDIO TTE.	PAIS ADQUISICION	ADUANA	CLAUSULA COMPRA	IMPORTACION	VARIEDAD	MARCA	PRECIO UNIT. US$	CANTIDAD	TOTAL CIF US$	TOTAL FOB US$
13/07/95	85077900 7	COSMETICOS AVON SA	MARITIMO	USA/PR	SAN ANTONI	FOB	ALOE VERA	TRITURIZADO	CIRCLE TRADE-	98.52	22.68	2,234.52	2.020 63
										TOTAL	22.68	2,234.52	2.020.63

FUENTE : CAMARA DE COMERCIO DE SANTIAGO

PARTIDA ARANCELARIA : 1302.19.00 (SOLO ALOE VERA)

UNIDAD DE MEDIDA : KILOS NETOS (UNIDAD EN LA CUAL SE EXPRESA EL PRECIO UNITARIO Y LA CANTIDAD)

FECHA	RUT IMPORTADOR	NOMBRE IMPORTADOR	MEDIO TTE.	PAIS ADQUISICION	ADUANA	CLAUSULA COMPRA	IMPORTACION	VARIEDAD	MARCA	PRECIO UNIT. USS	CANTIDA	TOTAL CIF USS	TOTAL FOB USS
3/03/95	81210400 4	REUTTER LTDA	MARITIMO	ALEMANIA	SAN ANTO	CIF	ALOE	EN POLVO FINO	CHEMOMEDIC	10.51	50	525 90	476 42
11/05/95	81210400 4	REUTTER LTDA	MARITIMO	ALEMANIA	SAN ANTO	CIF	ALOE	EN POLVO FINO	CHEMOMEDIC	12 32	100	1,232 36	1,105 85
24/08/95	90322000 7	LABORATORIO CHILE SA	AEREO	ALEMANIA	METROPO	CYF	EXTRACTO .DE ALOE	SER	CL-F	18.9	118	2,230 46	1,386 16
4/07/95	93681000 4	LABORATORIOS DAVIS SA	MARITIMO	USA/PR	SAN ANTO	EX-F	EXTRACTO DE ALOE	LIQ TEC VEGETA	REVLON-F	19 86	7 6	150 96	144 61
6/10/95	79692060 2	ARAMA LABORATORIOS Y CIA LTDA	AEREO	ALEMANIA	METROPO	CIF	JUGO VEGETAL ALO	SER	AMBRO	17.17	100	1,717 73	1,309 01
										TOTAL	375 6	5,857 41	4,422 05

FUENTE : CAMARA DE COMERCIO DE SANTIAGO

PARTIDA ARANCELARIA : 1211.90.90 (SOLO ALOE VERA)

UNIDAD DE MEDIDA : KILOS NETOS (UNIDAD EN LA CUAL SE EXPRESA EL PRECIO UNITARIO Y LA CANTIDAD)

FECHA	RUT IMPORTADOR		NOMBRE IMPORTADOR	MEDIO TTE.	PAIS ADQUISICION	ADUANA	CLAUSULA COMPRA	IMPORTACION	VARIEDAD	MARCA	PRECIO UNIT. US$	CANTIDAD	TOTAL CIF US$	TOTAL FOB US$
29/08/96	81210400	4	REUTTER LTDA	MARITIMO	ALEMANIA	VALPARAIS	CIF	ALOE EN POLVO	FINO	DSA-F	9.16	150	1.374.00	1.328 87
22/11/96	85077900	7	COSMETICOS AVON SA	AEREO	BRASIL	METROPOLI	FOB	ALOE VERA	COD 37640	AVON-F	108.68	4	434.75	405.29
23/12/96	85077900	7	COSMETICOS AVON SA	AEREO	BRASIL	METROPOLI	FOB	ALOE VERA	COD 3764	AVON-F	106.69	5	533.45	500 46
											TOTAL	159	2,342.20	2,234 62

FUENTE : CAMARA DE COMERCIO DE SANTIAGO

PARTIDA ARANCELARIA : 1302.19.00 (SOLO ALOE VERA)

UNIDAD DE MEDIDA : KILOS NETOS (UNIDAD EN LA CUAL SE EXPRESA EL PRECIO UNITARIO Y LA CANTIDAD)

FECHA	RUT IMPORTADOR		NOMBRE IMPORTADOR	MEDIO TTE.	PAIS ADQUISICION	ADUANA	CLAUSULA COMPRA	IMPORTACION	VARIEDAD	MARCA	PRECIO UNIT. US$	CANTIDAD	TOTAL CIF US$	TOTAL FOB US$
7/03/96 0	81210400	4	REUTTER LTDA	MARITIM	ALEMANIA	VALPARAI	CIF	ALOE	EN POLVO FINO	CARROUND-F	10 45	50	522 50	475 88
14/05/96	81210400	4	REUTTER LTDA	MARITIM	ALEMANIA	VALPARAI	CIF	ALOE	EN POLVO FINO	CHEMOMEDICA-F	12 38	50	619 35	565 29
4/12/96 0	81210400	4	REUTTER LTDA	MARITIM	ALEMANIA	VALPARAI	CIF	ALOE	EN POLVO FINO	CARROUND-F	12 3	100	1,230 00	1,163 08
19/11/96	85844100	5	COLGATE PALMOLIVE CHILE S A	MARITIM	USA/PR	VALPARAI	EX-F	ALOE VERA	MEZCLA LIQUIDA	THE MENNEN CO -	28 53	11 34	323 55	293 55
23/09/96	80447400	5	GUILLERMO HARDING Y CIA LTDA	MARITIM	ALEMANIA	VALPARAI	CYF	ALOES	POLVO P TECNICA	AMBRO-F	11 3	700	7,911 72	7,483 95
20/12/96	80447400	5	GUILLERMO HARDING Y CIA LTDA	MARITIM	USA/PR	VALPARAI	CIF	ALOES	POLVO P/TECNICA	AMBRO-F	10 9	300	3,271 58	3,126 51
14/10/96	90322000	7	LABORATORIO CHILE SA	AEREO	ALEMANIA	METROPOL	CYF	ALOES	SERIADO	CAESAR-F	26 01	50	1,300 53	804 17
26/07/96	93513000	K	BDF CHILE SA	AEREO	ALEMANIA	METROPOL	FOB	EST DE ALOE	POLVO GDO PROF	BDF-F	528 18	1	528 18	507 31
31/05/96	90322000	7	LABORATORIO CHILE SA	AEREO	ALEMANIA	METROPOL	CYF	EXTRACTO DE ALOE	POLVO GDO PROF	CAESAR-F	25 92	50	1,296 17	796 96
20/11/96	90322000	7	LABORATORIO CHILE SA	AEREO	ALEMANIA	METROPOL	CYF	EXTRACTO DE ALOE	POLVO GDO PROF	CAELO-F	26 21	50	1,310 87	836 29
18/07/96	93513000	K	BDF CHILE SA	AEREO	ALEMANIA	METROPOL	EX-F	EXTRACTO DE ALOE	SERIADO	BDF-F	30 01	25	750 29	645 73
24/01/96	84176900	7	REPRESENTACIONES DE MATERIAS PRIMASINDUSTRIALES L	AEREO	USA/PR	METROPOL	FOB	EXTRACTO HERBACEO D/ALOE VER	E/POLVO	TERRY-F	194 62	20	3 892 52	3 793 82
7/11/96 0	84176900	7	REPRESENTACIONES DE MATERIAS PRIMASINDUSTRIALES L	AEREO	USA/PR	METROPOL	FOB	EXTRACTO HERBACEO D/ALOE VER	E/POLVO	TERRY LAB -F	220 39	3	661 18	613 90
23/12/96	84176900	7	REPRESENTACIONES DE MATERIAS PRIMASINDUSTRIALES L	AEREO	USA/PR	METROPOL	CIF	EXTRACTO HERBACEO D/ALOE VER	SERIADO	TERRY-F	124 6	8 84	1,102 30	1 034 59
6/05/96 0	84176900	7	REPRESENTACIONES DE MATERIAS PRIMASINDUSTRIALES L	AEREO	USA/PR	METROPOL	FOB	EXTRACTO HERBACIO D/ALOE VER	NO TIDO15. EN POLV	TERRY-F	149 69	45	6,736 20	6 549 57
											TOTAL	1464 18	31,456 94	28,690 66

FUENTE : CAMARA DE COMERCIO DE SANTIAGO

PARTIDA ARANCELARIA : 3304.99.00 (SOLO ALOE VERA)

UNIDAD DE MEDIDA : KILOS NETOS (UNIDAD EN LA CUAL SE EXPRESA EL PRECIO UNITARIO Y LA CANTIDAD)

FECHA	RUT IMPORTADOR		NOMBRE IMPORTADOR	MEDIO TTE.	PAIS ADQUISICION	ADUANA	CLAUSULA COMPRA	IMPORTACION	VARIEDAD	MARCA	PRECIO UNIT. US$	CANTIDAD	TOTAL CIF US$	TOTAL FOB US$
10/06/96	79664180	0	RENEE DUMIT A Y COMPANIA LTDA.	CARRETERO	Z.F.IQ	IQUIQUE	CIF	CREMA ALOE VERA	8 OZ.	ARTMATIC	41	20	820.00	748.90
24/05/96	78538420	2	IMPORTACIONES Y COMERCIAL ANDINA LTDA	MARITIMO	USA/PR	VALPARA	FOB	LOCION CREMOSA DE ALOE	CREMA 12X1	LANDER	1.49	29.874	44,689.33	33,893.27
											TOTAL	29.894	45,509.33	34,642.17

FUENTE : CAMARA DE COMERCIO DE SANTIAGO

PARTIDA ARANCELARIA : 1211.90.90 (SOLO ALOE VERA)

UNIDAD DE MEDIDA : KILOS NETOS (UNIDAD EN LA CUAL SE EXPRESA EL PRECIO UNITARIO Y LA CANTIDAD)

FECHA	RUT IMPORTADOR		NOMBRE IMPORTADOR	MEDIO TTE.	PAIS ADQUISICION	ADUANA	CLAUSULA COMPRA	IMPORTACION	VARIEDA	MARCA	PRECIO UNIT. US$	CANTIDAD	TOTAL CIF US$	TOTAL FOB US$
10/01/97	85077900	7	COSMETICOS AVON S	MARITIMO	USA/PR	SAN ANTONI	FOB	ALOE VERA	COD.3764	CIRCLE TRADE-F	93.01	19.99	1,859.36	1,760.69
16/01/97	85077900	7	COSMETICOS AVON S	AEREO	USA/PR	METROPOLI	FOB	ALOE VERA	SERIADO	CIRCLE TRADE-F	96.35	56.5	5,444.25	4,971.98
#######	85077900	7	COSMETICOS AVON S	MARITIMO	USA/PR	SAN ANTONI	FOB	HOJAS DE ALOE VER	POLVO	CIRCLE TRADE-F	91.57	23.00	2,106.43	2,021.89
											TOTAL	99.49	9,410.04	8,757.56

FUENTE : CAMARA DE COMERCIO DE SANTIAGO

PARTIDA ARANCELARIA : 1302.19.00 (SOLO ALOE VERA)

UNIDAD DE MEDIDA : KILOS NETOS (UNIDAD EN LA CUAL SE EXPRESA EL PRECIO UNITARIO Y LA CANTIDAD)

FECHA	RUT IMPORTADOR		NOMBRE IMPORTADOR	MEDIO TTE	PAIS ADQUISICION	ADUANA	CLAUSULA COMPRA	IMPORTACION	VARIEDAD	MARCA	PRECIO UNIT US$	CANTIDAD	TOTAL CIF US$	TOTAL FOB US$
27/02/97	85844100	5	COLGATE PALMOLIVE CHILE S A	MARITIMO	USA/PR	VALPARAIS	EX-F	ALOE VERE	GEL	MENNEN-F	2 41	11 34	27 44	25 46
30/10/97	80447400	5	GUILLERMO HARDING Y CIA LTDA	MARITIMO	ALEMANIA	VALPARAIS	CYF	ALOES	POLVO P/TECNICA	CARROUX-F	9 68	650	6,294 14	6,006 07
1/10/97	79653800	7	PRODUCTOS QUIMICOS MATERIAS PRIMAS Y SERVICIOS A	AEREO	ARGENT	METROPOLI	EX-F	EXT GLICOL ALOE VERA	LIQ VEG 307 1041	DHACAM-F	34 18	5 1	174 34	161 48
13/05/97	79692000	2	ARAMA LABORATORIOS Y CIA LTDA	AEREO	ALEMANIA	METROPOLI	CIF	EXTRACTO ALOE	EN POLVO	HECO F	39 25	50	1,962 71	1,705 04
29/07/97	96757870	3	PROALTEC S A	MARITIMO	ESPANA	VALPARAIS	CIF	EXTRACTO D/ALOE VERA	VEGETAL PURO	PROVITAL-F	28 71	33	947 58	809 44
3/07/97	81210400	4	REUTTER LTDA	MARITIMO	ALEMANIA	VALPARAIS	CIF	EXTRACTO DE ALOE	POLVO FINO	CHEMOMEDICA-	12 89	100	1,289 89	1,237 17
24/12/97	81210400	4	REUTTER LTDA	MARITIMO	ALEMANIA	VALPARAIS	CIF	EXTRACTO DE ALOE	EN POLVO-VEGETAL	CHEMOMEDICA-	12 59	100	1,259 31	1,189 50
7/03/97	90322000	7	LABORATORIO CHILE SA	AEREO	ALEMANIA	METROPOLI	CYF	EXTRACTO DE ALOE	POLVO GDO PROF	CAESAR-F	23 59	159	3,751 98	2,787 09
13/10/97	90322000	7	LABORATORIO CHILE SA	MARITIMO	ALEMANIA	VALPARAIS	CIF	EXTRACTO DE ALOE	POLVO GDO PROF	AMBRO-F	9 84	150	1,476 40	1,393 12
17/06/97	93513000	K	BDF CHILE SA	MARITIMO	ALEMANIA	VALPARAIS	FOB	EXTRACTO DE ALOE	POLVO GDO PROF	BDF-F	25 77	10	257 74	242 25
8/10/97	93513000	K	BDF CHILE SA	MARITIMO	ALEMANIA	VALPARAIS	FOB	EXTRACTO DE ALOE	POLVO GDO PROF	DBF-F	24 58	10	245 82	234 27
18/11/97	93681000	4	LABORATORIOS DAVIS SA	MARITIMO	USA/PR	SAN ANTONI	EX-F	EXTRACTO DE ALOE	POLVO GDO PROF	RM-F	20 71	2	41 43	38 51
15/12/97	84176900	7	REPRESENTACIONES DE MATERIAS PRIMASINDUSTRIALES	AEREO	USA/PR	METROPOLI	FOB	EXTRACTO DE ALOE VERA	EN POLVO	TERRY LAB-F	195 39	20	3,907 99	3,778 50
23/07/97	85844100	5	COLGATE PALMOLIVE CHILE S A	MARITIMO	USA/PR	SAN ANTONI	EX-F	EXTRACTO DE ALOEVERA	GEL,PZA TECNICA	COLGATE-F	8 76	6 29	55 18	52 06
19/06/97	84176900	7	REPRESENTACIONES DE MATERIAS PRIMASINDUSTRIALES	AEREO	USA/PR	METROPOLI	FOB	EXTRACTO HERBACEO D/ALOE VER	TIPO TD015,EN POLV	TERRY LAB-F	143 22	45 01	6,447 63	6,257 88
15/10/97	96655550	5	LIPO CHILE S A	AEREO	USA/PR	METROPOLI	FOB	EXTRACTO VEGETAL	ALOE	BIO BOTANICA-F	227 41	2	454 82	341 42
16/12/97	96655550	5	LIPO CHILE S A	AEREO	USA/PR	METROPOLI	FOB	EXTRACTO VEGETAL	ALOE PHYTOGEL	BIO BOTANICA-F	114 42	7	801 00	726 47
3/02/97	96655550	5	LIPO CHILE S A	MARITIMO	USA/PR	SAN ANTONI	EX-F	JUGO DE EXTRACTO VEGETAL	ALOE	LIPO-F	320 47	5 45	1,746 58	1 617 44
											TOTAL	1366 19	33,141 98	28 603 17

FUENTE : CAMARA DE COMERCIO DE SANTIAGO

PARTIDA ARANCELARIA : 3301.29.00 (SOLO ALOE VERA)

UNIDAD DE MEDIDA : KILOS NETOS (UNIDAD EN LA CUAL SE EXPRESA EL PRECIO UNITARIO Y LA CANTIDAD)

FECHA	RUT IMPORTADOR		NOMBRE IMPORTADOR	MEDIO TTE.	PAIS ADQUISICION	ADUANA	CLAUSULA COMPRA	IMPORTACION	VERIEDAD	MARCA	PRECIO UNIT. US$	CANTIDA	TOTAL CIF US$	TOTAL FOB US$
29/10/97	79693930	3	INVERSIONES GILCO CHILE LIMITAD	AEREO	USA/PR	METROPOLI	EX-F	ACEITE ESENCIAL D ALOE VER	LIQUIDO GDO.TECNIC	MAYBELLINE-F	90.69	0.5	45.44	39.87
21/07/97	81164400	5	LIBRERIA WEIDNER Y CIA LTDA	AEREO	ALEMANIA	METROPOLI	FOB	ACEITE ESENCIAL DE ALOE	A5020 LIQUIDO	PRIMAVERA LIF-	65.53	37.52	2,459.21	2,263.04
											TOTAL	38.02	2,504.65	2,302.91

FUENTE : CAMARA DE COMERCIO DE SANTIAGO

PARTIDA ARANCELARIA : 3304.99.00 (SOLO ALOE VERA)

UNIDAD DE MEDIDA : KILOS NETOS (UNIDAD EN LA CUAL SE EXPRESA EL PRECIO UNITARIO Y LA CANTIDAD)

FECHA	RUT IMPORTADOR		NOMBRE IMPORTADOR	MEDIO TTE	PAIS ADQUISICION	ADUANA	CLAUSULA COMPRA	IMPORTACION	VARIEDAD	MARCA	PRECIO UNIT US$	CANTIDAD	TOTAL CIF US$	TOTAL FOB US$
12/09/97	96755250	K	COSMETICA DAVIS S A	MARITIMO	USA/PR	SAN ANTONIO	FOB	CREMA	ALOE ENV. 2.5OZ	JERGENS	8 78	418	3,673.09	3,344 00
30/05/97	96755250	K	COSMETICA DAVIS S A	MARITIMO	USA/PR	VALPARAISO	FOB	CREMA	JSC ALOE 7759;250M	JERGENS	2.52	8372 8	21,174.05	19,140 90
16/12/97	93513000	K	BDF CHILE S A	MARITIMO	ALEMANIA	VALPARAISO	FOB	ALOE VERA GE	GDO.COSMETICA	BDF-F	24 60	19.5	479.85	456 83
											TOTAL	8810 3	25,326 99	22,941 73

FUENTE : CAMARA DE COMERCIO DE SANTIAGO

PARTIDA ARANCELARIA : 1211.90.90 (SOLO ALOE VERA)

UNIDAD DE MEDIDA : KILOS NETOS (UNIDAD EN LA CUAL SE EXPRESA EL PRECIO UNITARIO Y LA CANTIDAD)

FECHA	RUT IMPORTADOR		NOMBRE IMPORTADOR	MEDIO TTE.	PAIS ADQUISICION	ADUANA	CLAUSULA COMPRA	IMPORTACION	VARIEDAD	MARCA	PRECIO UNIT. US$	CANTIDAD	TOTAL CIF US$	TOTAL FOB US$
5/11/98 0	6558064	0	ADRIANA A GONZALEZ ROJAS	MARITIMO	ALEMANIA	VALPARAIS	CIF	ALOE DEL CABO	PULVERIZADO.MOSSELBA	AMBRO-F	6.33	463.2	2,930.17	2,761.26
7/01/98 0	85077900	7	COSMETICOS AVON SA	MARITIMO	USA/PR	SAN ANTONI	FOB	HOJAS DE ALOE VERA	POLVO	CIRCLE TRADE-F	90.68	23	2,086.00	2,015.68
28/09/98	85077900	7	COSMETICOS AVON SA	MARITIMO	USA/PR	SAN ANTONI	FOB	HOJAS DE ALOE VERA	POLVO.	CIRCLE TRADE-F	95.86	23	2,205.07	2,048.45
1/07/98 0	70300000	2	FUNDACION CHILE	AEREO	MEXICO	METROPOLI	FOB	HOJAS FRESCAS DE ALOE VERA	CATEGORIA A	B NEUGEBAUER-F	4.62	50	230.87	68.25
											TOTAL	559.2	7,452.11	6,893.64

FUENTE : CAMARA DE COMERCIO DE SANTIAGO

PARTIDA ARANCELARIA : 1302.19.00 (SOLO ALOE VERA)

UNIDAD DE MEDIDA : KILOS NETOS (UNIDAD EN LA CUAL SE EXPRESA EL PRECIO UNITARIO Y LA CANTIDAD)

FECHA	RUT IMPORTADOR	NOMBRE IMPORTADOR	MEDIO TTE	PAIS ADQUISICION	ADUANA	CLAUSULA COMPRA	IMPORTACION	VARIEDAD	MARCA	PRECIO UNIT US$	CANTIDAD	TOTAL CIF US$	TOTAL FOB US$
29/07/98	81210400 4	REUTTER LTDA	MARITIMO	ALEMANIA	VALPARAIS	CIF	ALOE DEL CABO	POLVO-VEGETAL	CHEMOMEDICA	21 57	100	2,156 79	2,073 82
14/07/98	90322000 7	LABORATORIO CHILE SA	AEREO	ALEMANIA	METROPOLI	CYF	ALOE VERA	POLVO P F	AMBRO-F	12 94	300	3 882 27	2 215 35
29/10/98	93513000 K	BDF CHILE SA	AEREO	ALEMANIA	METROPOLI	EX-F	EXTRACTO DE ALOE	POLVO GDO PROF	BDF-F	712 36	1	712 36	473 75
15/12/98	93513000 K	BDF CHILE SA	MARITIMO	ALEMANIA	VALPARAIS	EX-F	EXTRACTO DE ALOE	POLVO GDO PROF.	BDF-F	29 64	10	296 42	284 01
21/07/98	80447400 5	GUILLERMO HARDING Y CIA LTDA	MARITIMO	ALEMANIA	VALPARAIS	CIF	EXTRACTO VEGETAL	DE ALOES EN POLVO	AMBRO-F	9 69	400	3.877 87	3,717 30
26/03/98	93513000 K	BDF CHILE SA	AEREO	ALEMANIA	METROPOLI	FOB	EXTRACTO VEGETAL DE ALOE	POLVO,PZA TECNICA	BDF-F	76 76	16	1,228 20	1,029 34
9/09/98	79653800 7	PRODUCTOS QUIMICOS MATERIAS PRIMAS Y SERVICIOS AFI	AEREO	ARGENT	METROPOLI	EX-F	ALOE VERA	LIQUIDO PZA TEC	DHACAM S R L	17 18	5	85 90	83 24
30/04/98	96757870 3	PROALTEC S A	AEREO	ESPANA	METROPOLI	FOB	EXTRACTOS VEGETALES	ALOE VERA	SANTIGA-F	15 37	128	1,967 70	1,491 03
14/05/98	96757870 3	PROALTEC S A	AEREO	ESPANA	METROPOLI	EX-F	EXTRACTOS VEGETALES	ALOE VERA	PROVITAL-F	16 47	120	1,975 82	1,491 64
19/06/98	96757870 3	PROALTEC S A	AEREO	ESPANA	METROPOLI	EX-F	EXTRACTOS VEGETALES	ALOE VERA	PROVITAL-F	19 58	58	1,135 57	900 17
23/02/98	79693930 3	INVERSIONES GILCO CHILE LIMITADA	MARITIMO	FRANCI	VALPARAIS	EX-F	EXTRACTO DE ALOE VERA	53594	L OREAL	17 93	30	537 75	524 30
8/05/98	96655550 5	LIPO CHILE S A	MARITIMO	USA/PR	VALPARAIS	EX-F	ALOE VERA	POLVO GDO TECNICO	LIPO-F	240 01	5	1,200 03	1,095 34
9/02/98	93681000 4	LABORATORIOS DAVIS SA	MARITIMO	USA/PR	SAN ANTON	EX-F	EXTRACTO DE ALOE	POLVO GDO PROF	RM-F	20 26	5	101 32	95 39
2/04/98	93681000 4	LABORATORIOS DAVIS SA	MARITIMO	USA/PR	SAN ANTON	EX-F	EXTRACTO DE ALOE	POLVO GDO PROF	REVLON-F	63 28	28	1,771 92	1,686 93
16/04/98	93681000 4	LABORATORIOS DAVIS SA	MARITIMO	USA/PR	SAN ANTON	EX-F	EXTRACTO DE ALOE	POLVO GDO.PROF	REVLON-F	22 38	5	111 90	102 77
21/08/98	93681000 4	LABORATORIOS DAVIS SA	MARITIMO	USA/PR	SAN ANTON	EX-F	EXTRACTO DE ALOE	POLVO GDO TECNICO	REVLON-F	21 48	2	42 95	41 03
17/07/98	84176900 7	REPRESENTACIONES DE MATERIAS PRIMASINDUSTRIALES	AEREO	USA/PR	METROPOLI	FOB	EXTRACTO DE ALOE VERA	ART WL004	TERRY LABORATOR	54 85	62	3,400 70	3,180 95
28/07/98	84176900 7	REPRESENTACIONES DE MATERIAS PRIMASINDUSTRIALES	AEREO	USA/PR	METROPOLI	FOB	EXTRACTO DE ALOE VERA	EN POLVO	TERRY LABORATOR	132 25	11	1,454 77	1,360 40
24/02/98	96670800 K	FOREVER LIVING PRODUCTS CHILE S A	MARITIMO	USA/PR	SAN ANTON	EX-F	JUGO CONCENTRADO D/ALOE	LIQUIDO GRDO TECNIC	ALOE V F	7 23	543.52	3,927 77	3,614 62
25/03/98	96670800 K	FOREVER LIVING PRODUCTS CHILE S A	MARITIMO	USA/PR	SAN ANTON	EX-F	JUGO CONCENTRADO D/ALOE VER	LIQUIDO GRDO TECNIC	ALOE V F	3 09	2033 11	6,291 85	5,682 57
2/06/98	96670800 K	FOREVER LIVING PRODUCTS CHILE S A	MARITIMO	USA/PR	SAN ANTON	EX-F	JUGO DE ALOE VERA	CONCENTRADO	ALOE VERA F	2 96	2642 72	7 834 92	7 066 65
24/07/98	96670800 K	FOREVER LIVING PRODUCTS CHILE S A	MARITIMO	USA/PR	SAN ANTON	FOB	JUGO DE ALOE VERA	CONCENTRADO	ALOE VERA F	4 38	8248 1	36,109 99	33 601 55
										TOTAL	14753 45	80,104 77	71 832 15

FUENTE : CAMARA DE COMERCIO DE SANTIAGO

PARTIDA ARANCELARIA : 3304.91.00 (SOLO ALOE VERA)

UNIDAD DE MEDIDA : KILOS NETOS (UNIDAD EN LA CUAL SE EXPRESA EL PRECIO UNITARIO Y LA CANTIDAD)

FECHA	RUT IMPORTADOR		NOMBRE IMPORTADOR	MEDIO TTE.	PAIS ADQUISICION	ADUANA	CLAUSULA COMPRA	IMPORTACION	VARIEDAD	MARCA	PRECIO UNIT. US$	CANTIDAD	TOTAL CIF US$	TOTAL FOB US$
15/06/98	96757870	3	PROALTEC S A	MARITIMO	ESPANA	VALPARAIS	CIF	ALOE VERA	COD.841703	PROVITAL-F	12.78	139	1,776.80	1,563 80
16/02/98	96757870	3	PROALTEC S A	MARITIMO	ESPANA	VALPARAIS	CIF	ALOE VERA EN POLV	COD.4741/75516	PROVITAL-F	152.83	1	152.83	137 47
10/02/98	96757870	3	PROALTEC S A	AEREO	ESPANA	METROPOLI	FOB	ALOE VERA EN POLV	COD.4741/83040	PROVITAC-F	232.63	5	1,163.15	650.19
											TOTAL	145	3.092.78	2.351 46

FUENTE : CAMARA DE COMERCIO DE SANTIAGO

PARTIDA ARANCELARIA : 3304.99.00 (SOLO ALOE VERA)

UNIDAD DE MEDIDA : KILOS NETOS (UNIDAD EN LA CUAL SE EXPRESA EL PRECIO UNITARIO Y LA CANTIDAD)

FECHA	RUT IMPORTADOR		NOMBRE IMPORTADOR	MEDIO TTE.	PAIS ADQUISICION	ADUANA	CLAUSULA COMPRA	IMPORTACION	VARIEDAD	MARCA	PRECIO UNIT US$	CANTIDAD	TOTAL CIF US$	TOTAL FOB US$
13/03/98	78702380	0	COMERCIAL URRUTIA E HIJOS LTDA	CARRETERO	Z.F.IQ	IQUIQUE	CIF	CREMA	ALOE VERA 8 O	ARTMATIC	3 45	132.5	457 50	427 48
											TOTAL	132.5	457 50	427 48

FUENTE : CAMARA DE COMERCIO DE SANTIAGO

NECON

ANEXO N° 2

Estudio de Factibilidad para Exportar Productos de Aloe a Japón

(JETRO – Japan External Trade Organization).

Aloe Products

(source: *Feasibility Study for Exporting to Japan* 1996 February)

CONTENTS

1. History of aloe products in Japan

Many types of aloe products exist in the world, but Japan is the place where the genus Aloe arborescens grows. This is the reason why aloe has been known in Japan from a long time ago as a medicine spread among people. However, Aloe arborescens is considered to have started as a marketted product in 1925, but in recent years many research studies were conducted and lead to the publication of reports in different academic fields tending to prove from an academic point of view the positive effects of aloe as a chemical and as a medical product. Together with these studies, aloe foods and cosmetics were developped by companies who started to reach a wider audience through advertisement efforts. Aloe products have started to spread progressively in Japan where people affectionate health-and-nature-friendly trends.

2. Statistics

As a health food, the size of aloe products market is known but no statistics are available concerning those products.

According to the Japan Health Food Association, the size of the market for aloe products taken as health food is estimated to reach approximately 23.5 billion yen. Some basic standards have been established by this Association concerning algae genus like chlorella, but aloe belongs to a group with no such standards.

3. Present situation of domestic demand

In Japan, aloe is used to some extent as a medical product, but demand for aloe focusses mainly on food application (approximately 80% of domestic demand) and on applications as a product for cosmetics and bath additives (appr. 20%).

(Aloe Shokuhin K.K.)

The following list shows the retail prices of the main aloe products marketed in Japan.

<Food products>

	(Retail prices)
• A.arborescens solution	¥ 3,000 (720ml)

(made of pressed A.arborescens only)

• A.arborescens juice	¥ 1,000 (300ml)
• Health pastille made of A.arborescens	¥ 3,000 (300pastilles)

(containing 70% of aloe extract and 30% of vitamins and calcium)

• Leaves of A.arborescens powdered	¥ 2,000 (50g)
• Dried leaves of A.arborescens	¥ 1,000 (40g)

(for aloe alcoholic beverages and aloe tea)

<Cosmetics and bath additives>

• Face soap	¥ 2,000 (100g)
• Cosmetic	¥ 2,000/¥2,500(120ml)
• Emulsifier	¥ 2,000/¥2,500(120ml)

- Nourishing cream ¥ 2,500/¥2,800(80ml)
- Beauty essence ¥ 3,000(30ml)
- Shampoo ¥ 1,200(300ml)
- Hair rinse ¥ 1,200(300ml)
- Body shampoo ¥ 2,000(800ml)

(Aloe Shokuhin K.K., House of Rose Co., Ltd.)

4. Current situation of domestic production

Aloe Shokuhin K.K. was the first Japanese company to manufacture aloe products and is presently cultivating, processing marketing and selling aloe products in Japan. Under this integrated marketing process, Aloe Shokuhin K.K. boasts a range of 8 items as food products and 14 items as cosmetics and bath additives products, mostly offered through direct mail purchase. With a sound turnover situation, the company foresees a 20% increase in 1995 over previous year (according to its march 1996 balance results). Running short of raw materials because of sales increase in recent years, Aloe Shokuhin K.K. has to buy also from base material manufacturers.

Another company, Goshu Yakuhin K.K., offers 5 bath additives items containing aloe extracts, the manufacturing of these products being consigned to an affiliated company. Aloe used as material is a domestic product. In the future, Goshu Yakuhin intends to manufacture other original products following the needs of consumers, such as cosmetics and health food products containing aloe.

5. Present situation of aloe products imports

A.arborescens is a domestically grown variety, but this genus is being recently cultivated as well in Korea and Korean companies have started to sell their products onto the Japanese market. According to Aloe Shokuhin, Korean aloes are cheaper in comparison to domestic production, but the main element, aloene, represents only half of the total composition, giving inferior products. Aloe Shokuhin has imported Korean aloe in the past but does not import these aloes anymore in order to avoid a drop of quality.

Another aloe genus is Aloe barbadensis, mainly imported from the US and Thailand, but production has increased recently in Okinawa as well. Concerning this Aloe variety as well, imported products tend to be cheaper, but production from Okinawa is considered a higher quality.

6. Sales situation

The company House of Rose is currently selling aloe cosmetics made of Aloe arborescens extracts (domestic cultivars) and Aloe barbadensis (imported cultivars). They have special contracts with manufacturers and do not go through wholesaling channels. Retailing is done only through House of Rose's proper retail outlets.

(House of Rose Co., Ltd.)

7. Customs duty and regulations concerning imports

Among many aloe varieties, Aloe arborescens, Aloe barbadensis and Aloe ferox are the most common varieties marketed in Japan. The following paragraphs will introduce the laws and regulations related to these three types.

7-1 Regulations according to Aloe variety

- The Pharmaceutical Affairs Law of Japan defines clearly drugs and foods. Taken as products to be absorbed through the mouth, "Aloe barbadensis" and "Aloe ferox" have to receive approval as drugs (in other words, they are not recognized as food products).
- "Aloe arborescens" is recognized as a food product.

7-2 Regulations according to the type of product

(1) Food Sanitation Law

The Japanese Food Sanitation Law defines standards and criteria to abide with concerning the food and drink category. Import of foods and drinks which would not fulfill these requirements is prohibited. Regulations concerning food additives are also stipulated in this Law and additives other than those designated by the Minister of Health and Welfare cannot be used.

Authority concerned (for more information)

The Ministry of Heakth and Welfare

Tokyo Quarantine Station, Food Inspection Division

3-9-35, Konan, Minato-ku, Tokyo 108

Tel. 03-3471-7913

(2) Pharmaceutical Affairs Law

The Pharmaceutical Affairs Law exists to ensure suitable levels of quality, effectiveness, and safety in drugs, quasi-drugs, cosmetics and medical equipment used in Japan by regulating their manufacture, import and sale. Import and sale of these products mean that importers have to obtain approval for manufacturing (importing) and an authorization for import and sale of the products.

The Pharmaceutical Affairs Law of Japan defines drugs, quasi-drugs, and cosmetics as follows.

Drugs

1) Items prepared according to the Pharmacopoeia Japonica.

2) Items, except for mechanical equipment, that are designed for use by humans or animals for the diagnosis, treatment, or prevention of illness.

3) Items, except for mechanical equipment, that are designed to affect the structure or functions of the bodies of humans or animals.

Quasi-drugs

Items, except for mechanical equipment and items pertaining to such equipment, which are recognized by the Minister of Health and Welfare as intended for the following purposes, and which exert only a mild effect on the human body.

1) Prevention of nausea and other disconfiture, oral and other body odors.

2) Prevention of heat rash and sores.

3) Prevention of hair loss, encouragement of hair growth, and hair removal.

4) Elimination or prevention of attack by mice, flies, mosquitoes and fleas against

humans or animals.

Cosmetics

Items intended to be painted, spread, or applied in similar ways to the body with the purpose of cleansing or beautifying the human body, increasing its attractiveness, changing its appearance, or keep the skin or hair in a healthy condition, while exerting only a mild effect on the body. However, items and quasi-drugs intended for these purposes which are used according to the second and third definitions of 'drug' above, are excluded from this category.

For information, such products as bath additives or treatment hair tonic belong to the category 'quasi-drugs' whereas shampoo and rinse belong to 'cosmetics'.

Concerning cosmetics, 'Japan Cosmetic Ingredients Codex' defines a set of standards for composition proportions and codifies ingredients to be used.

Authority concerned (for more information)

The Ministry of Health and Welfare

Pharmaceutical Affairs Bureau

Second Evaluation and Registration Division

1-2-1, kasumigaseki, Chiyoda-ku, Tokyo100

Tel.:03-3503-1711

7-2 Customs duty

According to application, type of product and composition among other, HS reference code is different. For this reason, importers are advised to contact Japan Tariff Association in advance. Some relevant examples are given below as information.

- HS No.1211.90.9900 -> Plants and parts of plants of a kind used primarily in perfumery, in pharmacy or for insecticidal, fungicidal or similar purposes, fresh or dried, n.e.s.:4.6%
- HS No. 1302.19.110 -> Vegetable saps and extracts, used as bases for beverage, obtained from a single material of vegetable origin: 10%.

For more information, contact

Japan Tariff Association

4-7-8, Kojimachi, Chiyoda-ku, Tokyo102

Tel. 03-3263-7221

8. Conclusion

In recent years, academic reports were published in Japan concerning the excellent properties of some element of aloe, together with the absence of side effect risks, resulting in a stronger interest from Japanese people for the value of aloe products. Natural cosmetics are gaining a very strong momentum in the US, and aloe is shown as one example of natural cosmetic. At the same time, cosmetic products are being better and better known. On the other hand, for aloe, but also for other products such as natural health foods and natural cosmetics, there is an increase of business ventures based on products using natural ingredients.

Cultivation and production of aloe can be easily carried out in Japan. This is the reason why Japanese companies developing a business in this field have an integrated range of activity: cultivation, production, processing, marketing and sales, but another reason stems from the purpose of garanteeing a high level of quality to the consumer, as a provider of products bound to make people healthy. However, many people regret a foreseeable progressive increase of cheap and low quality aloe imports compared to domestically produced ones.

