



Centro de Gestión Empresarial de Ñuble

*“Ayudando Al Crecimiento y Fortalecimiento
de las Empresas Agrícolas”*

INFORME TÉCNICO Y DIFUSIÓN

Misión de Captura Tecnológica de Valor

Agregado y Gestión Apícola a Manitoba, Canadá.



Ramón E. Paredes Vega
Coordinador Misión



GOBIERNO DE CHILE
INDAP



GOBIERNO DE CHILE
FUNDACIÓN PARA LA
INNOVACIÓN AGROPECUARIA

OFICINA DE PARTES - FIA	
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Fecha	17 ABR 2006
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INFORME TÉCNICO

Fecha de entrega del Informe

17 de abril de 2006

Nombre del coordinador de la ejecución

Ramón E. Paredes Vega

Firma del Coordinador de la Ejecución

Ramón Paredes Vega
Gerente
Centro de Gestión Ñuble

1. ANTECEDENTES GENERALES DE LA PROPUESTA

Nombre de la propuesta

Misión de Captura Tecnológica Valor Agregado y Gestión Apícola a Manitoba, Canadá

Código

FIA-CD-V-2005-1-P-078

Entidad responsable

Centro de Gestión Empresarial de Ñuble S.A.

Coordinador(a)

Ramón E. Paredes Vega

Tipo de Iniciativa(s)

☒ Gira ☐ Beca ☐ Evento ☐ Consultores ☐ Documentos

Fecha de realización (inicio y término)

24 de septiembre a 01 de octubre de 2005



2. RESUMEN DE LA PROPUESTA

Resumir en no más de una página la justificación, actividades globales, resultados e impactos alcanzados con la propuesta completa. Cuando exista más de una iniciativa, cada una de ellas debe ser resumida en forma específica. Estos resúmenes deben sintetizar los aspectos principales de la propuesta y cada una de sus iniciativas en forma general.

GLOBAL (Completar sólo cuando existe más de una iniciativa)

GIRA TECNOLÓGICA

Durante el mes de septiembre de 2005 se realizó Misión de Captura Tecnológica Valor Agregado y Gestión Apícola a Manitoba, Canadá la que estuvo conformada por siete personas entre profesionales y productores apícolas. En la Misión participaron dos instituciones vinculadas al agro como es el Centro de Gestión de Nuble y la Universidad de Concepción y tres empresas apícolas de la VIII Región como son la Cooperativa Campesina Apícola Coasba Limitada, Comité de Apicultores Futuro de Chillán y Cooperativa Miel de Los Ángeles Limitada. La iniciativa fue financiada por FIA y concretada a través de la alianza estratégica establecida con el Gobierno Provincial de la Provincia de Manitoba y la Universidad de Manitoba.

La agenda comprendió la visita a una de las más grandes cooperativa de comercialización de miel de Canadá (Bee Maid Honey Ltda.) donde fue posible ver el grado de asociatividad que muestran los apicultores. Además fue posible visitar la planta de fraccionamiento de miel y recorrer el proceso completo. Seguido de ello se visitaron productores apícolas de la Provincia de Manitoba donde se pudo compartir experiencias sobre manejo sanitario y extracción de miel. Se pudo visitar salas de extracción de miel de distintos grados tecnológicos, de una a dos líneas de envasado. Posteriormente se pudo visitar productores apícolas dedicados a la producción de subproductos como son polen y cera. Con ellos se vio la importancia de considerar a la colmena como una fuente de productos, todos los cuales deben ser comercializados. Un tema aparte es la visita realizada a un productor apícola dedicado a la confección de materiales apícolas como son alzas, y marcos. En cuanto a visitas, éstas se finalizaron en la Universidad de Manitoba donde fue posible visitar el laboratorio de entomología, conversar con dos de los investigadores y compartir experiencias en los temas de interés y que están siendo investigados.

El resultado de la Misión considera temas como manejo sanitario, gestión y producción de subproductos. Todos ellos, son indicados más adelante.



GOBIERNO DE CHILE
FUNDACIÓN PARA LA
INNOVACIÓN Y LA PAZ

BECAS

CONSULTORES

EVENTOS

DOCUMENTOS TÉCNICOS



3. ALCANCES Y LOGROS DE LA PROPUESTA GLOBAL

Problema a resolver, justificación y objetivos planteado inicialmente en la propuesta

El Objetivo General de la iniciativa es el siguiente:

Aumentar la competitividad y rentabilidad de los microempresarios del rubro apícola mediante la participación a una gira de captura tecnológica a Canadá sobre el manejo sanitario, productivo, valor agregado, organización, diversificación, gestión y comercialización.

Respecto de los Objetivos Específicos éstos son los siguientes:

OBJETIVO ESPECÍFICO 1:

Aumentar y fortalecer los lazos de comunicación, coordinación y cooperación entre los actores insertos en el sector apícola nacional.

OBJETIVO ESPECÍFICO 2:

Fortalecer programas de formación y capacitación de capital humano relacionados con el área productiva, obteniendo la profesionalización y especialización de los apicultores.

OBJETIVO ESPECÍFICO 3:

Incrementar productividad apícola mediante el uso de tecnología apropiada a la actividad, como el adecuado diagnóstico y tratamiento de las enfermedades que afectan a las abejas, técnicas de manejo en alimentación apícola, producción de miel y uso oportuno del potencial productivo de la flora melífera y polinífera disponibles en el país.

OBJETIVO ESPECÍFICO 4:

Incrementar la rentabilidad de las empresas apícolas, incorporando tecnología de valor agregado a la producción, envasado y creación de nuevos productos apícolas al mercado, como mieles monoflorales, mieles con polen, jalea real, propóleos, cera, apitoxinas y material genético.

OBJETIVO ESPECÍFICO 5:

Generar una plataforma de confianza con los clientes (importadores de miel) que permita en el mediano plazo, diversificar la oferta exportadora de productos apícolas chilenos libre de residuos.

OBJETIVO ESPECÍFICO 6:

Mejorar la gestión productiva, administrativa y comercial de las organizaciones asesoradas por el Centro de Gestión Empresarial Nuble.

OBJETIVO ESPECÍFICO 7:

Mejorar las directrices de inversiones monetarias de recursos gubernamentales hacia el sector apícola para el fomento productivo, valor agregado, gestión, incorporación de tecnología e investigación.



Objetivos alcanzados tras la realización de la propuesta

Respecto de los objetivos alcanzados tras la realización de la Propuesta, estos se detallan a continuación:

OBJETIVO ESPECÍFICO 1:

Aumentar y fortalecer los lazos de comunicación, coordinación y cooperación entre los actores insertos en el sector apícola nacional.

Resultado: Este objetivo fue alcanzado satisfactoriamente dada la articulación que se ha logrado establecer entre Empresas Asociativas Campesinas EAC, y Empresas Individuales EI en torno a actividades de capacitación e investigación que se encuentran desarrollando tanto la Universidad de Concepción como el Centro de Gestión Nuble. Posterior a la iniciativa, se ha logrado

OBJETIVO ESPECÍFICO 2:

Fortalecer programas de formación y capacitación de capital humano relacionados con el área productiva, obteniendo la profesionalización y especialización de los apicultores.

Resultado: El resultado de este objetivo fue cumplido satisfactoriamente dado que fruto de la Misión de inició el trabajo tendiente a traer un número de productores apícolas de Canadá a trabajar en las Empresas Asociativas de la Región produciéndose un intercambio de conocimientos mutuos. Además de ello, se encuentra en período de selección de productores apícolas chilenos para replicar dicha iniciativa.

OBJETIVO ESPECÍFICO 3:

Incrementar productividad apícola mediante el uso de tecnología apropiada a la actividad, como el adecuado diagnóstico y tratamiento de las enfermedades que afectan a las abejas, técnicas de manejo en alimentación apícola, producción de miel y uso oportuno del potencial productivo de la flora melífera y polínifera disponibles en el país.

Resultado: El resultado de este objetivo fue logrado satisfactoriamente dado que fue posible obtener información relevante sobre el manejo sanitario realizado por los productores avícolas canadienses y filtrar aquellos manejos posibles de replicar en Chile. Sin embargo ello, es posible indicar que en cuanto a manejo sanitario existen sólo algunas diferencias y estas están orientadas a la tecnificación de las labores.

OBJETIVO ESPECÍFICO 4:

Incrementar la rentabilidad de las empresas apícolas, incorporando tecnología de valor agregado a la producción, envasado y creación de nuevos productos apícolas al mercado, como mieles monoflorales, mieles con polen, jalea real, propóleos, cera, apitoxinas y material genético.

Resultado: Este punto fue muy exitoso dado que abrió una puerta para que los productores apícolas visualizaran el nivel tecnológico alcanzado en Canadá y hacia donde debe mirar el sector en cuanto a valor agregado y subproductos. Por otro lado, cobró cada vez más importancia la asociatividad para lograr contar con salas de extracción de miel de elevada tecnología y salas de fraccionamiento de miel comunitarias. Quedó muy clara la necesidad de asociarse para poder contar con esta infraestructura.

OBJETIVO ESPECÍFICO 5

Generar una plataforma de confianza con los clientes (importadores de miel) que permita en el mediano plazo, diversificar la oferta exportadora de productos apícolas chilenos libre de residuos

Resultado: Este objetivo fue completamente cumplido dado que fue posible visualizar el respeto y profesionalismo de los apicultores al desarrollar su actividad. Existe una gran conciencia en cuanto a los productos veterinarios que pueden ser utilizados y de la calidad e inocuidad de la miel. Todo ello fue expuesto en la jornada de Difusión y transmitido a los productores apícolas presentes. Esto ha sido fortalecido en Chile a través del Programa de Trazabilidad del Servicio Agrícola y Ganadero SAG y del Programa de Buenas Prácticas Agrícolas del Instituto de Desarrollo Agropecuario INDAP.

OBJETIVO ESPECÍFICO 6:

Mejorar la gestión productiva, administrativa y comercial de las organizaciones asesoradas por el Centro de Gestión Empresarial Nuble.

Resultado: Este objetivo fue cumplido exitosamente en cuanto a la información de las empresas asociativas como son las cooperativas. En reunión con el CEO de Bee Maid Honey pudimos ver en detalle la importancia que le dan a la asociatividad en Canadá y el grado de valorización a los servicios entregados por la empresa. Sin embargo creemos que el conocimiento adquirido a nivel de productor en el ámbito de gestión fue escaso, dado que en general no mostraron gran desarrollo del tema, ni en contar con registros productivos ni por contar con indicadores de gestión.

OBJETIVO ESPECÍFICO 7:

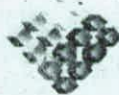
Mejorar las directrices de inversiones monetarias de recursos gubernamentales hacia el sector apícola para el fomento productivo, valor agregado, gestión, incorporación de tecnología e investigación.

Resultado: El cumplimiento de este objetivo fue clave en el desarrollo de la Misión, dado que permitió orientar las inversiones tanto a mediano como a largo plazo en los productores que participaron en la Misión. Es así como cada uno de ellos volvió a redefinir el plan de inversión de su empresa orientándolo a la tecnificación de los procesos, a la construcción de Salas de Extracción comunitarias y Salas de Fraccionamiento de miel. Un caso visible es el de la Cooperativa Coasba Limitada quien se encuentra ad portas de inaugurar su Planta de Fraccionamiento de miel destinada a mercado interno.