The food and cosmetic markets in Japan have already reached their saturation level. For this reason, what interests Japanese people in this period of accelerated ageing society is any product which is "good for the body" (for the purpose of health conservation or beautifying). Japanese companies who sell aloe products are presently considering the development of new products and for Aloe Shokuhin "the market may expand to a 100 billion yen market". These facts lead us to say that foreign manufacturers have quite sufficient possibilities to enter aloe market. However, the product category to which the product belong is an important point pertaining to regulations, that should not be overlooked.

(Aloe Shokuhin K.K., House of Rose Co., Ltd. Orihiro K.K.)

9. Information Source

* Japan Health Food Association	
Shokuhin-eisei Center Bldg.2-6-1, Jingumae, Shibuya-ku, Tokyo 150	Tel:03-5410-8231
* Ministry of Health and Welfare, Pharmaceutical Affaire Bureau Inspection and Guidance Division.	
* Ministry of Health and Welfare,Pharmaceutical Affaire Bureau Evaluation and Registration Division	
1-2-1, Kasumigaseki, Chiyoda-ku, Tokyo 100	Tel:03-3503-1711

* Tokyo Metropolitan Government, Bureau of Public Health Pharmaceutical Sanitation Section	
2-8-1, Nishi-shinjuku, Shinjuku-ku, Tokyo 163-01	Tel:03-5321-1111
* Aroe Shokuhin K.K.	
2208, Shimoedome, Ohikawa-machi, Shita-gun, Prefecture Shizuoka 421-02	Tel:054-622-5566 (Sales Administraion Div.)
* Goshu Yakuhin K.K.	
1-1-5, Hanazono-cho, Toyama-shi, Prefecture Toyama 930	Tel:0764-24-2661 (MR Ebitani)
* House of Rose Co.,Ltd.	
No.3 Inose Bldg.2-12-31, Kita-aoyama, Minato-ku, Tokyo 107	Tel:3475-6711 (Ms Nakayama)
* Orihiro K.K.	
541-1, Jinnari, Tomioka-shi, Prefecture Gumma 370-24	Tel:0274-60-2010

ANEXO N° 3

Principales Antecedentes Recopilados.

- Aplicaciones farmacológicas, farmodinámicas y farmacocinéticas del Aloe Vera – Laboratorios Farmacéuticos Pejoseca, S.L. - 1994
- A Modern Herbal : Aloes – Mrs. M. Grieve – 1995
- Overview of the Lyophilization Process – Thomas A. Jennings, Ph. D.
- U.S. Cosmetics & Toiletries Market: 1998/9 Edition – Resumen
- Estudio de mercado del Aloe Vera en Australia – PROCHILE 1990 – Varios Artículos.
- U.S. Food and Drug Administration Import Procedures – 1996
- United States Import Requirements – US Customs – 1997
- Capítulo 13 del Sistema Armonizado de Tarifas Arancelarias – USA
- Compendio de sitios WEB relacionados con agricultura
- TELSTAR – Características técnicas equipos de liofilización LIOMEGA
- MOLDA – Descripción procesos de deshidratación: Liofilización (Freezing Drying), Secado al vacío por correa y Secado por Spray.
- LYOSAN – Descripción de la compañía y del proceso de liofilización.

Laboratorios Farmacéuticos

Pejoseca, s.l.

Productos Naturales

English

APLICACIONES FARMACOLOGICAS, FARMACODINAMICAS Y FARMACOCINETICAS DEL

Aloe Vera

Las plantas que pertenecen al género áloe de las familia de las liliáceas han sido usadas en la Medicina popular en bastantes países durante miles de años. Muchas culturas antiguas (china, india, egipcia, romana, griega) conocieron y usaron los productos obtenidos de especies de áloes por su amplio rango de uso medicinal como laxantes, protectores de la piel, contra la sinusitis, gingivitis, fiebre, convulsiones, etc.

Son plantas perennes, suculentas, con tallo leñoso y robusto.

Las hojas son sésiles, carnosas de forma lanceolada con la base ensanchada y los bordes dentados, terminadas en punta recia y provistas de una fuerte cutícula; usualmente tienen espinas más pequeñas en los márgenes. Se reúnen en una roseta que puede ser basal o encontrarse en el ápice de un tallo de hasta 6 m; la planta toma en este último caso, porte aéreo.

Los aloes se distribuyen en áreas cálidas y áridas de todo el mundo; Mar Mediterráneo, Oriente Medio, Africa, China, Japón, México y Sur de Estados Unidos.

Varias especies de este género tienen importancia por sus propiedades y aplicaciones medicinales: Aloe arborescents Mill., Aloe Barbadensis Mill. (Aloe Vera L.), Aloe ferox Mill. Aloe Saponaria Haw., Aloe Vahombe, entre otras. De sus hojas se obtienen básicamente dos productos usados actualmente en terapéutica:

- **Acíbar**: Residuo seco obtenido por evaporación y concentración al vacío del látex o savia contenido en las células situadas inmediatamente por debajo de la cutícula (células del periciclo de hoja). Con efecto laxante. Se obtiene principalmente del A. ferox y A. barbadensis.

- **Gel de áloe**: Sustancia clara y gelatinosa de color blanco-amarillento que procede de las células mucilaginosas del parénquima central de la hoja. Con efecto tópico principalmente como hidratante y antiinflamatorio. Se obtiene sobre todo del A. barbadensis (=Aloe Vera).

Para la obtención del gel de áloe, las hojas frescas una vez recolectadas, se cortan en segmentos y se elimina la corteza que contiene los componentes fenólicos amarillos, lo cual deja libre la pulpa gelatinosa transparente que contiene el gel.

COMPOSICION

En función de la especie de áloe y de determinadas condiciones como la época de recolección de las hojas, la edad de las mismas, el riego y su almacenamiento, así como la forma de obtención del gel y el almacenamiento del mismo influyen en su composición y en sus propiedades físico-químicas y farmacológicas.

El gel de Aloe Vera contiene alrededor del 99.4% de agua en peso. En función del proceso al que se someten las hojas para extraer el gel, más del 60% de los sólidos totales son carbohidratos, principalmente mucílagos. Los azúcares encontrados son glucosa y manosa y cantidades menores de ramnosa, xilosa, arabinosa, galactosa y

ácidos urónicos.

El mucílago mayoritariamente está compuesto de polisacáridos neutros que suelen ser b-(174)-glucomananos, b-D-mananos, galactanos, arabinogalactanos, etc. en general, metilados y acetilados. Destaca el acemanano aislado del extracto etanólico del gel de Aloe Vera. El acemanano es un polisacárido parcialmente acetilado, que consiste en unidades lineales de (1/4)-D-manoiranosil. Los azúcares neutros que se unen en cadena a través de enlaces (1/6) son galactopiranosas en una proporción 1 por cada 20 azúcares.

El mucílago contiene también polisacáridos ácidos con diferentes proporciones de ácido galacturónico.

El resto de los sólidos que componen el gel son ácidos y sales orgánicas (ácido glutámico, málico, salicílico y cítrico y lactato magnésico, oxalato cálcico, etc.), enzimas (celulasa, carboxipeptidasa, bradikininasa, catalasa, amilasa, oxidasa, tirosinasa), sapogénicas, taninos, heteróxidos antracénicos (impurificando el gel), esteroles, triglicéridos, aminoácidos (lisina, histidina, glutamina, arginina, ácido aspártico, asparagina, treonina, serina, ácido glutámico, glicina, alanina, valina, metionina, isoleucina, leucina, tirosina, fenilalanina y triptófano), RNA, trazas de alcaloides, vitaminas (Betacaroteno, B1, B2, B3, B6, C, E, colina, ácido fólico) y minerales (Al, B, Ba, Ca, Cr, Cu, Fe, K, Mg, Mn, Na, P, Sr, Si), variando en función de la lluvia, el terreno y la época de recolección.

ACCIONES Y USOS DEL GEL EN FARMACIA

El gel de Aloe no tiene actividad purgante ni laxante. Las principales actividades que presenta el gel de Aloe son antiinflamatoria, inmunomoduladora e hidratante, aunque existen muchas investigaciones farmacológicas que muestran actividades e indicaciones relacionadas o no con las citadas.

cicatrizante	anti-inflamatorio	regenerador cutáneo
hidratante	queratolítico	analgésico
anti-histamínico	anti-hemorroides	anti-acné
antiséptico	disinfectante	anti-varicoso
estimulador capilar	epitelizante	anti-ulceroso
anti-asma	estimulante cardíaco	hipolipemiante
hipoglucemiante	hemostático	imunomodulador

El gel más estudiado ha sido el del Aloe Vera que es al que nos referimos a continuación.

En general tiene propiedades humectantes e hidratantes. Tiene capacidad de retener agua. El gel se usa cuando se requiere hidratación y suavidad, normalmente en combinación con otros hidratantes y humectantes cutáneos (glicerina, propilenglicol). En combinación con ellos se produce un efecto sinérgico.

Ha demostrado ser útil como vehículo en preparaciones que contienen sustancias antiinflamatorias de tipo corticoide. Por vía tópica dermatológica el gel es un buen transportador de corticoides a través de la capa córnea de la piel debido a su efecto de retener agua en la zona donde se aplica. Incrementa así la absorción del esteroide. Además tiene efecto propio por ser antiinflamatorio y actuar a nivel celular provocando la reparación del tejido, efecto no producido por los corticoides.

El gel de Aloe Vera penetra en el tejido dañado reduciendo el dolor. Es antiinflamatorio y previene la progresiva isquemia dermal causada por quemaduras, congelación, descargas eléctricas, radioterapias. Se utiliza para prevenir la necrosis, pérdida progresiva del tejido de la herida. La aceleración del proceso es importante porque reduce la contaminación bacteriana.

A pesar de la actividad del gel en curación de heridas superficiales, quemaduras, dermatitis producidas por radiaciones, etc. éste no es efectivo en incisiones cortantes profundas en la piel (cesáreas, etc.), ni tampoco en quemaduras por ácido fluorhídrico.

Por otra parte, el gel de Aloe Vera tiene efecto antienvejecimiento. Las alteraciones producidas en la piel por la edad y por las radiaciones solares se deben a que los cambios degenerativos superan a los regenerativos,

caracterizándose por la aparición de arrugas. Extractos de Aloe Vera restablecen el equilibrio entre estos cambios degenerativos/regenerativos, estimulando la síntesis de colágeno y de las fibras de elastina de la piel. El gel de Aloe incrementa el contenido de colágeno soluble en la piel tratada con el mismo. Por otra parte, el gel contiene tirosinasa que en aplicación continuada sobre la piel puede inhibir la formación de melanina, causante de las áreas de hiperpigmentación de la piel.

Al someter el gel de Aloe Vera a diálisis, se han separado sus componentes en dos fracciones, una de alto peso molecular y otra de bajo peso molecular. Ambas fracciones tienen parte de responsabilidad en la actividad del gel.

FRACCIONES DE ALTO PESO MOLECULAR

Se ha estudiado la actividad de:

- **POLISACARIDOS**. Tienen actividad inmunomoduladora, actuando sobre el sistema inmunológico como complemento.

Uno de ellos, el **acemanano** es un inductor de interlukina 1 y postglandina E2 producida por los macrófagos de la sangre humana. La interleukina influye en la actividad y producción de linfocitos T, B, fibrobastos y células endoteliales. Así, el acemanano induce la proliferación de células fibroblásticas aumentando la proporción de la actividad metabólica y replicación celular que son pasos fundamentales en un proceso curativo. El acemanano incrementa la actividad fagocítica de los monocitos y linfocitos, aumenta la cantidad de anticuerpos IgM y IgG a antígenos víricos y disminuye el tiempo requerido para su aparición en el suero sanguíneo.

Estos mecanismos provocan un aumento global de toda la respuesta inmune. Intervienen el aumentar los linfocitos T4 que ayudan a la reducir los síntomas asociados a las infecciones por HIV (SIDA) y ayudan a eliminar infecciones víricas. También son los responsables de curación de quemaduras, úlceras y otras heridas de la piel y mucosas.

Por otra parte, muchos autores han encontrado sustancias polisacáridas con alto contenido en manosa que actúan provocando proliferación celular en heridas. Esto sugiere que la manosa es el factor causante de esta actividad.

- **BRADIKINASA**. Es un enzima con actividad carboxipeptidasa que rompe los aminoácidos C-terminales de la bradikinina, angiotensina I y otros péptidos endógenos.

Tanto la bradikinina como la angiotensina I y II juegan un papel importante en el sistema natural de regulación de la presión de la sangre. La bradikinina es un monopéptido vasodilatador y un potente productor de dolor. La angiotensina I es un decapéptido inactivo que se convierte en angiotensina II por pérdida de los dos aminoácidos C-terminales. La angiotensina II es un vasopresor.

Por acción de la bradikinasa se inactiva la bradikinina y se produce angiotensina II. La acción enzimática de la de la bradikinasa reduce el dolor y disminuye la dilatación de los vasos sanguíneos. La activación de angiotensina II los contrae hasta su nivel normal. Es pues un buen método antiinflamatorio.

La angiotensina II tiene otras actividades: actúa directamente sobre las glándulas adrenales liberando aldosterona. Esta hormona junto con otras regula el metabolismo electrolítico, actúa como diurético, disminuye el edema por antagonización de la hormona antidiurética ADH.

FRACCIONES DE BAJO PESO MOLECULAR

Estos componentes del extracto acuoso del gel de Aloe Vera inhiben la liberación de radicales libres por polimorfonucleares, disminuyéndolos extracelularmente. En cambio, las concentraciones de estos radicales a nivel intracelular no se alteran.

Así la capacidad de los polimorfonucleares, de fagocitar y matar microorganismos a nivel intracelular se mantiene, mientras que se evitan los efectos citotóxicos producidos por los radicales liberados. Esto explica su eficacia terapéutica en la curación de heridas.

De entre estos componentes se ha estudiado la actividad del lactato magnésico. Este compuesto inhibe el enzima histidina-descarboxilasa, responsable de la conversión del aminoácido histidina a histamina que ocurre en los mastocitos. Así se inhibe la producción de histamina en los mastocitos disminuyendo la vasodilatación. Esto contribuye a que el gel sea efectivo en inflamación.

Por otra parte, el lactato magnésico, al igual que muchos azúcares del gel influyen en las propiedades hidratantes del gel y pueden reducir la proporción de pérdida de hidratación de las cremas y lociones farmacéuticas ayudando así al efecto hidratante de las mismas.

El gel de Aloe, principalmente se usa en dermatología, y dermofarmacia por su acción favorable en determinadas dermatosis. Tiene efectos curativos sobre quemaduras causadas por algunas radiaciones, en úlceras de piel, etc.

Asimismo, se incorpora como componente antiinflamatorio, curativo de heridas, en preparados para el cuidado de la piel. Normalmente, se puede incorporar a cremas y lociones, bronceadores, protectores solares, jabones, sprays para quemaduras, etc. Además de las propiedades curativas que tiene el gel, la capacidad de éste para retener agua en la zona dañada es también básica para la curación.

Bibliografía : Revista Acofar Diciembre/94, Laura Segura, Unidad de Investigaciones Farmacéuticas y Farmacológicas, Facultad de Farmacia, Universidad de Barcelona.

Subject: Aloes (http://www.botanical.com/botanical/mgmh/a/aloes027.html)
Date: Tue, 2 Mar 1999 00:32:16 -0400
From: "Santiago Zuniga" <szuniga@interaccess.cl>
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Botanical.com
A Modern Herbal
by Mrs. M. Grieve

Aloes

Botanical: Aloe Perryi (J. G. BAKER), Aloe vera (LINN)
Family: N.O. Liliaceae

---Part Used---Leaves.
---Habitat---Aloes are indigenous to East and South Africa, but have been introduced into the West Indies (where they are extensively cultivated) and into tropical countries, and will even flourish in the countries bordering on the Mediterranean.

The drug *Aloes* consists of the liquid exuded from the transversely-cut bases of the leaves of various species of Aloes, evaporated to dryness.

---Description---They are succulent plants belonging to the Lily family, with perennial, strong and fibrous roots and numerous, persistent, fleshy leaves, proceeding from the upper part of the root, narrow, tapering, thick and fleshy, usually beset at the edges with spiney teeth. Many of the species are woody and branching. In the remote districts of S.W. Africa and in Natal, Aloes have been discovered 30 to 60 feet in height, with stems as much as 10 feet in circumference.

The flowers are produced in erect, terminal spikes. There is no calyx, the corolla is tubular, divided into six narrow segments at the mouth and of a red, yellow or purplish colour. The capsules contain numerous angular seeds.

The true Aloe is in flower during the greater part of the year and is not to be confounded with another plant, the *Agave* or American Aloe (*Agave Americana*), which is remarkable for the long interval between its periods of flowering. This is a succulent plant, without stem, the leaves being radical, spiney, and toothed. There is a variety with variegated foliage. The flower-stalk rises to many feet in height, bearing a number of large and handsome flowers. In cold climates there is usually a very long interval between the times of its flowering, though it is a popular error to suppose that it happens only once in a hundred years for when it obtains sufficient heat and receives a culture similar to that of the pineapple, it is found to flower much more frequently. Various species of Agave, all of which closely resemble each other, have been largely grown as ornamental plants since the first half of the sixteenth century in the south of Europe, and are completely acclimatized in Spain, Portugal and Southern Italy,

but though often popularly called Aloes all of them are plants of the New World whereas the true Aloes are natives of the Old World. From a chemical point of view there is also no analogy at all between Aloes and Agaves.

Although the Agave is not employed medicinally, the leaves have been used in Jamaica as a substitute for soap, the expressed juice (a gallon of the juice yields about 1 lb. of the soft extract), dried in the sun, being made into balls with wood ash. This soap lathers with salt water as well as fresh. The leaves have also been used for scouring pewter and kitchen utensils. The inner spongy substance of the leaves in a decayed state has been employed as tinder and the fibres may be spun into a strong, useful thread.

The fleshy leaves of the true *Aloe* contain near the epidermis or outer skin, a row of fibrovascular bundles, the cells of which are much enlarged and filled with a yellow juice which exudes when the leaf is cut. When it is desired to collect the juice, the leaves are cut off close to the stem and so placed that the juice is drained off into tubs. This juice thus collected is concentrated either by spontaneous evaporation, or more generally by boiling until it becomes of the consistency of thick honey. On cooling, it is then poured into gourds, boxes, or other convenient receptacles, and solidifies.

Aloes require two or three years' standing before they yield their juice. In the West-Indian Aloe plantations they are set out in rows like cabbages and cutting takes place in March or April, but in Africa the drug is collected from the wild plants.

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---**Constituents**---The most important constituents of Aloes are the two Aloins, Barbaloin and Isobarbaloin, which constitute the so-called 'crystalline' Aloin, present in the drug at from 10 to 30 per cent. Other constituents are amorphous Aloin, resin and Aloe-emodin. The proportion in which the Aloins are present in the respective Aloes is not accurately known.

The manner in which the evaporation is conducted has a marked effect on the appearance of the Aloes, slow and moderate concentration tending to induce crystallization of the Aloin, thus causing the drug to appear opaque. Such Aloes is termed 'livery' or hepatic, and splinters of it exhibit minute crystals of Aloin when examined under the microscope. If, on the other hand, the evaporation is carried as far as possible, the Aloin does not crystallize and small fragments of the drug appear transparent; it is then termed 'glassy,' 'vitreous,' or 'lucid' Aloes and exhibits no crystals of Aloin under the microscope.

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---**Varieties**---The chief varieties of Aloes are Curacao or Barbados, Socotrine (including Zanzibar) and Cape. Other varieties of Aloes, such as black 'Mocha' Aloes, occasionally find their way to the London market. *Jafferabad* Aloes, supposed to be the same as 'Mocha' Aloes, is of a black, pitch-like colour and a glassy, somewhat porous fracture; it is the product of *Aloe Abyssinica* and is imported to Bombay from Arabia. It does not enter into English commerce. *Musambra Aloes* is made in India from *A. vulgaris*. *Uganda* Aloes, imported from Mossel Bay, not from Uganda, is a variety of Cape Aloes produced by careful evaporation. *Natal* Aloes, another South African variety, is no longer a commercial article in this country. The *A. Purificata* of the United States Pharmacopoeia is prepared by adding Alcohol to melted Aloes, stirring thoroughly, straining and evaporating the strained liquid. The product occurs in irregular, brittle, dull- brown or reddish pieces and is almost entirely soluble in Alcohol.

Curacoa Aloes is obtained from *A. chinensis* (Staud.) *A. vera* (Linn.) and probably other species. It was formerly produced on the island of Barbados, where it was largely cultivated, having been introduced at the beginning of the sixteenth century, and is still frequently, but improperly called *Barbados Aloes*. It is now almost entirely made on the Dutch islands of Curacoa, Aruba and Bonaire by boiling the Aloe juice down and pouring the viscid residue into empty spirit cases, in which it is allowed to solidify. Formerly gourds of various sizes were used (usually containing from 60 to 70 lb.) but Aloes in gourds is now seldom seen. It is usually opaque and varies in colour from bright yellowish or rich reddish brown to black. Sometimes it is vitreous and small fragments are then of a deep garnet-red colour and transparent. It is then known as 'Capey Barbados' and is less valuable, but may become opaque and more valuable by

keeping. Curacoa Aloes possesses the nauseous and bitter taste that is characteristic of all Aloes and a disagreeable, penetrating odour. It is almost entirely soluble in 60 per cent alcohol and contains not more than 30 per cent of substances insoluble in water and 12 per cent of moisture. It should not yield more than 3 per cent of ash.

Commercial Aloin is obtained usually from Curacoa Aloes.

Solutions of Curacoa and other Aloes gradually undergo change, and may after a month no longer react normally, and may also lose the bitterness natural to Aloes.

Socotrine Aloes is prepared to a certain extent on the island of Socotra, but probably more largely on the African and possibly also on the Arabian mainland, from the leaves of *A. Perryi* (Baker). It is usually imported in kegs in a pasty condition and subsequent drying is necessary. It may be distinguished principally from Curacoa Aloes by its different odour. Much of the dry drug is characterized by the presence of small cavities in the fractured surface, but the variety of Socotrine Aloes distinguished as *Zanzibar Aloes* often very closely resembles Curacoa in appearance and is usually imported in liver-brown masses which break with a dull, waxy fracture, differing from that of Socotrine Aloes in being nearly smooth and even. When it is prepared, it is commonly poured into goat skins, which are then packed into cases.

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---**Constituents**---The name 'Socotrine' Aloes is officially applied to both Socotrine and Zanzibar Aloes. Its chief constituents are Barbaloin (formerly called Socaloin and Zanaloin) and B. Barbaloin, no Isobarbaloin being present in this variety of Aloes. Resin water-soluble substances other than Aloin and Aloe-emodin are also present.

Socotrine Aloes should be of a dark, reddish-brown colour, and almost entirely soluble in alcohol. Not more than 50 per cent should be insoluble in water and it should yield not more than 3 per cent of ash. Garnet-coloured, translucent Socotrine Aloes is not now found in commerce, though fine qualities of Zanzibar Aloes are sometimes slightly translucent. Samples of the drug which are nearly black are unfit for pharmaceutical purposes. The odour of Zanzibar Aloes is strong and characteristic, and its taste nauseous and bitter.

Cape Aloes is prepared in Cape Colony from *A. ferou* (Linn.), *A. spicata* (Thumb.) *A. Africana, A. platylepia* and other species of Aloe. It possesses more powerfully purgative properties than any other variety of the drug and is preferred to other varieties on the Continent, but is chiefly employed in this country for veterinary purposes only though for this purpose the Curacoa Aloes is as a rule preferred. Another form of the drug used for veterinary purposes, called *Caballine* or *Horse Aloes*, usually consists of the residue from the purification of the more valuable sorts.

Cape Aloes almost invariably occurs in the vitreous modification; it forms dark coloured masses which break with a clean glassy fracture and exhibit in their splinters a yellowish, reddish-brown or greenish tinge. Its translucent, glossy appearance and very characteristic, red-currant like odour sufficiently distinguish it from all other varieties of Aloes.

Uganda Aloes is also obtained from *A. ferox*. It occurs in bricks or fragments of hepatic, yellowish-brown colour, with a bronze gold fracture and its odour resembles that of Cape Aloes.

Cape Aloes contains 9 per cent or more of Barbaloin (formerly known as Capaloin) and B. Barbaloin. Only traces of Capalores not annol combined with paracumaric acid. Cape Aloes should not contain more than 12 per cent of water; it should yield at least 45 per cent of aquoeus extract but not more than 2 per cent of ash Uganda Aloes yields about 6 per cent of Aloin, part of which is B. Barbaloin. The leaves of the plants from which Cape Aloes is obtained are cut off near the stem and arranged around a hole in the ground, in which a sheepskin is spread, with smooth side upwards. When a sufficient quantity of juice has drained from the leaves it is concentrated by heat in iron cauldrons and subsequently poured into boxes or skins in which it solidifies on cooling. Large quantities of the drug are exported from Cape

Town and Mossel Bay.

Natal Aloes. The source of this variety which is seldom imported, is not yet definitely ascertained, but it is probably prepared from one or more species of Aloe, probably including *A. ferox*. Natal Aloes is prepared with greater care than Cape Aloes the leaves being cut obliquely into slices and the juice allowed to exude in the hot sunshine, after which it is boiled down in iron pots the liquid being stirred until it becomes thick and then poured into wooden cases to solidify. Natal Aloes is much weaker than any other variety, having little purgative action on human beings, apparently because it contains no Emodin. It is no longer of commercial importance. It resembles Cape Aloes in odour and occurs in irregular pieces which are almost always opaque and have a characteristic, dull greenish-black or brown colour. It is much less soluble than Cape Aloes. It has not a glassy fracture like that of Cape Aloes and when powdered is of a greenish colour.

Good Aloes should yield 40 per cent of soluble matter to cold water.

Both Curacoa and Cape Aloes in powder give a crimson colour with nitric acid. Socratine Aloes powder touched with nitric acid does *not* give a crimson colour.

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---**History**---The Mahometans, especially those in Egypt, regard the Aloe as a religious symbol, and the Mussulman who has made a pilgrimage to the shrine of the Prophet is entitled to hang the Aloe over his doorway. The Mahometans also believe that this holy symbol protects a householder from any malign influence.

In Cairo, the Jews also adopt the practice of hanging up the Aloe.

In the neighbourhood of Mecca, at the extremity of every grave, on a spot facing the epitaph, Burckhardt found planted a low shrubby species of Aloe whose Arabic name, *saber*, signifies *patience*. This plant is evergreen and requires very little water. Its name refers to the waiting-time between the burial and the resurrection morning.

All kinds of Aloes are admirably provided by their succulent leaves and stems against the drought of the countries where they flourish. The cuticle which covers every part of the plant is, in those which contain a great quantity of pulpy material, formed so as to imbibe moisture very easily and to evaporate it very slowly. If the leaf of an Aloe be separated from the parent plant, it may be laid in the sun for several weeks without becoming entirely shrivelled; and even when considerably dried by long exposure to heat, it will, if plunged into water, become in a few hours plump and fresh.

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---**Medicinal Action and Uses**---The drug Aloes is one of the safest and best warm and stimulating purgatives to persons of sedentary habits and phlegmatic constitutions. An ordinary small dose takes from 15 to 18 hours to produce an effect. Its action is exerted mainly on the large intestine, for which reason, also it is useful as a vermifuge. Its use, however, is said to induce Piles.

From the *Chemist and Druggist* (July 22, 1922):

> '*Aloes*, strychnine and belladonna in pill form was criticized by Dr. Bernard Fautus in a paper read before the Chicago branch of the American Pharmaceutical Society. He pointed out that when given at the same time they cannot possibly act together because of the different speed and duration of the three agents. *Aloin is slow in action*, requiring from 10 to 12 hours. Strychnine and Atropine, on the other hand, are rapidly absorbed, and have but a brief duration of action.'

Preparations of Aloes are rarely prescribed alone, they require the addition of carminatives to moderate the tendency to griping. The compound preparations of Aloes in use generally contain such correctives, but powdered Aloes and the extracts of Aloes represent the crude drug.

Aloes in one form or another is the commonest domestic medicine and is the basis of most proprietary or so-called 'patent' pills.

There is little to choose medicinally between the Curacoa and Socotrine varieties, but the former is somewhat more powerful, 2 grains of Curacoa Aloes being equal to 3 grains of Socotrine Aloes in purgative action. The latter is more expensive, but varies much in quality.

Aloes is the purgative in general uses for horses, it is also used in veterinary practice as a bitter tonic in small doses, and externally as a stimulant and desiccant.

Aloes was employed by the ancients and was known to the Greeks as a production of the island of Socotra as early as the fourth century B.C. The drug was used by Dioscorides, Celsus and Pliny, as well as by the later Greek and Arabian physicians, though it is not mentioned either by Hippocrates or Theophrastus.

From notices of it in the Anglo-Saxon leech-books and a reference to it as one of the drugs recommended to Alfred the Great by the Patriarch of Jerusalem, we may infer that its use was not unknown in Britain as early as the tenth century. At this period the drug was imported into Europe by way of the Red Sea and Alexandria. In the early part of the seventeenth century, there was a direct trade in Aloes between England and Socotra, and in the records of the East Indian Company there are notices of the drug being bought of the King of Socotra, the produce being a monopoly of the Sultan of the island.

The word Aloes, in Latin *Lignum Aloes*, is used in the Bible and in many ancient writings to designate a substance totally distinct from the modern Aloes, namely the resinous wood of *Aquilaria agallocha*, a large tree growing in the Malayan Peninsula. Its wood constituted a drug which was, down to the beginning of the present century, generally valued for use as incense, but now is esteemed only in the East.

A beautiful violet colour is afforded by the leaves of the Socotrine Aloe, and it does not require a mordant to fix it.

---**Preparations**---Fluid extract: dose, 5 to 30 drops. Powdered extract: dose, 1 to 5 grains. Comp decoc., B.P.: dose, 1/2 to 2 OZ. Tincture B.P.: dose, 1/4 to 2 drachms. Tincture aloes myrrh, U.S.P.: dose, 30 drops.

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Overview of the Lyophilization Process

By

Thomas A. Jennings, Ph.D.

There may be individuals who visit our web site who are not familiar at all with the lyophilization process. As a consequence, they may find the current issues of INSIGHT to be difficult to understand and wish for a more general overview of the process and its associated instrumentation and equipment. It is to those individuals that we dedicate this issue of INSIGHT.

The very first thing that a person should understand is the definition of the term lyophilization. Such a definition will not only give a general description of the process in one sentence but serve as a basis for expanding one's knowledge of the subject. Without the aid of a definition, one often finds themselves cast adrift upon a sea of terms or technical jargon that leads to confusion rather than understanding. It is surprising to this author, to see the look of pain on an individual's face who has used the term lyophilization a countless number of times but is lost to provide a definition.

The lyophilization process is defined as " A *stabilizing process* in which a substance is first *frozen* and then the quantity of the solvent (generally water) is *reduced* , first by *sublimation* (referred to as the primary drying process) and then *desorption* (known as the secondary drying process) to values that will no longer support biological activity or chemical reactions"[1]. While the actual definition contains but 37 words - not counting those contained in the parentheses - less than one quarter of the words (those italicized) are considered key words and are essential to understanding of the nature the lyophilization process. The following will provide a brief discussion of the above key terms. In order to simplify the discussion, the example used will be a solution comprising of water as a solvent and a number solutes (constituents).

Stabilizing Process : The very essence of the lyophilization process is that it is a stabilizing process. In simple terms, it is a process that slows down the kinetic clock. The kinetic clock is the rate at which a substance undergoes change. An example of a substance undergoing a slow change would be rusting of iron while a material undergoing rapid change would be like the burning of gun powder. While lyophilization is not used to prevent the rusting of iron or the burning of gun powder, it is used in the health care industry to slow down the kinetic clock of pharmaceutical products.

For example, a pharmaceutical formulation will retain at least 90% of its original potency for two weeks when stored in a refrigerator where the temperature ranges from 4 C to 8 C. After two weeks, the potency is found to be less than 90% and the product must be discarded. This would then mean that the pharmaceutical product would have to be prepared, bottled, shipped (while being maintained at 4 C to 8 C) and administered by a physician to a patient all in less than two weeks. If the pharmaceutical company shipped too much of the product then it would suffer a financial loss as a result of the un-used product being discarded. If the company did not ship enough product, then there would be patients who would be forced to do without the product. One can see that with a shelf-life of only two weeks at 4 C to 8 C, it would be difficult to maintain a steady world wide supply of a pharmaceutical product.

Now enters the lyophilization process and the kinetic clock is slowed down where 1 second at the refrigerated temperatures is extended to 1 minute at room temperature. By changing the rate of the kinetic clock, the formulation that was only stable for two weeks at 4 C to 8 C is now stable for 120 weeks or 2.3 years. In slowing down the kinetic clock, the pharmaceutical manufacturer now has time to test the product before releasing it to the public. In addition, the product no longer requires refrigeration at 4 C to 8 C which makes distribution of product throughout the world a lot easier and safer. Further, there is less chance that the product will not be available for a patient or the product being discarded because of an expiration date.

Thus the principal function of the lyophilization process is to slow down the kinetic clock that is related to either biological activity or chemical reactions.

Frozen : The first step in the lyophilization of a product is to convert it into a frozen state. In obtaining the frozen state, three criteria must be satisfied. The first is that the product will not be altered as a result of the freezing process. This would mean that the potency of a pharmaceutical product would remain unchanged after being subject to a freezing process. For example, the potency of a vaccine after freezing would have an acceptable value or titer.

It is important that during the freezing process that the solvent (water) is crystallized. The formation of ice crystals results in a separation of the solutes and the solvent. Since the concentration of the solvent is generally greater than that of the solutes, the formation of ice forces the solutes into a region between the crystals known as the "interstitial". Thus the second function of the freezing process is to cause a separation of the solutes and the solvent.

Consider that the frozen product resembles a brick wall. The bricks are the ice crystals and the solutes are the mortar. When a brick wall is first formed and the mortar is still wet, it would take relatively little effort to separate the bricks from the mortar. However, once the mortar has dried, then separation of the bricks from the mortar would prove to be very difficult. In light of the above, the last step in the freezing process is to lower the temperature of the system such that the solutes (mortar) are in a solid state. A solid state would be defined as one in which the mobility of the water in the interstitial region approaches zero.

Sublimation: Sublimation is a process in which a substance, such as ice, goes from a solid to a gas without going through a liquid phase. When sublimation occurs during the lyophilization process, it is commonly referred to as the primary drying process. It is during this time that the ice bricks in our hypothetical walls are being removed and just the mortar remains or, in the case of lyophilization, the "cake".

While sublimation can occur at atmospheric pressures, the process is quite slow because the gas molecules from the ice must find their way through the atmospheric gases that are bombarding the surface of the ice. This slow process by which the water molecules leave the ice surface is known as "diffusion".

We can increase the rate at which the molecules sublimate from the surface by decreasing the pressure above the ice surface. This is accomplished by placing the frozen material into a chamber and removing the gases to create a vacuum. As we remove more gas from the chamber, the pressure in the chamber decreases; however, there is relatively little change in sublimation rate of the water from the ice surface. Only when the pressure in the chamber becomes less than the vapor pressure of the ice (defined by the ice temperature) is there a marked increase in the sublimation rate. However, the sublimating water molecules not only remove mass from the surface but also energy and there is a decrease in the temperature of

the ice or our hypothetical wall. Soon the temperature of the ice will cause the vapor pressure of the ice to approach the pressure in the chamber and there is a decrease in the sublimation rate. In order to maintain the rate, energy must be added to the product to compensate for that lost as a result of the sublimation process. It will require about 675 calories to sublimate just one gram of ice.

But there is a pitfall that one must avoid during the primary drying process and that is the temperature of the mortar of the wall must be low enough such that there is no significant mobile water or the resulting cakes may appear like that shown in Figure 66 a or 66 b (taken from the Lyophilization Seminar Notes). If mobile water is present then the mortar can sag or worse yet completely melt like that shown in Figures 66 d and 66 e . Figure 66 d illustrates the resulting cake when there is sufficient mobile water in the interstitial region to cause the wall to sag and is as commonly referred to in lyophilization as "collapse" . There is still some resemblance of the original wall but volume occupied by the ice bricks has been reduced. In Figure 66 e, the mobility of the water is so high that the mortar or interstitial region undergoes complete melting or "meltback". The problem with cakes showing "collapse" or "meltback" is that when a diluent (such as water) is added (reconstitution), it may require some extended period of time for the solutes to go back into solution and the product will not quickly dissolve as is typical for a lyophilized solution. Other problems associated with collapse and meltback may be excessive moisture content that could result in a lack of stability, loss in potency or even chemical reactions between solutes which can lead to a turbid solution.

Desorption : While the sublimation or primary drying process removes most of the water from frozen matrix, there still can be greater that 5% moisture wt./wt. in the cake. The reader should note that the percentage of the remaining water is with respect to the weight of the cake and not related to the original quantity of water in the solution. Moisture contained within the cake is referred to as "absorbed" water while water on the surface of the cake is defined as "adsorbed" water. In order to reduce the moisture content of the cake "to values that will no longer support biological activity or chemical reactions" it is necessary to complete the secondary process. The latter is accomplished by increasing the temperature while the cake is while still at low pressures (vacuum) so that water is desorbed from the cake surface. The reader will note that this author prefers to talk in terms of pressure rather than vacuum. The reason being is that pressure has units (force per unit area), whereas, vacuum is usually expressed as a range of pressures.

The pressure and temperatures for the secondary drying are based on the stability of the product. Some products may require that the moisture content not exceed 1% with no known lower limit. However, there are products, e.g., proteins and hydrates that may require an upper and lower moisture limit in order to achieve product stability. While not stressed in this brief introduction, the reader should be aware that nature of the initial formulation or material is paramount in defining the conditions necessary for conducting the lyophilization process.

Reduced : The means by which the water is reduced involves the freeze-drying equipment and its associated instrumentation. The freeze-dryer performs two important functions with respect to the lyophilization process. The first is to provide a safe environment for the product. A safe environment is one that is free of sources of product contamination, i.e., particulate matter (dust, lint, glass, metal, hair and oxides) harmful vapors (vapors from cleaning solution, sterilization liquid or fluids and gases used in the operation of the freeze-dryer) and microorganisms. In addition, the freeze-dryer must provide the necessary operating parameters to conduct the drying process, e.g., pressure and shelf temperature. It is important for the reader to recognize that the freeze-dryer should play a passive rather than an active role in the lyophilization process. For example, the lyophilization process should be determined from the operating parameters defined by the operator and not

arbitrarily set by an independent control system. The following will be a brief description of the key components of shelf freeze-dryer and the role that they play in the lyophilization process.

Drying Chamber: The drying chamber provides a thermally insulated vessel to house the shelves of the dyer and means (door) for loading and unloading product from the shelves. The shelves of the dryer are specially constructed so that their temperature may be varied by the passage a heat transfer fluid or gas. The gas or liquid is used to refrigerate or provide heat to the product. For the lyophilization of product in vials, the shelves can be moved so as to stopper the vials prior to opening the door of the dryer.

Condenser: The main function of the condenser is to remove the water vapor that is either sublimated or desorbed from the product. The latter is accomplished by directing the flow of the vapors from the product over a refrigerated surface. An "internal" condenser is one in which the condensing surfaces are located in the drying chamber while for an "external" condenser the refrigeration surfaces are contained in a separate insulated chamber. The principle advantages of the internal condensers is that the dryer will occupy less floor space and reduce the cost of dryer. External condensers permit the condenser to be isolated from the drying chamber during the backfilling of the chamber with a dry gas such as nitrogen. By isolating the condenser during the backfilling of the drying chamber, the possibility of the transport of water vapor from the from the condensed ice surface back to the product is eliminated.

Vacuum System: The freeze-dryer is equipped with a mechanical pumping system that removes the non-condensable gases. With oil sealed mechanical pumps, one must be careful to operate the dryer so that no hydrocarbon vapors from the pump can "backstream" into the drying chamber. Dry pumps or pumps that can operate without the use of an oil seal are now available.

Instrumentation: The drying chamber should be equipped with a vacuum gauge that will accurately determine the pressure during the drying process. In addition, the dryer should provide temperature sensors to measure the shelf and product temperatures throughout the lyophilization process. Most freeze-dryers can be equipped with a computer system that will control the pressure in the chamber and shelf temperature as a function of time. The product temperature will serve to verify that the shelf temperature and chamber pressure are within presided limits.

The author recognizes that the above in a very brief description of the lyophilization process and its associated freeze-dryer. For that reason, the reader should be made aware that the lyophilization process is a deceptively complex process with many pitfalls for the un-wary. Such pitfalls have been addressed in previous issues of INSIGHT and will be considered in future issues.

Reference

1. T. A. Jennings and Henry Duan "Calorimetric Monitoring of Lyophilization", Journal of Parenteral Science and Technology, Vol. 49, No. 6 pp. 272-282 (1995).

U.S. Cosmetics & Toiletries Market: 1998/9 Edition

HIGHLIGHTS

The U.S. Market for Cosmetics & Toiletries is expected to reach $23.9 billion in 1998, led by color cosmetics and a rebound in fragrances. Projections place the value of this market at $29.3 billion in 2003. Domestic manufacturers can expect volume growth of 3.1% annually over the next 5 years ... *See our tables covering over 40 years of sales data on 70 product categories.*

Prices paid to manufacturers of cosmetics and toiletries rose just 1.1% from 1993-1997, impacted by intense competitive pressures, a price-conscious consumer, and a shift to mass market distribution. While these conditions continue, a noticeable firming in prices has occurred in 1998, particularly in the cosmetic area...

Personal consumer expenditures for cosmetics and toiletries advanced at a slower rate in the first quarter of 1998 versus the first quarter of 1997. *See our analysis of consumer purchasing patterns as well as population projections to redefine target markets.*

The double-digit growth in exports that this industry enjoyed in ten of the last eleven years was subdued in 1998 as Japan, Hong Kong, Korea, Singapore, Thailand, and Malaysia cut back on their purchases of U.S. made cosmetics and toiletries. For 1998, exports will rise an estimated 7.2% to $2.9 billion, or 11.8% of domestic factory shipments... *See our extensive coverage of 56 overseas markets for 20 product categories as well as our foreign market profiles to pinpoint future growth potential.*

The Asian currency crisis and the resultant strength in the U.S. dollar also led to a flood of imported products in 1998, particularly in fragrances and cosmetics. For the year, imports will soar an estimated 20%, reaching $1.9 billion and capturing an 8% share of the U.S. market.

Employment in this industry is at an all-time high, with an estimated 2,100 factory workers added to its payrolls in 1998.

Star performers in 1998 include Estee Lauder, Stephan Company, Styling Technologies, and Bristol-Myers Squibb's Beauty Care Division. Aggregate sales of 36 companies studied in this report rose 5.7% in 1997.... *See our company profiles on more than 60 cosmetic and toiletry companies to follow their sales analysis and recent developments.*

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JA 13-70 AU/01

a Archivo
Copia Completa ALOE

OF. ORD. Nro.: D780/112/90
OBJ.: Remite información.
REF.: Su fax nro. 8343
Mi fax nro. 238/90.
Gel aloe.

Sydney, 21 de Diciembre de 1990.

DEL: JEFE DE LA OFICINA COMERCIAL DE CHILE EN AUSTRALIA

AL : SR. DIRECTOR DE PROMOCION DE EXPORTACIONES (PROAIM).

1.-Tengo el agrado de dirigirme a Ud. con relación a su fax de la referencia, por medio del cual solicita información relativa al 'Gel de la planta Aloe Perry Baker'.

2.-Sobre el particular, sirvase encontrar adjunto al presente oficio, la siguiente documentación:

CURRENT STATUS OF THE ALOE VERA INDUSTRY
CHOICES AND CHALLENGES (ALOE VERA)
THE ALOE VERA ALTERNATIVE IN NORTH QUEENSLAND
ALOE VERA .IS THERE ANY BASIS FOR ITS REPUTATION?
ALOE VERA:HAVE YOU REALLY GOT IT?
ALOE VERA-FARM NOTES.

3.-Como se puede observar leyendo los articulos antes mencionados, la experiencia en Australia con el cultivo de esta planta no fue muy exitosa, principalmente debido a que su procesamiento no fue eficiente y el mercado es muy pequeño.

4.-Las ultimas estadisticas de importación de que se disponen, son del año 1986, alcanzando 500.000 lts., a partir de entonces, las importaciones han sido tan reducidas, que ya no cuentan con una glosa propia en el arancel australiano.

I/024-09/01/91

Jefe Oficina Comercial Embajada de Chile en Australia
Telefono [illegible] Fax [illegible] Telex [illegible]

D04250

5.-La fuente de esta información es el Sr. Graham Jamieson, Senior Horticulturalist-Horticulture Branch. Floor 5; Primary Industries Building, GPO Box 46 (80 Ann St.), Brisbane Qld 4001.Tel: (07) 239.3326.Tlx: aa41620.Fax: (07)239.3379.

6.-La única empresa importadora de este producto es una compañía americana llamada: Forever Living..34 Prime Drive. Seven Hills, Sydney-Australia. Tel: 624-5599. Dicha empresa cuenta con grandes plantaciones propias, en Texas, E.E.U.U.

Saluda atentamente a Ud.,

MARCELO SALAS REGINATO
Consejero Económico

MSR/msr

July 1986

CURRENT STATUS OF THE ALOE VERA INDUSTRY

Aloe vera (formerly called A. barbadensis) is grown for its leaf gel which contains 99% water and vitamins, minerals and enzymes which are said to imbue the gel with amazing medicinal properties. The gel is used in cosmetics, lotions, ointments and health drinks and also for veterinary purposes. Conventional medicine recognises its value only for treatment of burns and cuts.

Commercial production began in Texas (USA) in the early 1970s and expanded to 1 600 ha in 1983 when heavy over-supply developed. More recently the industry has spread to many other countries in response to claims of huge markets and profits. It began in Victoria in the late 1970s and a Victoria Point (Qld) grower planted soon after. Since late 1983, a number of entrepreneurs have promoted planting in Queensland and more recently in every mainland state and NT.

The crop requires a well-drained soil and frost freedom. Suckers (pups) are grown in a nursery and then field planted at around 12 000/ha. Harvesting begins about two years after planting out and continues 3-4 times/year. Each plant produces about 10 leaves/year and with about 50% recovery, produces about 5 L of gel (40-60 t/ha). In addition, each plant produces about 10 pups annually which are available for further plantings. After a few years' harvesting, the plants become top-heavy and are cut off and replanted. The main pests and diseases are Phytophthora root rot and root knot nematode, but cases of undiagnosed physiological problems have been reported. Chemical pest and disease control is discouraged because the gel is used in the health market.

After harvesting, gel is extracted hygienically from the leaves by rollers or hand filleting. It is stabilized by a range of processes which are either patented or confidential and marketed to manufacturers in 200 L drums. At least 6 stabilization plants have been established in Queensland. Apart from the original plant in Victoria which has since closed down, there is no evidence to date of any stabilization plants being established in other states. One company is promoting the growing of aloe vera in southern states to supply the market with fresh leaves. Attempts by independent Queensland growers to market fresh leaves have met with little success, probably because of lack of promotion.

The area planted to aloe vera in Queensland is uncertain, but there are 40 ha under hydroponics in Bundaberg, up to 80 ha in areas north of Mackay and possibly another 100 ha (or more) in other parts of the state. Possibly another 100 ha have been planted in other parts of Australia. Expansion is continuing.

Major Problems in the Queensland Industry

- Over-production. In the year to 31.6.85 (before major local production), Australia imported 250 000 L stabilized gel (mostly from USA) and possibly a similar volume in manufactured products. This 500 000 L would be produced by around 10 ha of crop. Imports have since fallen considerably, but despite claims and publicity to the contrary, there is so far little evidence of success in finding stable export markets. The Bundaberg hydroponic venture has temporarily discontinued accepting leaf since March 1986 while it seeks a new market to replace a dishonoured marketing contract.

- Reliable gel quality is essential to success in establishing markets, but some stabilization techniques have proved to be unreliable. Northern Aloe Vera Extraction Plant (supplied by growers north of Mackay) was therefore forced into liquidation for lack of markets. (Their problems were compounded by heavy embezzlement by one of their principals who is now serving time for fraud in a previous venture).

- Potential growers have been given unrealistic expectations of the industry's potential and profitability by some of the less ethical entrepreneurs, whose sole objective is to sell plants. Some of these have encouraged planting of the crop on unsuitable sites - especially frost prone areas.

- Many growers have established crops on the basis of contracts which the promoter has failed to honour. This situation is continuing and one promoter has operated successively under at least five different company names. One company is inferring dishonestly to potential growers that it has an arrangement with a particular stabilizing plant to buy their leaves.

- As far as can be ascertained the first Aloe vera plants in Australia were introduced from USA by the original Victorian grower. Thus there has been a shortage of planting material to meet the heavy demand. The cost of pups is therefore artificially high ($4 - $16, with most sales at $12 cf 10c - 50c in USA). Although this has meant high profits to promoters, it has helped to limit plantings in the short term until the growers produce their own pups. Until recently, some promoters have (wittingly or otherwise) sold plants of other species of aloe, claiming them to be A. vera. QDPI consequently introduced a certification scheme with at least some success.

- Some unethical promoters are said to regularly misrepresent QDPI recommendations, particularly regarding frost susceptibility and the need for the grower to have a guaranteed (contract) outlet for leaf.

- QDPI has been unable to provide the pioneering growers with research based cultural information other than for nematode control.

Australian Aloe Association

A steering committee has almost completed drawing up a constitution, rules and code of ethics to form the Australian Aloe Association at a public meeting on 3.9.86. The Association hopes to rid the industry of malpractise, set standards for aloe vera products, promote their consumption bring stability to the industry.

G. I. Jamieson

J. I. JAMIESON

Queensland Department of Primary Industries
Information Series QI88026

CHOICES and CHALLENGES

farming alternatives for Queensland

Compiled by Denis L. Jenkins
Marketing Services Branch

Department of Primary Industries
Queensland Government
Brisbane 1989

OTHER

Aloe vera (Aloe vera syn. *A. barbadensis*)

Aloe vera is a succulent plant of the lily family, native to the Mediterranean region and the Canary Islands. Gel extracted from the succulent leaves has been used in folk medicine for the treatment of internal and external maladies of animals and humans for over 3 000 years.

Until the 1960s use of the gel was restricted to areas where the plant was grown, as the gel spoils rapidly after extraction. The development of a process to stabilise the gel created a market for its use in cosmetics, lotions, ointments and health drinks.

Growing of aloe vera expanded rapidly in Australia during the 1980s. Potential production now far exceeds market demand for aloe vera products and intending growers are strongly advised to thoroughly investigate the market opportunities before planting aloe vera.

Description and uses

Aloe vera plants produce succulent leaves containing 50% by weight of gel. The gel is noted for its therapeutic properties, with a high value being placed on its 'potency', said to be related to its mineral, vitamin and enzyme content. Aloe vera gel has been approved by the USA Federal Drug Administration for first aid treatment of burns and cuts. It also has other uses in cosmetics, lotions, ointments and health drinks.

Environmental requirements

Aloe vera should be grown in well-drained soils in a frost free environment and have access to a reliable supply of irrigation water. Although aloe vera will survive in a harsh environment, it requires a high level of nutrients and constant availability of moisture for maximum growth and production of quality gel.

Production/harvesting

Harvesting of mature leaves begins about 18 months after planting and occurs 3 to 4 times/yr. Annual yields of gel are about 40 t/ha.

Marketing/economics

Interest in aloe vera production began in Australia in the late 1970s when a grower/processor introduced the industry into Victoria. Market potential was claimed by entrepreneurs to be substantial, leading to rapid development of the industry in Queensland in the early 1980s and eventually throughout Australia.

However, the domestic market was found to be very much smaller than claimed. Demand can easily be satisfied by 10 to 15 ha of the crop, producing approximately 40 t/ha of gel. Exporters face severe competition from other producing countries, particularly USA. Consequently, processors have found markets difficult to obtain and can accept only small consignments of leaf from selected growers. A small consumer market is being developed for fresh leaf.

Further progress of the aloe industry will require the development of new domestic and export markets for manufactured products.

There is no published economic analysis on the profitability of producing aloe vera in Queensland. However, it has been estimated that a grower, using his own planting material at a planting rate of 12 500 plants/ha, would need to obtain an on-farm price of $160/t of leaf ($320/t of gel) to cover direct growing and harvesting costs of the crop. This calculation assumes that aloe vera is grown as a sideline crop on a commercial farm using existing land and machinery and that the grower uses his own

planting material. The purchase price of planting material is highly variable.

Supporting/limiting factors

Supporting

- generally an easy crop to grow and highly productive;
- markets will develop in competition with other natural medicines in line with the increase in public interest in these products;
- with promotion, there is a potential small market for high quality fresh leaf.

Limiting

- existing plantings are far above the capacity of the market to absorb the product;
- with the large number of uncertainties, investment in the industry must be considered speculative;
- conventional medicine recognises few of the claimed therapeutic properties of aloe vera;
- export markets are very competitive;
- being a health product, the gel must be of consistently high quality, and free from chemical residues.

Further information

The industry is represented by The Australian Aloe Association, Industry House, 375 Wickham Terrace, BRISBANE Q 4000, (07) 831 1699.

Asparagus *(Asparagus officinalis)*

Asparagus is a temperate vegetable crop. Commercial production began recently in Queensland in the Warwick, Lockyer Valley, Gympie, Bundaberg, Central Burnett and Stanthorpe districts. The crop requires a definite cold period to stop growth and provide the crowns with a dormant period. In Queensland it is normally harvested over a 3 month period between September and December.

The Queensland industry is small relative to other states, particularly Victoria. Increased demand from both the domestic and export markets has raised strong interest in asparagus around Australia. Queensland produces the earliest fresh market asparagus in Australia, commanding good prices for quality early-season spears. Although this early market is attractive, intending growers should carefully evaluate the market potential before deciding to plant.

Description and uses

Asparagus is a perennial plant that produces thick, fleshy shoots or spears in spring. The spears are cut and consumed fresh or preserved. The main variety grown throughout the world is Mary Washington and its selections. The product is well established in the catering and domestic trade.

Environmental requirements

Asparagus is a native of temperate regions. It requires a dormancy period initiated by low temperatures and deep well-drained soil, but will tolerate relatively high salt levels. Commercial plantings should be made only in localities where cold winters are experienced. Asparagus is grown in Queensland in the Warwick, Lockyer Valley, Bundaberg, Gympie, Central Burnett and Stanthorpe districts. Plants have a productive life of between 12 and 20 years with a winter dormancy period of approximately 8 weeks.

The aloe vera alternative in north Queensland

N. C. Sing, Economic Services Branch

In response to promises by entrepreneurs of enormous potential profits, Australian farmers and other landholders have recently planted the new crop, aloe vera, for the production of leaf gel, which is used mainly in alternative medicine.

Faced with the decline of the sugar industry, north Queensland farmers became interested in alternative crops; one of the crops that attracted their attention was aloe vera. This article demonstrates the potential pitfalls associated with a new and untried crop, by outlining the development of aloe vera in north Queensland and the role a departmental agricultural economist can play.

Initially, aloe vera was promoted by commercial entrepreneurs. Plants were advertised for sale in the area, but farmers knew nothing about the crop. To overcome this problem, the Development Bureau of the Hinchinbrook and Cardwell shires funded a visit by a Victorian aloe vera farmer, who it was thought, would be able to provide both technical advice and planting material. However, much of the advice available was based on temperate climate production and did not suit tropical conditions. Farmers had to rely on their existing farming knowledge of other crops and limited advice from the QDPI, to whom it was also a new crop.

Eventually a company, N.A.V.E.P. Pty Ltd, was set up to organise and run an aloe vera processing plant at Mission Beach near Tully. This company sold plants to growers and undertook to buy production from no more than six times the number of plants that the grower had originally purchased. The stated objective of the company was to attempt to limit production of aloe vera gel to available markets and to preserve the high price levels that prevailed at the time of initial development.

Owing to deterioration in the financial position of sugar-cane farmers, some of those interested in aloe vera production had to borrow money to buy and establish the plants, purchased at very high prices. An assessment by the Commonwealth Development Bank at the time was unfavourable, reflecting the uncertainties about growing and marketing the crop. Consequently, the author was asked to carry out an economic analysis of the crop to provide information on which economic decisions could be made.

As aloe vera was a new crop, reliable technical and cost information to use in the economic analysis was unavailable. Therefore, a number of assumptions had to be made about the life of the plant, disease control and similar matters. This lack of reliable data meant that the results had to be interpreted with caution, again demonstrating the uncertainty associated with a new crop.

A gross margin analysis, or gross income less variable costs, was carried out. This was an appropriate method of analysis for evaluating the outcome of the new crop for sugar-cane farmers, as fixed costs would not change with the new crop and little extra equipment would be required for aloe vera production. At a glance, the gross margin of $3,600/1000 plants/year, with 12 500 plants/ha, appeared to be good, assuming aloe vera leaf returned $0.50/kg.

However, there was a scarcity of information on the size of the market for aloe vera gel or the sensitivity of market returns to increased supply of product. Further, no information or comments were available on product quality or quality/price relationships.

Production began in 1985 with N.A.V.E.P. Pty Ltd accepting delivery of leaf for processing. The company also bought suckers (pups) from existing farmers for resale to new growers. Then disaster hit. The company buying the leaf went into liquidation as a result of processing problems and alleged misappropriation of funds, leaving nowhere for the farmers to get their leaf processed.

To re-establish the market for their leaves, the farmers purchased the processing plant, set up new management and organised new marketing arrangements. They found the markets were not as extensive as had been promised, with potential outlets available for only a third of the production level originally planned.

Returns to growers per 1000 plants have remained about the same, but the size of the industry originally planned has not been realised. As additional markets become available, the farmers share it in proportion to the number of plants they bought originally.

From hindsight, and from the marketing situation that has since developed, it appears that markets were nowhere near as assured as had been thought; also improvements were required in the processing method before assured sales could be made.

These growing, processing and marketing problems are typical of those found when new crops are being developed; they are extremely difficult to identify clearly prior to production.

A further problem arose with respect to taxation. After aloe vera had been grown for a year, a dispute arose between the farmers and the Taxation Department, to whom it was also a new crop. In other farming operations, the cost of seed is treated as an annual cost; the cost of orchard trees lasting many years is regarded as a capital cost. Aloe vera, having a useful life of 2 or 3 years, is neither one nor the other. The economic analysis carried out by the author has been used to provide information to the Commissioner of Taxation but, as yet, a ruling has not been made.

The aloe vera industry has had many setbacks during its development. It has suffered as many or more tribulations than many other new industries. It has suffered from little and often incorrect information on growing and processing, lack of venture capital, an unwillingness of banks to lend, uncertain markets, bad luck with some of the people working in the industry, and until involvement by the author, no information on the economics of its production.

North Queensland growers have now taken over the running of their industry, with the formation of a cooperative, which handles the processing of leaves and organises the marketing of aloe vera gel. The industry is not as big as was originally proposed; but it looks as if it is now firmly established, with expansion possible only as existing Australian and export markets are penetrated and new markets are developed. What has occurred in the aloe vera industry in north Queensland typifies the dangers inherent in producing any new crop.

Can you help?

It may seem unseasonably early to be talking of Christmas but at CHOICE we're already planning our November and December issues. This year we'd like to include a report on Christmas presents – and for this we need your help.

You've probably had time to use and assess the presents you received last year. We want to find out what gifts give the most pleasure or most lasting satisfaction and what are really just nine-day (or even nine-hour) wonders which in retrospect you wouldn't have wasted your money on.

So, while you can still remember, we'd like you to tell us what you got for Christmas and what you thought of these gifts. (We're asking the kids the same on the Kids' CHOICE pages.)

For your responses to be useful in preparing the article we need to receive them by 31 March, 1986. Mark your envelope 'Help' and send it to: ACA, 57 Carrington Rd, Marrickville, NSW 2204.

To make it easier for us to collate your answers, answer them in order numbering your responses with the question numbers we give.

1 List as many of the gifts you received as you can remember (include the less tangibles like vouchers, cash, or services rendered 'I promise to wash the car every week for a month', etc.)

2 Of these
   a) which ones gave the most pleasure (and why)?
   b) which gave the most satisfaction (and why)?

3 Did you tire of anything quickly and is it now gathering dust in some forgotten corner? (Tell us why. If you received more than one white elephant, tell us about them all!)

4 Did you receive anything you now wonder how you ever lived without? (What and why.)

5 Were any presents frustrating in any way – lacked something needed to make them work (batteries, for instance), or poor instructions, accessories or even design? (Give details.)

6 What type of gift do you most like to receive?

7 What type of gift do you least like to be given?

8 Are you male or female?

9 What age are you? 10 to 20 years; 21 to 40 years; 41 years or more.

Aloe vera

Is there any basis for its reputation?

In ancient Egypt it was known as the 'plant of immortality'; today, many people call it the 'miracle plant'.

Certainly the claims made by some people for the clear gel contained in aloe vera's fleshy spiky leaves – and for the products made from it – are nothing short of miraculous.

Anything from arthritis to asthma, baldness to boils, cancer to constipation, multiple sclerosis to stomach ulcers ...even Down's Syndrome ... aloe vera is sworn to cure.

It's also recommended for joint and muscular injuries and ailments, for healing wounds, skin abrasions and irritations.

As a 'therapeutic', aloe vera is marketed in several forms so you can drink it or spread it on your skin. It is also included in a wide range of shampoos, hair conditioners, skin cleansers, moisturisers, body lotions and other cosmetics for its alleged deep penetrating and regenerative properties.

Aloe vera products aren't cheap. The juice, for example, sells for around $15 to $20 for a litre bottle. But if the claims for aloe vera are true, can we afford *not* to buy it?

What is aloe vera?

The aloe vera plant is a succulent perennial, a species of the genus *Aloe* which is a member of the lily family *(Liliaceae)*.

Its thick fleshy leaves protrude from the upper part of the root, narrowing and tapering to a point and edged with spiny teeth.

There are over 200 species of *Aloe* (you might even have one in your backyard) but the main one grown for its health giving properties is aloe vera, botanically known as *Aloe barbadensis*.

The aloe vera leaf contains two distinct substances extracted for their alleged properties.

Immediately beneath the outer skin is a yellow liquid resin. From this bitter substance comes the 'bitter aloes' that parents once painted on children's finger nails to stop nail biting. The resin also contains anthraquinones used to produce the drug aloe (Aloin) which has a strong purgative action on the bowel and intestines. Its use in laxatives is declining because results are unpredictable and often violent, sometimes causing intestinal griping, colic and cramping. Pregnant women in particular are warned against using such 'irritant' laxatives for this reason.

Chemically different from the bitter resin and contained in the thin-walled cells of the leaf is the gel which is used to produce a wide range of aloe vera products including aloe vera juice.

So far the search for the ingredients which might account for aloe vera gel's alleged beneficial properties has drawn a blank.

However it has been found to contain complex carbohydrates (for example, starch and cellulose), amino acids, enzymes, glycoproteins (proteins with carbohydrates attached), inorganic salts (of sodium and potassium) and small amounts of vitamins and minerals (including calcium).

That's nothing to write home about though. You'll find most of them in any animal or plant tissue.

While aloe vera is promoted as containing, among other things, 484 parts per million (ppm) of calcium and 594 ppm of potassium, you can get more than twice that from milk ... for a fraction of the price.

What about the 'remarkable discovery' that aloe vera contains vitamin B_{12}?

One US manufacturer, Forever Living Products, which distributes its product in Australia, claims its juice contains 50 picograms of B_{12} per mL. That might sound impressive but 50 picograms per mL translates to 0.00005 mg per *litre*. Even if you quaffed a litre of juice a day you would be getting only about 2% of the recommended daily allowance of vitamin B_{12}. Vitamin B_{12} deficiency is rare in this country because B_{12} is widely available in foods most of us eat, is stored for about five years in the body, and even true vegetarians who don't eat *any* animal products need to take a B_{12} supplement only occasionally.

The claims – how true?

Considering the extraordinary claims we've heard about aloe vera, the people at the top of the marketing chain are remarkably modest about their product. They can afford to be, the legend of aloe vera's curative powers is spread successfully by word of mouth.

Free newsletters from health food stores extol its virtues without a scrap of sup-

orting clinical evidence. People who ay they have made miraculous re-overies from serious illnesses by taking loe vera make testimonies to this effect. Bottom-of-the-pyramid sellers spruik at party plan meetings about its wonderful though unsubstantiated) usefulness for ery conceivable illness or ailment.

One person who attended a party plan neeting was Mr Rob Marcuso, national ales manager for grower processor-urn-retailer, Aloe Vera of Australia. He vas appalled. 'It was like a gospel meet-ng,' he says, 'all "Hallelujah aloe vera" and "God bless aloe vera". Testimonials claimed all sorts of wonder effects.' He doesn't believe that aloe vera is good for cancer, multiple sclerosis, Downs Syn-drome or the like. 'There is no evidence for these claims,' he says.

Mr Peter Hawthorn, product develop-nent manager of Alan Black & Co which also markets aloe vera products, agrees aloe vera doesn't have the miraculous effects some people claim.

Both Marcuso and Hawthorn think that if people feel better after taking aloe vera juice, it's because of the juice's mild purgative effect, which they say has the effect of cleansing the system and re-leasing toxins. 'Some say aloe vera is fantastic for arthritis but it's not because aloe vera is good for arthritis. People feel better because of its cleansing action,' says Marcuso.

Both men do say the jellies and creams, topically applied, are good for healing wounds, for rashes, insect bites and so forth. Neither could identify the ingre-dients responsible but both attribute aloe vera's special healing properties to a 'combination of ingredients'.

That's about all they *can* say. Unlike the party plan spruikers, manufacturers making therapeutic claims for a product – either on the label or in advertisements or literature – have to be able to sub-stantiate their claims under State drugs and cosmetics regulations. According to Mr John Lumbey, deputy chief pharma-cist of the NSW Health Department's Pharmaceutical Services Division, 'companies approached [by the depart-ment] couldn't substantiate vitamin claims for aloe vera'. Equally, the Com-monwealth Department of Health says: 'No scientific data has been supplied or submitted [to the department] which would support the use of aloe vera for therapeutic use.'

In the US, two panels reviewing aloe vera gel for the Food and Drug Admini-stration (FDA) recommended further study before they would consider declar-ing it 'safe and effective' for its intended use. In the meantime the products can still be sold. As reported in *FDA Con-sumer*, the panels found 'there is not enough scientific evidence to show that aloe vera is useful for the treatment of minor burns, cuts, and abrasions or for the treatment of minor vaginal irritations'.

Controlled clinical trials have not been conducted and other investigations have been unable to find a magic ingre-dient.

Quality assured?

If you're still prepared to give aloe vera products the benefit of the doubt, can you at least be sure that the product you buy is the real thing? This was a ques-tion asked by several readers specifi-cally about the juice, no doubt following media reports late in 1984 that one brand was found to be nothing more than good quality drinking water.

Unfortunately you *can't* be sure.

The age of the plant when harvested, the season when it was harvested and the extraction and processing methods used all affect the composition of the raw gel. It is claimed that unless stabilised within hours of harvesting the plant the gel deteriorates.

The gel is 99% water anyway and there is no testing method available to verify the percentage of aloe vera stated.

One thing's for sure. You can't believe claims that a brand of juice is 100% aloe vera. The processed juice has to contain a preservative such as sodium ben-zoate, and often contains citric acid and other additives to help the stabilisation process, and flavourings in the flavoured versions.

Can you taste the difference if the juice has been watered down? According to Marcuso and Hawthorn, you can. They say the unflavoured version has a dis-tinct taste. 'It looks a bit like dishwater but doesn't taste like it,' says Marcuso. 'It tastes a bit like kava [a drink made from the crushed roots of a Polynesian shrub] without the tingling sensation. Some find the taste offensive, others find it bland, while others like it.'

We tasted one brand of juice marketed by Aloe Care International – the one ruled in court to be mostly water (but then they all are by definition). It didn't look like dishwater, it didn't taste like kava nor did it taste offensive. It looked and tasted just like water! Stuck over the name Aloe Care International is another company's name – Aloe Vera – Natur-care, of Rydalmere NSW.

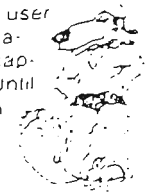
Conclusion

It *may* be that the 'curative' ingredients in aloe vera gel have eluded all modern methods of chemical analysis. It *may* be that we can't quantify the synergistic effect of *known* ingredients (when one ingredient enhances the properties of another).

What we know of modern day growing and manufacturing processes though suggests that even if the plant does have amazing properties, there's no guarantee they will be retained in the re-tail product. You would certainly need to have great faith to justify the price of juice.

Indeed, the placebo effect may go a long way towards explaining its alleged 'mira-cle' effects, and it's the danger in this that is our main concern, one that health authorities share: people may neglect or abandon treatment of serious illnesses in favour of a product with no known therapeutic value.

You can ignore its inclusion in every second cosmetic product on the shelf. Absolutely nothing suggests that aloe vera or, indeed, any fruit bowl additive in cosmetics, shampoos and the like have any beneficial effect for the user. As for use on minor skin abra-sions, the skin is perfectly capable of healing itself. Until marketers of aloe vera can prove its therapeutic benefits we think you would be wast-ing your money.



AGDEX 272
80

F 41 /MAR 84

ALOE VERA - (Aloe barbadensis Mill.)

by G.I. Jamieson, Senior Horticulturist, Brisbane.

For over 3,000 years, gel extracted from the succulent leaves of aloe vera plants has been used in folk medicine for the treatment of internal and external maladies of both humans and animals. Bitter aloes has long been manufactured from the powdered sap of the leaves of aloe vera (Aloe barbadensis) and its near relatives, Aloe perryi and Aloe ferox.

However, benefits from the highly acclaimed curative properties of the leaf gel have remained virtually restricted to areas where the plant will grow, as the gel spoils rapidly after extraction. It was not until the 1960s that a process was devised in USA to inhibit the spoilage, and improved processes have since been developed. These processes to stabilize aloe vera gel have opened up outlets in a wide range of products containing the gel, including cosmetics, lotions, ointments and health drinks.

Demand for these products is based largely on the claimed curative properties of the gel; consequently a high value is placed on its "potency", which is said to be related to its mineral, vitamin and enzyme content. The demand is highest for gel uncontaminated by extraneous chemicals.

In spite of its growing popularity, most of aloe vera's alleged healing properties are neither accepted nor understood by conventional medicine. Aloe vera gel has been approved by the US Federal Drug Administration only for first aid treatment of burns and cuts.

But through commercial promotion, demand for aloe vera products continues to grow in many parts of the world, and increasing quantities are being imported into Australia.

The first commercial planting of aloe vera in Australia was made in Victoria several years ago. In 1983, several commercial companies selected eastern Queensland and north eastern N.S.W. to promote the establishment of an industry, on the grounds that these areas are frost free.

However, information on the best cultural and processing methods is lacking in Queensland, and information is difficult to obtain from overseas because of the highly competitive nature of the industry.

DESCRIPTION

There are over 300 species within the genus Aloe, which belongs to the lily family. Aloe plants are succulent with fleshy, tapering, spiny-margined leaves arranged in a rosette or spiral.

Many species of aloe are grown as ornamentals. Aloe vera (Aloe barbadensis), Aloe ferox and Aloe perryi have long been grown as the principal sources of the latex which is extracted from the skin of the leaf and dried to produce the bitter aloes of commerce. Aloe barbadensis is now grown for the transparent pulp which is extracted from the fleshy leaves, stabilized, and marketed as aloe vera gel.

Aloe barbadensis Mill. is commonly called aloe vera. It is native to the Mediterranean region and the Canary Islands. Note that "Mill." is the abbreviation for Miller, the name of the taxonomist who first described Aloe barbadensis in 1768.

- Stems are stout, and grow to 30-40 cm in height in about 10 years.

Aloe vera: Have you really got it?

R. Dowling, Botany Branch

In recent years considerable interest has been shown in the use of herbs and natural plant products for curative and preventative health use and in cosmetic products. One plant that has attracted much interest, because of its alleged medicinal properties, is one known as aloe vera. This plant is a native of the Mediterranean region and the Canary Islands and has been in cultivation in many parts of the world for over 3000 years.

The currently accepted botanical name of this plant is *Aloe barbadensis*. This plant was first described by Philip Miller, the English gardener–botanist, in 1768. It has also in the past been known by the botanical name *Aloe vera*, hence its current common name.

Aloe vera in Australia

In Queensland considerable interest has been shown by many growers in the commercial production of this plant in coastal and subcoastal districts. Sugar cane growers, especially those in the Bundaberg, Tully and Ingham districts, have expressed interest in growing aloe vera.

There has been a heavy demand for planting material of *Aloe barbadensis*, which is currently in very limited supply. Because of this, many growers have used significant quantities of planting material of species other than *Aloe barbadensis* or have been sold other species on the pretext that they were *Aloe barbadensis*.

As the Australian processing industry is geared to handle only the gel from *Aloe barbadensis*, processors do not accept other species of aloe. Many growers who use them will subsequently find that they are unable to market their product.

Other species

For this reason, growers are strongly advised to ask vendors of aloe vera planting material to provide authentication of identity of the parental crop from which their planting material was derived. The Queensland Department of Primary Industries currently has an authentication service for *Aloe barbadensis*. All purchasers are advised to obtain a statutory declaration from vendors stating that planting material has been obtained from authenticated *Aloe barbadensis* mother stock. To date there are six known commercial suppliers of *Aloe barbadensis* planting material. A list of these is available from the Director, Horticulture Branch, DPI, Mineral House, George Street, Brisbane 4000. More Australian suppliers of *Aloe barbadensis* planting material may exist but to date they are not known to the Department. Commercial growers purchasing unauthenticated material do so at their own risk and face possible future commercial loss.

The gel of other species of aloes should have similar properties to that of *Aloe barbadensis* as they contain similar chemical compounds and should be suitable for home-grown use. Indeed the Russian aloe industry is based on *Aloe arborescens*, a common garden species in Queensland, whereas the American and Australian industries are based on *Aloe barbadensis*.

Description of *aloe barbadensis*

There are about 350 known species of aloes. Many of these species hybridise readily. Of these numerous species, *Aloe barbadensis* is fairly distinctive. It is a low growing plant forming a rosette of leaves at ground level. It is normally stemless but occasionally forms a small stem 2 to 3 cm high. The leaves usually number about 16, but this can vary somewhat depending on the age of the plant. They are usually erect and somewhat spreading, though old leaves may be held almost horizontally. Leaves are from 40 to 65 cm long and 6 to 9 cm wide at the base but gradually narrow to the apex. They are fleshy and about 2.5 cm thick at the base. The upper surface is flat to slightly dished and the lower surface is rounded. The margins of the leaf are armed with firm (but not spiny), spreading, triangular-shaped teeth about 2 mm long that occur close together (about 10 mm apart) near the base and from 15 to 20 mm apart towards the tip of the leaf. The leaves themselves are a distinctive grey-green due to the surface being covered by a greyish bloom similar in appearance to the bloom found on plum fruits.

Leaves of young plants and suckers are rounded to flat and may have elongated pale green to whitish patches, mainly on the upper surface.

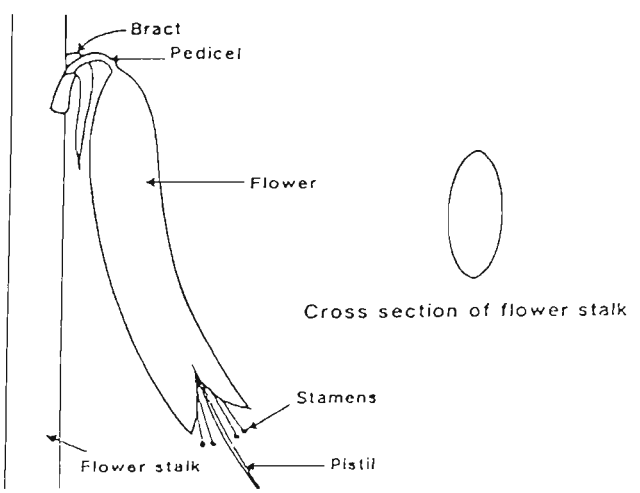
The flower stalk is from 60 to 100 cm in height and usually only once or twice branched though occasionally the flower stalk may branch up to three times. The stalk is biconvex or somewhat flattened in cross section and not rounded as is the case in many other aloe species. Flowers occur in the top third of the flower stalk.

The flowers of *Aloe barbadensis* are its most distinguishing feature. When mature they are canary yellow and about [illegible] to 3 cm long. Young flowers and buds may have a green tinge though this soon changes to yellow as the flowers mature. In other species of aloe the flowers are reddish-yellow, orange-yellow, orange tinged or red.

When opened, the flowers hang stiffly down, that is they are pendulous, almost parallel to the flower stalk. The flowers are tubular in shape and the ends of the petals are turned up slightly. In mature flowers the stamens and pistil protrude beyond the end of the petal tube. Most other species do not do this. Flowers mature progressively upwards from the base of the flower spike. Flowering usually occurs in spring or autumn and may begin when the plants are 2 to 3 years old.