Resultados e impactos esperados inicialmente en la propuesta

Con esta gira se pretendió generar el fortalecimiento de las organizaciones apícolas en base a propuestas que actualicen y den soluciones a las necesidades productivas y comerciales que los apicultores tienen. Se esperaba obtener las herramientas e información necesaria para dar una base sustentable a la realización de propuestas que generen programas funcionales de participación masiva entre los actores de este rubro, y cuyos resultados esperados específicos son:

a) Mejorar manejo sanitario de los problemas que afectan a las abejas en el país, de manera disminuir pérdidas productivas y generar productos apícolas libres de residuos químicos. Se considera obtener información relevante sobre el diagnóstico de parásitos y enfermedades apícolas, su etiología, epidemiología y técnicas de manejo profiláctico y control de *Varroa*



destructor, *Nosema apis*, *Melissococcus pluton*, *Ascosphaera apis*, *Acarapis woodi*, entre las patologías más importantes presentes en nuestro territorio

b) Obtener técnicas actualizadas y de vanguardia para producción de miel, tales como crianza de reinas, nutrición apícola, manejo de invernada, control de enjambración, modelos de mejoramiento genético orientado al aumento de la productividad, tecnología del mejor aprovechamiento de la flora melífera y optimización de la oportunidad de la cosecha de miel.

c) Obtener acceso a tecnología relevante para dar base a la diversificación de la producción apícola y su comercialización, tales como técnicas de manejo, extracción y manejo de post cosecha de los diferentes productos posibles a obtener en el rubro apícola, como Jalea Real, polen, propóleos, apitoxinas, abejas reinas y paquetes de material biológico como núcleos y/o abejas.

d) Obtener la experiencia de una organización exitosa y funcional como modelo para ser desarrollada en nuestro territorio en el tema de cooperación productiva, de comercialización interna de los productos, en la visión país como productores exportadores y en la participación activa entre los agentes productores del sector privado y los organismos gubernamentales, específicamente, centros de investigación, financieros y promotores del sector agropecuario.

e) Obtener una propuesta clara y funcional para mejorar la calidad en gestión empresarial, comunicacional, organizacional y comercial de los productores nacionales del rubro apícola.

Resultados obtenidos

Descripción detallada de los conocimientos y/o tecnologías adquiridos y/o entregados. Explicar el grado de cumplimiento de los objetivos propuestos, de acuerdo a los resultados obtenidos. Para consultorías es necesario anexar el informe final del consultor.

1. Generalidades

Desde inicio del año 2005 el Centro de Gestión de Ñuble junto a cuatro Empresas Asociativas Campesinas (EAC) acordaron realizar una actividad tendiente a incorporar valor agregado a los productos producidos por los socios de dichas EAC. Es así como posterior a ello se toma contacto con la Universidad de Concepción y se concreta –a raíz de la visita de Rheal Lafrenière de Manitoba Agricultura- la idea de presenta a Fundación para la Innovación Agraria FIA una propuesta tendiente a cumplir dichos objetivos. De esta forma en el mes de agosto de 2005 se presenta a FIA la propuesta, la que incorpora aspectos de valor agregado y gestión apícola, la que es finalmente aprobada.

2. Alcance

A partir de día 23 de septiembre y hasta el 02 de octubre se realizó Misión de Captura Tecnológica de Valor Agregado y Gestión a Manitoba, Canadá visitando instalaciones, apicultores, Instituciones de Educación Superior, Cooperativas apícolas. En la actividad participaron 7 personas entre profesionales, académicos y apicultores (Figura 1).



Figura 1. Participantes en Misión de Captura Tecnológica de Valor Agregado y Gestión Apícola a Manitoba, Canadá.

3. Objetivos

Los objetivos específicos perseguidos en la Misión fueron los siguientes:

- o Aumentar y fortalecer los lazos de comunicación, coordinación y cooperación entre los actores insertos en el sector apícola nacional.
- o Fortalecer programas de formación y capacitación de capital humano relacionados con el área productiva, obteniendo la profesionalización y especialización de los apicultores.
- o Incrementar la productividad apícola mediante el uso de tecnología apropiada a la actividad, como el adecuado diagnóstico y tratamiento de las enfermedades que afectan a las abejas, técnicas de manejo en alimentación apícola, producción de miel y uso oportuno del potencial productivo de la flora melífera y polenífera disponible en el país.
- o Incrementar la rentabilidad de las empresas avícolas, incorporando tecnologías de valor agregado a la producción, envasado y creación de nuevos productos avícolas al mercado, como mieles monoflorales, mieles con polen, jalea real, propóleo, cera, apitoxina y material genético.
- o Generar una plataforma de confianza con los clientes (importadores de miel) que



permita en el mediano plazo, diversificar la oferta exportadora de productos apícolas chilenos libre de residuos

- o Mejorar la gestión productiva, administrativa y comercial de las organizaciones asesoradas por el Centro de Gestión Empresarial de Ñuble.
- o Mejorar las directrices de inversiones monetarias de recursos gubernamentales hacia el sector apícola para el fomento productivo, valor agregado, gestión, incorporación de tecnología e investigación.

4. Desarrollo de la Misión

Generalidades

Canadá pertenece a la parte norte del continente americano. Es un país de enorme extensión geográfica, de hecho es el segundo más grande del mundo, con 6 diferentes husos horarios. Tiene fronteras con el Océano Atlántico (Este), el Océano Pacífico (Oeste), los Estados Unidos (Sur) y el Océano Ártico (Norte). Es una tierra de grandes bellezas naturales. Posee vastas costas, bosques, montañas, lagos y extensas praderas. En la Figura 1 se observa un mapa de Canadá:



Figura N° 2. Mapa Canadá.

Canadá mide más de 7 mil kilómetros de Este a Oeste, desde St. John en Newfoundland, hasta Victoria en British Columbia. Se necesitan más de 7 días para recorrer en automóvil Canadá de punta a punta, en tren se demora más de tres días y en avión el mismo viaje demoraría más de 7 horas. El centro del país está atravesado por Las Grandes Llanuras, en las que se cultivan cereales y se cría ganado. La mayoría de los canadienses vive cerca de los Grandes Lagos y del río San Lorenzo.

Clima

El inmenso tamaño de Canadá permite experimentar un amplio rango de climas desde las cálidas y húmedas costas del Pacífico y la más fría y brumosa costa del Atlántico, hasta las islas del helado Ártico norte. En muchas partes del mundo, Canadá se asocia con nieve y un clima extremadamente frío. En efecto, varía de una región a otra y de una estación a otra. Cuando se visita Victoria, en el medio del invierno, por ejemplo, se necesita solo un buen suéter para mantenerse caliente; pero si se va a Churchill, durante la misma estación, habría que vestirse como un verdadero inuit o esquimal. Si se regresa a esta región del lejano norte canadiense, en el medio del verano, se encontrará que las tardes son tan templadas como largas. Para entender mejor esta situación, conviene observar las características y variaciones climáticas de las principales regiones del país, ejemplificadas con algunas de sus ciudades más importantes:

Montañas Rocosas y Pacífico: zonas bañadas por las corrientes formadas por el cálido y húmedo aire del Pacífico, las cuales hacen que la costa de British Columbia tenga el clima más moderado de Canadá. Por su parte, Vancouver y Victoria, las ciudades más populosas de esta provincia, disfrutan de veranos placenteros y relativamente secos y de inviernos húmedos moderados. Las nevadas son raras en las áreas de baja altitud y, cuando cae nieve, generalmente se derrite el mismo día. Lo mismo ocurre en Prince Rupert, a pesar de que queda mucho más al norte, donde solo unos pocos centímetros de nieve permanecen en la superficie durante el invierno. Sin embargo, las localidades situadas más al norte, a veces registran temperaturas más frías, especialmente en verano. La ciudad de Jásper, que se halla en las Rocosas, tiene un clima severo, ya que su localización en las montañas origina inviernos mucho más fríos, largos y con más nieve. El verano, no obstante, es tan caliente allí como en la costa.

La duración del invierno en las más importantes ciudades de este territorio se especifica en el siguiente cuadro:

Ciudad	Nieve sobre el terreno
Victoria	Desde diciembre a enero
Vancouver	Desde diciembre a febrero
Prince Rupert	Desde diciembre a febrero
Jásper	Desde noviembre a marzo
Edmonton	Desde noviembre a marzo

Praderas y Manitoba del Norte: extendidas entre las Montañas Rocosas y los Grandes Lagos, las planicies de Alberta, Saskatchewan y Manitoba se encuentran entre las más ricas regiones cultivadoras de granos del mundo. Estas vastas praderas tienen un típico clima continental: inviernos fríos, veranos calientes y lluvia relativamente escasa. En Saskatchewan, por ejemplo, la precipitación anual promedio es solo de 350 mm aproximadamente (comparados con cerca de 1.000 mm en Vancouver y Montreal). El "chinook" es una de las características climáticas más sorprendentes de las praderas. En invierno, este viento cálido, normalmente seco, en ocasiones desciende de las Rocosas,



ubicada en la punta norte de Manitoba, en la costa del vasto mar interior conocido como bahía de Hudson (Hudson Bay), presenta un clima extremo propio del norte. Hemmed, cerca del Escudo Canadiense - una región rocosa, rica en minerales de toda clase -, situada en el lejano norte del país, tiene el clima más intenso, por el frío y la duración de los inviernos; pero también el más hermoso, por sus paisajes cubiertos de hielo y las luces del norte.

La duración del invierno en las más importantes ciudades de esta región se detalla a continuación.

Ciudad	Nieve sobre el terreno
Saskatoon	Desde noviembre a marzo
Winnipeg	Desde noviembre a marzo
Churchill	Desde octubre a abril

Tipo de Gobierno

Canadá es una monarquía constitucional. La Reina Isabel II de Inglaterra es la Jefa de Estado y es representada en Canadá por el Gobernador General. En la actualidad, Canadá pertenece al "Commonwealth" o Comunidad Británica de Naciones, asociación libre de 50 estados independientes soberanos que formaron parte de la corona Británica.

Canadá es gobernada por un sistema organizado de leyes. Estos reglamentos son creados por los gobiernos elegidos libremente por la gente, de acuerdo con los principios de la democracia parlamentaria.

El país tiene un gobierno federal, compuesto por tres poderes principales: el Ejecutivo, el Legislativo y el Judicial.

Posee una democracia parlamentaria integrada por un Senado y una Casa de los Comunes. Un Primer Ministro es el líder del partido con mayoría de los comunes. El gobierno federal es responsable por una amplia gama de asuntos de corte nacional, incluyendo defensa, política internacional, comercio, justicia criminal y beneficios sociales. El gobierno federal comparte con el gobierno de las provincias el control de la inmigración, la agricultura y muchas otras responsabilidades conjuntas.

Los gobiernos de las provincias controlan la educación, salud y servicios sociales. Cada una de las 10 provincias posee la misma estructura de gobierno federal, incluso tienen su propio parlamento. Los gobiernos de los territorios también poseen asambleas legislativas electas, pero tienen menos poderes que los gobiernos de las provincias.

Los canadienses eligen a los miembros de la casa de los comunes una vez cada 5 años. El Primer Ministro determina la fecha de estas elecciones. Los ciudadanos mayores de 18 años tienen el derecho a ejercer el voto (secreto), tal como lo establece la constitución.



Agricultura

En Canadá existe un Ministerio Federal o Canadiense que regula aspectos relativos a la Comunidad Británica de Naciones. Por otro lado existe un Ministerio Provincial de Manitoba que posee leyes propias en cada uno de los cultivos y actividades que realiza. Por ejemplo respecto de control de algunas enfermedades de las abejas, en la Provincia de Manitoba se realizan controles que en otras Provincias no se hacen. Canadá está dividido en 10 provincias y tres territorios y todos son responsabilidad del gobierno central. Cada una de las provincias tienen gobiernos independientes de acuerdo a las responsabilidades que les entrega la constitución. En cada provincia existe un Jefe de Estado llamado Premier o Primer Ministro, el que cuenta con un gabinete y asamblea legislativa provincial. Respecto del poder legislativo existe una Corte Suprema Federal y provincial lo que abarcan distintos temas. Por ejemplo el tema étnico es netamente federal. Respecto del idioma, el 20% de su población habla francés y el resto inglés y algún dialecto nativo.