A papery bract is attached to the stalk at the base of each flower stem (pedicel). The bract is about 10 mm long, 5 to 6 mm wide and about twice as long as the pedicel.

If you have any doubts about which species of aloe you are growing, a specimen, pressed between newspaper, should be sent to The Director, Botany Branch, Department of Primary Industries, Meiers Road, Indooroopilly, Queensland 4068. The specimen should contain at least one full leaf and the complete flower stalk and flower heads. A description of habit of growth of the plant and the number of leaves it has should also be included.



Flower arrangement (not to scale)

AGDEX 272/20

F 42/MAR 84

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ALOE VERA - culture in Queensland

by G.I. Jamieson, Senior Horticulturist, Brisbane.

This Farm Note has been compiled to help overcome the wide gap in information on the commercial cultivation of aloe vera in Queensland. Information has been collated from the limited available literature (some of it contradictory), and some suggestions are offered to assist growers attempting to pioneer this new industry in Queensland.

SITE SELECTION

Aloe vera is native to a mediterranean climate, but has adapted successfully to other areas with a frost-free climate and well drained soils. Although aloe vera will survive in a harsh environment, it requires a high level of nutrition and constant availability of moisture for maximum growth and production of quality gel.

Therefore the production site must have a well drained soil, be frost-free and have access to a reliable supply of irrigation water.

SOIL PREPARATION AND DRAINAGE

The internal drainage of even a well drained soil can be further improved by deep ripping down the slope. More permanent improvement may be achieved by installing an underground drainage system.

A soil pH of around 6.5-7.0 is required. Dolomite is the most appropriate soil amendment for correcting pH, and should be applied early in the process of land preparation.

Addition of organic matter either directly or through cover cropping will do much to improve the soil's physical and chemical properties.

Before planting, weeds should be brought under control. Runner grasses are a major problem in commercial aloe vera crops.

Before planting, the soil is brought to a fine tilth, and planting hills are constructed to a height of about 30 cm to further improve drainage. Spacing between the centres of the hills should be designed to suit the machinery that will be used, but should not be less than about 90 cm.

LAYOUT

The farm layout should be designed to maximise drainage and protection from erosion, and provide ready access to the crop in all weathers. Land management principles could be effectively modelled on those followed in the pineapple industry. These entail:-

- Construction of a diversion bank if necessary above the cultivated area. This will protect the planting from runoff water from any land above the cultivation.
- Siting the planting hills and channels with sufficient fall to allow runoff water in the furrows to escape rapidly without causing erosion.
- Construction of a stabilized waterway to carry water from the diversion bank and the channels down the slope into a permanent water course or a dam.
- Siting parallel access roads separating the cropped lands.
- Running the hilled rows along the length of the lands so that machinery may be used in the crop. Alternatively, hilled rows could cross the lands to allow easy walking through the crop between the access roads.

The general principles of farm layout are described in the D.P.I. booklet, "Farm Layouts

- Leaf bases are white and clasp the stem. They are arranged around the stem in a close rosette.
- Leaves are fleshy, sword-like and upturned.
- Mature leaves are grey-green with a powdery bloom. They are 50-65 cm long, flat on the upper surface and rounded on the lower surface. The leaf base is about 9 cm wide and 2.5 cm thick. The leaf tapers to a slightly channelled, slender tip up to 6 mm thick.
- Leaf margins are spiny, the spines being pale, strong, short and curved.
- Juvenile leaves may be marked with some white dots or streaks.
- The flower stalk is erect, 60-90 cm tall, and is usually branched.
- The flower raceme is 30-45 cm long.
- Flowers are yellow, 2.5 cm long or slightly longer, tubular and pendent.

ALOE VERA PRODUCTION IN AMERICA

Although householders in many parts of the world have long grown aloe plants in their gardens for medicinal purposes, the United States has recently led the world in establishing a commercial aloe vera industry. Around 95% of the US crop is grown in the Rio Grande Valley in Texas, where plantings expanded from about 84 ha in 1978 and about 200 ha in 1979 to about 1 600 ha in 1983. Other producing areas are in Arizona, Florida, Mexico, certain Caribbean islands and Israel. Rapid expansion of the industry led to over-supply of gel on the world market in 1983, and some Texas crops were ploughed in.

After harvesting, leaves are sold to processors on a weight basis and the price in late 1982 was around 10-15¢/lb., equivalent to about 50¢/L of gel. Lower prices were paid during the period of over-supply in 1983. Gross earnings have averaged around US $20,000/ha/annum, netting about US $12,000. Growers earn extra income from the sale of small 15 cm suckers for around 50¢ and mature plants for $15. During 1983, the price of suckers fell to 10¢ each.

Severe frosts during the 1983-84 winter caused heavy crop losses in Texas, and this will have an effect on world supply and prices of aloe vera gel until about 1985. Although the over-supply situation may have been temporarily relieved, it is obvious that demand must be greatly stimulated in the long term to accommodate increasing world production.

ALOE VERA POTENTIAL IN QUEENSLAND

To meet increasing demand, American production was doubling annually prior to the period of over-supply in 1983, and new plantings are being established in various countries around the world. The new Australian industry must compete with imported aloe vera products, and commercial companies are already arranging export markets. As production increases, world markets will become more competitive and significant price drops may be anticipated in Queensland.

Considerable pioneering and adaptation of growing methods lie ahead of Queensland growers. Practical details of spacing, fertilizing and weed control must still be established. Growers must ensure that the planting material they purchase is the correct species; they must also ensure that a local market for the gel is available, as the cost of transporting leaves to a distant processor may be unaffordably high.

Details of the technology for stabilizing the gel will be difficult to obtain from overseas sources. A significant amount of developmental work will be necessary to adapt the product to the range of market outlets.

Expanded markets must be found for Australian manufactured aloe vera products.

With the large number of uncertainties and teething problems, investment in the infant Queensland aloe vera industry must be considered to be speculative. Growers other than experienced gamblers should not invest more in the industry at this stage, than they can reasonably afford to lose.

to prevent the possible establishment of cross-pollinated volunteer plants.

As field grown plants approach about 5 years of age, excessive root development may cause lodging; crop vigour declines, and leaf and gel production fall. On some American farms, the plants are pulled from the ground, and are replanted after the roots are trimmed. Alternatively, the plant stems are cut off above ground level, and the cut plants are replanted. The crop should preferably be replanted in rested, freshly prepared ground. Shading will minimise the transplant shock. The crop resumes leaf production within 6-8 months. Replanting is necessary about every 18 months in hydroponic crops, but recovery is said to be more rapid.

WEED CONTROL

In America, weeds are usually controlled by hand chipping, which is very expensive in Queensland. However, mechanical weed control will be necessary until suitable chemicals are found that have no effect on the plants or the gel quality.

Plastic mulch laid over the hills would provide effective weed control and also conserve soil moisture.

PESTS AND DISEASES

Root rot caused by poor drainage is a major problem in aloe vera. It is prevented by planting the crop in a well drained soil, and further improving drainage by deep ripping, underground drainage, hilling and controlling surface runoff.

Aloe vera is reputed to be relatively free of other pest and disease problems, but pest attacks may occasionally occur. Pesticides may contaminate the gel.

HARVESTING

To avoid injury from the leaf spines, protective clothing is necessary when harvesting aloe vera. A harvesting boom similar to those used by pineapple growers would improve labour efficiency.

Crops are harvested 3 or 4 times each year, and only fully developed leaves are selected.

The leaves are nicked with a sharp knife where the narrow leaf base clasps the stem. They are then peeled away from the stem and broken off. The harvested leaves are laid flat in bins to a maximum height of 70 cm for transport to the processing factory.

Carefully handled the leaves will remain in good condition without refrigeration for 2-3 weeks. However, for maximum gel quality, processors prefer to process the leaves on the day of harvest.

PROCESSING

Hygiene and quality control are very important in the processing of aloe vera gel. The leaves are washed and sterilized before being split and rolled for the extraction of the gel. After cleaning, the gel is stabilized using various laboratory techniques for the different gel products. Details of these techniques may be difficult to obtain in Queensland.

PRODUCTION

Crops grown in the soil by conventional farming methods are usually ready for the first harvest by the time they are 2½-3 years old - that is, within 1½-2 years of being field planted. Hydroponically grown pups will commence production within 1 year of planting.

Gel recovery and quality depend on the size and maturity of the leaf. A mature, well managed plant may produce up to 10 harvestable leaves per annum, each yielding 0.5 kg or 0.5 L of gel. Although 5 L of gel may be anticipated from each plant, the usual production from well grown field crops in America is about 4 L per plant. This is equivalent to around 40 t/ha. It is claimed that hydroponically grown plants have much higher yields.

Because of the high productivity of the crop, oversupply of aloe vera gel can easily develop, and it will be difficult to maintain stability if the industry becomes large.

farm note

AGDEX 272/637

F145/DEC 85

ALOE VERA – root knot nematode

ISSN 0155-3054

R. Grattidge, Horticulture Branch, Townsville, and P.C. O'Brien, Plant Pathology Branch, Brisbane

Aloe vera formerly known as Aloe barbadensis, has recently been introduced to Queensland and little is known about the problems of growing this crop. Provided the crop is planted into a well drained situation, it is reputed to be relatively free of pest and disease problems. Unfortunately, this is not the case as recent observations suggest root-knot nematode (Meloidogyne sp) is widespread and could be seriously affecting growth of "in ground" aloe vera. This nematode has also been identified from plants growing in a hydroponic system but appears unlikely to be affecting plant growth at this stage.

Symptoms of root-knot nematode

Root-knot nematode usually produces abnormal swellings, galls or "knots" on plant roots. Early symptoms on aloe vera roots are a swelling of the roots which may or may not be terminal. These swellings do not develop into obvious galls. The roots darken, sometimes becoming black, and have excessive cracking on the surface.

In the later stages, roots sliced along their length reveal white female nematodes or pink to dark circular areas where plant tissue around the females has changed colour. If the swelling is terminal, the root tip will die and a proliferation of lateral roots usually occurs behind the damaged area. It is common to find primary roots which appear normal but which have developed short lateral roots showing black swollen tips or terminal galls.

In advanced stages of nematode damage, the plants have very few roots and these roots and the plant butts are black. It may look like a root rot, except the few remaining roots are firm and the roots and butts are not rotted.

Sources of infection

1. Introduction with the planting material. Suckers (pups) and mature plants taken from infested areas will have infected root systems. The nematode is then transferred from one area to another in these infected roots.

2. The soil to be planted may already be infested.

Control

Experimental work is in progress which may improve nematode control. Until these results are available, control of root-knot nematode aims to eliminate or minimise infection from planting materials and soil.

1. Planting material

Aloe vera is propagated from suckers (pups) or from mature plants. The pups removed from the parent plant usually have some roots of their own, while the mature plants are cut off above ground level and replanted without roots.

Rooted pups may be from infected parent plants and adhering soil could be contaminated. Pups should be washed to remove all soil, and any excess butt and all remaining roots should be pared from the plant. This will remove most, if not all, of the root-knot nematode contamination.

Mature plants without roots will be free of nematodes providing they are clean. Any soil adhering to the plants should be washed off.

Pups and mature plants with cut surfaces should not be planted into soil for at least 24 hours. This allows the wounds to seal and protects the plants from invasion by other soil organisms. Plants may be stored dry for extended periods if necessary.

2. Nursery Beds

If the pups are grown in well-fumigated nursery beds, they can then be transplanted into the field with their roots intact. The best nematode control can be achieved with the selected fumigant if the bed surface is properly sealed. Plastic sheeting provides the best seal.

3. Soil

Several fumigants; methyl bromide, Ditrapex°, Vapam°, Basamid°, Telone II° and EDB (ethylene dibromide) are registered as pre-plant treatments to control nematodes in the soil. Telone II° and EDB are registered for nematode control, while the others are registered as a broad spectrum treatment for weeds, diseases and nematodes.

EDB is the most cost effective nematicide. It is available in two formulations:-

- as EDB 15° which contains 325 g/L of ethylene dibromide in power kerosene and
- as a miscible oil containing 1 930 g/L ethylene dibromide.

The fumigant is applied with suitable injection equipment delivering a constant stream of liquid at a depth of 15 to 20 cm in two lines 30 cm apart; that is, 15 cm on each of the intended plant row, or as an overall treatment in lines 30 cm apart throughout the planting area.

Best control is obtained with overall treatment at the rate of 340 L/ha of EDB 15° (102 mL/10 m of row) or the prepared emulsion of EDB at the rate of 336 L/ha. (102 mL/10 m of row).

Prepared emulsion is a mixture of 1 part EDB 193° miscible oil with 5 parts of water.

The same rate (102 mL/10 m of row) is used for either overall treatment or two row applications.

Satisfactory overall applications of EDB are obtained with an aqua ammonia injector.

Application

1. Read the chemical label to ensure the correct and optimum application of the fumigant.

2. Cultivate the soil to a fine tilth. For best results, it would be free from undecomposed organic matter, warm and moist. If the soil is too wet, the fumigant does not diffuse properly and, if too dry, diffusion from the soil is too rapid.

3. Seal the surface after injection by light rolling or a light spray irrigation of 5 or 6 mm.

4. Leave the soil undisturbed for 7 to 14 days after treatment, then cultivate to aerate the soil. This is the ideal time to form up hills for planting the crop. If heavy rain or low temperatures occur during the waiting period, cultivate a couple of times to allow the soil to aerate more freely, and delay planting.

Precaution

1. If using the miscible oil formulation of EDB, mix only the quantity required for immediate application. DO NOT allow the prepared emulsion to stand overnight.

2. Chemicals are hazardous and the correct safety procedures must be adopted.

HO 85/30

Department of Agriculture
New South Wales

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'Aloe vera'

Agfact P6.2.2, first edition 1984
F. W. Cutting, Principal Agronomist
(Fibres and Oils)
Sydney

Aloe vera, which should be known as *Aloe barbadensis*, has developed a reputation in parts of the U.S.A. as a natural healing agent for a wide variety of external and internal medical conditions. This reputation has been promoted in Australia by various interests.

The *National Farmer* newspaper drew attention to aloe vera in November 1980, reporting 'remarkable pain-relieving, curing and rejuvenating properties' for 'a natural cortisone and hormone gel' obtained from the leaves.

In recent months aloe vera growing has been promoted through the publicity about alleged profits to be made and also through the publicity being given to cosmetic products containing aloe vera extracts.

The genus *Aloe* includes some 300 species or hybrids, some of which may be confused with *Aloe barbadensis*. The following extract from "Exotica", Series 3, 9, edited by A. B. Graff discusses *Aloe barbadensis:*

> "vera (Cape Verde, Canary Isl., Madeira), the 'True Aloe' or 'Medicine plant', the pulp of which is used to heal sore burns and cuts; widely cultivated; short-stemmed, suckering rosette with fleshy, dagger-shaped, channeled leaves to 2-ft long, gray-green and glaucous; spotted when young; edged with soft pale spines; nodding, cylindrical, yellow flowers."

If purchasing planting material, it is true to label.

Aloe vera is a succulent from which an orange to red-brown powder containing aloin (or barbaloin) can be produced. The latter is a vermifuge and a carthartic which acts on the large intestine.

The plant originated in the mediterranean area. It was introduced into the American tropics and cultivated there, where it was given the name Barbados, or Curacoe, aloe. It also spread to India, being known there as the Indian or Jaffarabad aloe. These areas have been the traditional sources of medicinal aloes—bitter aloes.

Aloe vera is adapted to Mediterranean climates where there is little or no frost. It requires good drainage and, if grown in more arid regions, requires irrigation. Given well-drained, fertile soils in summer rainfall regions, growth may be satisfactory as long as there is no prospect of waterlogging, to which the plant is sensitive.

Bill Coats, a graduate pharmacist at the University of Texas, is credited with developing a formulation (or gel) which preserves the activity of the plant liquid extract. Previously, this had only been possible with the powder form.

Plantings of aloe vera were made in the Rio Grande River region of Texas about 15 years ago, and commercial production of the 'gel' and of other aloe vera products. The Federal Drug Administration of the U.S.A., has approved the use of aloe vera for first aid purposes only (FIT magazine, U.S.A.).

The N.S.W. Royal Botanic Gardens and National Herbarium has little information on the plant, its habitat and behaviour, or on current developments. The *National Farmer*, 1980 reported that trial plantings in New South Wales had failed, but that production was underway at Heatherton in Victoria. No commercial plantings in New South Wales have been traced. The Department of Agriculture undertook a search of overseas literature through AGRICOLA and CAB*, and this resulted in the discovery of four abstracts/references. Three were scientific reports on pests and diseases of aloe vera in India, and the fourth was a monograph by Bill Coats.

In spite of the promotion of this plant through suggested very attractive costs and returns, and promotion in parts of Queensland,

* Two computer based bibliographic reference systems.

D. WEST, GOVERNMENT PRINTER N.S.W. - 1981 - 1981

as reported by the ABC program 'Country Wide', authoritative evidence of substantial market opportunities for this crop is lacking. Persons interested in the production of aloe vera should establish the market prospects to their satisfaction before proceeding.

Intending growers in New South Wales will need to develop a suitable production technology involving operations from planting and spacing to nutrition, harvesting and perhaps processing.

Expanding production could oversupply the Australian market, possibly resulting in unprofitable prices and or contract defaults.

In conclusion, it appears that investment in this crop is risky in the absence of independent authoritative information on Aloe vera production costs, end uses and markets.

Editorial assistance: J. Balcombe
Division of Agricultural Services

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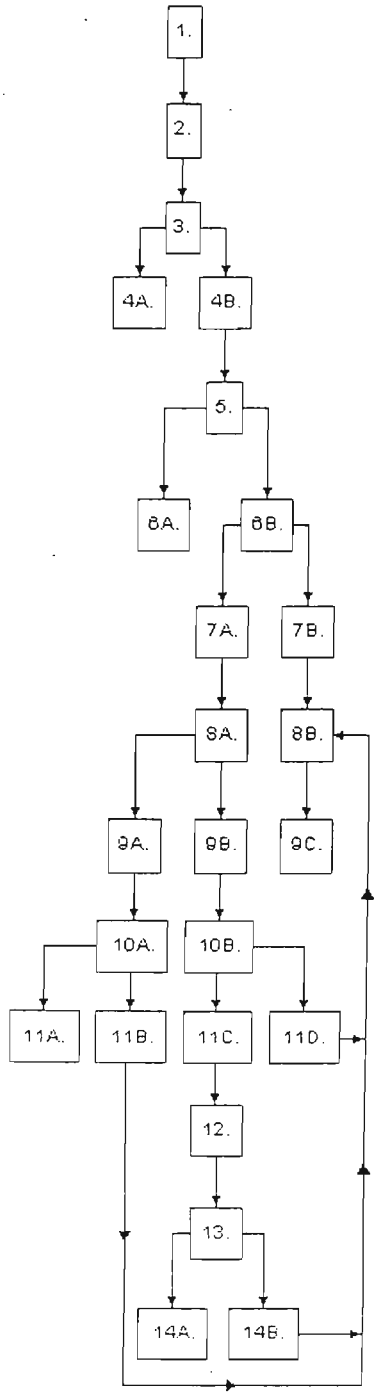
U.S. Food and Drug Administration
Center for Food Safety & Applied Nutrition
Industry Activities Staff Flyer: 1996

FDA IMPORT PROCEDURES



1. Importer or agent files entry documents with U.S. Customs Service within five working days of the date of arrival of a shipment at a port of entry.

2. FDA is notified of an entry of a regulated food through:

   - Duplicate copies of Customs Entry Documents (CF 3461, CF 3461 ALT, CF 7501 or alternative),
   - Copy of commercial invoice, and,
   - Surety to cover potential duties, taxes and penalties.

3. FDA reviews Importer's Entry Documents to determine if a physical examination, wharf examination, sample examination should be made.

4A. Decision is made not to collect a sample. FDA sends a "May Proceed Notice" to U.S. Customs and the importer of record. The shipment is released as far as FDA is concerned.

4B. Decision is made to collect a sample based on:

   - Nature of the product,
   - FDA priorities, and,
   - Past history of the commodity.

   FDA sends a "Notice of Sampling" to U.S. Customs and the importer of record. The shipment must be held intact pending further notice. A sample will be collected from the shipment. The importer of record may move the shipment from the dock to another port or warehouse (contact U.S. Customs for details).

5. FDA obtains a physical sample. The sample is sent to an FDA District Laboratory for analysis.

6A. FDA analysis finds the sample to be in compliance with requirements. FDA sends a Release Notice to U.S. Customs and the importer of record.

6B. FDA analysis determines that the sample "appears to be in violation of the FD&C Act and other related Acts." FDA sends U.S. Customs and the importer of record a Notice of Detention and Hearing which:

- Specifies the nature of the violation, and,
- Gives the importer of record 10 working days to introduce testimony as to the admissibility of the shipment.

The hearing is the importer's only opportunity to present a defense of the importation and/or to present evidence as to how the shipment may be made eligible for entry.

7A. Consignee, true owner, importer of record, or a designated representative responds to the Notice of Detention and Hearing. The response permits the introduction of testimony, either orally or written, as to the admissibility of the shipment.

7B. Consignee, true owner, importer of record, or a designated representative neither responds to the Notice of Detention and Hearing nor requests an extension of the hearing period.

8A. FDA conducts a hearing concerning the admissibility of the product. The hearing is an opportunity to present relevant matters and is confined to the submission of pertinent evidence.

8B. FDA issues a Notice of Refusal of Admission to the importer of record. This is the same person or firm who was sent a Notice of Sampling. All recipients of the Notice of Sampling and the Notice of Detention and Hearing are sent a copy of the Notice of Refusal.

9A. Importer of record presents evidence indicating that the product is in compliance. Certified analytical results of samples, examined by a reliable laboratory and which are within the published guidelines for levels of contaminants and defects in food for human use, may be presented.

9B. Importer of record submits an Application for Authorization to Recondition or to Perform Other Action (FDA Form FD 766). The form requests permission to try to bring a food that is adulterated or misbranded into compliance by relabeling or other action, or by converting to a non-food use. A detailed method to bring the food into compliance must be given.

9C. FDA receives verification of the exportation or destruction of the shipment from U.S. Customs. The exportation or destruction of the merchandise listed on the Notice of Refusal of Admission is carried out under the direction of U.S. Customs.

10A. FDA collects follow-up sample to determine compliance with guidelines.

10B. FDA evaluates the reconditioning procedure proposed by the importer. A bond is required for payment of liquidated damages.

- Specifies the nature of the violation, and,
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10A. FDA collects follow-up sample to determine compliance with guidelines.

10B. FDA evaluates the reconditioning procedure proposed by the importer. A bond is required for payment of liquidated damages.

11A. FDA finds that the sample is "in compliance." A Release Notice with the statement "Originally Detained and Now Released" is sent to U.S. Customs and the importer.

11B. FDA finds that the sample is not in compliance. The importer may either submit an Application for Authorization to Recondition or to Perform Other Action (see 9B), or, FDA will issue a Notice of Refusal of Admission (see 8B).

11C. FDA approves importer's reconditioning procedures. The approved application contains the statement "Merchandise Should Be Held Intact Pending the Receipt of FDA's Release Notice."

11D. FDA disapproves applicant's reconditioning procedure if past experience shows that the proposed method will not succeed. A second and final request will not be considered unless it contains meaningful changes in the reconditioning operation to ensure a reasonable chance of success. The applicant is informed on FDA Form FD 766.

12. Importer completes all reconditioning procedures and advises FDA that the goods are ready for inspection/sample collection.

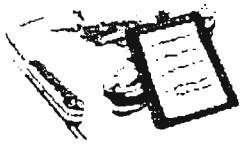
13. FDA conducts follow-up inspection/sample collection to determine compliance with the terms of the reconditioning authorization.

14A. FDA analysis finds that the sample is in compliance. A Release Notice is sent to the importer and to U.S. Customs. The charges for FDA supervision are assessed on FDA Form FD 790. Copies are sent to U.S. Customs which is responsible for obtaining total payment including any expenses incurred by their personnel.

14B. FDA analysis finds that the sample is still not in compliance. Charges for FDA supervision are assessed on FDA Form FD 790. Copies are sent to U.S. Customs which is responsible for obtaining total payment including expenses incurred by their personnel.

IMPORTERS CAN SPEED FOOD ENTRIES!

- Determine before shipment that the product to be imported is legal.
- Have private laboratories examine samples of foods to be imported and certify the analysis of the processor. While not conclusive, these analyses might serve as an indication of the processor's ability to produce acceptable, legal products.
- Become acquainted with FDA's legal requirements, before contracting for a shipment.
- Request assistance from the FDA District Office responsible for your port of entry.
- Know the food importing procedures described on this information sheet.



United States Import Requirements

United States IMPORT REQUIREMENTS

This pamphlet is intended as a general explanation of import requirements for a person interested in establishing an importing business or a person who may be importing a personal shipment whose value is in excess of $2,000.

We at Customs want to help expedite the movement of goods in international trade. Continual review of methods and procedures and the enactment of new laws create constant change. Therefore, we encourage you to obtain more specific import information from a Customs officer at the port nearest your residence.

To speed customs clearance, the import community and the Customs Service have created the Customs Automated Commercial System (ACS), which receives and processes entry documentation and provides cargo disposition information, all electronically. Cargo carriers, customs brokers, and importers may use the system, which reduces clearance time from days to hours or even minutes. Persons entering into the importing trade who intend to file their own entry documentation with Customs are encouraged to explore this method of transacting business. Also, persons importing merchandise for their own use may use a customs broker who transacts customs business using the Automated Broker Interface (ABI) with ACS.

CONTENTS:

United States IMPORT REQUIREMENTS

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1. An individual may make his own customs clearance of goods imported for personal use or business.
2. The U.S. Customs Service does not require an importer to have a license or permit. Other agencies may require a permit, license, or other certification, depending on the commodity.
3. All merchandise coming into the United States must clear customs and is subject to a customs duty unless specifically exempted from this duty by law. Clearance involves a number of steps--entry, inspection, appraisal, classification, liquidation.

4. Customs duties are, generally, an *ad valorem* rate (a percentage) which is applied to the dutiable value of the imported goods. Some articles, however, are dutiable at a *specific* rate of duty (so much per piece, liter, kilo, etc.); others at a compound rate of duty (combination of both ad valorem and specific rates).
5. The dutiable value of merchandise is determined by Customs. Several appraisal methods are used to arrive at this value. Generally, the transaction value of the merchandise serves as the basis of appraisement. Transaction value is the price the buyer actually pays the seller for the goods being imported.
6. The Harmonized Tariff Schedule of the United States (HTSUS), issued by the International Trade Commission, prescribes the rates of duty and classification of merchandise by type of product; e.g., animal and vegetable products, textile fibers and textile products.
7. The tariff schedule provides several rates of duty for each item: "general" rates for most-favored nations; "special" rates for special trade programs (free, or lower than the rates currently accorded most-favored nations); and "column 2" rates for imports not eligible for either general or special rates.
8. Processing fees may also apply.

Arrival of Goods

Imported goods may not be entered legally until the shipment has arrived within the limits of the port of entry and delivery of the merchandise has been authorized by Customs. This is normally accomplished by filing the appropriate documents, either by you as the importer or by your agent. Customs entry papers may usually be presented, however, before the merchandise arrives.

The Customs Service does not notify you of the arrival of your shipment. Notification is usually made by the carrier of the goods. You should make your own arrangements to be sure you or your agent is informed immediately so that the entry can be filed and delays in obtaining your goods avoided.

Imported merchandise not entered through Customs in a timely manner (up to 30 days) is sent by Customs to a general order warehouse to be held as unclaimed. The importer is responsible for storage charges which are incurred while unclaimed merchandise is held at the warehouse. If it remains unclaimed at the end of six months, the merchandise is sold at auction.

You must make whatever entry is required at the first port of arrival. If you are unable to be there to prepare and file your entry, commercial brokers, known as customs brokers and licensed by the Customs Service, may act as your agent. Such brokers charge a fee for their services. A list of customs brokers may be obtained from your local Customs office or classified telephone directory.

In the case of a single noncommercial shipment, you may appoint a relative or other individual to act as your agent for customs purposes. This person must have knowledge of the facts pertaining to your shipment and must be authorized in writing to act for you.

Customs employees are prohibited by law from performing these tasks for the importing public. They will advise and give information to importers about Customs requirements, however.

Entry of Goods

To make or file a customs entry, the following documents are generally required:

1. A bill of lading, airway bill, or carrier's certificate (naming the consignee for customs purposes) as evidence of the consignee's right to make entry.
2. A commercial invoice, obtained from the seller, which shows the value and description of the merchandise.
3. Entry manifest (Customs Form 7533) or Entry/Immediate Delivery (Customs Form 3461).
4. Packing lists, if appropriate, and other documents necessary to determine whether the merchandise may be admitted.

When the entry is filed, the importer indicates the tariff classification and pays any estimated duty and processing fee. A surety bond containing various conditions, including a provision for paying any increased duty that may be later found to be due, may also be required.

Other Types of Entry

Imported goods may be sent in-bond from the first port of arrival to another Customs port. Arrangements for in-bond shipments should be made before the goods leave the country of export. In-bond entries postpone final customs formalities, including payment of duty and processing fee, until the goods arrive at the final port.

Imported merchandise may also be sent to a bonded warehouse under a warehouse entry. Duties and processing fees are not paid on warehoused merchandise until the goods are withdrawn for consumption. Storage fees are paid to the warehouse proprietor by the importer.

Customs Examination of Goods

In simple cases involving small shipments or certain classes of goods such as bulk shipments, examination may usually be made on the docks, at container stations, cargo terminals, or the importer's premises. The goods are then released to the importer. In other shipments, representative packages of the merchandise may be retained by Customs for appraisal or classification purposes and the remainder of the shipment released. These packages will also be released to the importer after examination has been completed.

Examination of goods is necessary to determine:

1. The value of the goods for customs purposes and their dutiable status.
2. Whether the goods must be marked with the country of their origin or with special marking or labeling. If so, whether they are marked in the manner required. Generally, imported merchandise must be legibly marked in a conspicuous place and in a manner to indicate the English name of the country of origin to the ultimate purchaser in the United States. Certain specific articles are exempt from this requirement.
3. Whether the goods have been correctly invoiced.
4. Whether the shipment contains prohibited articles.
5. Whether requirements of other federal agencies have been met.
6. Whether goods in excess of the invoiced quantities are present or a shortage of goods exists.

If necessary, goods may be analyzed by a Customs laboratory to determine proper classification and appraisal.

When examination or appraisal of the goods by Customs reveals differences from the entered descriptions in terms of characteristics, quantity or value, or when Customs finds that a different rate of duty than the one indicated by the importer applies, an increase in duties may be assessed.

When all the information has been acquired, including the report of the Customs import specialist as to the customs value of the goods, and the laboratory report, if required, a final determination of duty is made. This is known as *liquidation* of the entry. At this time, any overpayment of duty is returned or underpayments billed.

Protest

If an importer desires, he may, within 90 days after the date of liquidation or other decision, protest the decision and secure administrative review. Notice of the denial of a protest, in whole or in part, will be mailed to the importer or to his agent. The importer may then decide whether to litigate. If an importer wishes judicial review, he will be required to file a summons in the Court of International Trade.

Mail Shipments

Shipments by mail which do not exceed $2000 in value, whether commercial or noncommercial importations (except for commercial shipments of textiles from all countries and made-to-measure suits from Hong Kong, regardless of value), are entered under a mail entry prepared by a Customs officer after the Postal Service submits the package for customs examination. The parcel is delivered to the addressee by the post office and is released upon the payment of the duty, which is shown on the mail entry accompanying the package. A postal handling fee in the form of postage due stamps will also be collected from the addressee at the time the package is delivered. This fee is not charged on packages sent through military mail channels. (Commercial shipments of textiles from all countries and made-to-measure suits from Hong Kong regardless of value, require a formal entry; see next paragraph.)

A formal entry is required for any commercial mail shipment exceeding $2000 in value. Formal entry is also required, regardless of value, for commercial shipments of textiles from all countries and all made-to-measure suits from Hong Kong. The parcel is forwarded to the Customs office nearest the addressee. Customs notifies the addressee of the parcel's arrival and the location of the Customs office where customs formalities may be arranged. Customs clearance will require filing an entry in the same manner as for shipments arriving by vessel or air freight.

Restricted Merchandise

Because our officers are stationed at all ports of arrival in the United States, including Puerto Rico,

they are called upon to enforce laws and regulations of other government agencies.

A license or permit from the responsible agency is necessary to import:

alcoholic beverages
animals and animal products
certain drugs
firearms and ammunition
fruits, nuts
meat and meat products
milk, dairy, and cheese products
plants and plant products
poultry and poultry products
petroleum and petroleum products
trademarked articles
vegetables

Certain items in these categories may also be prohibited.

Most of the above items are regulated, variously, by:

Bureau of Alcohol, Tobacco, and Firearms
Washington, D.C. 20226

(202) 927-8110 (alcoholic beverages)
(202) 927-7920 (arms and ammunition)

Animal and Plant Health Inspection Service
(animals/animal products)
USDA-APHIS-VS
Hyattsville, MD 20782

(301) 734-7885

Animal and Plant Health Inspection Service
(plants/plant products)
USDA-APHIS-PPQ
Hyattsville, MD 20782

(301) 734-8645

Agricultural Marketing Service
(fruits, vegetables & specialty nuts)
USDA-AMS-MOAB
14th & Independence Ave. S.W.
Room 2525-South,
Washington, D.C. 20250

(202) 720-2491

U.S. Fish and Wildlife Service
Office of Management Authority
4401 N. Fairfax Drive
Arlington, VA 22203

(703) 358-2093

Food and Drug Administration
Division of Import Operations and Policy
5600 Fishers Lane
Rockville, MD 20857

(301) 443-6553

Today, an increasing number of goods and products such as textiles, clothing, automobiles, boats, radios, television sets, and medical devices, are subject to special standards, declarations, certification, marking or labeling requirements.

Other merchandise must be examined for fitness of use, freedom from contamination, or may be subject to quotas on the quantity imported.

All these requirements must be met before the merchandise may be released by Customs.

Foreign Assets Control

The regulations administered by the Office of Foreign Assets Control (FAC) generally prohibit the unlicensed importation of merchandise--except information and informational materials--of Cuban, Iranian, Iraqi, Libyan, or North Korean origin. Goods may not be imported from or through commercial entities owned or controlled by the governments of Cuba, Iran, Iraq, Libya, or North Korea, or owned or controlled by any commercial entity in those areas, regardless of the location of the entity. Vessels or aircraft under the registry, ownership, or control of the governments of, or commercial entities in, the above areas may not import merchandise into the United States.

Specific inquiries concerning FAC Regulations, including any recent changes, should be made to the Office of Foreign Assets Control, U.S. Treasury Department, Washington, D.C. 20220. Telephone: (202) 622-2500.

Publications

Persons intent on going into the importing business will find the following publications invaluable. They may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D.C., 20402, (202) 512-1800. Prices are subject to change.

Information on the Customs Automated Commercial System (ACS) can be found in the pamphlet "Yes You Can . . . on ABI" and the more detailed "ABI Overview," obtainable free of charge from the Documentation Branch, Office of ACS Operations, U.S. Customs Service, 1301 Constitution Avenue, NW., Washington, D.C. 20229.

The Office of Rulings & Regulations also publishes a series of electronic brochures that are very valuable. These Informed Compliance Publications offer very specific guidance on importing certain

goods and on following various procedures.

Customs Regulations of the United States

Loose-leaf volume containing regulations published for the purpose of carrying out customs, navigation, and other laws administered by the U.S. Customs Service. Price: $68 includes revised pages for subscription year; $85 foreign mailing (surface). **Note:** Customs regulations are also contained in the Code of Federal Regulations, Title 19, Chapter 1.

Customs Bulletin

A weekly pamphlet containing regulations, rulings, decisions, and notices concerning Customs and related matters, decisions of the United States Court of Appeals for the Federal Circuit and the Court of International Trade. Price: $155 a year, domestic mailing; $193.75 a year, foreign mailing.

Harmonized Tariff Schedule of the United States (Annotated)

A technical document for use in classification of imported merchandise for rates of duty and statistical purposes. Price: $56 domestic, $70 foreign.

Importing Into the United States

A highly technical 88-page book providing extensive details on the topics covered in this pamphlet. Aimed at those contemplating commercial importing, it also contains sample forms and lists of quotas and other restrictions on a variety of generic merchandise (fibers, fabric, metals, food-stuffs, vehicles, etc.) of interest to commercial importers. For a free copy, write to the U.S. Customs Service, P.O. Box 7407, Washington, D.C., 20044. Additional copies can be ordered from the Government Printing Office, Washington, D.C., 20402, (202) 512-1800 for $6.50 each; $8.13 for foreign mailing.

Import Quotas

"Import Quotas" (Customs publication no. 519) describes the merchandise subject to U.S. import quotas, as administered by the U.S. Customs Service.

The Customs electronic bulletin board (CEBB) contains status reports and quota book telegrams (QBTs), which identify new and revised quotas. Your ACS client representative can assist you in gaining access to the CEBB.

North American Free Trade Agreement (NAFTA): A Guide to Customs Procedures

This NAFTA guide (Customs publication No. 571) explains the rules of origin and procedural

obligations relating to Customs administration of NAFTA. It summarizes various terms of the agreement and gives an overview of the benefits to and requirements of importers. Price: $5 domestic, $6.25 foreign.

Revised April 1997 Customs Pub. No. 517

DEPARTMENT OF THE TREASURY

U.S. CUSTOMS SERVICE

WASHINGTON, DC

CHAPTER 13 - LAC; GUMS; RESINS AND OTHER VEGETABLE SAPS AND EXTRACTS

II
13-1

Note

1. Heading 1302 applies, inter alia , to licorice extract and extract of pyrethrum, extract of hops, extract of aloes and opium.

The heading does not apply to:

(a) Licorice extract containing more than 10 percent by weight of sucrose or put up as confectionery (heading 1704);

(b) Malt extract (heading 1901);

(c) Extracts of coffee, tea or maté (heading 2101);

(d) Vegetable saps or extracts constituting alcoholic beverages (chapter 22);

(e) Camphor, glycyrrhizin or other products of heading 2914 or 2938;

(f) Medicaments of heading 3003 or 3004 or blood-grouping reagents (heading 3006);

(g) Tanning or dyeing extracts (heading 3201 or 3203);

(h) Essential oils, concretes, absolutes, resinoids, extracted oleoresins, aqueous distillates or aqueous solutions of essential oils or preparations based on odoriferous substances of a kind used for the manufacture of beverages (chapter 33); or

(ij) Natural rubber, balata, gutta-percha, guayule, chicle or similar natural gums (heading 4001).