Economía y nivel de vida

El índice de inflación canadiense se ha mantenido entre los más bajos del mundo industrializado, durante los últimos 5 años.

Canadá tiene una economía altamente diversificada. Las industrias como la forestal, minería, energía, agricultura y pesca, son las fuentes principales de empleo y riqueza.

Canadá es reconocida mundialmente como líder en tecnología en áreas como las telecomunicaciones, la informática y computación, ingeniería, industria aeroespacial, transporte urbano, dispositivos médicos y software avanzado, energía hidroeléctrica y nuclear, biotecnología, procesamiento de alimentos y bebidas, y en las industrias oceánica y del medio ambiente.

Su economía está respondiendo a los cambios y la competencia de los mercados mundiales. Cada día se abren más puestos de trabajo que tienen que ver con la gente y la información. Además, se registra un crecimiento importante de las industrias de servicio.

Vivir en Canadá implica innumerables costos que varían de una provincia a otra y que suelen ser considerablemente altos, sobre todo en las ciudades grandes.

Gastos aproximados de manutención, por un año, van de los CAD\$ 9.200 a 11.600, calculados por una sola persona, incluyendo alimentos, alojamiento, transporte, seguro médico, libros, ropas y artículos varios.

Para hijos o dependientes, el Ministerio de Ciudadanía e Inmigración exige un 60% adicional de los gastos de manutención totales, para el primer dependiente, y CAD\$ 1.300 por dependiente adicional. El cálculo varía para la provincia de Quebec.

El sistema de salud de Canadá es uno de los más destacados del mundo. Este país cuenta con excelentes hospitales y clínicas, en todas las ciudades y comunidades. Ofrecen servicios gratuitos a todos los ciudadanos o residentes que estén amparados por el seguro del sistema nacional de salud, conocido como "Medicare".

La tasa de desempleo se ubica en apenas un 4% para profesionales con títulos universitarios, 6% para graduados en nivel técnico y 9% para el nivel de bachilleres.



Apicultura en Canadá

Como se ha indicado anteriormente la Provincia de Manitoba está ubicada al sur del país, cercano a EE.UU.. En la provincia existen 600 apicultores pequeños lo que corresponde al 56% del total de apicultores y poseen menos de 50 colmenas. Estos apicultores son considerados hobistas dado que las personas que trabajan en él no desarrollan sólo esa actividad, tienen otra que incrementa sus ingresos. Existe además un 18% de apicultores que posee sobre 200 colmenas. Además un 25% de apicultores considerados comerciales cuya principal entrada proviene de la actividad apícola. Finalmente un 3% tiene sobre 1.000 colmenas, los que son considerados una minoría. Ahora sólo 2 apicultores poseen sobre 3.000 colmenas. La ubicación de estos apicultores es de un 15% se encuentran al Noreste de Manitoba, 19% en el Sudeste, el 35% interlack y 31% en el Centro. Esto está asociado a la ubicación de la Ciudad Capital Winnipeg.

Ahora respecto del número de colmenas totales estas son 82.000, sin embargo el número de colmenas durante los últimos 17 años no ha variado mucho manteniéndose en el rango de 80 a 110 mil colmenas. El nivel más bajo fue alcanzado hace una década con 70.000 colmenas. Respecto del ingreso por colmena (producción por precio anual) ha ido aumentando como también el costo de producción, lo que ha generado problemas en el sector y en los apicultores dado que incluso en algunos años el costo a superado a los ingresos. Otro factor que ha complicado a los apicultores es la entrada de nuevos apicultores en años de muy buen precio, los que han hecho bajar los precios y aumentar las enfermedades por el bajo nivel de control fitosanitario. En Canadá los problemas sanitarios son muy similares a Chile. Consideran que los ácaros no son un gran problema dado que posee control, varroa es un gran problema, loque americano es un problema pero con control es manejable, nosema es considerado problema pero es manejado por los apicultores y el gobierno, polilla de la cera es problema pero con el stress del invierno se produce un autocontrol. Finalmente un problema que han mantenido bajo control son los osos, los que destruyen colmenas en todo el país. Los apicultores agrupados en sus Asociaciones negocian compensaciones con el gobierno provincial para mitigar los daños causados por osos y de esta forma ellos también se comprometen a proteger la fauna. Una práctica muy utilizada en Canadá es el confinamiento de las abejas en galpones con condiciones (temperatura y humedad) manipuladas. Esto les permite reducir la pérdida de abejas a casi un 3%, lo que es considerado como muy bajo. La otra opción es cubrir con cajas de aislapol blanco cuatro colmenas en el apiarios, alimentarlas y dejarlas ahí durante el invierno (Figura 3). Por otro lado la investigación se encuentra muy concentrada en control de varroa y en forma secundaria en otras enfermedades.

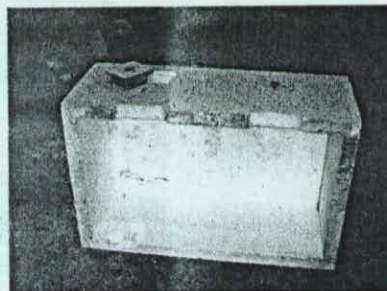
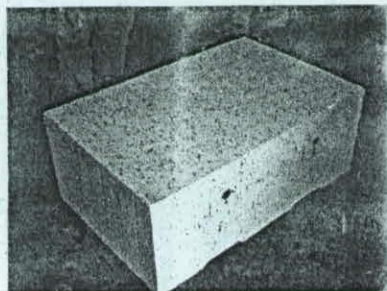


Figura 2. Protección de colmenas en apiarios con aislapol.

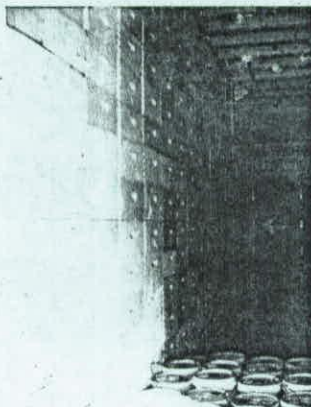


Figura 3. Confinamiento de colmenas en invierno

La relación entre la mayor universidad de la Provincia – Universidad de Manitoba – es muy estrecha, investigando temas de interés de ambos actores. Para ello establecer acuerdo de cooperación, que permitan el crecimiento del sector y sus productores.

La Misión fue realizada a través de visitas previamente coordinadas desde Chile, con nuestro contacto en Canadá señor Rhéal Lafrenière de Manitoba Agricultura, Food and Rural Initiatives Apiarists. El resultado de las visitas fueron los siguientes:

DÍA 1: 26 de septiembre de 2005

➤ Visita 1

Gordon Marks, CEO de la Cooperativa Bee Maid Honey Ltda.

Objetivo de la Visita: obtener información sobre la organización de productores apícolas en torno a una Cooperativa de miel con destino doméstico o nacional y para exportación.

Resultado de la Visita:

Se inició la visita a Bee Maid (Figura 4) con un recorrido a la planta de fraccionamiento de miel de la Cooperativa, la cual se inició con la recepción de la miel de los cooperados la que es decepcionada en tambores de 300 kilos. En la planta se separan 18 de estos tambores para formar un "batch" el que es procesado para luego fraccionarlos en envases más pequeños (Figura 1). La miel de los tambores viene graduada de acuerdo a tres características: color, humedad y presencia de pólen (polen predominante). En este caso lo más presentes son de alfalfa, raps y maravilla. En la Cooperativa trabajan con miel polifloral, sin embargo ellos consideran que el 50% de predominancia manda respecto del origen polínico de la miel.



GOBIERNO DE CHILE
INICIATIVA PARA LA
INNOVACION AGRARIA



Figura 4. Ingreso Planta de Bee Maid Honey Ltda.

El tambor de miel, es decepcionado y posterior a ello se toma una muestra que es analizada en la misma planta. Se conforma el "bach" y se carga en estanques que a través de serpentines aumentan la temperatura entre 45ª a 80ªC de modo de contar con ella en forma más líquida (Figura 5). La miel vaciada es homogeneizada durante 20 a 30 minutos, posterior a lo cual es sacada una muestra para realizar análisis de humedad y color. La miel homogeneizada pasa a estanques decantadores con camisa que permite el flujo de temperatura. Luego de 15 horas de decantación, las impurezas salen a flote y son eliminadas de la miel. Transcurrido las 15 horas, la miel es bombeada a un pasteurizador el que aumenta la temperatura de la miel para disolver cristales de miel y eliminar levaduras. Respecto de esto, es importante destacar que el grado de cristalización de la miel es distinto por las clases de azúcares presentes. A mayor contenido de glucosa, mayor cristalización. Luego de ello pasa del pasteurizador a estanques abiertos donde se le agrega tierra diatomea, la que atrapa cualquier cristal que pudo haber quedado. Seguido de esto la miel es filtrada para rescatar la tierra diatomea agregada, proceso que asegura que la miel no cristalice por un año. Siguiendo el proceso, la miel es enfriada a 140°F con un radiador. Luego esta miel es enviada a un estanque donde es acumulada por 7 a 12 horas para liberarla de burbujas de aire que pudieran haberse formado en el proceso. El embasado de la miel es hecho desde estos estanques por gravedad en embasases de distinta forma y capacidad (Figura 6, 7 y 8). Este proceso es para miel líquida.



Figura 5. Contenedores de miel Planta Bee
Maid Money Ltda

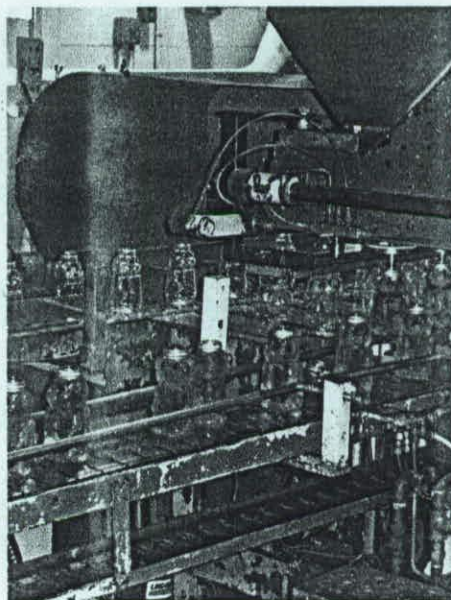


Figura 6. Fraccionamiento de miel en Bee Maid
Money Ltda.



Figura 7. Embases utilizados en Bee Maid Honey Ltda.

Figura 8. Embases utilizados en Bee Maid Honey Ltda.



Para miel crema es proceso es algo distinto y se diferencia de la líquida en la temperaturas del proceso y en el proceso propiamente tal. La Cooperativa produce miel con canela, tomate y pimienta, sin embargo el mercado de este tipo de miel es muy reducido (Figura 9). En Canadá y EE.UU. los consumidores buscan consumir miel pura de abejas. Además la Cooperativa no embasa miel orgánica, por el mismo motivo anterior.

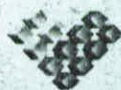


Figura 9. Miel fraccionada con aromas a frutilla, tomate, pimienta, cereza etc.