1301	Lac; natural gums, resins, gum-resins and oleoresins (for example, balsams):			
1301.10.00	Lac.....		.....	Free
20	Seed lac.....	kg		
40	Bleached shellac.....	kg		

60		Other	kg			
1301.20.00	00	Gum Arabic		kg	Free	
1301.90		Other:				
1301.90.40	00	Turpentine gum (oleoresinous exudate from living trees)	kg	1.3%	Free (A*,CA,E,IL,	
1301.90.90		Other			Free	
10		Balsams	kg			
30		Tragacanth	kg			
40		Karaya	kg			
90		Other	kg			
1302		Vegetable saps and extracts; pectic substances, pectinates and pectates; agar-agar and other mucilages and thickeners, whether or not modified, derived from vegetable products:				
		Vegetable saps and extracts:				
1302.11.00	00	Opium			Free	
		anhydrous morphine content	kg			morphin
1302.12.00	00	Of licorice	kg		4.5%	Free (A,
1302.13.00	00	Of hops	kg		$1.25/kg	
1302.14.00	00	Of pyrethrum or of the roots of plants containing rotenone	kg	Free		10%
1302.19		Other: Ginseng; substances having anesthetic, prophylactic or therapeutic properties:				
1302.19.20	00	Poppy straw extract		X		Free
1302.19.40		Other				1.2%
20		Ginseng		kg		
40		Other		kg		
1302.19.90		Other				Free
20		Cashew nut shell liquid	kg			
40		Other	kg			
1302.20.00	00	Pectic substances, pectinates and pectates	kg		Free	
		Mucilages and thickeners, whether or not modified, derived from vegetable products:				
1302.31.00	00	Agar-agar	kg		1%	Free (A,
1302.32.00		Mucilages and thickeners, whether or not modified, derived from locust beans, locust bean seeds or guar seeds		Free		Free
20		Guar	kg			
40		Locust bean	kg			
1302.39.00		Other			3.8%	Free (A+

10	Carageenan.....	kg
90	Other.....	kg

&fly3X

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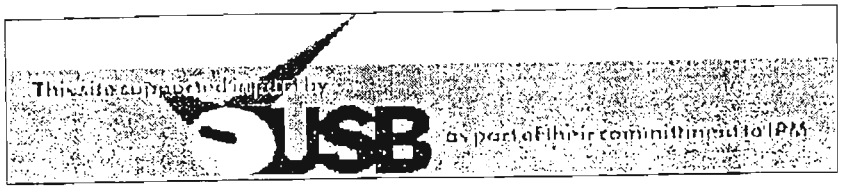

WWW Virtual Library

The World Wide Web Virtual Library

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    Links and Databases
  - Universities
  - Extension WWW Coordinators and Servers
  - State and County Departments of Agriculture
  - Agricultural/Environmental Safety Information
  - U.S. Government Ag-related Servers
  - Global Crop Pest Identification and Information Services (from Cornell, under construction)
  - Cornell's Mann Library - USDA reports and statistics from ERS and NASS
  - Institutes,Colleges of Agriculture,and Departments
    SEE ALSO the National IPM Network for University-based information
  - Information for the 'Low Input' Farmer
  - Horticultural Information
  - Agricultural Weather
  - Agricultural Market News
  - Associations and Organizations

WWW Virtual Library Sites Relevant to Agriculture

- Agricultural Economics
- Biological Control Virtual Information Center
- Biosciences Index
- Biotechnology
- Fish, and other Aquatic Animals
- Entomology
- Forestry
- Gardening
- Grains Specialty Library
- Irrigation and Hydrology
- Livestock
- Plant Biology

- Population Ecology Home Page
- Poultry Science Virtual Library
- Sustainable Agriculture Virtual Library
- Veterinary Medicine

Resources Containing Lists of WWW Sites Relevant to Agriculture

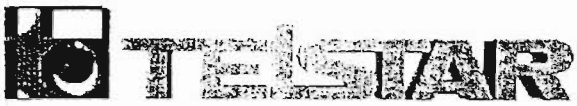
- Agriculture Network Information Center (AgNIC)
- Agricultural Economic Recovery & Development Initiative
- Agbiotech Online - Information Systems for Biotechnology (NBIAP)
- Agricultural/Environmental Links - Joe Walker
- Agriculture (Engineering & Technology from EINet Galaxy)
- Agriculture Home Page - Links from FSU
- Center for Integrated Pest Management an NSF Industry/University Cooperative Research Center
- Cyberstacks - Agriculture
- Dryland Cropping Systems Information System from Washington State University
- Entomology Internet Resource List at Iowa State University
- Farmer's Guide to the Internet
- Florida AgriGator Agriculture and Related Information.
- INFOMINE A long listing of sites including many international sites.
- Mother of all BBS Agriculture
- National Agricultural Pest Information System (NAPIS)
- National Biological Control Institute
- National Integrated Pest Management Network An Expanding Network of IPM Information.
- National IPM Materials Database
- Not Just Cows: A guide to Internet/Bitnet Resources in Agriculture
- Plant and Insect Parasitic Nematodes
- The Plant Pathology Internet Guide Book, a resource guide for phytopathology and related fields
- Science and Agriculture from Yahoo
- Soil Micromorphology
- Vet/Med Links from Auburn University - College of Veterinary Science

Horticultural Information

For commercial companies, see the Commercial Gardening section.

- AGROPOLIS. Non-technical Texas A&M information on gardening, agriculture, environment, and home and family living
- G and G WWW Page - A Good Resource for Botanical Gardens and Gardening Resources.
- American Bamboo Society
- Florida Plants Online
- Glossary of Botanical Terms
- Horticulture and Home Pest News from Iowa State University
- Horticulture in Virtual Perspective
- Texas A&M University - Dept of Horticultural Science
- Horticulture and Molecular Biology
- INFOMINE Biological, Agricultural and Medical Resources
- Northwest Berry & Grape InfoNet
- Pukeiti Rhododendron Trust (New Zealand)

- Rhododendron Page
- Royal Botanic Gardens
- Tyler Arboretum
- UKEXNET Horticultural Index
- USDA/ARS Vegetable Lab



EQUIPOS DE LIOFILIZACION

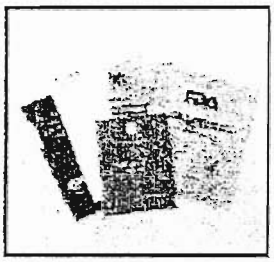
LIOMEGA

La estructura de TELSTAR permite una gran flexibilidad y una alta capacidad de adaptación a las necesidades concretas del mercado.

La innovación en el diseño, la agilidad en la fabricación y suministro, y la rapidez y eficacia en la asistencia técnica, son el resultado de la voluntad de servicio de TELSTAR.

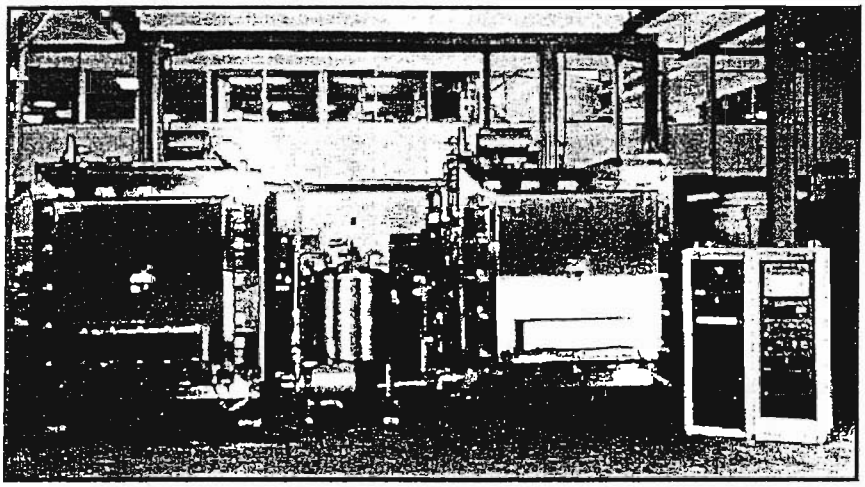
Más de 30 años de experiencia y más de 200 liofilizadores industriales distribuidos por todo el mundo y a las principales multinacionales del sector farmacéutico avalan el avanzado nivel tecnológico ofrecido por TELSTAR.

TELSTAR, trabaja de acuerdo con las más estrictas normas internacionales y la construcción de los liofilizadores se realiza siguiendo las normas y recomendaciones dictadas por la FDA, GMP y GLP.



Protocolos y documentació necesaria para la Validació del sistema DQ, IQ y OQ

SOP y formació del personal de producció y mantenimiento.



- Diseño compacto y fácilmente accesible para mantenimiento y revisión. Mínimo espacio ocupado en zona de máquinas.
- Acabado de suprficies, conexiones y válvulas de diafragma, de tipo sanitario, soldadura orbital de tubos.
- Cámara preparada para facilitar la limpieza periódica. Esquinas curvas, fondo inclinado con desagüe, ausencia de puntos inaccesibles.
- Estricto control de estanqueidad de todos los componentes antes y después del ensamblaje. Detección de fugas con espectrómetro de masas por helio.
- Duplicidad de los sistemas principales del equipo (frío, calor, vacío) con circuitos independientes para garantizar una máxima seguridad.
- Trampa (Bafle) enfriado por agua, encima de la bomba rotativa, para evitar la retrodifusión de los vapores de aceite.

- Interdistancia variable entre las placas de la cámara, muy fácilmente regulable, que permite la liofilización de diversos tamaños.
- Dispositivo del control del vacío en cámara que actúa sobre la válvula de vacío a condensador. Posibilidad de control por inyección de aire estéril (fuga controlada).
- Máxima precisión en la temperatura de calefacción. Uniformidad de temperatura entre placas.
- Condensador de alta eficacia. Mayor velocidad de condensación y tiempos mas cortos de liofilización. Fácil acceso al interior, tapa posterior desmontable.
- Puertas opuestas para la carga y descarga de la cámara, situadas en diferentes zonas estériles.
- Dispositivos para el ahorro de energía mediante el paro alternativo de componentes.
- Conexiones para realizar la validación de la cámara y del condensador, durante los procesos de esterilización a vapor.
- Esterilización a vapor de la cámara y condensador hasta 2,5 bar (a). Secuencia del proceso de esterilización mediante microprocesador proqramable. Esterilización con peróxido de hidrógeno
- Capacidades de condensador desde 30 a 300 litros. Superficie de placas en cámara de 2 a 40 m2.

MAS INFORMACION

- CARACTERISTICAS TECNICAS
- DIMENSIONES GENERALES
- DETALLES GENERALES
- DETALLES DE LA CAMARA
- DETALLES DEL C.I.P. (CLEAN IN PLACE)
- CARACTERISTICAS DEL SISTEMA DE CONTROL

PROGRAMA DE LIOFILIZACION

Liofilizadores industriales

- Modelos Standard: LIOMEGA
- Capacidades de condensador entre 30 y 1000 litros.
- Instalaciones en túnel de gran capacidad, para Industrias Alimenticia y Química.

Servicio de Asistencia Técnica y Mantenimiento

A cargo de técnicos especialistas en vacío, frío y electrónica, que aseguran una asistencia rápida y eficaz.

Servicio de control y validación periódicos

Para revisión y ajuste de todos los instrumentos y equipos de control de temperatura, vacío y presión necesarios para el óptimo rendimiento del proceso, realizados bajo recomendaciones GMP y GLP

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LIOFILIZADORES LIOMEGA

Características Técnicas

MODELO	CAPACIDAD				PLACAS CAMARA			CONDENSADOR		PESO	POTENCIA TOTAL
	diam. de los frascos			Litros en bandejas	Número útiles	Dimensiones (mm)	Superficie útil en m2	Capacidad Kg hielo	Temperatura ° C	(Kg)	(kW)
	16 mm	20 mm	32 mm								
LIOMEGA-20	6900	4500	1800	35	5	600x600	1.8	30	-75	2000	14
LIOMEGA-40	12300	7900	3200	65	6	600x900	3.2	60	-75	4000	30
LIOMEGA-80	25100	16200	6400	130	6	900x1200	6.5	110	-75	6500	50
LIOMEGA-100	33200	21400	8500	175	8	900x1200	8.6	130	-75	10000	60
LIOMEGA-150	-	29900	11900	220	8	1000x1500	12	200	-75	11500	70
LIOMEGA-200	-	-	-	400	16	1000x1500	24	400	-75	14000	90
LIOMEGA-300	-	-	-	600	14	1500x1500	31.5	600	-75	16000	120
LIOMEGA-400	-	-	-	800	14	1500x1800	37,8	800	-75	21000	170

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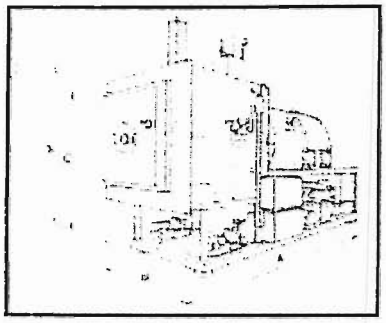
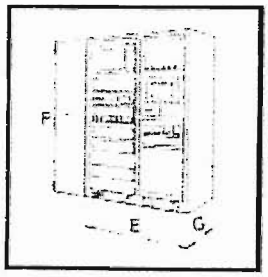
LIOFILIZADORES LIOMEGA

Dimensiones Generales (mm)



MODELO	L-20	L-40	L-80	L-100	L-150	L-200	L-300	L-400
A	2690	2910	5150	5150	5400	6000	6300	8200
B	1370	1415	1730	1730	1830	2200	2600	2600
C	2128	2290	2300	2360	2360	2475	2550	2550
D (*)	2700	3100	3100	3120	3120	3400	3700	3900

** Incluye dispositivo cerrado vacío*



MODELO	L-20	L-40	L-80	L-100	L-150	L-200	L-300	L-400
E	550	550	1110	1110	1110	1110	1110	1110
F	1810	1810	1810	1810	1810	1810	1810	1810
G	620	620	620	620	620	620	620	620

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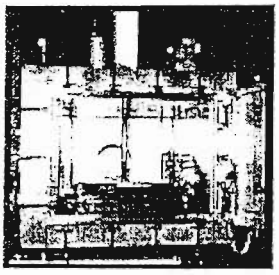
LIOFILIZADORES LIOMEGA

Detalles de la cámara



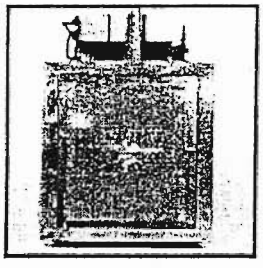
Dispositivo de cerrado de frascos mediante pistón hidraulico.

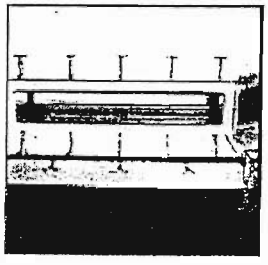
Doble junta de cierre mecánico.

Fuelle estanco; de aislamiento del pistón, esterilizable.

Puerta de la cámara con cierre rápido a volante central.

Dispositivos de seguridad y protección adecuados a la presión y temperaturas de trabajo.





Puerta auxiliar para la carga de las bandejas a altura constante.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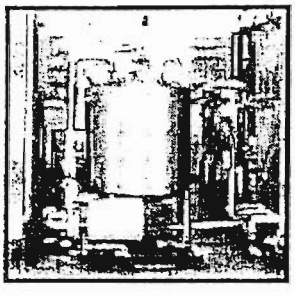
LIOFILIZADORES LIOMEGA

Detalles del C.I.P. (clean in place)



Unidad C.I.P. (clean in place) con programa automático de limpieza.

Sistema de limpieza C.I.P. del interior de la cámara y condensador, mediante bolas de limpieza y chorro de agua a presión.

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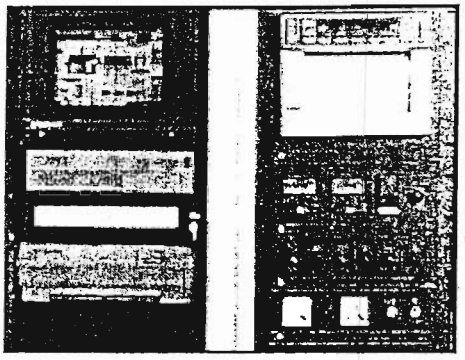
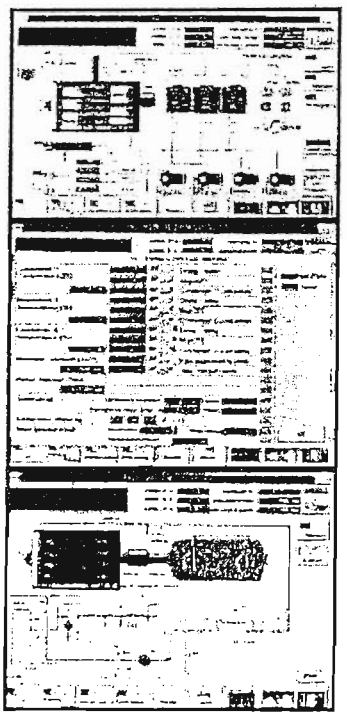
LIOFILIZADORES LIOMEGA

Sistema de control



CARACTERISTICAS GENERALES

Conexión a red Ethernet para acceder a los datos del liofilizador desde otros PC's conectados a la red (mantenimiento, control, producción, etc ..).
Estación auxiliar, para la visualización de pantallas en una unidad de control situada en la zona estéril.
Posibilidad de asistencia técnica a distancia vía módem.
Autómata programable, con ordenador PC compatible Monitor, ratón, teclado e impresora Software LYOSTAR.



- El programa de control, supervisión y adquisición de datos LYOSTAR, proporciona una interfase gráfica y un control centralizado de todos los parámetros del sistema.
- El programa del PC supervisor no controla directamente el sistema sinó que funciona como interfase de operador entre el usuario y el PLC.
- Permite la programación de recetas o ciclos completos de liofilización que son enviados al PLC para su ejecución automática.
- Registrador gráfico a 16 canales (ampliables a 32) configurables Comunicación RS 232.
- Gestión de alarmas Visualización en pantalla de históricos de alarmas. Generación de ficheros.
- Visualización en tiempo real de todas las variables de temperatura y presión y curvas programadas en receta.

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INNOVATION IS OUR TRADITION

Freezing Drying Process

Technical Information

Process:

The frozen product is fed into the drying process. The evaporation of the water is effected by sublimation

Possibilities:

A continuous production line as well as 19 filling stations.
Total heating surface: 1,800 m², high flexibility Minimum load 1t of raw material.
Evaporation temperature at about minus 20° C.
No damage to the product while maintaining the lumpy structure, if desired.
Excellent reconstitutive properties - water is extracted by capillary action

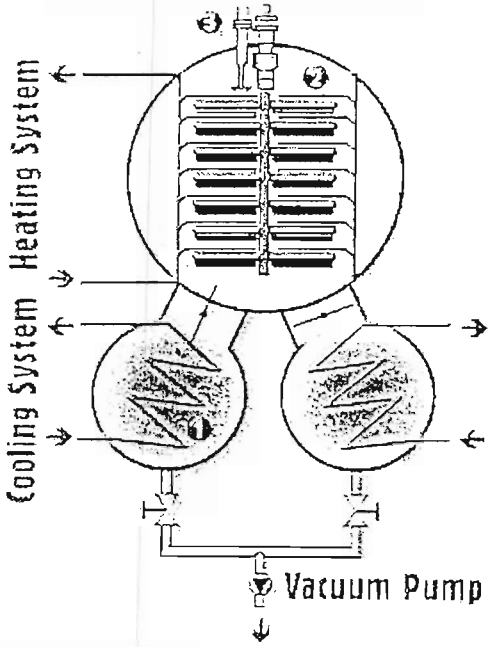


Diagram
Freeze Drying
Plant

1. Condenser
2. Heating Plates
3. Weighing Device and Rotary Valve

MOLDA

INNOVATION IS OUR TRADITION

Vacuum Belt Drying

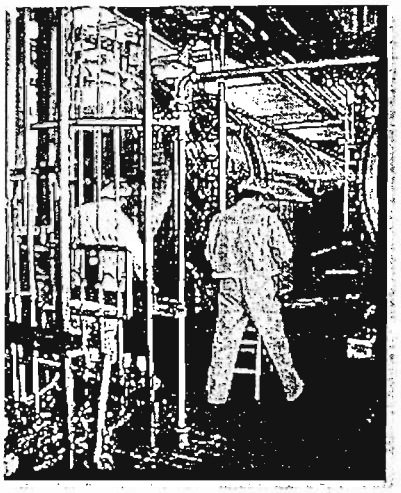
Technical Information

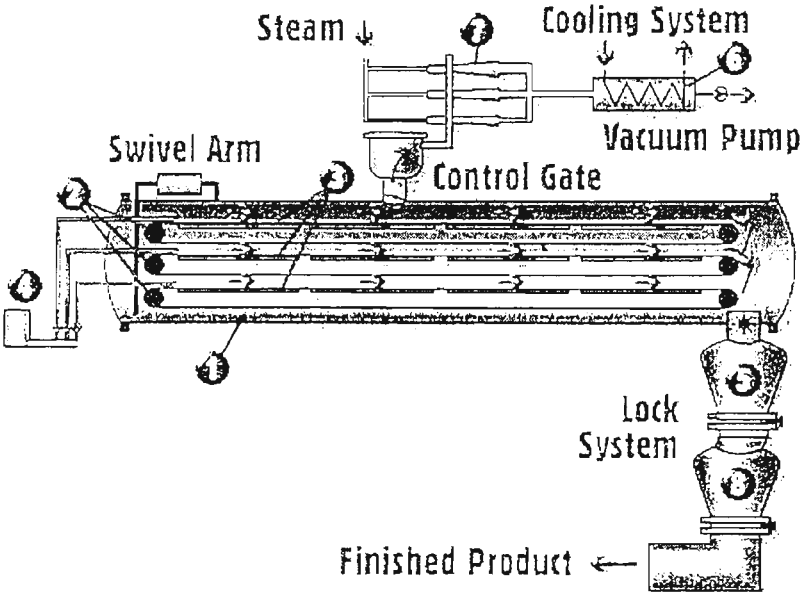
Process:

This drying system closes the gap between freeze drying and spray drying as far as processing engineering is concerned

Possibilities:

Suitable for viscous and lumpy products with high dry matter
Drying at destillation temperatures of the water at between 0 and 40° C ; thus low thermal strain on the products.
Relatively low production costs owing to continuous working process.
Good instant properties of the products, low creation of dust and low bulk weight.
Pinpointed control of Maillard reactions.
Even adequate for hygroscopic goods.
Three continuous plants in use
Total drying surface: 300 m².





Schema Vakuumbandtrockner

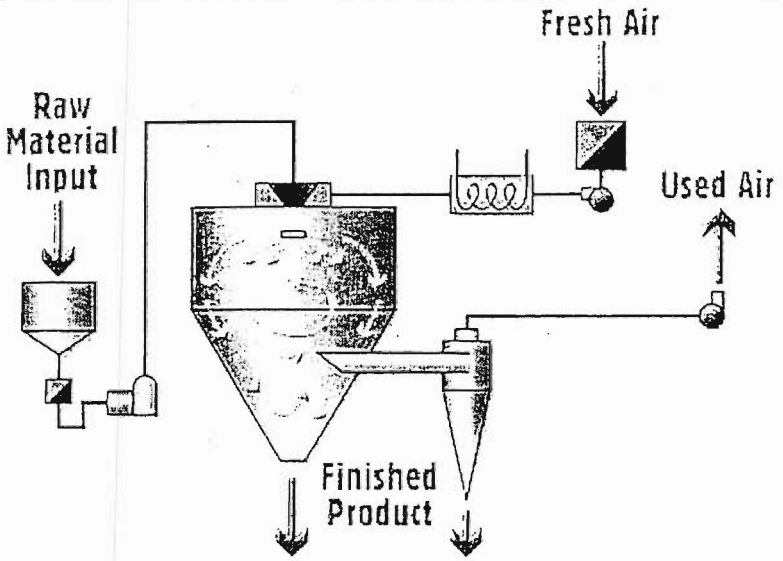
INNOVATION IS OUR TRADITION

Spray Drying

Technical information

Process:
The drying process takes place after atomization of the liquid in a hot-air stream. Usual standard technique

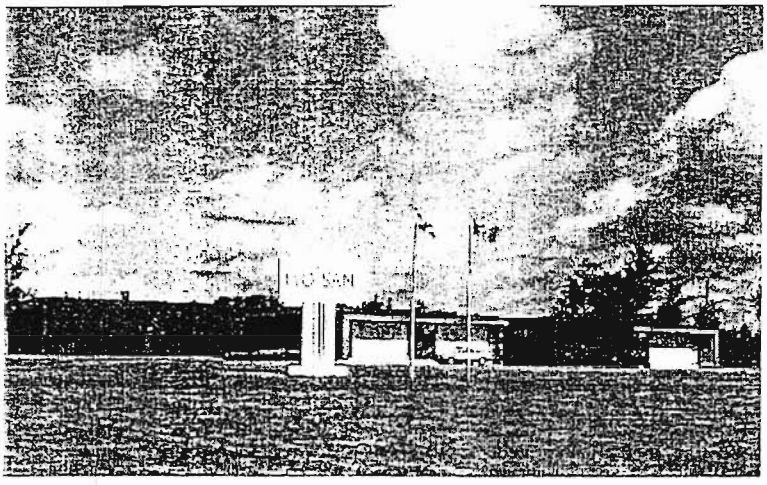
Possibilities:
Five spraying towers of different size
High flexibility, particularly suitably for emulsions fora high fat content enulsitfiers, standard techniques for milk, eggs, not suitably for hygroscopic products.



Company
Profile

lyosan

Lyo-San Inc. is a family business, founded in 1983 and situated in Lachute, Quebec. Lyo-San specializes in the freeze-drying (lyophilization) of various nutritional products, especially dairy cultures (lactic ferments) and probiotics. Our dairy cultures are primarily designed for making home-made yogurt, kéfir, soft cheeses and sour cream. We also produce acidophilus and bifidus-type bacteria which are used to make dietary supplements and natural health products. Lyo-San also manufactures the famous Yogourmet Multi yogurt maker which produces perfect home-made yogurt every time.



Lyo-San produces and markets freeze-dried meals for sports enthusiasts. These products were developed in consultation with Odile Dumais, a specialist in sport nutrition and outdoor recreational sports, and are marketed under the trade name Outdoor Gourmet Plein Air.

Our Yogourmet products are distributed throughout North America. We are serving customers throughout the world and have years of experience in satisfying an international clientele.

We invite you to visit our site and hope you will enjoy your visit. Please contact us if you have any comments or if you require additional information.

Lyo-San Inc.
500, boul. de l'Aéroparc
C.P. 598 Lachute (Québec) Canada
J8H 4G4

Téléphone: (800) 363-3697 no charge if available in your region, or
(450) 562-8525
Fax: (450) 562-1433

Lyophilization

lyosan

- What is lyophilization ?
- Advantages
- Lyophilization apparatus

What is lyophilization ?

Lyophilization is a process which extracts the water from foods and other products so that the foods or products remain stable and are easier to store at room temperature (ambiant air temperature).

Lyophilization is carried out using a simple principle of physics called sublimation. Sublimation is the transition of a substance from the solid to the vapour state, without first passing through an intermediate liquid phase. To extract water from foods, the process of lyophilization consists of:

1. Freezing the food so that the water in the food become ice;
2. Under a vacuum, sublimating the ice directly into water vapour;
3. Drawing off the water vapour;
4. Once the ice is sublimated, the foods are freeze-dried and can be removed from the machine.

Advantages

Lyophilization has many advantages compared to other drying and preserving techniques.

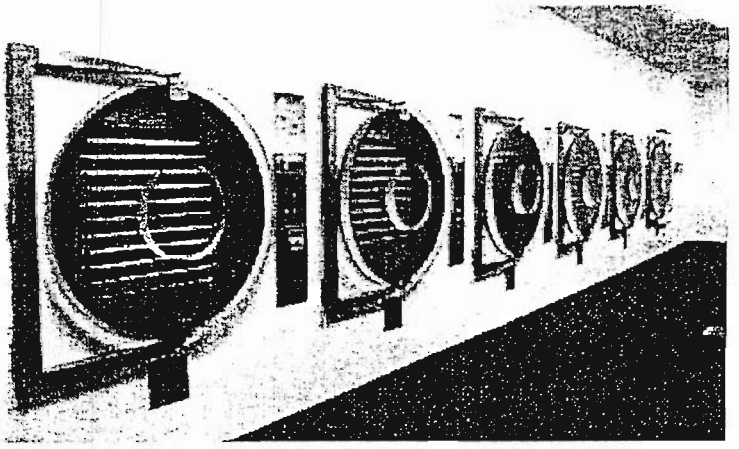
1. Lyophilization maintains food quality because the food remains at a temperature that is below the freezing-point during the process of sublimation;

   The use of lyophilization is particularly important when processing lactic bacteria, because these products are easily affected by heat.

2. Foods which are lyophilized can usually be stored without refrigeration, which results in a significant reduction of storage and transportation costs.
3. Lyophilization greatly reduces weight, and this makes the products easier to transport. For example, many foods contain as much as 90% water. These foods are 10 times lighter after lyophilization.

4. Because they are porous, most freeze-dried foods can be easily rehydrated. Lyophilization does not significantly reduce volume, therefore water quickly regains its place in the molecular structure of the food.

Lyophilization apparatus



The freeze-dryer unit we use is of our own design. Each dryer is composed of a large air-tight cylindrical reservoir, equipped with shelves to hold the trays of food to be freeze-dried. Access is through a large door, made of 6 cm thick acrylic, strong enough to resist the high pressure created when air is withdrawn from the freeze-drying unit to produce a vacuum needed for the process of sublimation.

Index ◆ E-mail ◆ Profil ◆ Outdoor Gourmet Plein Air
Lyophilization ◆ Yogourmet ◆ Other products and services

ANEXO N° 4

Principales antecedentes de la empresa Forever Living Products

Forever Living Products International, Inc.

COMPANY CAPSULE | NEWS

7501 E. McCormick Pkwy. 135 South
Scottsdale, AZ 85038

Phone: 602-998-8888
Fax: 602-905-8451

http://www.foreverlivingproducts.com

Although Forever Living Products International might not lead to immortality, its aloe vera-based health care products could improve your overall well-being. Founded in 1978, the firm sells an aloe vera juice drink (its first product), as well as products such as tooth gel, shampoo, lotion, deodorant, honey, and nutritional supplements. Owner Rex Maughan also owns 5,000 acres of aloe vera plantations; Aloe Vera of America, an aloe vera processor and packager; and Forever Resorts, a string of 22 resorts located throughout the US, including Dallas-area South Fork Ranch (of *Dallas* TV show fame). Forever Living Products International sells its goods through a worldwide network of independent distributors.

Top Competitors: Herbalife | Nature's Sunshine | Sunrider

Hoover's Snapshot: Household & Personal Products Industry

NEWS & COMMENTARY

Current News Stories Mentioning Forever Living

More News

SEARCH THE WEB FOR FOREVER LIVING

AltaVista | AOL NetFind | Dogpile | Excite | HotBot | Infoseek | Lycos | Northern Light | Yahoo!

KEY NUMBERS

Company Type: Private company

#351 in *Forbes* Private 500

Fiscal Year-End: December

1997 Sales (mil.): $1,300.0 (est.)
1-Yr. Sales Growth: 7.3% (est

1997 Employees: 1,500
1-Yr. Employee Growth: 10.3%

KEY PEOPLE

Chairman, CEO and President:
Rex Maughan

SVP Finance:
David Hall

VP Human Resources:
Glen B. Banks

KEY RESOURCES

For Researchers:
Company History
Buy D&B Business Reports
Patents

For Job Seekers:
HR Contact: Glen B. Banks

Available to Hoover's Onlin members.

Yahoo!

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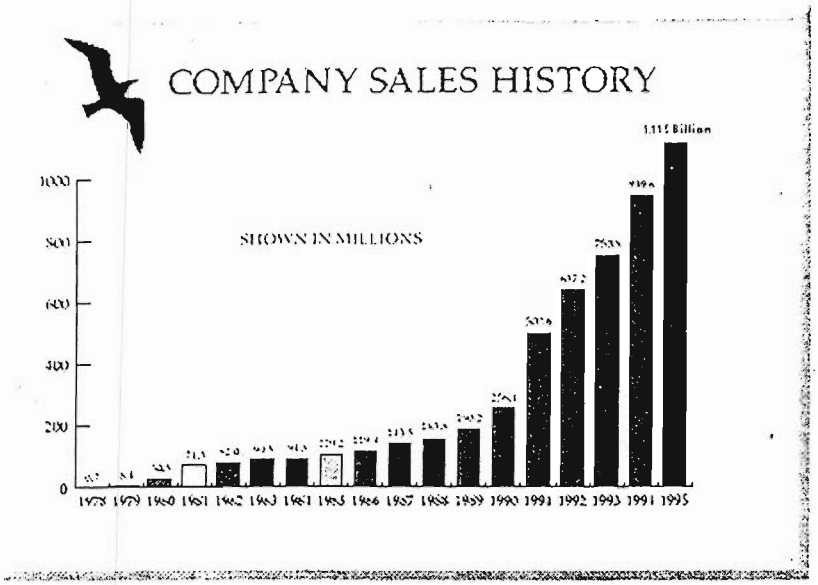

Return to previous page.

The Company

Forever Living Products is a company that started out with a marketing concept before a product was decided upon. It all started with an idea and a dream of providing a way for people to set themselves free financially. It could be agreed that this was putting the cart-before-the-horse, but in this case it worked. The search for a product led the Company to stabilized Aloe Vera, one of nature's wonders.

Known as the "burn plant," this incredible miracle gel and Forever Living's marketing concept formed a perfect union. Together, the product and concept created enough excitement throughout the United States, Canada and elsewhere in the World that Forever Living got off to a dramatic start.

It all began in the Del Webb Townhouse, in downtown Phoenix, Arizona, on May 13, 1978. This was the first Certification Meeting of the Company, and it was an exciting time. Forty-three people attended, and the first product orders were filled. Goals were clearly in focus. Growth was immediate, and success was inevitable.

Since that first Certification Meeting, Forever Living Products has experienced phenomenal growth. Today, the International Headquarters are located at 7501 E. McCormick Parkway in beautiful Scottsdale, Arizona. Since April, 1983, the facility accommodates the executive team, accounting personnel, marketing, sales, programming and operations specialists and all the support staff under one roof.

Once Forever Living Products was on its way to success it was quickly realized that only a limited supply of Aloe Vera existed in the country. To assure the Company and its Distributors a plentiful supply, we acquired our own Aloe Vera Plantations. In addition to providing us with all the product we needed, this also gave us the ability to control the cultivation and quality of Forever Living Products Aloe Vera.

The town of Harlingen, Texas, sits in the lower Rio Grande Valley. Mexico is only 15 miles away to the south. The Gulf shores are about 30 miles east. And just three miles west of Harlingen, on Expressway 83, are the headquarters of the Forever Aloe Plantations where Forever Living Products' Aloe Vera is grown, receives loving care and is harvested.

Since Forever Living Products purchased its first Aloe Vera fields in 1980, we now own or control a majority of all commercial Aloe Vera cultivated in the United States.

Upon full maturity, the Aloe Vera plant is harvested. Millions of large, mature, succulent leaves a year are carefully removed from the plants and, with our own transport vehicles, conveyed to Mission, Texas for processing.

Another significant step was taken on May 1, 1981, when we acquired the assets of Aloe Vera of America, which included a field processing facility in Mission, Texas, for Aloe Vera stabilization, and a small cosmetic manufacturing facility in Dallas. Also, at the time, we acquired two essential patents for the stabilization of Aloe Vera. The patented process allows for packaging of Aloe Vera cosmetics and health products without loss of efficacy.

Since then we have added manufacturing and processing facilities which have allowed us to quadruple the amount of processing to meet the needs of our ever expanding world markets.

The Mission stabilization facility was completely renovated and tripled in size. Today it stands as a gleaming tribute to the excellence that Forever Living Products demands. In order to be close to the harvest of the precious, health-giving leaves, Aloe Vera of America located the processing and stabilizing facility in Mission.

When the Aloe Vera leaves are moved from the Plantations to the processing and stabilizing facility, they are placed on specially designed and patented conveyor belts. During their trip through the facility, the leaves are washed, the tips and bottoms are removed, and finally they are filleted.. "Fillet of Aloe" involves removal of the leaf's exterior rind and the extraction of the clear gel found in the center. In the Mission facility, there are filleting machines capable of separating 6,000 gallons of raw Aloe Vera gel in a single day.

The clear gel is collected in stainless steel vats and then piped through hundreds of feet of stainless steel to the opposite end of the facility where it is placed in large mixing tanks, also made of stainless steel. These tanks hold as much as 6,000 gallons of gel. The all-important, patented stabilization process prevents the loss of nutrients and other beneficial elements found in Aloe Vera. this process has been proven so unique that at present, Forever Living Products owns three United States patents on Aloe Vera stabilization processes and has several additional patents pending approval.

After the stabilization process is completed, the gel is shipped to our manufacturing facility in Dallas, Texas.

The stop at the processing plant makes the difference. Without it, Aloe Vera, a plant so rich and potent in nutrients that it can be used effectively both internally and externally, would go to waste. With it, the benefits are locked in, stabilized for a variety of health purposes, and kept true to its name-Aloe Vera, "True Aloe"

The Dallas manufacturing facility also underwent major renovations since being purchased by Forever Living Products in 1981. Plans were immediately put into effect to expand the operations. Planning included a new plant and warehouse facility along with recruitment of qualified personnel. The new Facility had to have the production capability for immediate and future needs and to allow operations on multiple shifts as expansion would demand.

When the current facility was open in Dallas, in May of 1982, its total space was over 100,000 square feet, which represents an investment of millions of dollars by forever Living Products. It is simply one of the finest production facilities of any kind and is unexcelled in comparison with any other cosmetic laboratory in the world.

The manufacturing facility has three cosmetic bottling lines with a capacity of 65,000 bottles per shift. The juice bottling line has a shift capacity of 40,000 bottles.

The facility's staff of qualified microbiologists, as well as support personnel, go to work, running a series of strict laboratory test on the products. Only when each product line clears quality control is it approved for storage and eventually shipping. Aloe Vera of America's quality assurance registered by the Food and Drug Administration as a cosmetic manufacturer, but also registered as a pharmaceutical manufacturer. This registration requires rigid quality control inspections.

Nestled among the evergreens on the edge of the Forever Aloe Plantations is our Aloe Vera Information center opened in February, 1983.

The Center stands as a reminder to everyone of Forever Living Products' commitment to telling the World how important Aloe Vera is in their lives. Everyone visiting the Information Center has the opportunity to taste the exotic flavor of Aloe Vera Juice, Forever Bee Pollen, Forever Honey or rub on a little Aloe Lotion to feel its soothing and moisturizing qualities.

Return to previous page

FOREVER LIVING PRODUCTS

1	BATH GELEE	Delicada formula biodegradable : Elimina células cutáneas muertas, estimula, suaviza, refresca, limpia profundamente y perfuma toda la piel del cuerpo.
15	GEL	Nutriente, coagulante, regenerador celular, acidez, gastritis, ulceras, vesícula, inflamaciones, colon, alergias, estreñimiento, mas 64 y 36, artritis, reuma y bursitis
19	FOREVER LITE	Programa nutricional niños y adultos, embarazadas, debilidad operados, falta de energía, adelgazar, subir ó mantener peso; suple carencias estructurales. Aporta la totalidad de las vitaminas, carbohidratos, ácidos grasos, proteínas, aminoácidos, minerales, elementos traza y fibras. Suple las necesidades del organismo para funcionar equilibradamente. El programa nutricional mas completo del mercado mundial ; sobrepasa holgadamente el 100% RDA.
22	ALOE LIPS	Piel, labios partidos, excoriaciones, ulceras, quemaduras, resequedad, picada de insectos, irritaciones, cortaduras, espinillas, atenúa poros y arrugas, hemorroides.
25	BEE HONEY	Alimento natural enriquecido con polen y jalea real, sin contaminación, sin filtrar, cualidades intactas; completa nutrición, energía, memoria, vista, pelo y piel.
26	BEE POLLEN	Todos los minerales, mejor alimento natural, neurosis, ansiedad, depresión, estrés, insomnio, falta de ánimo, apatía sexual, trastornos digestivos, regula metabolismo.
27	BEE PROPOLIS	Antibiótico natural, potencia sistema inmunológico, controla flora microbiana patógena, combate infecciones, acné , gripe, garganta, tos, gastritis, diarrea, resfrío.
28	TOOTHGEL	Dentrifico de acción prolongada. Blanquea los dientes, elimina placa bacteriana, halitosis, sangramiento e infecciones, desinflama y cicatriza encías, refresca.
34	ALOE BERRY	Gel de Aloe más manzana más arándano, estimulante hepático y renal, suave diurético para edemas, inflamaciones, infecciones. Retención de líquidos, aumenta defensas.
36	ROYAL JELLY	Poderoso energético, neurotransmisor, afrodisiaco, regenerador celular, regula metabolismo, mayor longevidad, mejora reuma, artritis, vista, pelo, piel, memoria, rejuvenece.
37	NATURE MIN	Reconstituyente general, facilita y equilibra la función metabólica, hormonal, celular, y de intercambio ionico; carencias generales y especificas, estabiliza actividad.
38	LIQUID SOAP	Para manos y cara, delicado perfume, biodegradable, antivirus, hongos, bacterias, Ph balanceado, antialergico limpia, suaviza, hidrata, nutre y repara.

39	ARTIC SEA	Aceites poliinstaurados, de pescados de aguas frías, y aceita de oliva, reduce nivel de colesterol, triglicérido, riesgos de coágulos, mejora la circulación.
40	R3 FACTOR	Crema antiarrugas de aloe y glicólico, eficaz defensa de ultima generación, notable disminución de líneas y arrugas y signos de envejecimiento de la piel.
41	FLEUR DE JIOUVENCE	Programa restaurador de belleza, nutre, estimula, lubrica, protege, y elimina líneas, surcos, poros, alivia, humecta, suaviza, renueva, y rejuvenece la piel.
42	REHIDRATING TONER	Remueve desperdicios metabólicos, ambientales, estimula, tonifica, suaviza, rehidrata, lubrica, refina, y tensa la piel dejándola flexible y vibrantemente joven
43	EXPOLIATING CLEANSER	Elimina totalmente el maquillaje, impurezas, excesos de grasitud, células cutaneas muertas y residuos inactivos para usar en alérgicos, zona de párpados y labios.
44	FUNDATION LOTION	Crema de día sirve de base de maquillaje, suaviza, humedece y protege contra elementos ambientales agresivos como el sol, smog, viento, polvo y contaminación.
45	FACIAL MASK POWDER	Para todo tipo de cutis, es el polvo de la mezcla para mascara facial de Fleur de Jouvence : Estimulante tonificante, tensor de fibras conjuntivas bajo la piel.
46	RECOVERING CREME	Aloe mas elastina mas colágeno extra y mas Ay E,, nutre, repara, induce producción de células nuevas, tersura, previene y contrasta el envejecimiento.
47	GIN CHIA	Sinergismo de milenarios reconstituyentes naturales, estimulantes, curativos energéticos, mayor longevidad, vigor, resistencia, buen animo, rejuvenece.
48	ABSORVENT C	Concentrados cítricos mas avena para máxima absorción, mayor estimulación, sistema inmunologico, resistencia capilar, integridad de los tejidos, evita efectos de contaminación.
49	ALE HERBAL TEA	Te de flores de aloe vera combinadas con esquisitas hierbas escogidas, sin cafeína, tranquilizantes, dietético, relajador, digestivo y calmante ideal para dietas y la sed.
50	ALOE MPD	Biodegradable multiproposito, mayor ropa fina, tejidos delicados, lavadora, disuelve grasas, manchas rebeldes, alfombras, tapices, cortinas, pisos, cerámica, artefactos, etc.
51	ALOE PROPOLIS CREME	Aloe mas propoleo, para manchas queliodes, cicatrices, psoriasis, rosácea, acné adulto y juvenil, hongos, irritaciones, prurito alérgico, infecciones, furunculosis.
52	ALOE ACTIVADOR	Liquido (100% puro) de la mascara facial Fleur de Jouvence, poderoso astringente, humectante, acondiciona y afirma la piel, mas 61 detiene la caída del pelo.

53	ALOE SUNTAN LOTION	Con finos emolientes y filtro solar FPS15, brocea lubrica, humecta y protege del sol en exposición excesiva, refresca, alivia dolor, hidrata, y regenera piel dañada.
54	A BETA CARE	Fuente natural de vitamina A (Beta Caroteno) y vitamina E mas selenio, antioxidantes esenciales por anular radicales libres, oxidantes que provocan mas función y envejecimiento.
55	TONING SET	El mas eficaz, programa antiselulitico conocido, reduce, afirma, tonifica, activa y suaviza con resultados sorprendentes y medibles desde su primera aplicación.
56	BODY TONER	Estimula y calienta profundamente la piel y tejido conjuntivo sostén, moviliza toxinas reduciendo depósitos de células grasas, reafirma y tonifica todo el cuerpo.
57	CONDITIONING CREME	Estimula, acondiciona, refresca, activa, y suaviza la piel. Sus agentes activos comprimen las células grasas y reducen notablemente el efecto colchón o celulitis
58	ALOE JOJOVA SHAMPOO	Gran penetración, lubrica y nutre el cuero cabelludo, folículos pilosos y pelo, elimina caspa, puntas partidas, caída de pelo, da cuerpo, brillo y sedocidad.
59	COND. RINSE	Elimina cargas electrostáticas de pelo, desenreda, fortalece, abrillanta, suaviza, protege del secado por calor; su uso en seco evita sequedad y puntas florecidas.
60	ALOE SCRUB	Con microesferas de aceite jojoba, elimina células cutáneas muertas, oxigena, nutre, lubrica profundamente, humedece y activa la piel, atenúa poros y líneas
61	ALOE JELLY	Nutriente y regenerador celular, astringente, humectante, rehidratante, coagulante, antinflamatorio, analgésico, antialergias, virus, hongos, bacterias.
62	ALOE LOTION	Aloe, elastina hidrolizada, colágeno natural, jojoba, mas vitamina E, magistral combinacion antialergica reafirmante, desintoxicante, antioxidante, rejuvenece y repara.
63	MOISTURIZING LOTION	Aloe mas elastina mas colágeno, ingredientes que la transforma en la mas fina crema humectante, elasticidad, flexibilidad, suavidad, tersura.
64	ALOE HEAT LOTION	Profunda penetración, desinflama, alivia asma, dolores musculares, articulares y óseos, mas 15 y 36, reuma artritis, bursitis. Usar antes y después de deporte.
65	GARLIC TIME	Aceite ajo sin olor equi. A 1000 mg. , expectorante, reduce presión arterial, evita putrefacción, controla flora patógena intestinal, digestión antibiótico natural.
68	FIELD OF GREEN	Unico producto que aporta a diario los beneficios de comer vegetales verdes mas el nuevo quemador de grasas que no provoca perdida de masa muscular

Los Conquistadores #2464, Providencia, Santiago.
Fono : 334-4408 , Fax : 334-4405

Lista de Precios Publico

Cod	Producto	Puntos	Precio(con iva)
1	Touch	2	229.246
14	Bath Gelee	0,076	9.165
15	Gel	0,096	11.633
19	Forever Lit vainilla	0,117	14.100
20	Forever Lit fresa	0,117	14.100
21	Forever Lit chocolate	0,117	14.100
22	Aloe Lips	0,016	1.939
25	Bee Honey	0,082	9.870
26	Bee Pollen	0,064	7.755
27	Bee Propolis	0,131	15.862
28	Toth Gel	0,033	4.076
34	Aloe berry nectar	0,096	11.633
36	Royal jelly	0,134	16.215
37	Nature min	0,090	10.928
38	Liquid soap	0,064	7.755
39	Artic - sea	0,131	15.863
40	Factor - R-3	0,129	15.540
41	Aloe fleur de jouvence	0,392	47.236
42	Rehydrating toner	0,064	7.755
43	Exfoliating cleanser	0,064	7.755
44	Firm foundation ltn	0,088	10.576
45	Facial mask powder	0,082	9.870
46	Recover Night creme	0,123	14.805
47	Gin - chia	0,082	9.870
48	Absorbent - c	0,067	8.108
49	Aloe herbal tea	0,067	8.108
50	Mpd	0,111	13.396
51	Aloe propolis creme	0,082	9.870
52	Aloe activator	0,058	7.050
53	Aloe suntan lotion	0,058	7.050
54	A - Beta - Care	0,117	14.100
55	Toning kit	0,357	43.004
56	Body toner	0,117	14.100
57	Conditioner creme	0,140	16.919
58	Shampoo Aloe Jojoba	0,067	8.108
59	Conditioner rinse	0,058	7.051
60	Aloe scrub	0,067	8.108
61	Aloe Gelly	0,058	7.050
62	Aloe Lotion	0,058	7.050
63	Moisturizing Lotion	0,058	7.050
64	Aloe heat Lotion	0,058	7.050
65	Garlic - tyme	0,082	9.870
67	Aloe ever shield	0,035	4.229
68	Field of greens	0,055	6.625
69	Aloe first	0,088	10.574

Nota : Los precios finales incluyen IVA e impuestos

Cta Cte. Banco de Chile N° 162-00449-04

ANEXO N° 5

Documentación recibida del IASC

(International Aloe Science Council)

International Aloe Science Council, Inc.
1300 E. Rochelle Blvd., # A1047, Irving, TX 75062
Tel: 972-258-8772 - Fax: 972-258-8777
e-mail: iasc@airmail.net - www.iasc.org

****Facsimile Transmission****

Date: February 11, 1999

To:

Country: Chile

Attn: Hector Espinoza

From: Gene Hale

Fax Number: 562-369-1930

Number of Pages (Including this one): 8

Hector, following this fax, please find some information on the Aloe Science Council and aloe vera.

As we discussed on the phone, I feel it would be helpful to know a little more about aloe, where it grows, various types of raw material prepared from the harvested leaves and the IASC certification process.

Because of the nature of the beast, it would be much more successful for you to grow, harvest and process the aloe for distribution to all areas wishing to buy from you. Recently, countries like China, Spain, Hawaii, Thailand and Australia are also growing aloe.

Hopefully, you will give them enough information to cause them to send you to Dallas to visit with me and possibly spend 4-6 hours with an independent consultant. He can get information from you and aim you in a more prudent direction.

Please feel free to call me if I can help in any way possible.

Best regards,

Gene Hale / Rey

Managing Director

GH/rmy

INTERNATIONAL ALOE SCIENCE COUNCIL, INC.

The International Aloe Science Council is a non profit association based in Irving, Texas, USA, organized in January of 1981 through a Board of Directors elected from among its membership. Our objective is to address the needs of a growing Aloe vera Industry. This represents all segments of the industry - growers, processors, manufacturers, wholesale, and retailing companies around the world.

Active membership in IASC is open to companies that deal with Aloe products either as growers, processors, manufacturers, wholesale and retailing companies who abide by the IASC Code of Ethics. Associate membership is open to those companies that supply goods and services to members.

Goals were established to accomplish the following:

1. The IASC was organized to establish the highest quality standards for Aloe vera as well as ethical standards for the methods used to promote and market Aloe products.

2. The IASC is designed to interface with the appropriate regulatory agencies in order to protect and defend our industry and to promote harmony with these governmental bodies.

3. The IASC is charged with the responsibility of conducting research on Aloe vera in order to gain insight into the properties of Aloe so that Aloe quality and purity can be established.

4. The IASC has designated certain committees, such as Science and Technical, Public Relations, Finance, Ethics, Membership and Certification to carry out these business activities.

5. The IASC has established a meaningful certification program to confirm the quality and purity of Aloe. Those who certify their products through the Council can proudly display the certification seal on products and literature.

6. The IASC works to update the analytical methods of standardization and identification of Aloe.

We are pleased that the Council has been successful in these pursuits. We currently have a strong international membership base; our research programs are in progress and are effective; and our certification program procedures are functioning as intended. Our annual Scientific Seminars have developed into meaningful programs with professional speakers that are outstanding.

We invite you to join with us in perpetuating the high ideals set forth by our founders. As individuals, we have limited power; as an association working together, we can accomplish all of the precepts that have been set forth for the betterment of the Aloe industry.

Sincerely Yours,
The International Science Council Board of Directors

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HE JOURNAL OF THE INTERNATIONAL ALOE SCIENCE COUNCIL, INC.

/orldwide Aloe Acreage Estimation

On the basis of as yet incomplete information, it is estimated that there are no more an 13,460 acres planted in Aloe vera throughout the world. As the use of Aloe in health re and beauty products grows, it is thought that such acreage should be substantially creased, particularly in the light of the possibility of another freeze, such as that which curred in 1985.

The acreage breaks down as follows:

Location:	Low:	High:
United States		
Texas	1,500	2,500
California	30	100
Florida	10	40
Oklahoma	3	20
Mexico	3,000	3,200
Central America		
Costa Rica	—	600
El Salvador	—	200
Guatemala	—	200
West Indies		
Dominican Rep.	400	2,500
Puerto Rico	100	400
Dominica	90	100
Aruba	—	100
Haiti	—	50
South America		
Venezuela	400	1,500
Brazil	400	500
Spain	60	200
Australia	—	100
Israel	30	250
India	—	100
Thailand	—	600
China	50	100
Korea	—	100
TOTALS	6,073	13,450

As might be imagined, it is sometimes difficult to get exact figures from some areas of the world, and it is suspected that some of the numbers are little more than "guesstimates". Nevertheless, the numbers reported above are, we believe, more or less indicative of the actual acreage planted in Aloe vera throughout the world. The IASC actively seeks updated information for this list, and welcomes corrections and additions. We are grateful to Frank Duffy for the above information. ■

'Wonder Drug"

ontinued from page 7

nal clinical studies, it seems to have worked or those who have tried it.

There are a substantial number of other Aloe investigations currently underway. One, long-term (4 years) and well-financed study eaded by Dr. Byung Pal Yu, Professor of hysiology at the University of Texas Health Science Center, and Dr. Jerome T. Herlihy, Principal Investigator and Associate Professor of Physiology, also at U.T., has been launched to determine whether dietary Aloe (in drink form) can slow down the aging process in humans!

Other studies, recently completed, or in progress, suggest that Aloe: has antibacterial, antiviral and antifungal properties, and

continued on page 11

How Much Aloe?

continued from page 1

done which suggests that, in order for A to be therapeutically effective in a cosm formula, it must be present in a strengt 20% or more, and, in some cases, consi ably more.

Of course there are any number reputable manufacturers who properly r resent the Aloe content in their produ Often these companies are IASC certifi understand and respect their custom needs, and know what Aloe vera will d meet those needs.

There are, to be sure, manufactu who take advantage of any fad that co along. Case in point: One manufacture nail care products prominently displays fact that one of its products contains a w known gelatin because there is a pop supposition that the ingestion of gelatin strengthen nails. Of course it does no g whatever to rub it on the nails and, in f research has shown that even eating drinking gelatin won't strengthen nails.

This is not to say that, in years p "contains Aloe vera" has not been use much the same manner, and for the s ends. Fortunately consumers can now rel the International Aloe Science Cou Certification Seal in making product chase decisions. This seal certifies that particular product upon which it appears been independently analyzed and certi as containing the percentage of Aloe li and the quality of the gel.

It should be noted the FDA has r that in any product that has b reconstituted with either Aloe powder concentrate, water must be listed as the mary ingredient.

So, what should you do? Read ingredient list before you buy, then chec make sure that the aloe-based products purchase display the IASC Seal on the la If Aloe vera is contained in the produc amounts sufficient to be effective, it appear near the top of the list, and may e indicate the percentage of Aloe in formula.

As in buying any product, be a s consumer: read the label and check t sure the industry certification se displayed prominently. Those manufac ers displaying the seal do so beca they're proud of the products they o What better recommendation could ask for? ■

1. General information on the agricultural aspects of cultivation of the aloe plant, soil condition, etc.

Aloe grows and thrives well in semi tropical areas such as Mexico, Rio Grande Valley, Dominican Republic, Africa, and even in some areas of California and Florida.

It needs lots of sunlight, a fair amount of rain and ground with good drainage. Aloe does not normally need a lot of water, but if it is very dry most of the time, some type of irrigation is necessary.

Aloe vera plants cannot stand cold weather (below freezing). This type of weather will totally destroy the crop. Generally sandy-loam type of soil is best for growing the plants. The soil needs to be fertilized on a scheduled basis and crop rotation is good for maintaining the soil if every 3 or 4 years you plow up the aloe and plant a different crop that can be plowed under to restore the soil with nitrogen, etc.

Aloe plants (small or large) or pups which grow around the base of the mother plant are used to plant a field when starting up an aloe plantation. Basically, the plants are planted in rows that are 2 feet apart and the plants are spaced 4 ft. apart for ease of harvesting and removing from the field. The rows should be kept clean of grass and other growth to maximize the aloe growth.

Full grown plants will normally range in size from 2 1/2 to about 4 feet tall and will have around 12 to 15 leaves. These leaves are harvested by removing the outer leaves and letting the inside ones grow to maturity.

The leaves are wide 4 or 5 inches and weigh 1/2 to over 3 lbs. at full maturing. The leaves are cut by hand by field workers, below the gel line where the leaf has turned white.

Normally, only the outer leaves are used with 3 to 5 leaves (outer) being picked every 5 to 8 weeks.

2. The real challenge in aloe is in the processing of the leaves (extracting the inside gel). Once this gel is extracted it has to be stabilized very quickly, which involves heat and preservatives. If the gel is to be sold for food use, then only FDA-food approved preservatives can be used. If it is strictly to be used for cosmetics, then different preservatives can be used.

The storage and handling of aloe is very critical. From the washing of the leaves to filling the product into bottles, there are numerous places where bacteria can be introduced into the gel which will destroy it.

3. The market for aloe products vary and at the moment the market in the USA is saturated.

4. If you are serious about the aloe business, it would be wise to hire a consultant to help you get started off properly. You can contact the IASC for some suggested names.

5. The International Aloe Science Council, Inc., the trade association for aloe, has an annual 2 day meeting each year. You may want to consider joining the Council. Membership is as follows:

$300 - $500: **Full Membership** - Renewed annually. Members are raw material suppliers, finished good manufacturers, marketers and other businesses in the Aloe Industry.

$150: **Associate Member** - Renewed annually. Associate Members are companies indirectly associated with the Aloe Industry, such as printers, screen printers, package suppliers, insurance companies and many others.

$50: **Subscriber** - Renewed annually. Subscribers are individuals (not companies) such as direct sales people and other interested in the Aloe Industry.

6. I would dwell on getting a consultant to line out a plan for you to follow and then join the Council and plan on attending the annual seminar.

If you need further assistance, please advise.

INTERNATIONAL ALOE
SCIENCE COUNCIL, INC.

SUGGESTED CONSULTANTS

John Butters
Rt. 6, Box 745
Harlingen, TX 78550

Tel: 956-423-6093

James Barber
2103 Ashwood Ln.
Carrollton, TX 75006

Tel: 972-242-7350

300 E. Rochelle Blvd.
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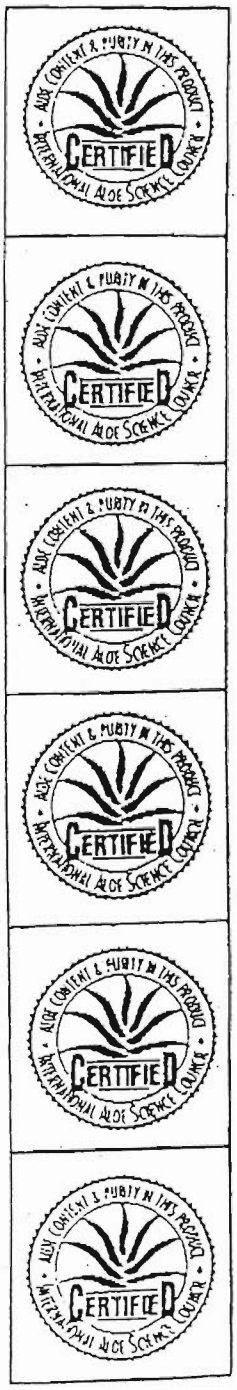
The International Aloe Science Council, Inc.

OFFICIAL CERTIFICATION PROGRAM

FOR ALOE VERA

Compiled by the Science and Technical Committee of the IASC to clarify certification procedures.



100% Pure Aloe Vera.

Guaranteed!

Three Keys To Success

By establishing a formal certification program, the IASC has taken a huge step in laying ground rules for quality. With this foundation in place, three factors will determine the future for pure, unadulterated Aloe Vera.

1 More press coverage and scientific studies that distinguish between companies producing pure Aloe Vera and companies which compromise quality.

2 Better FDA oversight of Aloe production, labeling and product standards.

3 Most importantly, increased consumer demand for pure Aloe.

The International Aloe Science Council, Inc.

What is IASC Certification?

This certification is a program initiated by the International Aloe Science Council that is similar to the "Good Housekeeping" Seal of Approval for Aloe Vera Products. The certification includes auditing of Aloe manufacturing facilities and verification of Aloe processing. This guarantees that the product being certified meets the standards set by the industry for pure Aloe Vera.

Why do we need IASC Certified Aloe Vera?

While there are many products on the market claiming to contain Aloe Vera, only those certified by the IASC have passed a third-party verification of product purity. This is important to ensure that the product being used is pure and provides 100% of the natural benefits consumers expect from Aloe Vera.

How can my products become IASC Certified?

All Aloe Vera suppliers are invited to submit their products for certification by the IASC. If your supplier is certified and your product contains the specified minimum amount of Aloe Vera, then you are eligible to apply for the IASC Seal of Approval.

Companies wanting to earn and display the IASC Seal of Approval must have their products tested by independent experts who use approved procedures developed by the Council's Science and Technical Committee.

Two Programs Available

Two types of certification programs are offered. The Raw Material program is for anyone processing Aloe for use in finished products. The Finished Goods program provides certification when the raw Aloe and the finished product both pass certification. (For a finished product to be considered for certification, at least 15% of its volume must be pure Aloe Vera.)

The benchmark scientific tests for pure Aloe Vera evaluate four naturally occurring components: magnesium, calcium, total solids, and the HPLC Ratio - a chromatographic "signature" for Aloe Vera. If the values are not consistent with accepted standards, the product does not pass.

The program also involves detailed site inspections which concentrate on harvesting methods, the condition of production facilities and labs, temperatures in the cold storage sections and processing centers, quality of production equipment and samples.

This is important because Aloe Vera, like any fruit or vegetable, is subject to spoilage. Consequently, harvested leaves must be processed or put in cold storage within four hours, or the components which give Aloe its many beneficial properties will begin to deteriorate.

Raw material records are also given special attention by inspectors, because they chart the origin of materials, storage conditions, filleting equipment in use, processing technology, filtration, additives and other relevant information.

Bottom line: Certification is neither easy nor cost-free. But it is very valuable to companies receiving the coveted Seal of Approval because it signifies Aloe products which have met the high standards more buyers and consumers are demanding.

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THE JOURNAL OF THE INTERNATIONAL ALOE SCIENCE COUNCIL, INC.

Volume I • Issue I Fall 1994

FDA Approves Aloe-Derived Acemannan for AIDS Treatment Trial

In an action that has sent shock waves through the Aloe industry and the Gay community, the FDA has given Carrington Laboratories, of Irving, Texas, permission to begin human trials on HIV and AIDS patients, using their trademarked compound, acemannan, a complex carbohydrate derived from Aloe vera.

The Phase 1 trials follow on the heels of a Canadian government-sponsored Phase III study, which used oral acemannan in their human trials, and a separate "safety study", using injectable acemannan, performed at the University of Texas Health Science Center, in Houston.

According to information gained in previous studies, acemannan has been demonstrated - in both animal and human trials - to promote healing.

> *Acemannan interacts with the immune system, thus acting as an immunomodulator.*

In addition, injectable acemannan has been conditionally approved by the U.S.

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How Much Aloe is Really in the Products You Buy?

Sometimes it's hard to tell.

As a rule of thumb, you can get some idea of the amount of Aloe in a given product by reading the ingredient list, which usually appears on the back of the package. If Aloe is listed prominently on the front of the label but without an exact amount shown on the ingredient list, or if Aloe appears at, or near the bottom of the list, chances are that the product contains little more than a trace amount of Aloe. So, if the product you purchase has a big "contains Aloe vera" on the front of the label, but shows Aloe at the bottom of the list, on the back, you might be justified in thinking that the manufacturer is being less than totally straightforward with you.

In today's market, particularly in the case of cosmetic products, manufacturers are aware that their potential customers regard Aloe vera highly for its ability to moisturize skin, so they add it, sometimes putting in enough to justify their claim that the product does indeed contain Aloe. Is that enough to do the job for which Aloe is reputed? In general, the answer is no.

Some preliminary research has been

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PREVENTION Magazine Survey Finds Aloe #1 Herbal Home Remedy

In a recent national survey conducted b PREVENTION magazine among 5,000 of it readers, 97% of the respondents found Alo vera to be the "most used" and "most popu lar" herbal remedy, getting top marks for it ability to soothe and heal minor burns.

Readers were asked to rate their pe sonal experiences with home remedies, u ing such natural products as cranberry juice garlic, comfrey, chamomile and Aloe. Alo won conclusively. 98% of those respondin reported regular Aloe use, with 87% ratin results "good" and 12% "fair".

The results were not surprising to Varr Tyler, Ph.D., a professor of pharmacology Purdue University, and an advisor to PRE VENTION. According to Dr. Tyler, "Evidenc seems to indicate that something in Aloe ve

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THE JOURNAL OF THE INTERNATIONAL ALOE SCIENCE COUNCIL, INC.

A Note From Don Smothers

Chairman of the International Aloe Science Council

The Aloe vera industry appears to be going through another of its many transition periods. Those of us who have been active participants in this industry for many years have experienced several of these transitions. Through it all, we have come to understand that we deal with a remarkable product that has remarkable properties that can work for the benefit of mankind.

There are many factors and forces that drive our industry today. While we have fewer processors and producers than in previous years, the industry has grown considerably in terms of sales dollar volume per year. We have emerging markets showing great promise, and many well-established marketers in foreign countries. All this bodes well for the future of Aloe vera, if we continue to work toward the further introduction of our products both here and abroad.

Our industry has gone through many profitable changes in recent years and it looks as though this trend will continue into the future.

Those who attend the IASC's Annual Aloe Scientific Seminar, usually held in July, will be able to gain some important insights into the future of this unusual and challenging industry. The program is always loaded with interesting and informative speakers, who offer new and different approaches from the perspectives of both marketing and science.

One of the most important aspects of the seminar, will be the opportunity to speak with people in the industry who make things happen, to establish new relationships, and to continue relationships developed over the years.

Don Smothers

Don Smothers
Chairman, IASC.

A Message from Our President

International Aloe Science Council, Inc.
910 Houston Street, Suite 110,
Fort Worth, TX 76102

Dear Aloe Colleagues:

The International Aloe Science Council, Inc. is the only association representing all segments of the Aloe vera industry - growers, processors, manufacturers, wholesale and retailing companies throughout the world.

The IASC was formed in January of 1981 to address the needs of a growing Aloe vera industry. Goals were established to accomplish the following:

- Create a method to standardize and identify Aloe.
- Provide information on Aloe products used in the consumer manufacturing process.
- Create a reliable source of information about the growing, processing and stabilization of Aloe.
- Encourage research that would provide insight into the components, to separate and identify the active fractions of Aloe.

It is with these goals in mind that I present to you the premier issue of the JOURNAL of the IASC. For the first time you have an industry publication that truly represents your industry. The JOURNAL will keep you abreast of the changes rapidly taking place in the world of Aloe. I hope the information presented in this and futures issues will be of benefit to you.

Jess F. Clarke, Jr.

Jess F. Clarke, Jr.
President,
International Aloe Science Council

Prevention Survey

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inhibits the action of brandykinine, a peptide that produces pain in injuries like burns. It also inhibits the body's production of thromboxanes, chemicals detrimental to wound healing."

Many of those responding to the survey were quite specific in their reports. A Staten Islander said that he used Aloe directly fr the plant on a leg that had been burned a hot pipe. "It was the only way to keep pain away," he said, "It healed beautifu and left no scar."

Many readers reported that they kept Aloe plant in the kitchen, to be used minor burns, or cuts and scrapes. Others s that they took their plants or a few leaves w

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THE JOURNAL OF THE INTERNATIONAL ALOE SCIENCE COUNCIL, INC.

IASC Appoints Executive Coordinator

Robert Eugene (Gene) Hale has been appointed Executive Coordinator for the International Aloe Science Council, Inc., reporting to the IASC President, Jess F. Clarke, Jr. and the Board of Directors.

His responsibilities will include coordination of membership recruiting, major event planning, publication of the IASC Newsletter on a frequent basis, establishing liaison with Texas Health and the FDA to present the IASC position and developing additional IASC funding sources.

On his acceptance, Mr. Hale stated: "I look forward to spending the years ahead serving the industry that has served me so well. I am dedicated to the cause of helping to build a strong, much needed industry association that will continue to promote the sales and increased usage of Aloe vera around the world."

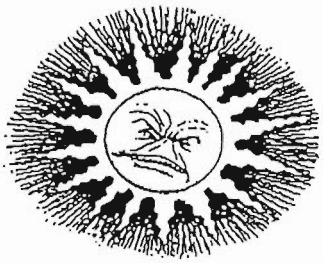
Mr. Hale, born in Carter, Oklahoma, and now living in Irving, Texas, is married to Jody Hale, and has three children and six grandchildren. He is a former Kiwanis Club President, and a member of the Society of Cosmetic Chemists.

Over the past 25 years, Gene has been involved with several aspects of Aloe vera, including sales, sales management and as head of his own Aloe vera business. Since 1989 he has worked with Aloe from raw product to finished products.

In his new role as IASC Executive Coordinator, Gene believes that he has found the ideal position, in that he continues to work with Aloe vera and the people and companies he has come to know well through the years, and with the industry organization that will, he believes, help introduce the benefits of Aloe vera to millions of people throughout the world.

For all information regarding IASC activities, you may contact Gene Hale at: IASC, Suite 110, 910 Houston St., Ft. Worth, Texas, or call him at (817) 338-1315. Fax #: (817) 338-1319 or, in the Dallas Metro Area, (817) 429-4272. ■

Sunburn Can Impair Your Immune System



But A New Study Suggests Aloe Can Undo The Damage.

Excerpt from a study by Dr. Faith Strickland
University of Texas, M.D. Anderson Cancer Center

In years past it was popularly supposed that a deep suntan made us look better than the pale look we wore during the winter months...as though a mahogany tan meant that we could afford to go south for the winter, or to some sun-drenched island, instead of having to work for a living like our contemporaries. It set us apart from the drudges who worked all winter, unable to afford the sunny climates.

Well, we may have looked better (although some would dispute the fact), but it turns out that what we were really doing was bringing about potentially serious damage to our skin and immune systems.

Recent studies have shown that a bad sunburn, even one that we might have suffered many years ago, can turn into cancer in later life. Not all of these cancers turn out to be melanoma, the really serious form of skin cancer, and may be surgically removed. But melanoma can metastasize, or spread through the body, and that becomes a serious problem, indeed.

Now we have information that sunburn can, and often does, wreak havoc with the body's immune system, leaving us vulnerable to other diseases. The immune system helps keep us well by providing the body's primary defense against those germs and viruses that it recognizes as "foreign bodies". When it is functioning well, we may expect to remain reasonably healthy. When it is compromised, illness results, in most cases, since our bodies are constantly being bombarded by things that can make us ill.

Exposure to Ultra Violet-B light, from the sun, has been shown to impair the cellular immune response of the skin, which may lead to tumor formation. But the work of Dr. Faith Strickland, of the M.D. Anderson Cancer Center at the University of Texas, suggests the possibility that Aloe vera can not only stop the damage done to the immune system, but can actually restore the system to full working order.

Obviously this doesn't mean that we can go out and get a worry-free sunburn, then apply some Aloe to our skin and forget about it. Dr. Strickland's work, while conclusive in laboratory tests, has not yet been clinically tested to her satisfaction, or that of the medical community.

Nevertheless, if you do happen to get a bit more sun than intended, it makes good sense to get yourself some Aloe vera gel and gently massage it into the affected area. It won't hurt, and it may well make you feel a good deal better. Obviously, if you get a bad sunburn, it becomes a medical problem that should be treated by a physician without delay. Your doctor can prescribe something to ease the discomfort and help return your angry epidermis to normal in a few days.

The research done by Dr. Strickland and hundreds of other researchers and scientists is mounting up, resulting in a more complete understanding of the therapeutic value of Aloe vera gel and the many ways in which Aloe can contribute to the health and well-being of people throughout the world. ■

Prevention Survey

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them when they went on vacation trips in case something happened. And a Home Economics teacher in Bangor, Maine, keeps several plants in her classroom. "Burns are common in my class," she wrote, "And fresh Aloe is the best answer I've found."

In a PREVENTION issue that preced the questionnaire, Dr. Tyler wrote an artic entitled 'The Top 7 Herbs For Health' which he listed Aloe as one of the herbs m used. He wrote, "In a remarkable new stu Aloe aided 18 people who had fac dermabrasion (sanding away scars). I searchers applied the usual wound dressi

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THE JOURNAL OF THE INTERNATIONAL ALOE SCIENCE COUNCIL, INC.

Aloe Use Increases Worldwide

Even considering recent dramatic increases in Aloe vera sales in the United States and in several of the Pacific Rim countries, much of the international market is still seen as a "sleeping giant" by Aloe marketers.

But most growers and manufacturers believe it is about to be awakened.

While industry leaders are confident that continued education and the dissemination of scientific information on the proven benefits of Aloe and aloe-based products will open international borders, there are still cultural differences and misconceptions about the uses and properties of Aloe that must be addressed and overcome.

For example, in France — so far a disappointing area for Aloe beverages — the word "Aloe" is often confused with "Aloin", the French name for a popular purgative laxative. Further confusion results because raw Aloe does contain aloin, a substance that has purgative properties. In fact, however, the aloin is processed out of Aloe before it is used in cosmetic, beverage, and health care products in the United States.

> Many industry experts believe that the key to European sales expansion is the U.S.

Korea is currently the largest international marketplace for Aloe, with Japan running a close second. Both of these countries have a long and respected tradition of herbal medicine, a determining factor in their acceptance of Aloe.

Koreans consider liquid Aloe to have soothing properties, and drink beverages with Aloe concentrations as high as 99%. This trend is spreading throughout much of the Pacific Rim area, particularly in Singapore and Malaysia.

Sales are up in Australia, as well. Australians accept the fact that Aloe is an effective remedy for sunburn, and this translates into an increasing market for skin and hair products. Since there is a substantial and growing Japanese population in Australia, the market for Aloe beverages and other products should increase.

Many industry experts believe that the key to European sales expansion is the U.S., since it is, in many respects, a trend-setter for Europe. What becomes popular in the U.S. is very quickly acclaimed in Europe - an excellent indicator for Aloe sales. The growing popularity of "natural" ingredients in American cosmetics also benefits Aloe. According to Allan Mottus, a cosmetics industry consultant, "natural" cosmetics now account for 4% of the $16 billion U.S. cosmetics market, and this product segment is growing at a yearly rate of from 12% to 15% - about three times as fast as the industry as a whole. One company benefiting greatly from this "natural" trend is The Body Shop, a London-based company whose sales have skyrocketed in recent years.

Aloe vera gets high marks in the U.S. as an all-around natural treatment. Scientific research has been a major factor in Aloe's growth as a skin moisturizer and as a desirable additive in sunscreens and tanning lotions.

As a beverage, Aloe drinks have long been a staple in American health food stores and with direct marketing companies. Now it's going mass market. With thickeners and a variety of flavors (both natural and otherwise) added, it is now sold in drug stores, health food outlets, grocery markets and by discount food chains. This growing popularity in the U.S. is expected to spur sales in Europe.

Although Aloe beverages are seeing limited success in Germany and the United Kingdom, the people of both countries have shown a remarkable acceptance of Aloe in a wide range of natural cosmetics such as skin moisturizers and cleansers, hair care products, depilatories and deodorants.

The use of Aloe in cosmetic products is growing at a somewhat more modest rate in the Scandinavian countries, Switzerland, Italy and Spain, but there is a surprising new market for Aloe health care products in several African nations, according to Jess Clarke, Jr., who markets his Miracle of Aloe® product line there.