La Cooperativa tiene 65 años de funcionamiento, es una de las dos Cooperativas más importantes de Canadá y fue fundada dado que los apicultores se dieron cuenta de lo negativo que era competir entre ellos. En un comienzo los apicultores pusieron dinero para construir la planta. Bee Maid es la marca de la Cooperativa, la que comercializa productos apícolas a sus socios y les entrega asistencia técnica. Todos los socios comercializan bajo la misma marca. Cuenta con 200 socios apicultores (90% apicultores y 10% apicultoras) y en la planta trabajan 12 personas. Actualmente la Cooperativa no está incorporando nuevos socios, sin embargo anteriormente este proceso tenía un costo de US\$ 1 y contar con a lo menos 2 toneladas de producción mínimo. Operan con un fondo de capital de 5% el que es devuelto a los apicultores, lo que deben entregar el 100% de su producción a la empresa. Esto es verificado a través del número de colmenas que posee cada socio y las estadísticas de producción de miel por colmena. Respecto del pago, al entregar la miel a la Cooperativa el apicultor recibe el 50% del precio por kilo y posterior a ello se le cancela en cuatro cuotas de 12.5% cada una. El rendimiento promedio por colmena es de 70 kilos en 2 a 3 meses. La Cooperativa es la dueña de los tambores y financia el transporte de la miel a la planta de fraccionamiento de miel. En la planta realizan análisis a las mieles procesadas como por ejemplo análisis de polen, humedad, residuos de pesticidas (antibióticos). Cuentan con dos plantas de fraccionamiento de miel una en Winnipeg y otra en Alberta (200 apicultores socios cada una), las que procesan 70 mil toneladas de miel al año. De esta miel 4.000 toneladas son consumidas en mercado interno en Canadá y el resto es exportada a EE.UU.. Canadá además importa miel para consumo interno, proveniente principalmente de China y Argentina. En Canadá en consume per cápita es de 1 kilo/persona. La miel de especialidades (aromatizadas) es destinada a exportación. No tienen —ni les interesa— contar con denominación de origen dado que el consumidor no paga por ello (Figura 10). La Cooperativa cuenta en sus instalaciones con una tienda de productos apícolas donde comercializa miel, embases, velas, material apícola, productos veterinarios etc. (Figura 11).

Figura 10. Ingreso a Cooperativa Bee Maid Money Ltda. y muestra de productos.



Figura 11. Muestras de los productos comercializados en Bee Maid Money Ltda.

Su CEO responde a Directores de las dos Cooperativas, los que cuentan con 5 Directores por cada una de ellas (Figura 12).



Figura 12. Reunión con CEO de Bee Maid Money Ltda., Gordon Marks.



Visita 2

Phil Veldhuis, Presidente de la Cooperativa de Productores de Miel de Manitoba.

Objetivo de la Visita: Conocer las bases para el éxito del cooperativismo que puedan ser aplicadas en Chile, como las responsabilidades y roles entre los cooperados y la cooperativa.

Resultado de la Visita:

El apicultor y Presidente de la Cooperativa tiene 800 colmenas (Figura 11). Partió cuando tenía tres años y es tercera generación de apicultores. Es Presidente de la Cooperativa y profesor de filosofía de educación. Realiza además crianza de reinas para uso propio. Tiene un rendimiento de 80 a 90 kilos por colmena, obtenido con el manejo de una persona. Las alimenta con una solución de agua y azúcar (proporción de 2 por 1 respectivamente), de acuerdo a la necesidad de sus abejas (10.000 litros anuales) (Figura 13). No tiene problema de enjambración por que el ciclo de producción de miel en Canadá es corto (abril a mayo). Fabrica sus propios materiales avícolas y no realiza prestación de servicios de polinización. Además de ello, recibe asesoría técnica gratuita del estado. Sólo usa productos permitidos por el Ministerio de Agricultura.



Figura 13. Los participantes en la Misión y Phil Veldhuis, Presidente de la Cooperativa de Productos Apícolas de Manitoba y Rheel Lafrenière de Manitoba Agriculture.

Respecto del proceso de extracción de miel, el apicultor indica que la miel llega a una zona con una temperatura de 32°C de modo de que la miel sea más fácil de trabajar. Posee una centrifuga tiene una capacidad de 30 marcos y en cosecha requiere contratar 3 trabajadores para desarrollar las labores. Además —e igual que la mayoría de los apicultores en Canadá— posee una bodega climatizada donde guarda sus colmenas durante el invierno (6 meses) como una forma de protegerlas. En dicha bodega se maneja la temperatura y Humedad, ingresando aire helado cuando la temperatura aumenta de 5°C (Figura 14). Tiene para ello una alarma que les avisa en caso de que ocurra esto. El porcentaje de mortalidad es relativamente bajo en este periodo (5 a 8% aproximadamente).

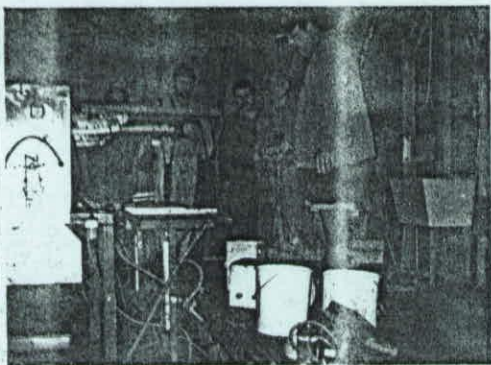


Figura 14. Visita Planta de extracción de miel de Phil Veldhuis.

Finalmente el apicultor recomienda a mecanizar la actividad en Chile, de modo de poder contar con más tiempo y resultado de ello aumentar el número de colmenas por apicultor. Sugiere mejora la eficiencia del trabajo, dado que de acuerdo a la visita realizada por él a Chile vio que se trabajaba mucho y con poca eficiencia (Figura 15).



Figura 15. El apicultor mostrando alternativas de mecanización en apicultura. En la imagen una grúa manual para trasladar tambores de miel.

DIA 2: 27 de septiembre de 2005

Visita 1

Murria Lewis de Lewis Faros.

Objetivo de la Visita: Ver las instalaciones, maquinarias y requerimientos necesarios para la fabricación de equipos comerciales usados en la producción, extracción, procesamiento y envasado de la miel. Tomar conocimiento de los requerimientos necesarios para la implementación de maquinarias y procesos de agregación de valor de los productos apícolas.

Resultado de la Visita

Murray Lewis es un profesor de colegio y apicultor que enseña a sus alumnos la apicultura en forma industrial, de modo de que se dediquen a ello. En cuanto a lo que posee en su predio, cuenta con el equipamiento necesario para la confección de material apícola (cajones, marcos) (Figura 16 y 17). Las maquinarias utilizadas por Murray para ello fueron diseñadas y fabricadas por su hermano ingeniero que está jubilado. El apicultor atribuye el éxito de las maquinarias a que han podido probarlo de inmediato y corregir posibles errores de fabricación. El empresario fabrica cajones para apicultores de la provincia utilizando pino blanco como materia prima, aprovechando la ventaja que posee en cuanto a ser muy liviano. Recomienda además pino radiata (utilizado en Chile) dado que no se parte. El material apícola es impregnado en cola para carpintero + pez castilla. Lewis fabrica dos tipos de productos, alzas ensamblados y otros listos para ensamblar, produciendo 400 cajones por día con 4 buenos trabajadores. Esta actividad es más importante para él que la producción de miel.

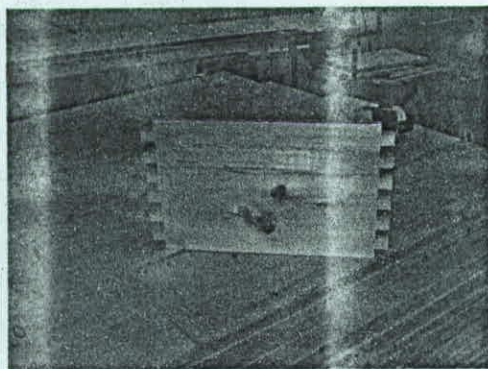


Figura 16. Características del material apícola producido.

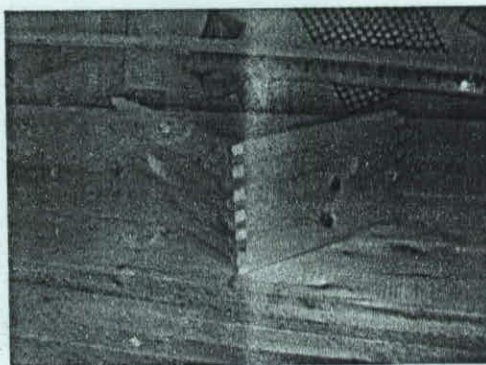


Figura 17. Detalle de ensamblaje de los cajones.

El empresario indica que luego de años de trabajo y diseño, ha logrado posicionarse en el mercado (Figura 19). No ve competencia en el tema dado que no existen los equipos de fabricación de material apícola en el mercado. Además de alzas, el empresario produce trampas para varroa y marcos, especialmente diseñados para cera plástica. Esta cera es muy utilizada en Canadá dado que es más económica y reduce problema de contaminación. Sin embargo a veces las abejas no la toman, por lo que el empresario le adhiere una línea de cera de abejas (figura 20).



Figura 19. El apicultor frente a uno de los equipos diseñados por él y su hermano.



➤ Visita 2

Keith & Kathy Lloyd de MacGregor Wax Works.

Objetivo de la Visita: conocer una planta de procesamiento de cera de abeja, su rendimiento comercial, proceso de fabricación, y ver las múltiples formas de productos posibles de comercializar.

Resultado de la Visita

Keith Lloyd proviene del mundo apícola a través de sus padres, perteneciendo a la tercera generación de apicultores de la familia (Figura 21). Poseen como familiar una planta procesadora de cera para poder contar con trabajo en invierno. No son apicultores y se dedican 100% de su tiempo a dicha actividad. Partieron hace 10 años aproximadamente desarrollando los productos artesanales de cera como son las velas, al transcurrir del tiempo esta actividad ha ido decayendo dado que ya no es considerada una novedad para el cliente por lo que ellos derivaron como empresa a la producción de cera estampada y cera destinada a la industria cosmética (Figura 22).

En un comienzo trabajaban con 125 personas, las que se fueron reduciendo hasta llegar a un tercio del personal. Además de ello prestan servicios a los apicultores. A pesar de considerarse consolidados, actualmente y dada la penetración de las ceras plásticas, la actividad nuevamente se ha visto tambalear generando incertidumbre en el sector. A pesar de que la cera plástica lleva 10 años en el mercado, su introducción en los apicultores ha sido lenta dado que las abejas no la toleran bien (Figura 23).



Figura 21. Los participantes de la Misión y el matrimonio de apicultores.



Figura 22. Cera lista para ser comercializada

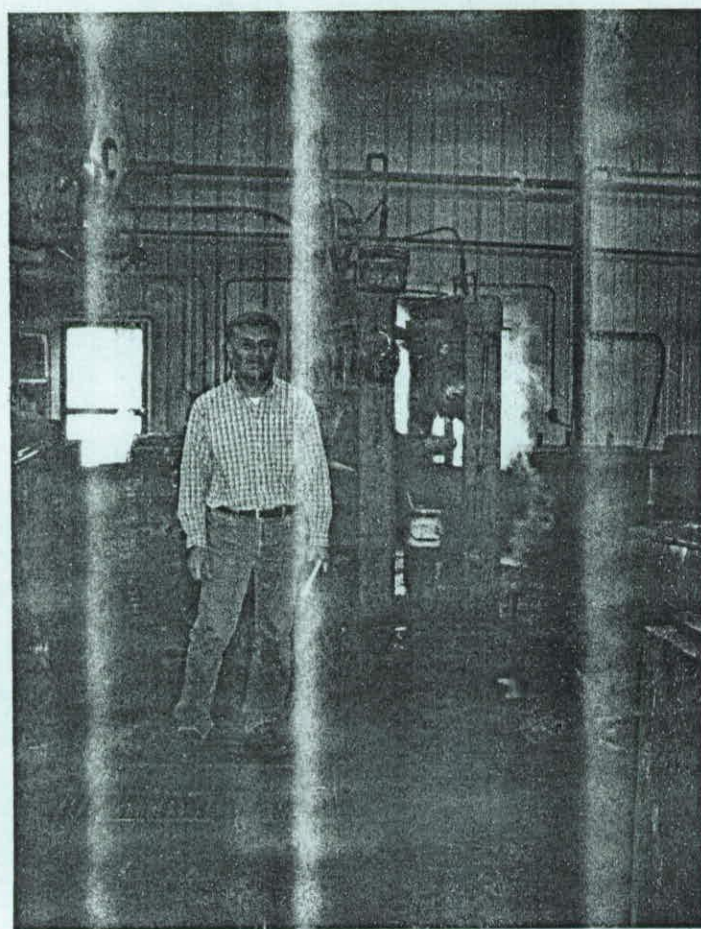


Figura 23: Planta de fundición de cera de abejas.



La cera que ellos utilizan, es adquirida en tambores de y mucha de ella viene en los mismos marcos. Anualmente la empresa procesa 400 mil kilos de cera por año, privilegiando ceras de colores más claros, los que logran mejores precios. A su vez ellos la comercializan en bloques de 35 libras, las que apilan en pallet de 2.000 libras.

El proceso es relativamente sencillo, y parte con la mezcla de cera y agua caliente en grandes recipientes. Al transcurso de un tiempo y aplicándole calor, la cera está completamente derretida para poder amoldarla. La cera líquida es bombeada, filtrada y prensada en moldes. El residuo que queda de este proceso es utilizado como combustible. Respecto de este tema, la industria de cosméticos está muy preocupada por el tema medioambiental asociado al negocio, lo que los ha obligado a hacer análisis de las ceras decepcionadas. El destino de su cera es EE.UU., a pequeñas compañías de cosméticos. El proceso de fundido de cera no mata esporas de *Loque americano*. Además la empresa –como se indicó anteriormente– se dedicó a otras actividades como es la artesanía y material apícola (Figura 24).

Figura 24. Algunos productos comercializados por la empresa.

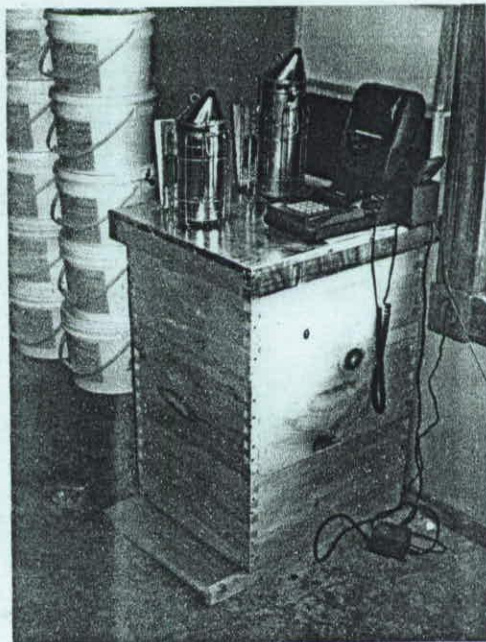


Figura 25. Instalaciones y muestra de antiguos embases de cera y miel.



➤ Visita 3

Mike Hill de Bee Basics Limitada.

Objetivo de la Visita: demostrar como una pequeña tienda de productos apícolas puede llenar un nicho de mercado.

Resultado de la Visita

Mike Hill partió abasteciendo con productos apícolas en MacGregor, trabajando en conjunto con el almacén de productos apícolas de Bee Maid. Produce y comercializa material apícola como cajones y marcos, cámaras de cria, alzas etc. Utiliza cera plástica de color miel y color negro. No utiliza cera dado que puede estar contaminada con productos químicos. Comenta que no ha tenido grandes problemas con la cera plástica, sin embargo las abejas no toman igual de bien este tipo de cera en relación a la cera natural, sólo lo hacen bien cuando existe un buen flujo de polen hacia la colmena. La gran ventaja de este tipo de cera es que dura más y puede ser utilizada por ejemplo en la producción de miel orgánica. Además se produce un ahorro de mano de obra. Esta empresa –a pesar de tener apicultores vecinos–, es la única dedicada a la actividad en la zona y abastece de productos al resto de los apicultores.

➤ Visita 4

Marc Nichol de Nichol Money Faros

Objetivo de la Visita: ver planta de procesamiento de polen y su estrategia comercial.

Resultado de la Visita

Marc Nichol es tercera generación de agricultores dedicado al sector apícola (Figura 26). Ellos como empresa procesan, secan y empaican polen para ser comercializado. El polen en estas condiciones es empacado y congelado para ser distribuido (Figura 27). Su destino es consumo humano, como suplemento proteico / alimento y lo que queda del proceso es para consumo de las abejas. Respecto de esto último, ellos lo utilizan como una pasta formada por polen (15 a 20%) y fructosa la que es dada como alimento a las abejas en invierno. En un año malo comercializa 7.000 libras de polen proveniente de 700 colmenas y en un buen año 10.500 libras provenientes de las mismas colmenas. La producción de polen de su empresa tiene destino el mercado interno, comercializando su producto a fraccionadores de polen en Canadá. El no ha logrado pasar a un segundo nivel en la cadena de comercialización –siendo fraccionador– dado que le exigen contar con un profesional calificado para ello y él no ha podido financiarlo. El polen de esta forma procesado es vendido a granel en pequeños baldes plásticos.



Figura 26. Los participantes en la Misión y Marc Nichol.

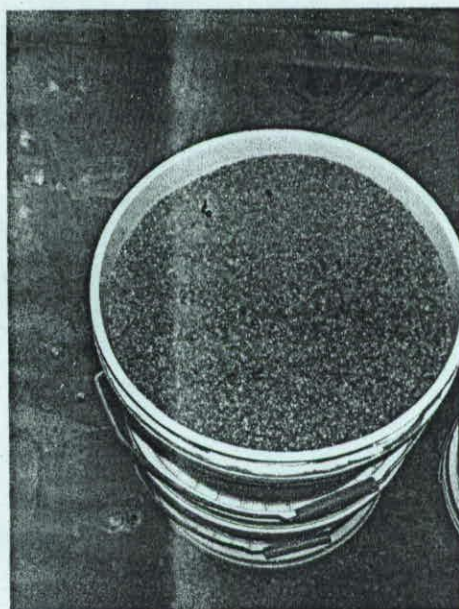


Figura 27. Polen a granel procesado y listo para ser comercializado.

En consumo de polen de esta forma producido ha aumentado durante los últimos años, dado que seco y congelado su duración supera el año de vida (Figura 29). El proceso de congelado es realizado para mantener sus características como porcentaje de proteínas, las que se pierden con aumentos de temperatura. El proceso de secado es mantener el polen a 10°C por 3 a 4 días, con buena ventilación (Figura 28). Además el productor indica que comercializan polen de distintos orígenes dado que es muy difícil producir de uno solo. Hoy en día el polen es más rentable que la miel, y a pesar que no lo ha logrado, podría producir más y el mercado lo consumiría.

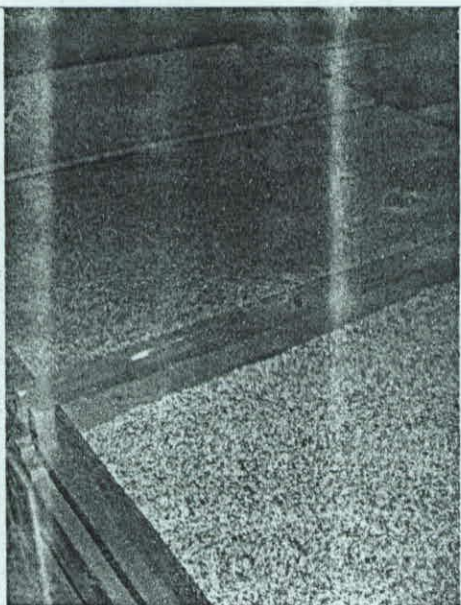


Figura 28. Polen en proceso de secado.

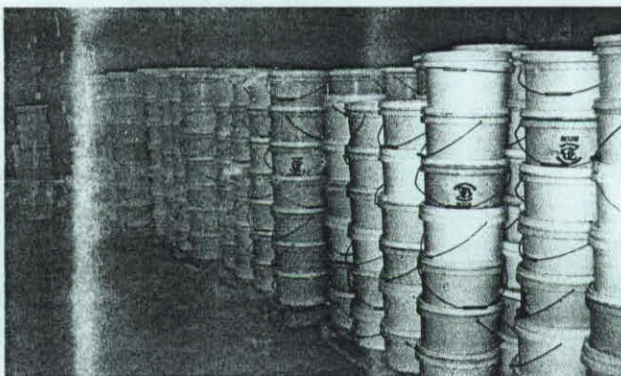


Figura 29. Almacenamiento de polen a granel en pequeños
tambores plásticos.

DIA 3: 28 de septiembre de 2005.

VISITA 1

Brian Ash de Ash Apiaries Ltda.

Objetivo de la Visita: Visitar una empresa apícola muy grande, con su propia planta procesadora y envasadora comercial de miel. Conocer las técnicas de manejo productivo, uso eficiente de mano de obra, manejo sanitario y como se distribuyen las actividades de la empresa a través del año.

Resultado de la Visita

La sociedad es una empresa familiar que se inició hace 50 años aproximadamente (Figura 30). Es segunda generación de apicultores y pertenece a la Asociación de Apicultores de Manitoba y EE.UU.. En 1985 la empresa contaba con 4.600 colmenas y hoy en día bordea las 3.500, dado que realizó un mal negocio hacia EE.UU. donde su cliente luego de recibir el producto (miel) no le pagó y los bancos le embargaron sus bienes. Esto lo obligó a partir de cero y con la ayuda de sus vecinos, logró repuntar y llegar a las 3.500 colmenas. Sin embargo en su momento peak el apicultor llegó a poseer 5.100 colmenas.

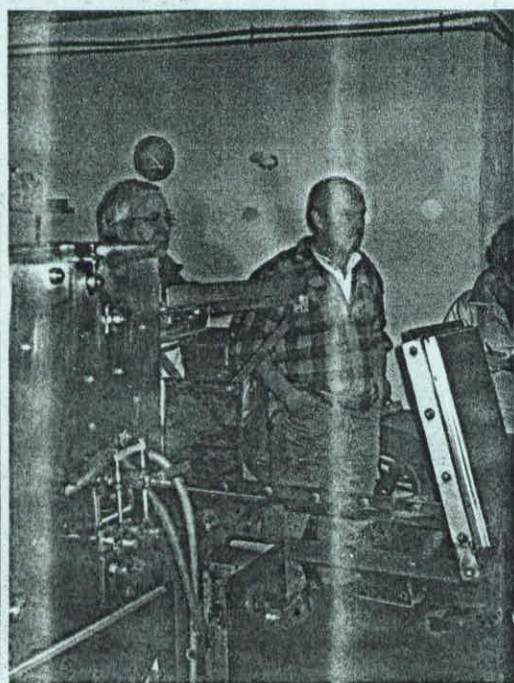


Figura 30. El apicultor mostrando sus instalaciones.