The potential for Aloe vera in international markets would appear virtually unlimited. Even the Eastern Bloc countries should offer new potential, when their economies stabilize. In short, the international market for Aloe and Aloe-based products is alive and well, and the future for this sometimes maligned plant has never looked better than it does today. ■

Medical Applications of Aloe Vera from Antiquity to Today

Aloe gel has been used to help heal cu scrapes, burns and bruises for perhaps 3,0 years. In very early times, its use was high recommended by the physicians of the day a remedy for all manner of things, includi a litany of common or odd complaints th were not otherwise understood or curab with the materia medica and therapeuti then available.

Among the staunch proponents of Al was the Greek physician, Dioscorides, wh recommended Aloe for practically everythi for which there was no other cure. The Bib speaks of Aloe in a number of passage calling it the "bitter herb". There is son doubt that the references were to Aloe ve And legend has it that some 2,300 years ag Aristotle urged Alexander the Great to atta and conquer the island of Socotra in order secure a reliable supply of Aloe to treat t wounds of his injured soldiers.

No one is sure when Aloe was first us medicinally, but it is known that Chine doctors were prescribing it at least 3,0 years ago and that King Solomon was partic larly taken with it. As the story is told, ma

THE HISTORY OF ALOE

- 1552 B.C.— Egyptain medical man use Aloe.
- 325 B.C.— Aristotle advises Alexander the Great to conquer
- 100 B.C.— Socotra for its Aloe.
- 1494 A.D.— Discorides, the Greek doctor, uses Aloe.
- 1859 A.D.— Columbus "discovers" Aloe in the New World.
- 1945 A.D.— Aloe cultivated in Barbados.
- 1970 A.D.— Aloe found effective in treating burn victims.
- 1974 A.D.— Health Food stores distribute Aloe.
- 1981 A.D.— Major package goods manufacturers begin using Aloe in product formulations.
- 1990 A.D.— National Aloe Science Council founded to promote scientific investigation and public education.
- 1991 A.D.— Prevention Magazine Survey reveals 87% of publi has positive image of Aloe.
- 1991 A.D.— IASC name changes to International Aloe Science Council

of the beauties of these very early days ow their fine skin and beautiful hair to the use Aloe. Certainly possible, if not provable this late date.

The Greek word for Aloe was probat Aloeh, which translates as a shining bitt substance. *Aloe vera*, Latin for True Aloe, known in Arabic and Egyptian as sabr, mea ing bitter medicine. These words and th definitions point out the diverse locations which folkloric medicine was practiced wi

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THE JOURNAL OF THE INTERNATIONAL ALOE SCIENCE COUNCIL, INC.

Aloe Leaf Handling and Constituent Variability

by Ivan E. Danhof, Ph.D., M.D.
Excerpted from his book: Remarkable Aloe: Aloe Through The Ages.

What it the best Aloe?

The question, "What is the best Aloe" is often asked. I answer the query with another question, "What do you want the Aloe product to do." The BEST Aloe is one which contains the constituents that have the actions and benefits the final product should contain and does not contain materials with negative effects.

An Aloe leaf contains more than 200 different constituents—each of them in relatively small quantities. The juice contains, on average, more than 99% water, thus all the

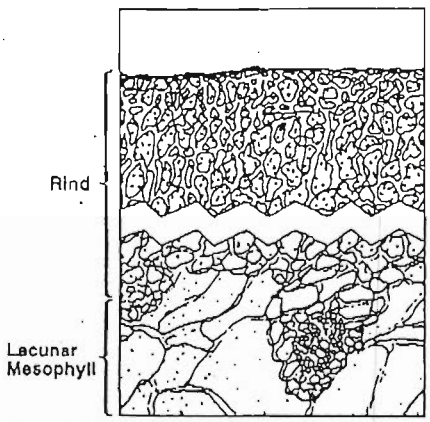


Figure 1. A composite photomicrographic section through the outer layers of the leaf of Aloe barbadensis Miller, showing the thick green rind and the outer portion of the lacunar mesophyll (mucilage).

constituents together amount to less than 1%. This implies that actions and benefits may be brought about by very small amounts of active ingredients. It also points to the fact that the leaf should be harvested and processed to assure that the active constituents are present in satisfactory amounts and are not adversely altered by the method of preparation.

To answer our initial question, the BEST Aloe is a preparation which: maximizes the desired constituents, minimizes any ingredient with negative effects, maintains the constituents in an unaltered and active form, preserves the actions and benefits, and is present in the final product in amounts which, indeed, can bring about the desired result when the product is used as recommended.

Where are the aloe constituents made?

In figure 1, is a photomicrographic section through the outer portion of an Aloe leaf. The rind consists of 15-18 layers of cells interspersed with chloroplasts (small round bodies), where the constituents are synthesized, and with inclusions containing calcium oxalate and magnesium lactate crystals.

Just beneath the thick green rind are located the vascular bundles. As shown in Figure 2, the outer support of the vascular bundle is provided by the sheath cells. Inside the vascular bundles are three types of tubular structures: the xylem (transports water and minerals from roots to leaf) the phloem (transports starches and other synthesized materials to the roots), and the large pericyclic tubules (containing the yellow latex or sap which is very high in the laxative anthraquinones, especially aloin).

The anthraquinones absorb ultra violet rays of the sun and prevent overheating of the central portion of the Aloe leaf, the water storage organ. Note that the pericyclic portion of the vascular bundle is adherent to the rind, while the remainder of the vascular bundle protrudes into the lacunar (large spaces) parenchyma or mesophyll, which is very thick and slimy. This provides a movable layer between the more solid inner gel fillet and the stiff outer rind. This liquid layer is termed the mucilage.

The innermost and major portion of the leaf is the spongy parenchyma or mesophyll constituting the gel filet. This layer has more structural integrity than the slimy mucilage layer.

All of the carbohydrate (polysaccharides) and glycoprotein (enzymes) constituents of the Aloe leaf are made in the thick green rind. Carbohydrates synthesized in excess of that needed for energy metabolism are transported to the gel fillet for storage of water and minerals and carbohydrates.

The carbohydrates are transported by the phloem vessels to small cellulose-containing vessels in the gel fillet, which constitutes most of the pulp of fillet. Water is then osmotically attracted the carbohydrates serving as the water s age organ of the plant.

The carbohydrates (and small amou of lipids or fats) consist of carbon, oxy

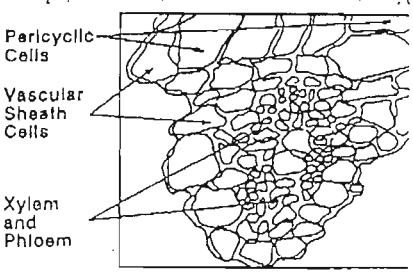


Figure 2. The various portions of the tubules of a vascular bundle are labeled. The pericyclic tubules contain the laxitive agents of the yellow sap or latex. Xylem and phloem vessels serve in water and nutrie transport, respectively.

and hydrogen. These are derived from bon dioxide from the air taken into the through the stomata (pores) at night. water from the ground. There is no sunli to energize the photosynthesis mechan to change the CO2 into carbohydrate. entrapped CO2 is stored as malic acid. wh gives the internal part of the leaf an acidic of about 4.0. When sunlight hits the some of the malic acid can be changed to carbohydrate used as fuel by the plant's thetic machinery. Only a portion of carbohydrate is used for energy, the rem der being stored in the mucilage and fillet.

Protein consist of Carbon, Hydrog Oxygen and Nitrogen, the latter com from the soil transported in the xylem sels. ■

Dr. Danhof's article will be concluded in the issue of the JOURNAL.

Ivan E. Danhof, Ph.D., M.D. has published more than 80 research papers and has served as a consultant to several pharmaceutical research institutes and the Federal Food and Drug Administration.

Dr. Danhof is considered a leading authority in the study of Aloe and has been cited several times for his insightful investigations into this amazing plant.

THE JOURNAL OF THE INTERNATIONAL ALOE SCIENCE COUNCIL, INC.

IASC Science & Technical Committee Offers New Pamphlet: *Official Definitions of Aloe*

To clarify and identify the many terms and names used within the Aloe industry for consumer products, the Technical Committee of the IASC has now defined the official nomenclature to be used and offers a pamphlet listing them for the benefit of all involved with or purchasers of Aloe.

As is obvious from this list, it has sometimes been difficult to properly label Aloe vera products for the edification of the buying public. Now it is hoped the resulting confusion will be seldom intentional rather than the rule in the past. All Aloe vera products manufactured and sold by IASC members and member companies displaying the IASC Seal must adhere to the new terminology.

The Official Definitions pamphlet is available from the IASC at no cost to members and other interested parties. Contact Gene Hale, Executive Coordinator, IASC, 910 Houston St., Suite 410, Fort Worth, TX 76102, (817) 338-1315, fax (817) 338-1319. ■

The terms and names so described include:

- Aloe vera Beverage
- Aloe vera Drink
- Aloe vera Oil
- Aloe USP
- Aloe vera Latex
- 100% Aloe vera
- Aloe vera Gel/Juice
- Aloe vera Pulp
- Raw Aloe vera Gel/Juice
- Whole Leaf Aloe vera Gel/Juice
- Aloe vera Gel/Juice Spray Dried
- Stabilized Aloe vera Gel/Juice
- Aloe vera Gel/Juice Freeze Dried
- Reconstituted Aloe vera Gel/Juice Spray Dried
- Reconstituted Aloe vera Gel/Juice Freeze Dried
- Aloe vera Concentrate and Reconstituted Aloe vera Gel/Juice.

IASC Associate Memberships Now Available

At the recent Board of Directors meeting, the International Aloe Science Council voted to open its rolls to Associate Members. These are those not directly involved in growing, processing or the production of raw materials or finished Aloe vera goods.

This new membership category includes those involved in direct sales, related organizations, chemical suppliers, container companies and any business having a direct or indirect relationship with the rapidly growing Aloe vera industry.

Membership dues for this new category are $150.00 per year, rather than the $250.00 charged regular members. Although Associate Members do not have voting privileges they are encouraged to attend local, regional and national meetings and seminars offered by the IASC.

Beginning with the July, 1994 Annual Seminar, trade booths will be available for any Associate Members wishing to display their products or services at a cost of $200.00. These booths will be up on both Seminar days for viewing by all attendees. The regular registration fee will be waived in lieu of the display fee.

Associate Members will be placed on the IASC mailing list, and will have access to the membership roll for business purposes.

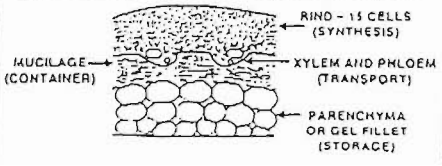
For further information, call Gene Hale, IASC Executive Coordinator, at 1-817-338-1315, or you may Fax at 1-817-338-1319. ■

Comments On The Aloe Vera Leaf

Robert H. Davis, Ph.D.
Professor Emeritus, Pennsylvania College of Podiatric Medicine

The structure of the Aloe leaf, seen below in cross section, shows the outer rind, consisting of 15 cell layers in thickness. The rind is the "manufacturing plant" where carbohydrate, fat and protein are made. The green color comes from the chloroplasts (round bodies) which are important in the manufacture of Aloe vera. The vascular bundles consist of the xylem, which carries water, minerals and nitrogen from the roots to the green rind. Calcium and magnesium contribute to the hardness of the rind. The phloem transports synthesized materials to the roots and other parts of the leaf. The pericyclic tubules connect the xylem and phloem to the large tubules running lengthwise toward the leaf base that nourishes the "pup leaves". Mucilage consists of long chain polysaccharides, the function of which is to act as a container to hold and keep the enclosed Aloe gel sterile. The gel fillet consists of large parenchyma cells that store water and large amounts of carbohydrate. ■

Cross Section of the Aloe Vera Leaf



Prevention Survey

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on one side of each face, the same dressing soaked in Aloe gel on the other. Aloe's advantages: less swelling after two days, less crusting by day four and 90% skin regrowth by day six, compared to only 40% to 50% on the Aloe-free side. And Aloe appeared to reduce throbbing, although it stung when applied. The researchers calculate that Aloe speeded up overall wound healing time by three days". (Journal of Dermatological Surgery and Oncology, May, 1990). ■

THE JOURNAL OF THE INTERNATIONAL ALOE SCIENCE COUNCIL, INC.

The "Wonder Drug" Challenge... Is it Aspirin or Aloe Vera?

"If Aloe vera were to be discovered today, and its remarkable healing properties investigated, it would be hailed as the wonder drug of this century." Ivan E. Danhof, Ph.D., M.D.

By Bob Hayward

In fact, many reputable researchers and scientists now believe that properly processed Aloe vera is, in many respects, the equal of aspirin in terms of its benefits to mankind.

It may be said, with certainty, that aspirin has benefited millions with its ability to reduce fever, ease minor aches and pains, its anticoagulant properties and its ability to fight inflammation.

New research suggests that aspirin may also be useful in the prevention of heart attack, strokes, high blood pressure during pregnancy, cataracts and may lower the risk of colorectal cancer.

Aspirin has long been, and continues to be, an important medical tool. As a result, its use is widespread, particularly in the United States, where some 80 billion tablets are consumed each year.

> Aspirin, now synthesized, is no longer considered a natural product.

Originally derived from a natural source, a substance found in the bark of the Willow tree, aspirin is now produced synthetically throughout the world, and is no longer regarded as a natural product.

Aloe vera, on the other hand, has always been a natural product - in whatever form it has been used. Derived directly from the plant's leaves, Aloe is so effective in its natural state that there has been found no compelling reason to spend the time and the enormous sums of money necessary to develop a synthetic version. Indeed, Aloe presents such a chemically complex picture that it may never be successfully synthesized.

Both Aloe vera and aspirin (in its original form) come from a long tradition of organically-derived medicines. A partial list of important medications derived from natural sources would include: *digitalis*, used to control heart problems, comes from the common Foxglove; *penicillin*, perhaps this century's most potent infection-fighter, was discovered in bread mold; *quinine*, comes from another tree bark; *ephedrine* was found in a desert plant. The list is extensive.

It is hardly surprising, then, that another "wonder drug" such as Aloe might spring from this tradition of using natural botanicals to treat mankind's illnesses, as well as being in common use as a beauty aid.

Since 1979, Aloe has been the subject of increasingly vigorous, scientifically-based, and rewarding investigations. It has been shown that this ancient plant, primarily the *Aloe vera barbadensis Miller* variety, offers a wide range of curative and cosmetic properties that were undreamed of by the early Egyptian healers who first wrote of Aloe's powers in the 4th century, B.C., in the Ebers Papyrus.

Nevertheless, and despite centuries of testimonial evidence concerning the curative powers of Aloe, mainstream medicine has long viewed Aloe with very little enthusiasm. This is surely due, in part, to the often outrageous claims made for Aloe by some who were anxious to sell it, or who were misled by the bad science of early times.

Because of the new research on Aloe, it is rapidly taking its rightful place in the pharmacopoeia of modern medical practice, with its use increasing as new discoveries are made.

> Aloe may offer answer to many of the medical problems we face.

Even though much Aloe research is of comparatively recent origin, and some of it has not yet been subjected to the rigors of FDA acceptable trials, researchers, in animal and laboratory studies, have clearly shown, the following:

Topically-applied Aloe vera gel can speed wound healing times by as much as 35% by dilating capillaries, which increases blood supply to the wound site, thus accelerating cell proliferation.

Topically-applied Aloe vera gel effectively ameliorates pain in burn and wound sites. The precise mechanism of Aloe's ability to reduce pain is not completely understood yet. Interestingly, however, we still have an incomplete understanding of exactly how aspirin works!

Galactomannans (long-chain Aloe-derived sugars) have been shown to possess a wide variety of immune-system stimulative and protective effects within the human body.

Injectable acemannan (see the Carrington Labs/AIDS story on Page 1) is being used successfully to treat fibrosarcoma in cats and dogs and, in oral form may soon get FDA approval as an AIDS-fighting tool. Acemannan is derived from Aloe vera.

In a study published by Dr. Faith Strickland (see Sunburn article on page 3), it was shown that topically-applied Aloe vera gel will not only speed the healing of sunburn, but will help restore the immune-system to normal functioning when it has been compromised by sunburn.

In a paper published in the Journal of *Phytotherapy Research*, it was reported that Aloe helps reduce the glucose levels of diabetic patients to the fasting level. In still another trial, conducted at Fujita Health University, in Japan, it was reported that patients' fasting levels went down, and that Aloe produced similar effects on hypoglycemia patients.

The report stated: "These effects are attributed to the stimulation of insulin secretions from residual pancreatic beta-cells".

According to an article recently published in *Runners' World* magazine considered the "Bible" of runners, a number of athletic coaches and trainers have been using Aloe gel, mixed with aspirin, to treat the pain and peripheral bleeding associated with muscle strains and sprains. It appears that the exceptional penetrant properties of Aloe are able to "transport aspirin right through the skin, taking the aspirin directly to the bloodstream." While this use of Aloe has not been substantiated in for

continued on page 1

Carrington Aids

continued from page 1

Department of Agriculture as an aid in the treatment of fibrosarcoma in cats and dogs.

As the JOURNAL understands the action of acemannan, it is not a "cure" for Acquired Immune Deficiency Syndrome (AIDS). Rather, it arrests the syndrome's progression, enabling the patient to live out a more or less normal lifespan, when used in conjunction with AZT, the most-used medication for AIDS.

As might be imagined, the release of this information has, according to a Carrington spokesman, brought on a steady stream of calls from desperate AIDS sufferers and doctors from all over the nation. The company has begun a treatment program for an as yet undisclosed number of AIDS patients and, rightly so, declines to comment further on the trials until they have been completed, the results certified by the FDA, and permission to market the product has been granted.

Acemannan was identified by Carrington scientists in 1984 as one of the therapeutically active ingredient in Aloe vera gel, and devised a method of ensuring its stability and purity. A patent was applied for in 1986 and was issued in 1988.

Initial studies revealed that this active ingredient of Aloe vera gel was a complex carbohydrate. No longer considered merely an energy source for intracellular metabolism, carbohydrates are now recognized as potentially useful for a wide range of applications, including ligands for immuno-modulation, drug delivery vehicles, modulators of cell-to-cell communication and competitive inhibitors of pathogen attachment to healthy host cells.

Acemannan is a complex polysaccharide consisting of long-chain beta-linked mannose polymers interspersed with acetyl groups. It is not metabolized until it reaches the target cell. It interacts with the immune system, thus acting as an immunomodulator. Immunomodulators are compounds that stimulate cell function and cytokine synthesis and have a wide variety of potential uses in the treatment of animal and human diseases. Acemannan also possesses significant antiviral activity, which makes it potentially useful in the treatment of infectious diseases.

Although the precise mechanism of acemannan's antiviral effect remains unclear, it is believed either that acemannan interferes with the activities of glycosidases or, alternatively, it alters carbohydrate transport within the cell. The net result is decreased infectivity of the virus. This direct antiviral activity suggested that acemannan might be of significant benefit as an aid to the treatment of diseases such as AIDS that are mediated by a virus with envelope glycoproteins. In addition, acemannan also appeared to act synergistically with AZT, resulting in a significant enhancement of the antiviral effects of AZT at low, nontoxic doses.

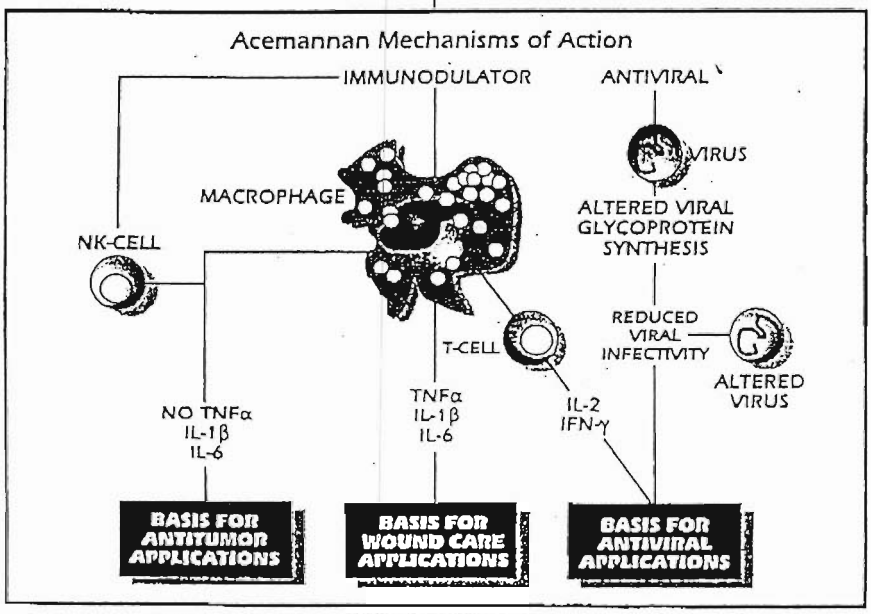
> Acemannan, when used as a vaccine adjuvant, produces marked stimulation of the immune system.

In 1993, two new derivatives of acemannan were synthesized by Carrington. Preliminary *in vitro* data indicate these molecules may demonstrate more antitumor activity, when compared with the parent molecule, acemannan. This is a very exciting development in view of the potential for these synthetic products to act as highly potent antitumor and antiviral drugs.

With respect to the Canadian test, a 48-week, 60-patient, double-blind, placebo-controlled trial of oral acemannan in patients with advanced AIDS was begun in February of 1991. This early-phase trial was conducted under the auspices of the Canadian HIV Clinical Trials Network, which is supported by Health and Welfare Canada. The principal objective of this study was to assess the effect of acemannan on CD4 decline, the primary indicator of HIV disease progression. Within the study, acemannan was given in addition to AZT. There occurred a statistically significant stabilization between weeks 16 and 48 in the acemannan group, compared to placebo. These results were encouraging, and provided an impetus for the continued development of acemannan in the treatment of AIDS.

And it all began with Aloe vera! Where it will end is not yet known, but the continuing investigation of Aloe, by Carrington and dozens of other researchers and research groups will, we believe, eventually lead to the discovery of new cures for some of the old diseases that have beset humanity since the beginning of time.

Carrington Laboratories, and the many Carrington people who have contributed to their success, are to be congratulated. We do so, wholeheartedly. ■



Acemannan's interaction with the body's immune system and its antiviral activity bring about a very wide variety of clinical indication.

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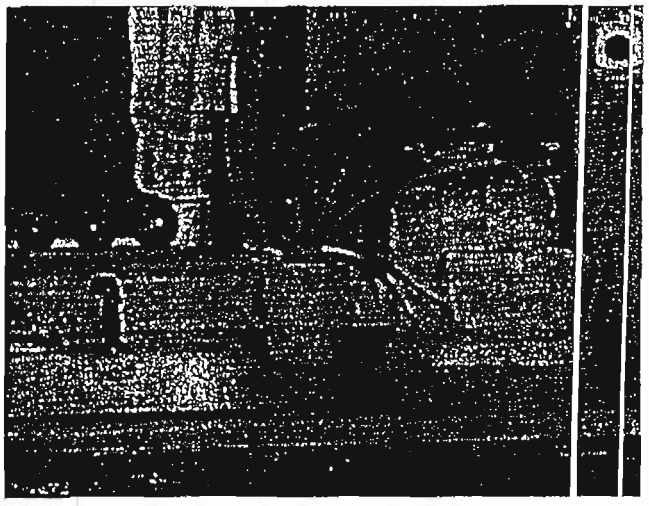
THE JOURNAL OF THE INTERNATIONAL ALOE SCIENCE COUNCIL, INC.

The Plant Kept in the Kitchen

Many of us have fond memories of a parent or perhaps a grandparent who kept an Aloe vera plant in the kitchen — usually on the windowsill or countertop — in order to have it handy when small accidents occurred...the everyday burns, scrapes and bruises common to cooks and children.

Applied with soothing words and some tender loving care, the Aloe seemed to "make it better". My grandmother would cut off a small piece of the living plant and rub the juice it exuded on the hurt, promising that the pain would soon be gone and the damage healed, as if by magic. And it worked!



Many of us have fond memories of a parent or grandparent who kept an Aloe vera plant in the kitchen

In those days, nobody really knew why Aloe vera helped with the healing process, relieved the pain, lessened inflammation and reduced scarring. It just worked, and that was all that mattered.

Millions of people all over the world have been using Aloe as a home remedy for what historians tell us has been well over three thousand years. And for just about the same length of time, women were using Aloe gel to improve or maintain the appearance of their skin and hair.

Early medical writers promised that Aloe could cure all manner of problems, including dog bites, falling hair, corns and calluses, catarrh, failing eyesight, male-pattern baldness, impotence and snakebite, among many others.

Today we scoff at many of those old claims, of course. And, not incidentally, the medical profession, by and large, has scoffed at many of the anecdotal claims made by Aloe enthusiasts. They wanted, and still want, proof derived from clinical trials and experimental data not then available.

Now, happily, a good deal of proof is available, and the medical community has come to understand that Aloe does, indeed, have a place in their therapeutic pharmacopoeia.

Scientific researchers have determined that Aloe vera is an amazing mixture of more than 200 constituents, including polysaccharides (a complex carbohydrate), enzymes (complex proteins), glycoproteins (a conjugated protein), amino acids (the chief components of proteins), vitamins and minerals. Empirical proof now exists to validate Aloe's ability to reduce inflammation, speed the healing of wounds, ameliorate pain, improve vascular flow, and reduce scarring.

It appears that, after centuries of use by "folks" - much of it based on the simple act of cutting off a leaf from the plant, and applying the gel to skinned knees, minor burns, scrapes and small hurts - Aloe has finally earned acceptance by many doctors. It took quite a while, but it was worth the wait.

Now, as in years past, mothers and grandmothers are keeping an Aloe vera plant in their kitchens, and are continuing the tradition of home health care. Neither Aloe nor TLC have gone out of style over the years, and the "magic" still works. ■

Medical Applications of Aloe Vera from Antiquity to Today

continued from page 4

Aloe in Southern Asia and the areas bordering the Mediterranean Sea.

Closer to home, the Indians of the Americas used Aloe extensively to treat their skin disorders, calling Aloe "the wand of heaven", and believing that anyone touched by the gel of the plant would be healed. Did it work? Those same tribes still use it today—you decide.

These many applications of Aloe were tried, of course, without any hard scientific evidence to prove Aloe's healing powers. It was all trial and error. If something worked, people kept on using it. Many in the scientific community had serious reservations about Aloe's ability to heal anything at all. In their view, the so-called "proof" was all anecdotal, and therefore, greatly suspect.

Even in recent years, the tendency among some doctors has been to doubt any "natural" therapeutic agent unless it has been thoroughly tested in clinical trials. Naturally, clinicals don't happen very often to "natural" products, since the cost of doing so is astronomically high, and very few pharmaceutical companies are willing to expend the resources necessary to test something they cannot patent. This is understandable, if frustrating to those who believe in the efficacy of the Aloe vera plant.

> According to some, Cleopatra owed her beauty to the use of Aloe vera.

When you consider that many of today's most effective medications are derived from nature—penicillin, quinine and digitalis for example—it is difficult to understand why the same scientific tests and standards took so many years to be applied to Aloe.

In fact, some observers have suggested that, if Aloe vera were discovered today, it might well be hailed, like penicillin, a true "miracle drug". Only time will tell, but expectations in the scientific community are high, and research continues worldwide. ■

THE JOURNAL OF THE INTERNATIONAL ALOE SCIENCE COUNCIL, INC.

Worldwide Aloe Acreage Estimation

On the basis of as yet incomplete information, it is estimated that there are no more than 13,460 acres planted in Aloe vera throughout the world. As the use of Aloe in health care and beauty products grows, it is thought that such acreage should be substantially increased, particularly in the light of the possibility of another freeze, such as that which occurred in 1985.

The acreage breaks down as follows:

Location:	Low:	High:
United States		
Texas	1,500	2,500
California	30	100
Florida	10	40
Oklahoma	3	20
Mexico	3,000	8,200
Central America		
Costa Rica	—	600
El Salvador	—	200
Guatemala	—	200
West Indies		
Dominican Rep.	400	2,500
Puerto Rico	100	400
Dominica	90	500

Location:	Low:	High:
Aruba	—	100
Haiti	—	50
South America		
Venezuela	400	1,500
Brazil	400	500
Spain	60	200
Australia	—	100
Israel	30	250
India	—	100
Thailand	—	600
China	50	100
Korea	—	100
TOTALS	6,073	13,460

As might be imagined, it is sometimes difficult to get exact figures from some areas of the world, and it is suspected that some of the numbers are little more than "guesstimates." Nevertheless, the numbers reported above are, we believe, more or less indicative of the actual acreage planted in Aloe vera throughout the world. The IASC actively seeks updated information on this list and welcomes corrections and additions. We are grateful to Frank Duffy for the above information. ■

"Wonder Drug"

continued from page 7

mal clinical studies, it seems to have worked for those who have tried it.

There are a substantial number of other Aloe investigations currently underway. One, a long-term (4 years) and well-financed study headed by Dr. Byung Pal Yu, Professor of Physiology at the University of Texas Health Science Center, and Dr. Jerome T. Herlihy, Principal Investigator and Associate Professor of Physiology, also at U.T., has been launched to determine whether dietary Aloe (in drink form) can slow down the aging process in humans!

Other studies, recently completed, or in progress, suggest that Aloe: has antibacterial, antiviral and antifungal properties, and

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How Much Aloe?

continued from page 1

done which suggests that, in order for Aloe to be therapeutically effective in a cosmetic formula, it must be present in a strength of 20% or more, and, in some cases, considerably more.

Of course there are any number of reputable manufacturers who properly represent the Aloe content in their products. Often these companies are IASC certified, understand and respect their customers' needs, and know what Aloe vera will do to meet those needs.

There are, to be sure, manufacturers who take advantage of any fad that comes along. Case in point: One manufacturer of nail care products prominently displays the fact that one of its products contains a well-known gelatin because there is a popular supposition that the ingestion of gelatin will strengthen nails. Of course it does no good whatever to rub it on the nails and, in fact, research has shown that even eating or drinking gelatin won't strengthen nails.

This is not to say that, in years past, "contains Aloe vera" has not been used in much the same manner, and for the same ends. Fortunately consumers can now rely on the International Aloe Science Council Certification Seal in making product purchase decisions. This seal certifies that the particular product upon which it appears has been independently analyzed and certified as containing the percentage of Aloe listed and the quality of the gel.

It should be noted the FDA has ruled that in any product that has been reconstituted with either Aloe powder or concentrate, water must be listed as the primary ingredient.

So, what should you do? Read the ingredient list before you buy, then check to make sure that the aloe-based products you purchase display the IASC Seal on the label. If Aloe vera is contained in the product in amounts sufficient to be effective, it will appear near the top of the list, and may even indicate the percentage of Aloe in the formula.

As in buying any product, be a smart consumer: read the label and check to be sure the industry certification seal is displayed prominently. Those manufacturers displaying the seal do so because they're proud of the products they offer. What better recommendation could you ask for? ■

THE JOURNAL OF THE INTERNATIONAL ALOE SCIENCE COUNCIL, INC.

"Wonder Drug"

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appears to be effective against a broad spectrum of germs, inhibiting the reproduction of herpes and measles in vitro.

Can control itching by inhibiting histamine reactions produced by insect bites and stings, as well as the body's reaction to poison Oak and poison Ivy.

Is beneficial in the treatment of various gastrointestinal disorders, including diverticulitis, gastric, peptic and duodenal ulcers and colorectal colitis.

In addition to the above, studies are being conducted that suggest, at least in the early stages, that Aloe vera may provide the world with still other treatments and cures for other ills that plague mankind. This simple "medicine plant" may yet be shown to hold answers to many of the perplexing medical problems we face.

In the great "Wonder Drug" Challenge, which is the new champion...Aspirin or Aloe vera? You be the judge.

Our money's on Aloe vera. ■

IASC Code of Ethics

The International Aloe Science Council has developed an industry code of ethics to underscore its commitment to engage in no unfair trade practices, and to make no claims about Aloe vera's health and beauty benefits without scientific research and technical data to support such claims.

Deceptive or Unlawful Consumer Practices: No member of the council shall engage in a deceptive or unlawful consumer practice.

Products or Services: The offer of products or services for sale by member companies of the Council shall be accurate and truthful about price, grade, quality, value, performance, quantity, currency of the product and availability.

Pyramid Schemes: No member of the council shall, as part of its business, engage in a pyramid or endless chain scheme as either of those forms as defined in federal, state or local laws and regulations.

In addition to these basic prohibitions, the Board can promulgate procedures with regard to responsibilities and duties of member companies and enforcement of the Code. Such procedures may include the reporting of violations by the Council to appropriate federal or state agencies. ■

IASC Certification COSTS

The IASC Science and Technical committee has developed a technique to certify Aloe gel by using specific physical parameters and a high pressure liquid chromatography procedure. This certification program is conducted by an independent testing facility.

Companies wishing to have their raw materials or finished consumer products certified so that they may display the IASC seal of certification on their packages may apply to the IASC for testing and certification.

Fee Schedule for Certification of Raw Aloe Vera and Finished Products:

	IASC Member	Non-Member
Certification Fee for One Product	$1,000.00	$1,500.00
Fee for Each Additional Product at Same Time (Max. 6 products)	$300.00	$400.00
Add'l Cert. Fee (for add'l product after initial cert.)	$1,000.00	$1,500.00
Daily Inspection Fees	$355.00	

Air fares, Hotels, Car Rentals, extra cost. (Example: 2 travel days plus one inspection day for first product equals $2,065 plus air, hotel, and car rentals.) Fees include periodic monitoring with review of products at the discretion and option of the IASC Board of Certification.

Applications for certification are available by writing to IASC International Headquarters, 910 Houston Street, Suite 110, Fort Worth, TX 76102 U.S.A.

International Aloe Science Council, Inc. MEMBERSHIP APPLICATION

Enclosed is my IASC. Dues payment in the amount of $250.00, (Associate Membership $150.00) representing our company's commitment to the International Aloe Science Council and confidencein the future of the Aloe vera industry.

My signature represents a pledge to adhere to the IASC. Code of Ethics.

Signature _____ Date: _____

Please fill in the following information: (Please Print)

Company _____

Address _____

City _____ State _____ Zip Code: _____

Telephone _____ Fax _____

Chief Executive Officer _____

Executive Contact to IASC _____

Principal Products _____

Circle one or more, as appropriate:

Manufacturer Processor Marketer Drug Cosmetic Food

Other _____

Please return this completed form to:

IASC Headquarters
910 Houston Street, Suite 110
Fort Worth, Texas, U.S.A. 76102

Dues are payable on an annual basis, in advance, and are not refundable. Dues shall be payable upon receipt of the dues statement, which will correlate with the above date. ■

THE JOURNAL OF THE INTERNATIONAL ALOE SCIENCE COUNCIL, INC.

ASC Certification Program Assures Quality and Quantity of Aloe in Products

eal Indicates Compliance with Quality and Purity Standards

Prior to 1981, no organization existed at could certify raw Aloe's quality or purity the Aloe content and purity of manufac-red products containing it. Claims on con-nt and purity were made that bore no lationship to the truth, so it became clear at something had to be done in order to rotect the integrity of the Aloe industry and safeguard consumer interests.

In 1981, responding to this need, people ithin the Aloe industry banded together, rmed the IASC, and formulated its objec-ves. Paramount among these were the es-blishment of quality and ethical standards r both raw materials and manufactured oe-based products.

A Scientific and Technical Committee as formed and given responsibility for the andardization and identification of com-onents, and has worked continuously to evelop and disseminate information to in-rested parties, including people in the Aloe dustry, the general public and appropriate overnmental agencies.

In addition, the Council pledged its ef-rts to work closely with the Federal Food nd Drug Administration to the end that ceptable standards and identification of loe vera raw materials be developed: to onsor and encourage the sponsorship of search programs to establish standards for Aloe vera and its multiplicity of uses in health and beauty products; to prepare and distribute educational materials; and to arrange for and sponsor annual Scientific Seminars relating to Aloe vera research.

Certification of Aloe vera products is conducted by means of a high pressure liquid chromatography procedure, using specific physical parameters that have been established. It is done by an independent testing facility, and is sponsored by the Aloe Research Foundation.

The Certification process is continuous, and includes periodic monitoring, with a review of products at the discretion and option of the IASC Board of Certification. Certification offers an assurance that the materials and products so certified have met or exceeded the stringent standards established by the Council and provides a guarantee of these standards to the public.

Those manufacturers or product marketers who display the IASC member logo do so to indicate they adhere to the manufacturing and ethical standards established and monitored by the IASC.

For the buying public, purchase of products bearing either the IASC membership logo or the Certification Seal provides an assurance that they may buy these products with confidence. In this sense, the Seal is somewhat anaogous to the Good Housekeeping Seal of Approval.

It is in the best interests of Aloe growing, manufacturing and marketing companies to apply for and obtain both membership and certification, given that public awareness of the promised FDA "crackdown" on some natural health care products is growing. We don't want the buying public to "throw out the baby with the bathwater", that is, to lump Aloe in with some of the questionable products being touted by disreputable companies, and refuse to buy products containing Aloe vera. When the IASC certification appears on your label, you're telling the world that your product has passed rigid scientific inspection, and its purity and quality are unquestionable. ■

INTERNATIONAL ALOE SCIENCE COUNCIL, INC.
910 Houston Street, Suite 110
Fort Worth, Texas, 76102

SÖFW Journal

Cosmetics
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Specialities

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1993

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10. DGK-Symposium

R. P. Pelley, Y.-T. Wang, T. A. Waller*

Current Status of Quality Control of Aloe barbadensis Extracts

Summary

For over 11 years now the International Aloe Science Council (IASC) has been striving to ensure that Aloe products are undiluted, unadulterated, and of good quality. For the last three years, scientists, supported by the Aloe Research Foundation (ARF), have been at work perfecting tests to make aloe certification and quality control possible *(2–5)*. In this article, a summary of a paper at the recent European Conference on Aloe, we will examine the developments in analytical chemisty that are bringing us closer to the IASC's goal of benchmark tests for Aloe gel identity and quality; **1.** measurement of ions *(5)*, **2.** high pressure liquid chromatography or HPLC *(2, 3)* and **3.** measurement of total polysaccharides.