Actualmente el apicultor está dedicado a la producción de miel con destino mercado externo (EE.UU.), comercializándola a granel y cruda, y en condición de pago efectivo. Comercializa su miel lo rápido posible en la temporada, a pesar de considerar que en esa fecha el precio de la miel es más barato. Respecto de su infraestructura, explica que la ha logrado gracias al esfuerzo y a la banca privada, dado que el gobierno canadiense no cofinancia este tipo de activos (Figura 31, 32, 33, 34). En general el apicultor es muy crítico del accionar del Ministerio de Agricultura canadiense, señalando que su labor se aboca a la asesoría técnica esporádica a los apicultores. Hace 5 años, él se dedicaba a la producción de otros productos de la apicultura sin embargo hoy día está concentrado sólo en miel dado la condición de precio de los otros productos y lo complejo del mercado. No llevan registros y en general desconocen las Normas de Buenas Prácticas Agrícolas que aplican. Cree que posee un muy buen sistema productivo, prueba de ello es que una sola vez lo visitaron sus clientes (en 1976). La Agencia de Alimentos Canadienses responde por la calidad del producto exportado, lo que garantiza la calidad de ellos. Respecto del manejo sanitario, hace test de resistencia a Loque americana. Utiliza antibióticos para control de varroa (crumafox) y confina sus abejas en invierno para protegerlas de las condiciones climáticas, entregándole condiciones de temperatura (7 a 9°C de temperatura) óptimas. Este confinamiento no aumenta la mortalidad de las abejas, inclusive comparándolas con el porcentaje de muerte por manipulación humana (30% en algunos casos). En el confinamiento, encierra las abejas ya alimentadas y luego les suministra sólo agua. En general el daño no supera el 6%. Luego de 4 a 5 meses, saca las abejas de confinamiento cuando éstas se tornan demasiado activas. Tiene un rendimiento a cosecha de 1.100 cajones por 6 horas de trabajo (Figura 36). Cada línea de trabajo tiene un costo de \$ 30.000.000 y vende el kilo de miel a \$1.000. . No es socio de Bee Maid dado que no cree en el sistema de cooperativismo, además posee dos hijos que le aconsejan que se retire del negocio dado que no le ven futuro (Figura 35).

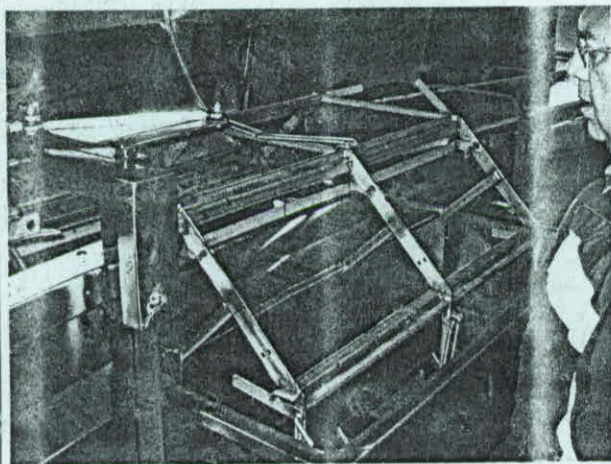


Figura 31. Instalaciones del empresario, en este caso una centrifuga de acero inoxidable.

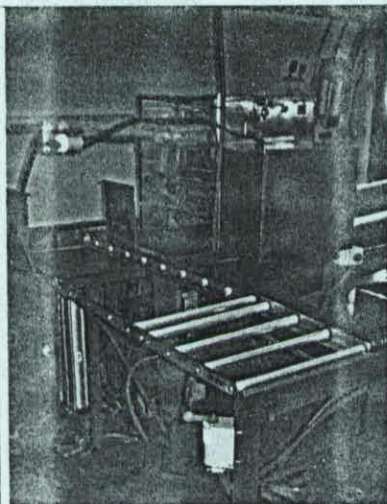


Figura 32. Instalaciones del apicultor, en este caso línea de proceso de extracción de miel.

Figura 33. Instalaciones del apicultor, en este caso línea de extracción de miel.

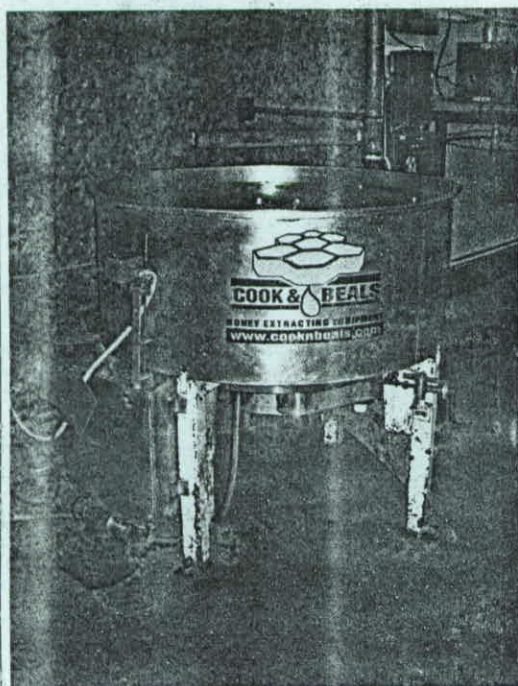
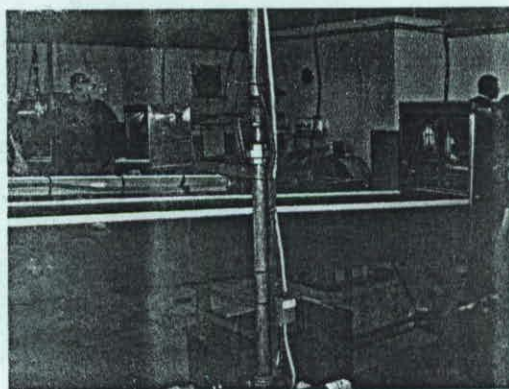


Figura 34. Centrífuga de acero inoxidable utilizada en el proceso de extracción de miel



Figura 35. El empresario y su familiar en reunión con los participantes en la Misión.

➤ Visita 2



Figura 36. Colmenas del apicultor, donde se muestra la forma de alimentar las abejas

Bruce Podolski de Podolski Money Farms

Objetivo de la Visita:

Resultado de la Visita

La empresa partió hace 40 años en la producción apícola, con 120 colmenas, luego de transcurrido ese tiempo han logrado posicionarse con 4.500 colmenas totales (Figura 38, 39). De ellas, cuentan con un mapa con la descripción de cada apiario de su propiedad y la ubicación geográfica en la Provincia de Manitoba, donde es posible ver registros de manejo sanitario y cosecha. En su caso no almacenan sus colmenas si no que las aíslan en el potero donde están ubicadas. La empresa actualmente está dedicada sólo a la producción y comercialización de miel, la que en estas condiciones tienen un rendimiento por colmena de 100 kilos anuales, con 40 colmenas por apiario en promedio. La miel producida es comercializada fraccionada en embases de 250, 500 gramos.



Figura 38. El empresario mostrando sus instalaciones.

Según cifras productivas, Podolski Money Farm pierde anualmente el 30% de sus abejas por el tiempo destinado a invernar (10%) en primavera (10%) y en la etapa de producción de miel (10%) (Figura 40). En primavera por ejemplo, si verifica que una colmena cuenta con menos de 6 marcos con miel, la elimina. Adquiere sus reinas desde Hawái, Columbia Británica y EE.UU. a US\$ 18 a 20 cada una (Figura 44).

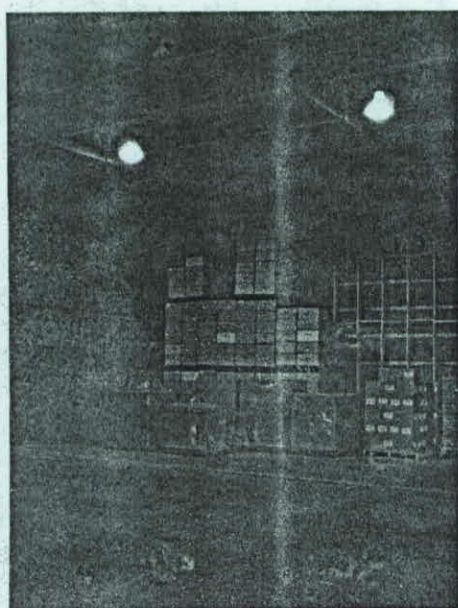


Figura 40. Confinamiento de colmenas en invierno.



Figura 41. Confinamiento de colmenas en invierno.



Figura 42. El apicultor y el grupo
participante en la Misión



Figura 44. El apicultor mostrando sus colmenas
a los participantes en la Misión

Figura 49. Los participantes en la Misión
compartiendo los conocimientos
entregados por el apicultor.





Respecto del tema extracción de miel, cuenta con una línea que le permite el fraccionamiento de la miel y su posterior comercialización. Cuenta con una centrífuga de 120 marcos de capacidad y en cosecha trabaja con 5 personas en forma permanente. En cuanto a rendimiento de cosecha, logra cosechar 1.000 alzas por día, o 30 alzas en 30 minutos por línea (cuenta con dos). El destino de su miel es mercado interno, Alemania, Irlanda y EE.UU. y logra procesar la totalidad de su miel en tres días de trabajo y está dedicado todo el año a comercializar su producción. No es socio de la Cooperativa Apícola de Manitoba. Produce además miel aromatizada y miel crema, la que está destinada a nichos de mercado muy específicos y donde el volumen es menor. El proceso está certificado en el Sistema de Análisis de Peligros y Puntos Críticos de Control, HACCP.

➤ Visita 3

Todd Yakimishen, Presidente de la Asociación de Apicultores de Manitoba

Objetivo de la Visita: Conocer una planta de extracción de miel de gran escala productiva pertenecientes a la Asociación de Apicultores, conocer la forma de organización y funciones de los socios y hacer además un tour a una gran operación del comercio apícola.

Resultado de la Visita

Todd es la segunda generación de apicultores y es a su vez Presidente de la Asociación de Apicultores de Manitoba. Tiene 32 años y se inició con su padre desde muy niño (Figura 45). Poseen 1.200 colmenas con una producción de 130.000 kilos de producción anual. En la empresa trabajan 12 trabajadores dedicados a producción primaria y secundaria (Figura 46). Reciben paquetes de abejas de Australia para el uso de la empresa, y las alimentan con sirope de maíz. Estas abejas llegan en el mes de abril (1.5 kilogramos por paquete) y son utilizadas en forma inmediata. Para poder internar este tipo de abejas existe un Protocolo canadiense que indica el procedimiento seguro para ello y en este caso trabajan sólo con material certificado (libre de varroa). En el primer y segundo año las abejas no son analizadas dado que vienen libres del acaro. El año pasado fue muy húmedo y se produjo muchos enjambres. En promedio cuentan con 30 colmenas por apiario, con 1º y 2º alzas con crías y luego 6 alzas mielíferas donde se acumula la miel. Respecto de la carga polínica, indican que no existe flora nativa y que principalmente proviene de cultivos como raps, alfalfa, girasol, etc.. Respecto de la cosecha indican que en un buen día de trabajo cosechan 400 alzas. Además de esto, ellos confeccionan material apícola como pisos, cielos, alzas y marcos (Figura 47). Fraccionan la miel y es comercializada en el mercado local (Figura 48). Igual que gran parte de los apicultores canadienses guarda sus colmenas en invierno (Figura 50).



Figura 45. Los participantes en la Misión y el apicultor y su familia.



Figura 46. Taller de trabajo en las instalaciones de la empresa

Figura 47. Material apícola utilizado en la empresa.





Figura 48. Miel fraccionada por la empresa.

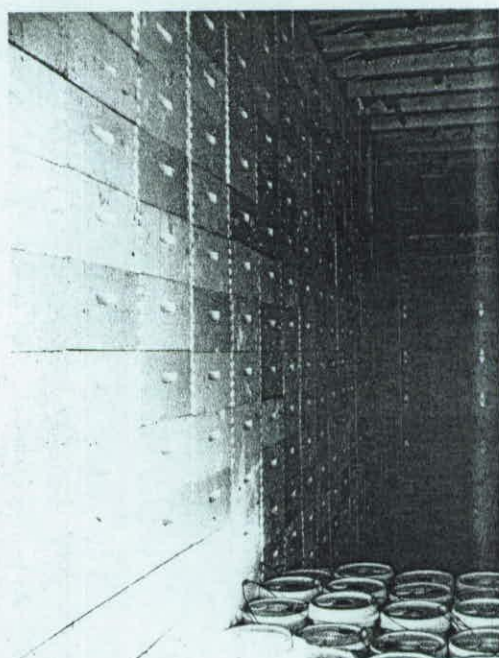


Figura 50. Confinamiento de colmenas en invierno.