Background – Certification and Quality Control of Aloe

Ultimately, analytical chemistry serves two functions for the Aloe Industry: **1.** establishing that a material contains Aloe (Certification) and **2.** determining the quality of the Aloe (Quality Control). Certification (Table I) is a process developed by the International Aloe Science Council (IASC), a trade organization composed of approximately 150 corporate members engagend in various aspects of growing, processing, and marketing Aloe products. The IASC certification seal (Figure 1) indicates that the company has undergone an inspection and audit to verify **1.** that operations are conducted under sanitary conditions and products are bacteriologically clean **2.** that plant capacity matches product output **3.** that consumption of raw materials equals product output and **4.** conducts chemical tests of Aloe products to determine if the product's alleged content of Aloe is consistent with what is currently accepted as the chemical composition of bona fide Aloe. At present, for liquid gel extracts, the IASC Standards consist of four test parameters (Table II). The certification process is overseen by a Science and Technology Subcommittee comprised of quality control personnel (TAW) from some of the larger and more technologically advanced companies. University-based scientists are not part of the IASC. However, for the last 11 years, the IASC

Fig. 1 IASC certification seal

On Site Activities

A. Aloe Facility Inspection

1. Assembly Line/Processing Line
2. Laboratory
3. Storage – Cold
4. Storage – Room Temperature
5. Raw Materials Records
6. Equipment – Production

B. Aloe Raw Materials Audit

C. Aloe Finished Product Audit (for each product)

1. Percent of Aloe in Final Product Based on Label Claim
2. Percent of Aloe in Final Product Based on Formulation Data

D. Manufacturing Audit (for each product)

1. Total Amount of Aloe Purchased
2. Products Manufactured
3. Starting and Finishing Inventory

Off Site Activities

A. Laboratory Tests

1. Solids Content
2. Calcium Content
3. Magnesium Content
4. HPLC Profile
5. Microbiology (as part of Onsite Inspection A.2)

Table I IASC – ARF Quality Assurance Program

Test	Average	Range
Solids (105 °C Nonvolatiles)	0.92 g per dl	0.75 to 1.50
Calcium	33 mg per dl	23.3 to 52.3
Magnesium	3.9 mg per dl	3.2 to 4.7
HPLC Profile*	67% of freshly prepared leaf	51 to 110%

* As originally stated, the peaks to be examined in this test were unspecified as was the standard sample of Aloe to which the analyte was compared. For certifications conducted in 1991–1992, the peak analysed was »E Peak« and the standard sample was Aloe Research Foundation Standard Sample ARF'91A Process A (Crude Gel), Frozen.

Table II Chemical Laboratory Tests for IASC Certification of Aloe barbadensis Gel (1982–83 Database)

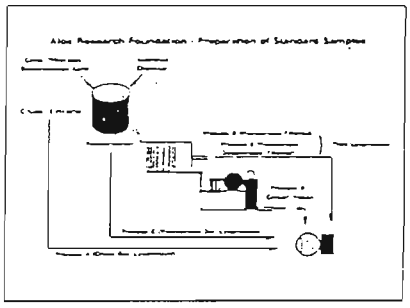

Fig. 2. Preparation of Aloe Research Foundation (ARF) Standard Samples.

sponsors an annual Scientific Seminar at which academicians summarize recent scientific studies of Aloe materials. By and large the IASC does not sponsor scientific work although academic scientists (RPP) have collaborated in the certification process *(4)* and have been supplied (YTW) with fresh Aloe barbadensis leaves for the purpose of establishing a analyte data base *(5)*.

The Aloe Research Foundation (ARF), chartered three years ago, is funded by several of the largest companies in the Aloe Industry and is charged with sponsoring and supervising research on basic and applied aspects of Aloe materials. The Scientific Advisory Board of the ARF, composed of industrial and academic scientists with established credentials in Aloe research, reviews grant applications, supervises the progress on funded projects, and acts as a pool of experts to advise the ARF and IASC. Two of us (RPP & TAW) are members of the Scientific Advisory Board of the ARF. The ARF also sponsors a yearly scientific symposium on Aloe research and the biennial International Congress of Phytotherapy. The ARF is in the process of establishing a professional service library to make available scientific and technical documents on Aloe materials.

Since 1991, the ARF has sponsored and supervised the preparation of Standard Samples of Aloe barbadensis extracts (Figure 2, Table III). These carefully prepared extracts are made on a semi-industrial scale starting with metric ton amounts of leaves and producing up to several kg of freeze dried extracts. The ARF Standard Samples represent the best approximation of authentic Aloe materials available and are dispensed in lyophilized from to scientists and industrial quality control laboratories regardless of whether or not the scientist is funded by the ARF or whether the company is a contributer to the ARF. The only proviso is that the scientists be of academic repute and that the companies use the Standard Samples for their own internal quality control purposes. To date, 7 Standard Samples of gel extracts have been made (ARF'91A through ARF'93A). The major thrust of these programs of the ARF is elucidating the biological properties of Aloe materials and developing quality control tests for Aloe.

Field Operations

Highest degree of sanitization obtained
Gel filleted from leaves within 1 hour of leaf harvest
Pulp removed by passage through 250μm mesh
Chilled 4°C within minutes of depulping

Plant Operations

Crude Gel (Process A)
Lyophilized, within 2 hours of filleting

Pasteurized (Process C)
65°C, 15 min then lyophilized

Filtered – (Process D)
After Pasteurization, absorbed with Celite »Filteraid« Diatomaceous Earth Silica Gel and passed through 20μm Cellulose Filter

Decolorized – (Process E)
Pasteurized, absorbed with Norite Darcoal activated charcoal, »Filteraid« Diatomaceous Earth, and filtered

Concentrated – (Process B)
Any of the above materials concentrated by rising/falling thin film evaporation under reduced pressure prior to freeze drying

Storage

Dessicated, 4°C or -20°C

Table III Aloe Research Foundation Standard Samples

Many of the tools that industrial Aloe quality control labs use are those that are also used for IASC Certification. These are record keeping, bacteriology, solids content, ion determinations, and HPLC analysis. Over the last two years these tests have increased in their power because of a statistical database developed at Texas A & M University, Weslaco Agricultural Experiment Station *(5)*.

Quality control labs also employ tests such as pH and color that are primarily for specification purposes and other tests (such as anthraquinone content) that are primarily for health and regulatory purposes. Some of these tests are not yet completely chemically or statistically validated. Examples of these are assays for polysaccharide or anthraquinones. Hopefully, future scientific development will bring these tests up to the standards that the IASC Certification Tests are now approaching.

The Chemistry of Aloe

All the chemical tests are based upon our knowledge of the chemical composition of Aloe and its relationship to the biological activities of Aloe. Aloe barbadensis gel extracts are 99.5% water – all of the biological activities specific to Aloe thus reside in the 0.5% non aqueous molecules that comprise the solids content of Aloe. In general *(6,7)*, Aloe is composed of molecules such as the quinones aloin and aloe-emodin *(8)*, polysaccharides of various chemical linkages and varying molecular weight *(9–13)*, reducing sugars, a mixture of proteins *(15–17)*, and molecules of lower molecular weight such as salts, fats, amino acids and other molecules *(7)*.

The solids of Aloe gel extracts can be chemically thought of as containing two crude classes of molecules – large molecules and small molecules. The macromolecules make up approximately 20% (range in ARF Standard Samples, 10 to 25%) of the solids content of Aloe gel and are overwhelming polysaccharide. Studies at the University of Texas have confirmed earlier published studies *(9–13)* indicating that Aloe gel extracts contain a mixture of polysaccharides including a linear highly acetylated β1–4 mannan, branched dextrans, pectic acids and other polysaccharides with negative charge. In contrast to the claims of some commercial concerns *(14)*, we do not find that only one highly linear polysaccharide (the acetylated β1–4 mannan) is essentially the only polysaccharide of Aloe species gel extracts. Polysaccharide hexose makes up approximately 10% of the total mass of the solids of Aloe. Associated closely with these polysaccharides are small molecules, primarily positively charged ions. Proteins, on the other hand, make up only approximately 1% of the solids content of Aloe barbadensis extracts. The predominant proteins in gel extract are of low molecular weight (11,000 and 14,000 kd respectively for the two polypeptide chains). They are probably associated with the Aloe lectin *(15, 16)* and may account for the mitogen activity described for Aloe *(17)*. Caution must be exercised in interpreting the protein content of Aloe because the β1–4 mannan appears to react in some of the biochemical assays commonly used to determine protein content (the Lowry assay and the Coumassie Blue dye binding assay).

The small molecules of Aloe extracts fall into four chemical groups 1. cations 2. anions, 3. sugars, and 4. neutral or amphipathic small molecules. Of these, the cations and anions comprise approximately 50% of the mass of the small molecules. Later, we will devote an entire section of this paper to the cations and their measurement. The anions consist of chloride and the organic anions, chiefly organic acids. The organic acids are notable mostly for their tendency to form insoluble precipitates with calcium when Aloe extracts are concentrated. The free, reducing sugars, consisting primarily of glucose and mannose, make up about 20% of the small molecules but vary greatly in content from extract to extract *(5)*. Therefore they are of little utility for purposes of certification and quality control although their presence or absence may be useful in detecting cases of adulturation. The remaining small molecules consist of a mix of at least 100 compounds including sterols, terpenes, amino acids, neutral lipids and of course anthraquinones.

A great deal of the published literature on Aloe species is devoted to the anthraquinones. The commercial importance of the anthraquinones lies in the area of quality control. Anthraquinones are undesirable in consumer products because of concerns over their long term toxicity *(21–23)*. Furthermore, anthraquinones are susceptible to oxidation and therefore tend to be associated with product color change problems subsequent to processing and compounding. Although fascinating to the analytical biochemist, anthraquinones are generally removed during the processing of Aloe extracts by absorbtion with activated charcoal. This removal makes them unsuitable markers for certification.

Biologically, Aloe latex was traditionally associated with the cathartic activity of anthraquinones *(8)*. Gel extracts of Aloe barbadensis (Fig. 3) are associated with emolliency (see the numerous patents on the subject), acceleration of wound healing *(18, 19)* and reduction of inflammation *(18, 20)*. Aside from the laxative activity of the Aloe anthraquinones (which are not present in significant concentration in most commercial gel extracts) we do not know for certain which molecules are associated with which biological activities.

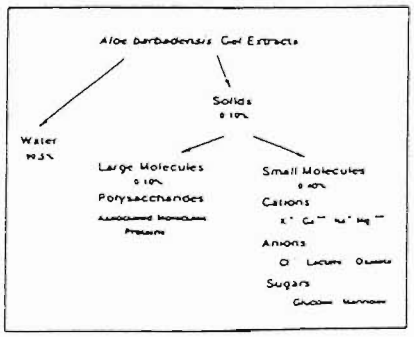

Fig. 3. The chemical composition of Aloe barbadensis gel extracts based on *(6)* and our own unpublished results. For details of preparation see Table II.

Aloe Chemical Data Bases

Given this state of knowledge, between 1982–1984 the IASC somewhat arbitrarily selected a set of analytes (Table II) to serve the purposes of quality control *(1)*. This was based upon the 1. presence of these molecules in Aloe, 2. their stability and persistance during processing into commercial products and 3. our ability to quantitate them. The IASC and ARF commissioned one of us (YTW) to determine the concentration of these 4 analytes in samples consisting of 3 Aloe leaves (yeilding approximately 500 g of gel extract). Leaves were raised on 4 different plantations and were harvested at weekly intervals throughout a two year cycle. Recently, we completed the sample acquisation phase of the study and have presented the data on solids content and Ca^{++} and Mg^{++} *(5)*. We have also studied the content of Na^{+}, K^{+} and reducing sugars. It is hoped that the complete database will soon be made available to the entire industry and serve as the statistical basis for future Certification Programs. Analyte values for the ARF Standard Samples closely approximate the mean values for the analytes in the Texas A & M study.

Determination of Ions

The determinations of solids, K^{+}, Ca^{++}, Na^{+} and Mg^{++} are straightfoward. Confer Table IV for the values of these analytes to date in the Texas A & M study. Solids are measured by taking an aliquot, evaporating at about 65° C and drying overnight at 105° C. Salts are best determined by atomic absorbance spectroscopy because the salts are partially tied up with the organic acids and charged polysaccharices. For example,

the calculated ionic strength for the Texas A & M distribution of the four major cations is 3.70 ± 1.38 mMHO (mean ± Standard Deviation) based on a solution of the four cations, with Cl^- as the anion. Direct determination of Aloe barbadensis gel extract ionic strength yeilds a value of 1.7 ± 0.49 mMHO. This indicates that only 50% of all ions exist in solution in the freely ionized form. Therefore determination of individual ion concentrations by a method such as ion selective electrodes is fraught with danger. Ion selective electrodes (or determination of ionic strength) can be very useful in a relative sense when appropriate standards (such as ARF Standard Samples) are employed. However, this was the reason that a primary reference method (atomic absorbance) was employed in the Texas A & M study.

Figure 4 illustrates the distribution of the 4 cations in the four plantations sampled. There are two significant sources of variability in the distributions. First there is sample to sample variability over time at a single farm (for example, at Farm 1, Ca^{++} versus Mg^{++} versus K^+ and Na^+). The second source of variability is farm to farm varibility (for example Farm 1 versus Farm 4). Realizing that there are multiple sources of variability in the data base, we can examine the distribution of ion content values (Figure 5). With the exception of Na^+ (skewed by the low values of Farm 4), the values are normally distributed. We can state with high confidence that there is a threshold of combined cation content that essentially all Aloe barbadensis gel extracts contain. If we take twice the standard deviation as our confidence limit (Figure 5, arrows), the probability of falsely rejecting an Aloe sample is very low. This is because when the values for one analyte are low (for example, Figure 4; Farm 4, Na^+; Farm 3, K^+), the value for other analytes compensate.

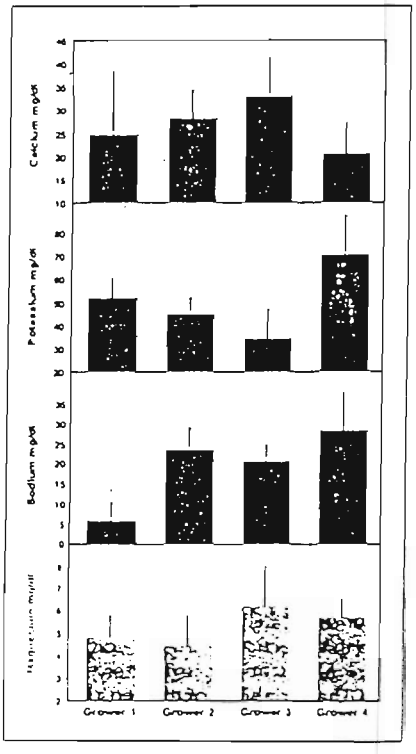

Fig. 4. Variation in Content of Calcium, Potassium, Sodium, and Magnesium in Fresh Aloe barbadensis Gel Extracts Among the Four Participating Growers. Data are from that portion of the Texas A & M population that was analysed as of June, 1992 (Table IV). Values expressed are the mean ± one standard deviation (1 σ).

Atomic absorbtion analysis has serious deficiencies as a routine quality control tests. The equipment is expensive, difficult to maintain, and requires skill to operate. If conducted commercially, the cost of analysing a single sample of Aloe for all four cations generally exceeds $ 100. In this case ionic strength (determined by conductivity) can be used as a screening test because the equipment is cheap and the test is easily and quickly performed. Figure 6 illustrates the results of conductivity testing on the 7 ARF Standard Samples reconstituted to a solids content of 0.59 g/dl (the average solids content of the Texas A & M distribution). The mean ionic strength of the sample was 1.74 mMHO with a standard deviation of 0.49 mMHO and a coefficient of variance of 28%. Maltodextrin, a common adulterant, has negligible conductivity (0.026 mMHO). The average coefficient of variance of the Texas A & M cation distribution is somewhat larger (37.5%) than that for the ARF Standard Sample sample (28%). Adopting the Texas A & M distribution, the lower two standard deviation limit for conductivity is 0.44 mMHO. Using this as the lower confidence limit for Aloe ion content allows us to quickly and cheaply screen samples and perform atomic absorbance spectroscopy

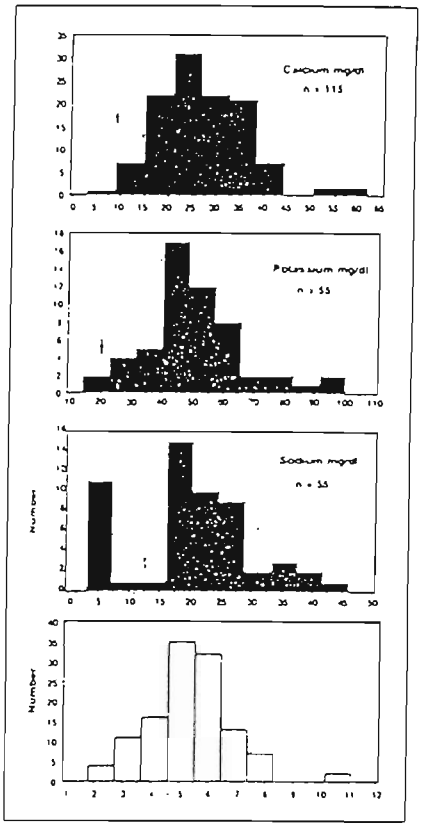

Fig. 5. Frequency Distribution Analysis of Calcium, Potassium, Sodium, and Magnesium Content in Fresh Aloe barbadensis Gel Extracts. The arrows indicate two standard deviations (2 σ) below the mean for the samples. These data are derived from the same samples as described in Figure 4 and Table IV.

Test	Mean	Standard Deviation	Coefficient of Varience	n
Solids (105°C Nonvolatiles)	0.59 g per dl	0.11	18%	201
Calcium	27 mg per dl	10	37%	115
Magnesium	5 mg per dl	2	28%	120
Sodium	20 mg per dl	10	50%	55
Potassium	51 mg per dl	17	34%	55
HPLC Profile*	»E Peak« Present in All Cases			200

* The standard sample of Aloe to which the analyte was compared Aloe Research Foundation Standard Sample ARF'91A Process A (Crude Gel), Frozen.

Table IV Texas A & M Study of Aloe barbadensis Gel 1991–93 Database (Analyses to Date)

for the four cations only on those materials with conductivity below 0.44 mMHO at a solids content of 0.59 g/dl. This sort of screening results in a great savings of money and time.
It is theoretically possible to adulterate Aloe by addition of salts and organic solids with the aim of disguising dilution.

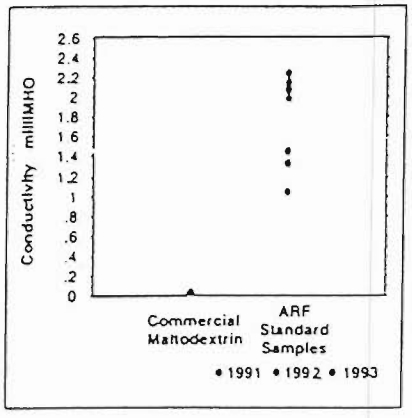

Fig. 6. Conductivity of Aloe Research Foundation (ARF) Standard Samples, Process A. The seven Standard Samples of Aloe barbadensis gel extract, Process A (Crude gel, lyophilized directly from 1:1 gel without processing) were suspended at a concentration of 0.59 g/100 ml in deionized water and conductivity determined with a Radiometer Conductivity Meter (Copenhagen, Denmark). Values expressed are mean conductivity in reciprical OHMs per cm.

We have not observed this to date in our analysis of commercial Aloe powders (which are usually adulterated with low ionic strength maltodextrin) although it may occur with liquid gels. Further efforts are underway to chemically analyse Aloe in order to discover molecules in Aloe – particularly those chemicals mediating the biological effects of Aloe – that can serve as rigorous certification standards. Recently studies have focused on the use of HPLC because of the ability of this technique to separate components without prior extraction or derivitization. Efforts have been made using this technique to find a molecule that serve as a diagnostic marker for high quality Aloe.

What is HPLC

Chemical tests tend to fall into two categories: 1. tests where the molecule we attempt to measure (the analyte) is detected by a highly specific chemical reaction and 2. tests which first separate analytes one from another and then detect analytes by methods which rely on general physical-chemical properties of broad classes of compounds. Classic examples of the first type of test are the analysis of sugar and protein in blood and urine. HPLC, thin layer chromatography and gas chromatography are the best known examples of the second type of test. **Figure 7** illustrates in skematic fashion an HPLC for Aloe barbadensis gel extracts and **Table V** lists the conditions for its use.

The IASC Diagnostic Molecule – E Peak

Approximately 10 years ago, Dr. Fleming found emperically that cation exchange matrices (bonded amine HPLC columns) yeilded a pattern for Aloe that could be interpreted after some degree of experience. At Aloecorp, it was noted that in commercial preparations of Aloe, there was a late eluting peak that was consistently present in fresh Aloe (**Figure 8**, upper Panel, peak eluting at approximately 12.5 minutes). This peak appeared to correlate with a commercially acceptable product. In many commercial preparations this was the fifth peak, in order, to elute. Since peaks are usually named with letters in the order that they elute (e.g. A, B, C, D, E, etc.) this diagnostically useful material was termed »E peak«. Unfortunately, the chemical identity of this material was unknown at that time. Furthermore, no chemically pure reference standards were available for calibration of quantitation and no standard samples were available for standardization of retention time. Even so, the needs for quality control and quality assurance were pressing enough so that the HPLC method was adopted as part of the certification process. A standard proceedure has been suggested by the IASC for this proceedure (**Table V**).
In January of 1991 the Aloe Research Foundation decided to adopt this system as one of criteria for the analysis of Aloe and systematic efforts were made to include this analysis in our explorations of the biological activities of purified Aloe materials. The first stage in our studies was to produce a set of reference samples of Aloe barbadensis representative of the native plant or of commercial materials prepared under carefully defined conditions – the ARF Standard Samples. In the Texas A & M study, »E Peak« was present in all samples tested. By comparison with this population we are confident that the HPLC profiles of the ARF Standard Samples are representative of Aloe barbadensis commercially grown in the lower Rio Grande Valley.

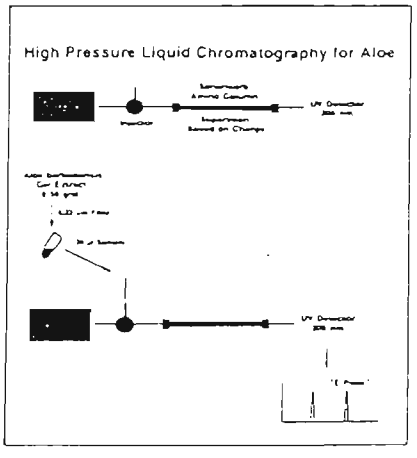

Fig. 7. Skematic of HPLC

Properties of »E Peak«

Preliminary studies of the IASC diagnostic molecule »E Peak« has yeilded the following preliminary findings **Table VI**. »E Peak« is a highly acidic molecule based on its extractive properties and late elution from the cationic amino column. It is heat stable (105° C) even in the presence of sodium hydroxide (although it is labile at pH 1). It is reasonably stable in sterile solutions (several weeks at 4° C). **Figure 9** demonstrates that »E Peak« is not removed during usual industrial processing which includes Pasteurization, activated charcoal absorbtion and filtration in the presence of Celite diatomaceous earth (On this particular HPLC column, »E Peak« elutes at approximately 10 minutes. The variability of elution time with aging of the column emphasizes the need for the use of ARF Standard Samples for calibration of the technique). »E peak« has relatively little UV absorbance suggesting the absence of aromatic rings (thus ruling out an anthraquinone or chromone structure) or conjugated dienes. Studies that we will present later demonstrate that this material is readily assimilated by bacteria that are capable of growing in Aloe. Gel fil-

tration of commercial Aloe materials results in concentration of this material in fractions of molecular weight less than 500 but it is larger than the inorganic anions and cations abundant in Aloe. Studies of these gel filtration fractions by Dr. *W. D. Winters* at the University of Texas Health Sciences Center in San Antonio suggest that this material is neither an in vitro growth factor nor is it particularly toxic to cells in culture.

Over the last year we have been purifying »E peak« from a number of ARF Standard Samples by classical organic chemical means. The lower panel of Figure 8 illustrates the purity of the material we have isolated. Currently, we and others are engaged in determining the structure of »E peak«. The techniques we are using include measuring the absorbtion of light in the ultraviolet and infrared regions (which tells us about the bonds connecting the atoms), mass spectroscopy (which measures the size of the molecule and tell us how it breaks apart) and nuclear magnetic resonance spectroscopy (which measures the vibration of the atoms in a magnetic field and tells us which atoms are hooked to each other). These studies will allow us to draw a picture of the chemical structure of »E Peak«.

Bonded Amino Column (Alltech, 4 mm × 250 mm)	
Mobile Phase:	70% Acetonitrile 0.05M dihydrogen phosphate (pH 5.6)
Flow rate:	1 ml per minute
Eluates monitored at 205nm.	
Samples prepared by passage through 0.22μm filter	
Sample volume:	20μl

Table V IASC Standard Procedure for HPLC Analysis of Aloe barbadensis Extracts

Present in Highest Concentration in Fresh Leaf Extracts
Unaffected by Commercial Processing
Presumably Acidic with Significant Nonpolar Component
Stable to Heat and Base
Not an Anthraquinone
Assimilable by Aloe Associated Bacteria
Low Molecular Weight
Neither Growth Inhibitor nor Growth Factor

Table VI Characteristics of the IASC Diagnostic Molecule (»E Peak«)

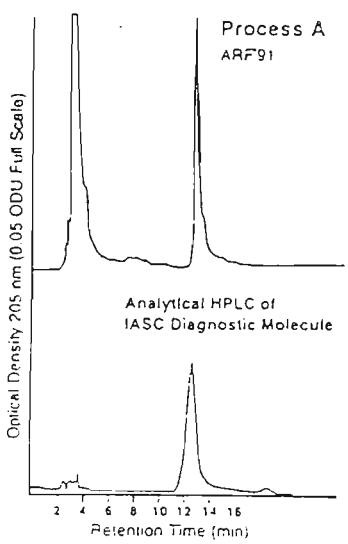

Fig. 8. Upper panel: HPLC Analysis of ARF Standard Samples of Aloe barbadensis Gel Extract # 1 for 1991 (ARF '91A). This material was Process A (Crude gel, frozen 1:1 gel, without processing). This material was thawed, passed through a 0.2 μm filter and 20μl was injected. Samples were chromatographed under IASC conditions (Table V). »E Peak« is considered to be the peak eluting at 12.5 minutes. Note that in the lower panel, »E Peak« is considered to be the peak eluting at 12.3 minutes. This degree of variation is considered to be usual with isocratic elution from Amino columns and appears to be a partial function of column loading as exemplified by the relative size of the upfield peaks. As the column »ages« there is a tendency for the peak to elute at earlier retention times which is only partially reversed by treatment of the column with strong organic solvents. Extremes of pH are to be avoided in attempts to »regenerate« the column as these may »strip« the amino groups from the matrix.

Lower Panel: HPLC Analysis of Purified »E Peak« IASC Diagnostic Material. Material was isolated by two cycles of solvent extraction followed by preparative HPLC on a 26 mm diameter Spherisorb NH_2 column in IASC buffer. Pooled material was concentrated by rotary evaporation to remove acetonitrile and the aqueous solution was lyophilized. The amount of phosphate in the sample was calculated from the composition of the Buffer. Approximately 5 μg of purified »E Peak« was injected. Conditions of HPLC are IASC Standard conditions except for scale (0.05 ODU full scale in this figure)

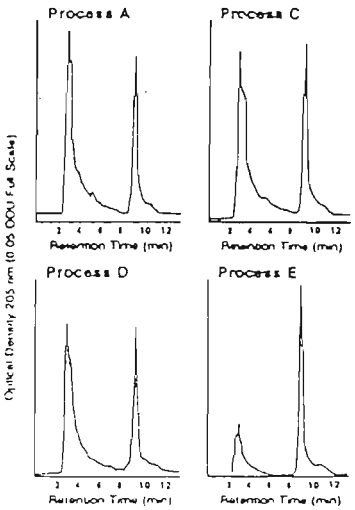

Fig. 9. Effect of »Commercial Processing« of Aloe barbadensis Gel Extracts upon Content of »E Peak«. The materials were from Aloe Research Foundation Standard Sample # 4 for 1991 (ARF '91D). Samples consisted of the following: Process A (Crude Gel, lyophilized directly from 1:1 gel without processing), Upper Left Panel; Process C (Gel Pasteurized for 15 minutes at 65° C and then frozen and lyophilized without

further processing); Upper Right Panel; Process D (Pasteurized Gel, incubated with Celite diatomaceous earth »Filteraid« and then passed through a cellulose filter), Lower Left Panel; and Process E (Pasteurized Gel, incubated with Norite activated charcoal »Darcoal« and diatomaceous earth and then filtered), Lower Right Panel. These materials were stored frozen and after thawing filtered through 0.2 μm filters before 20 μl were injected. Columns were run under IASC Standard conditions.

HPLC and the Bacteriology of Aloe

Studies, at the University of Texas, in collaboration with Dr. *J. Heggers*, and in the laboratory of Dr. *L. Sheffield* at the University of Wisconsin, have shown that Aloe barbadensis extracts are bacteriostatic for a wide variety of organisms. However, there are some bacteria, particularly those organisms associated with the rind of Aloe, that are capable of growing in Aloe gel. We have isolated a wide variety of bacteria from ARF preparations and have maintained these organisms as pure cultures on artificial media. Under certain circumstances bacteria can cause commercial problems with Aloe extracts.

Some of the organisms we have identified are, indeed, the same as organisms causing commercial problems. Earlier, studies at Aloecorp had noted that »E Peak« was decreased or absent in preparations of Aloe contaminated with large numbers of bacteria. An emloyee of Nam Yang Aloe Company, *B. S. Kang* recently spent some time in the University of Texas laboratory examining this problem systematically. Aloe extracts can be absolutely sterilized – either by membrane filtration or by high (105° C) heat without the loss of »E. Peak«. This sterile Aloe can then serve as a growth media to explore, in controlled fashin, the growth of defined organisms (Figure 10). Some bacteria, such as members of the genus Bacillus (**Figure 10, Panel A**), are incapable of growing in liquid Aloe-containing medium. Other bacteria, such as the Gram– rod Cedecea (Panel B) or the Gram+ coccus Enterococcus (Panel C), are capable of multiplying in Aloe 9 fold in 24 hours at room temperature. Aloe extracts in which bacteria have not grown have a normal »E Peak« content (**Figure 10, Panel A**). However, the growth of certain bacteria such as Cedecea or Enterococcus causes the disappearance of »E Peak« from the Aloe – presumably because the bacteria eat it. Additionally new peaks appear in the chromatogram (e.g. Panel B, at 5.5 and 12 minutes; Panel C, 5.5 minutes) that were not present in fresh Aloe. Interestingly enough, by these experiments we can produce a chromatograph that looks very much like the HPLC profile (Panel D) we observe in ARF Crude Gel that has been allowed to sit at 4° C for three weeks without Pasteurization or any preservatives.

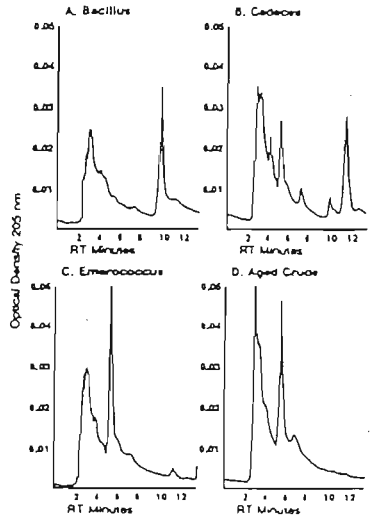

Fig. 10. Effect of growth of bacteria in Aloe barbadensis Gel Extracts upon Content of »E Peak«. The culture media consisted of Aloe Research Foundation Standard Sample # 4 for 1991 (ARF '91D) Process D (Pasteurized Gel, incubated with Celite diatomaceous earth »Filteraid« and then passed through a cellulose filter). The Aloe liquid was sterilized by sequential passage through membrane filters terminating in a 0.2 μm filter. Organisms were isolated by at least two cycles of picking and streaking isolated colonies. Taxonomy was determined by morphology on Gram stain and biochemical typing (Autobac). Bacteria were innoculated into sterile Aloe at a concentration of approximately 30,000 CFU/ml. Bacterial numbers were determined by dilution and spread plating on respectively Yeast Extract Nutrient Agar (Bacillus), Levine Agar (Gram negative organisms), and Columbia CNA Agar (Gram positive cocci). Cultures were incubated at 23° C and organisms enumerated and samples taken for HPLC analysis at 8 hour intervals. By 36 hours, the cultures innoculated with the Gram negative rods and the Gram positive cocci had attained stationary phase (> 100,000,000 CFU). Samples were filtered through 0.2 μm filters prior to HPLC analysis. Aged Aloe consisted of ARF '91D Process A material that was never lyophilized or frozen. Rather it was stored, without preservatives, at approximately 23° C until analysis.

Caveats About HPLC

Experiments such as these suggest that HLC cannot only be used to tell if fresh Aloe is present, but can also tell us something about how carefully the Aloe was handled and processed. HPLC promises to add a whole new dimension to Aloe quality control. However, it is obvious that the Interpretation of HPLC profiles is complicated and we should be cautious when we read HPLC chromatograms. Commercial materials frequently contain preservatives (anti-oxidants and anti-microbials). These compounds and their breakdown products introduce novel peaks to the chromatograms. During the production of beverages other additives are added that can further complicate interpretation. Since the final elucidation of the structure of »E Peak« remains incomplete, we must at present rely on the use of ARF Standard Samples for calibration of the HPLC technique. All of the authors strongly recommend against over interpretating HPLC »fingerprints« and over reliance on a single technique for quality control of Aloe.

New Techniques Under Development

Currently we are developing an assay to measure the polysaccharides that comprise the bulk of the large molecules in Aloe. The purpose of these tests is not based solely because of their content in Aloe but because maltodextrin apparently is commonly being used to adulterate Aloe powders. The technique, using freeze-dried or spray-dried powder (**Figure 11**) is based upon the older publications isolating and characterizing the different subclasses of polysaccharides found in different Aloe species *(9–13)*. The polysaccharides are precipitated by classical means using alcohol. In authentic Aloe only 10–25% of the material precipitated is polysaccharide.

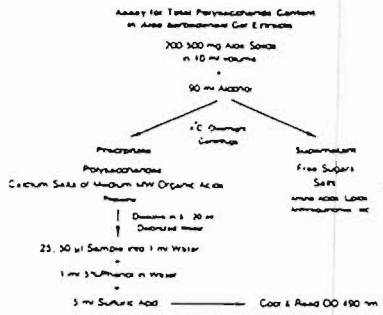

Fig. 11. Assay for Total Polysaccharides.

The rest of the mass consists of poorly alcohol soluble complexes of organic acids and divalent cations. The polysaccharide in the precipitate is then measured with the Dubois assay for total hexose *(25)*. As **Figure 12** illustrates, free sugars such as mannose have minimal activity in this test while approximately one half of the mass of commercial maltodextrin is alcohol precipitable hexose. ARF Standard Sample Aloe barbadensis gel extract (ARF'93A, Process E) contains about 6 % polysaccharide as alcohol precipitable hexose – a value in keeping with those in the scientific literature. Commercial »Aloe« powders containing amounts of alcohol precipitable hexose similar to maltodextrin are likely, in fact, to be maltodextrin. Confirmation that this is so requires hydrolysis of the polysaccharide, sugar analysis, and analysis of the likages involved. Such confirmatory studies are obviously more the task of academic laboratories than industrial quality control laboratories. However, the test for total polysaccharides outlined above offers a quick, cheap and easy method for initial screening of powders.

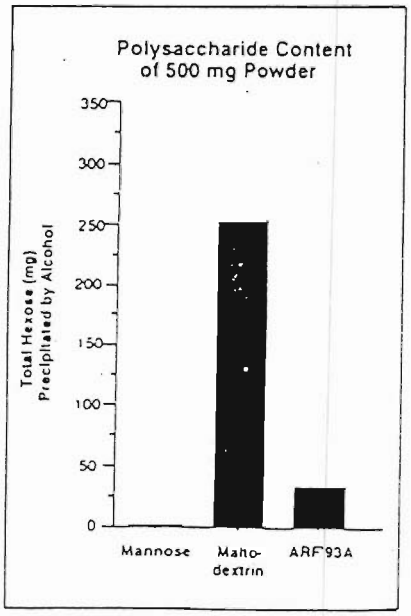

Fig. 12. Polysaccharide content of 500 mg powder.

Obiously, our tests for polysaccharides must undergo the same sorts of analytical development, data base accumulation, and industrial confirmation as the tests for ions and HPLC have undergone. However, this is the first assay that tests the macromolecules of Aloe. Hopefully with time assays for Aloe macromolecules will, probably in some modified form, become accepted by the IASC.

Conclusions

What we have achieved to date is this. There are at present several tests for determining the quality of Aloe feedstocks. The authors do not regard any single test as definitive but we believe that they are best run in ordered sequence. The best strategy is to buy a IASC Certified feedstock. In the case of materials such as Aloe powders where no IASC Certified feedstocks are available, it is best to buy material from an IASC Certified producer. Common sense dictates that producers who have something to hide, avoid certification. If tests are needed, the first test to be run can be ionic strength using ARF Standard Samples as controls. If ionic strength is more than 75 % lower than ARF Standard Sample then the individual ions should be measured by atomic absorbtion spectroscopy. If HPLC equipment is available, a profile should be generated using a Spherisorb Amino packing under IASC conditions. The fingerprint should be compared to ARF Standard Sample Aloe. The degree of testing employed should be a function of the capabilities of the quality control lab and the suspection with which the feedstock is viewed.

We are continuously adding new analytes to the QC armamentarium. In the future, the availability of purified »E peak« will mean that we can quantitate the freshness of Aloe with a precision and reproducibility we never before had. Whether or not »E peak« will be truely useful in identifing a product as Aloe will depend upon how widely distributed »E peak« is in nature, its structural identity and its biological activity. Next, will be the deployment of assays for polysaccharides. In the far future, as the ARF identifies the active ingredients in Aloe, we will be able to develope chemical tests based on biological activity.

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Copies of articles pertaining to Aloe not commonly accessible in general public or academic libraries may be obtained from the Aloe Research Foundation library service. These are often from industrial publications such as references 1–5 above or from somewhat obscure scientific journals (such as references 6, 11, 18 & 19 above). Contact Dr. *T. Tolbert,* Executive Director, Suite 800, 910 Houston St., Fort Worth, Texas 76102-6627.

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