Figura 52. Maquinaria utilizada en la empresa.



Figura 51. Equipos utilizados en la empresa



Figura 55. Equipos utilizados por la empresa.



Manitoba Beekeeper Association (MBA)

La asociación se formó en 1903, estableciendo reuniones anuales desde esa fecha. En esas reuniones entre otras cosas, se eligen los miembros de la Junta Directiva y planifican una Convención Anual con información escrita para tres meses. Además planifican y ejecutan capacitación para los socios y aprovechan de hacer actividades de socialización entre ellos. La asociación hace lobby para legislación y programas de gobierno en temas como: inspección enfermedades, compensación por mantener vida silvestre, registro de medicamentos y reciben préstamos para capital de trabajo. Junto con esto trabajan con: Ministro de Agricultura, equipos técnicos (Bee Maid por ejemplo), asociaciones de otros sectores (Asociación de Apicultores Río Rojo) y Universidad de Manitoba entre otros. Para tener algunos de estos beneficios deben ser socios de la asociación de apicultores y además ser socios de alguna asociación. En cuanto a extensión la asociación realiza: Barry Fingler Memorial Researchs (fondo de investigación), cobra una cuota por pertenecer a la asociación y apoya iniciativas de sustentabilidad de la agricultura en Manitoba. Por otro lado respecto de educación de los consumidores de miel, cuenta con casetas de exhibición de productos en los centros comerciales, participa en ferias donde promueve recetas con ingrediente miel, ecuación sobre abejas, llevan colmenas demostrativas, competencias de miel, educar al consumidor sobre leer etiqueta de la miel y ver el origen de ella.

Respecto de la Asociación y su estructura organizativa, la asociación posee 12 Directores de los cuales 9 tienen derecho a voto y representan a todas las regiones de la Provincia de Manitoba. Este Directorio es elegido cada tres años reemplazándose el 33% en ese período, por lo que en cuatro años se reemplaza los 12 Directores. Esto está incorporado en una Ley de la Provincia de Manitoba para las asociaciones gremiales. Existen miembro directo y miembro asociado. Para poder ser parte de la asociación existen distintas categorías: 50 colmenas o menos pueden tener participación parcial del negocio, 50 colmenas o más pueden tener participación total, 150 colmenas permite estar asociado, 600 colmenas o más ser apicultor activo. De acuerdo a la reglamentación debieran estar todos. El costo de incorporarse es de US\$ 120 y luego US\$ 25 por colmena con un máximo de 1.000 colmenas. La asociación es una organización gremial, no comercial. A los Directores no se les paga, sino que rinden gastos de traslado, viáticos etc. Cada 6 semanas se reúne Junta Directiva.

DIA 4: 29 de septiembre de 2005

➤ Visita 1

Mery Marlon de Kemnay Apiaries Ltda.

Objetivo de la Visita: Mostrar un criador comercial de reinas y discutir la función de la asociación de Criadores de Reina de Manitoba. Hacer un tour de su apicultura y operaciones en crianza de reinas.



Resultado de la Visita

El empresario es apicultor dedicado a producción de abejas reinas y en menor escala a la producción de miel (Figura 56). En cuanto a esta última unidad de negocio, mantiene alrededor de 700 colmenas las que maneja junto a un par de trabajadores, obteniendo un rendimiento de 80 kilogramos por colmena. Ahora en cuanto a la crianza de reinas, Mery es además Presidente de la Asociación de Criadores de Reinas de Manitoba, a lo cual llegó a través de una crisis sanitaria entre EE.UU. y Canadá generada en 1987. A raíz de esto Canadá cerró sus fronteras a la importación de paquetes de abejas y abejas reinas desde EE.UU. y se generó una demanda tan grande de parte de los apicultores que impulsó a apicultores canadienses a suplir esta oferta norteamericana. Es así como el apicultor se inicia produciendo reinas y supliendo esta necesidad, llegando a manejar 1.800 pequeños núcleos productivos. Actualmente ha bajado el número llegando a 400 núcleos dado que se encuentra parcialmente retirado. Respecto de su actividad explica que ésta debe ser muy controlada, dado que requiere producir reinas desde el 15 al 21 de junio posterior a lo cual no existe demanda para este producto. El apicultor explica que tiene mucho cuidado con lo que exporta, sobre todo en el tema sanitario y que en general considera que posee un muy buen material genético fruto del desarrollo de sus propias reinas. Además señala que ha investigado y busca una forma práctica de producir buen material con características como comportamiento higiénico, tolerante a enfermedades y no enjambradoras. Para reducir este problema utilizan la estrategia de manejar dos factores: reinas jóvenes y reducir colmenas muy jóvenes. Anualmente multiplica 3 a 4 madres de él y 2 a 3 en proyectos con la Universidad de Manitoba. Para ello utiliza una colmena iniciadora y una terminadora, donde cría 2.000 celdas de las cuales el 70% prende (Figura 57, 58, 59). Junto con ello señala que ha trabajado en proyectos de investigación con la Universidad de Manitoba, buscando resistencia a varroa la que es determinada por conducta higiénica y la ubicación de donde abre la celda la abeja. En general señala que la abeja más polinizadora es más higiénica y a su vez más agresiva, pero indica que es la mejor. Sobre este punto sugiere cambiar las reinas cada dos años como una forma de mantener colmenas más sanas y activas. Los apicultores chilenos comentan la similitud del proceso seguido por el apicultor a lo realizado en Chile, donde tenemos grandes productores de abejas reinas. Esto es vislumbrado como un potencial negocio entre ambos países, considerando que a Canadá sólo es posible importar material apícola vivo desde Australia, Nueva Zelandia y Hawái. Señala además que el material genético que posee fue seleccionado por el mismo en base a su material y a otro colectado.



Figura 56. El apicultor mostrando el proceso de crianza de reinas.

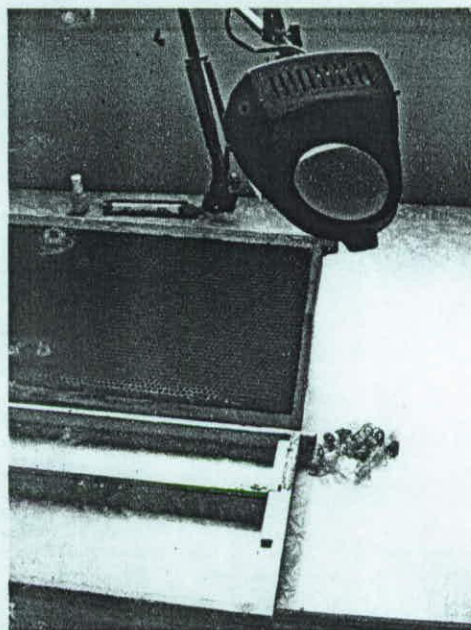


Figura 57. Material para producción de abejas reinas

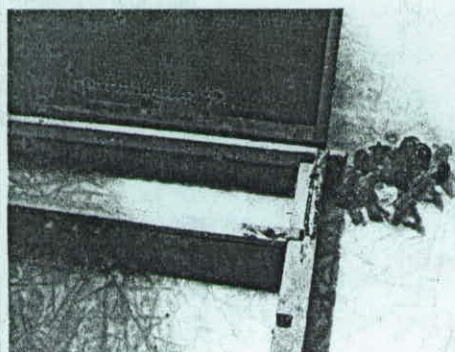


Figura 58. Detalle material para producción de abejas reinas



Figura 59. Cámaras de cría para producción de abejas reinas.



Figura 60. Detalle cámaras de cría para producción de abejas reinas

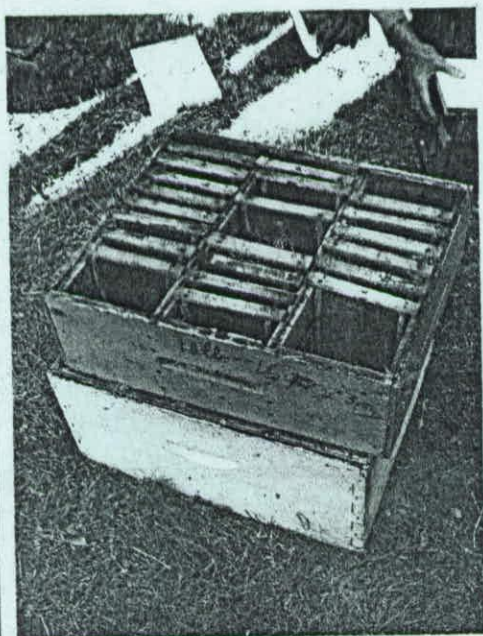


Figura 61. Detalle de marcos



Figura 61. El apicultor y el grupo que conformó la Misión.

Visita 2

James Clark de Ferry Apiaries

Objetivo de la Visita: Conocer a un criador comercial de reinas y discutir la función de la asociación de Criadores de Reina de Manitoba. Hacer un tour de su apicultura y operaciones en crianza de reinas.

Resultado de la Visita

James es tercera generación de apicultores, lo que se inició con su abuelo en Canadá. Comenzó a trabajar en el tema en 1957 cuando era niño con un tío. Luego en 1962 deja Winnipeg y se dedica completamente a ser apicultor. En 1963 viaja a California a buscar paquetes de abejas y se queda trabajando por una temporada, lo que finalmente se alarga a 14 años. En 1980 se informa que se producirá el cierre de la frontera canadiense – norteamericana por problemas sanitarios. En esa época los paquetes de abejas eran muy difíciles de producir, lo que lo impulsó a iniciarse en la producción de paquetes de abejas y abejas reinas. Anualmente produce algunos cientos de abejas, es productor / comercializador de miel y polinizador (Figura 63). Nunca ha adquirido reinas, dado que produce una buena cantidad. Por otro lado estima que la pérdida producida en inviernos es realmente baja (3%), considerando las condiciones de almacenamiento de las colmenas. Cuenta con 167 colmenas y en algún minuto llegó a poseer de 700 a 800. El valor de cada abeja reina es de US\$ 20 más impuesto y asegura que pueden durar 5 inviernos.



Figura 63. Visita apiarios

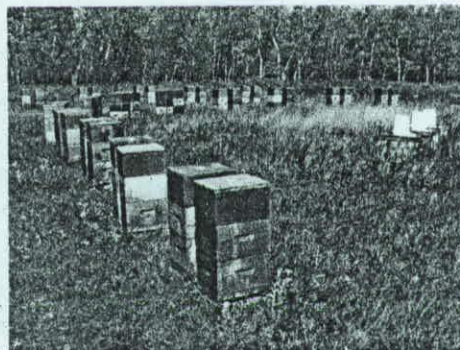


Figura 64. Apiarios del empresario



Figura 66. Los participantes de la Misión y los apicultores visitados.



DIA 5: 30 de septiembre de 2005

➤ Visita 1

Rheal Lafrenière y David Ostermann de Amitoba Agricultura Food and Rural Initiative Apiarist y Don Dixon, Director of the Crops Branco to tour the Provincial Apicultural Laboratory.

Objetivo de la Visita: Proporcionar una descripción del rol y responsabilidad del gobierno en el soporte del desarrollo y crecimiento de la industria apícola local. Conocer algunos requerimientos y procedimientos para realizar análisis en laboratorios para el diagnóstico de las enfermedades apícolas. Conocer tratamientos y remedios de problemas sanitarios comunes.

Resultado de la Visita

Rheal es asesor técnico vinculado al Ministerio de Agricultura de la Provincia de Manitoba (Figura 68). Inspecciona un porcentaje de las colmenas de los apicultores y recomienda tratamientos para el control sanitario. Inspecciona el 10% de las colmenas de Manitoba de las que —si es necesario— toma muestras para su análisis y posterior diagnóstico. Un apicultor promedio en Manitoba posee 5 apiarios con 40 colmenas por apiario. Al recibir muestras en el laboratorio, analizan presencia de varroa para lo cual necesitan 200 abejas como muestra (Figura 70). Para el ácaro de la traquea requieren 103 abejas. Respecto del análisis los pasan a capsulas Petri con hidróxido de potasio el que deja sólo la traquea. El resultado del análisis puede estar listo en dos días. Si es detectado un nivel alto llaman por teléfono y recomiendan en forma inmediata un producto veterinario para su control, caso contrario envían el resultado vía correo certificado. En caso de haber recomendado y el apicultor no controla, se le multa y requisan las colmenas sin restituirlas. Estos mismos análisis pueden ser efectuados en terreno (síntomas) y como lo hemos visto acá en laboratorio. El examen de ácaro da un porcentaje de cómo resultado porcentaje de abejas infectadas. Respecto de la muestra a analizar, se considera un 10% de las colmenas. En algunos casos la recomendación es utilizando antibióticos, sin embargo esto no se hace con miel fluyendo a la colmena. En primavera se realizan tres tratamientos, separados por una semana. Otro producto utilizado es el mentol y ácido fórmico, el que se aplica en 3 tratamientos por cada 15 días, el que es aplicado directo en el piso de la colmena de modo de no contaminar la miel. Respecto de avariosis, ésta enfermedad se encuentra en Canadá desde 1987. Hoy es considerada como endémica y se ha visto que ha ido aumentando anualmente. En 1994 pasó a ser endémica con una explosión de la enfermedad a nivel de país. Además se señala que existe una relación directa entre varroa y traquea. En general se considera que sobre un 10% es un problema de características comerciales. No es posible erradicarla sin embargo si es posible regularla, lo que está tratando de hacer el Ministerio de Agricultura.



GOBIERNO DE CHILE
FUNDACIÓN PARA LA
INNOVACIÓN AGRARIA



Figura 69. Rheal Lafrenière, Manitoba
Agricultura, Food and Rural Initiatives
Apiarist.



Figura 70. Alex Fernández participante
en la Misión, Rheal Lafrenière y R.W.
Currie de la Universidad de Manitoba

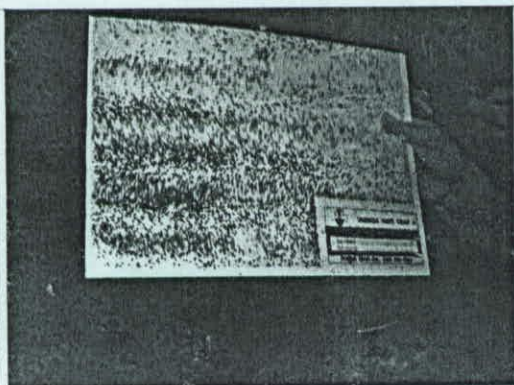


Figura 71. Muestra de varroa.

Respecto de nosema, utilizan tablillas con adhesivo para su control. Respecto del impacto en la actividad, éste es muy severo si no se realiza aplicación dado que genera deshidratación de las abejas por la imposibilidad de alimentarse. Se frena crecimiento y desarrollo. Para su análisis abren el abdomen y agregan 100 ml. de agua por cada 100 abejas, las muelen y el líquido obtenido lo agregan a un porta objetos graduado y el cuenta números de esporas en un microscopio. El número de protozoo no debe superar los 40 por muestra. Cuentan cinco veces número de esporas y sacan un porcentaje. Cuando el nivel es menos a 10% el nivel es bajo. Ellos van de 6 a 10%, lo que indica que es recomendable aplicar. En el mes de febrero aumentan los niveles por que las colmenas en invierno se encuentran confinadas. En este estado se aplican antibióticos en otoño. En general los apicultores indican que el stress y condiciones ambientales extremas generan la enfermedad en las abejas, esto es por que uno de los síntomas es que las abejas se ven imposibilitadas de defecar. El producto veterinario utilizado por los apicultores es fumagilina, aplicado de dos formas: introduciendo nuevos marcos y antes del stress del invierno con alimento fresco. En caso de los marcos viejos deben ser sacados y limpiados. En cuanto a varroa solían controlar con apistan para el control hoy se han dado cuenta que el ácaro creó resistencia. Respecto de su control recomiendan realizar cuatro aplicaciones cuando los niveles superen el 1%. Respecto de *Loque americano*, indica como síntomas el mal olor debido al ataque de la bacteria a las larvas de abejas. Además señalan que el control se basa en aplicación de antibióticos. En caso de traquea es posible que el apicultor realice su propio análisis, sin embargo en Loque no lo es. Las esporas duran más de 40 años y al calor pueden morir a 100°C por cinco minutos de exposición. Al detectar un apiario contaminado, no necesariamente todas las colmenas lo están. Respecto de su aparición en Canadá, ésta fue detectada hace 10 años aproximadamente, y hoy en día han detectado algunas abejas con resistencia a esta bacteria. Los apicultores consideran que es una enfermedad muy grave, sin embargo consideran también que se encuentra controlada.



Laboratorio Apícola

Cuentan con una infraestructura para trabajar en análisis químico y proteico, análisis de residuo y ensayo con abejas reinas. Ellos comparten conocimientos con otros técnicos vinculados al tema apícola y trabajan en distintos tipos de virus. Actualmente tienen dos estudiantes trabajando en el laboratorio. Un estudiante de doctorado y otro de magister, el que se encuentra estudiando de cómo se defienden las abejas de la varroa y el cómo manipular las condiciones de manipulación (humedad y temperatura) para control de varroa. Además están creando termogenética en las abejas, estudiando interacción con análisis infrarrojos. Junto con ello tienen proyectos con la Asociación de Criadores de Reinas de Manitoba. La universidad posee un galpón de confinamiento de abejas donde se controlan distintos factores como humedad, temperatura y es posible verificar comportamiento de las abejas a aplicaciones de productos veterinarios. Respecto de soluciones para el control de enfermedades, muchos de los resultados obtenidos han salido del trabajo con los apicultores. La universidad trabaja estrechamente vinculada con ellos, de modo de que la investigación sea posteriormente utilizada. Por otro lado los apicultores los impulsan a hacer investigación que les sea de utilidad a pesar de que la Universidad puede estar investigando otros temas.

R.W. Currie Profesor de Entomología de la Universidad de Manitoba y Director de la asignatura de Cultivos del Departamento de Agricultura y Desarrollo Rural, tiene cifrado sus intereses en trabajar con Chile para desarrollar dos Centros de Capacitación en conjunto con la Universidad de Concepción.



5. Conclusiones

Como resultado de la Misión fue posible obtener:

- Aumentar y fortalecer los lazos de comunicación, coordinación y cooperación entre los actores insertos en el sector apícola nacional.
- Fortalecer programas de formación y capacitación de capital humano relacionados con el área productiva, obteniendo la profesionalización y especialización de los apicultores, de acuerdo a calendario realizado por Universidad de Manitoba y Universidad de Concepción.
- Incrementar la productividad apícola mediante el uso de tecnología apropiada a la actividad, como el adecuado diagnóstico y tratamiento de las enfermedades que afectan a las abejas, técnicas de manejo en alimentación apícola, producción de miel y uso oportuno del potencial productivo de la flora melífera y polenífera disponible en el país.
- Incrementar la rentabilidad de las empresas avícolas, incorporando tecnologías de valor agregado a la producción, envasado y creación de nuevos productos avícolas al mercado, como mieles monoflorales, mieles con polen, jalea real, propóleo, cera, apitoxina y material genético.
- Generar una plataforma de confianza con los clientes (importadores de miel) que permita en el mediano plazo, diversificar la oferta exportadora de productos apícolas chilenos libre de residuos.
- Mejorar la gestión productiva, administrativa y comercial de las organizaciones asesoradas por el Centro de Gestión Empresarial de Ñuble.
- Mejorar las directrices de inversiones monetarias de recursos gubernamentales hacia el sector apícola para el fomento productivo, valor agregado, gestión, incorporación de tecnología e investigación.



1. Agradecimientos

A través de estas líneas quisiéramos expresar nuestros agradecimientos al Ministerio de Agricultura de Chile y muy especialmente a la Fundación para la Innovación Agraria FIA por hacer posible la realización de la Misión. Destacar el apoyo brindado por las profesionales de FIA Claudia Fernández y Gabriela Casanova sin lo cual el resultado no hubiera sido el mismo. Agradecer a Rheal Lefrenière de Manitoba Agricultura, por coordinar la agenda de visitas en Canadá.



2. Anexos

Resultados adicionales

Describir los resultados obtenidos que no estaban contemplados inicialmente como por ejemplo: formación de una organización, incorporación de alguna tecnología, desarrollo de un proyecto, firma de un convenio, entre otros posibles.

Como resultados adicionales se obtuvo la idea de desarrollar un proyecto comercial en conjunto con ProChile orientado a la comercialización de subproductos. Además de las iniciativas en carpeta con Universidad de Concepción. Por otro lado es importante destacar la integración entre las EAC de la región posterior a la Misión.

Aplicabilidad

Explicar la situación actual del sector y/o temática en Chile (región), compararla con las tendencias y perspectivas presentadas en las actividades de la propuesta y explicar la posible incorporación de los conocimientos y/o tecnologías, en el corto, mediano o largo plazo, los procesos de adaptación necesarios, las zonas potenciales y los apoyos tanto técnicos como financieros necesarios para hacer posible su incorporación en nuestro país (región).

Sobre las tecnologías posibles de implementar en Chile, se detallan a continuación:

3. Confinamiento de abejas en invierno

Ventajas

- Reducir la mortalidad de las abejas por bajas temperaturas invernales.
- Protección ante el ataque de enemigos naturales.
- Facilidad de aplicación de productos fitosanitarios para control de varroa.

Desventajas

- Costos incorporados en el proceso e infraestructura requerida para el confinamiento.
- Mortalidad de 3 a 5%.

Aplicabilidad en Chile

Escasa dada las condiciones climáticas de Chile y los costos involucrados en el proceso.

4. Vínculo estrecho entre Universidad, Gobierno Provincial y productores apícolas.

Ventajas

- Investigación de interés para los productores apícolas.
- Dado que existe un trabajo conjunto es posible detectar problemas sanitarios y dar alerta rápidamente.



dar alerta rápidamente.

- Es posible obtener material genético mejorado y adaptado a condiciones locales.

Desventajas

- No se observan desventajas.

Aplicabilidad en Chile

- Esta alianza público – privada debe ser replicada a corto plazo en el país.
- El triángulo Universidades- Productores Apícolas e Instituciones Públicas debe potenciarse.
- La investigación debe llegar al sector productivo y ser reflejo de su realidad.
- Respecto de los recursos necesarios, estos no son lo importante en relación al interés común de poder desarrollar un trabajo conjunto.

5. Producción de mieles saborizadas.

4

Ventaja

- Mayor precio en el mercado.
- Acceso a nuevos clientes.

Desventaja

- Mayor costo de producción.
- Inversión en investigación y desarrollo tecnológico.
- Mercado muy pequeño.
- Producto desconocido en el país.
- Los canadienses consumen miel pura de abejas, no quieren este producto con sabores.

Aplicabilidad en Chile

- Es posible desarrollar una industria de miel saborizada en Chile, sin embargo previo a ello se requeriría hacer Estudio de Mercado para detectar nichos en EE.UU. O UE para dicho producto.
- Es necesario que en forma paralela se invierta en Investigación y Desarrollo tecnológico que permita desarrollar esta actividad.
- En un futuro cercano, es posible implementar este tipo de producto con la infraestructura necesaria.



6. Desarrollo del mercado doméstico o mercado interno.

Ventajas

- Acceder a un mayor precio en forma constante.
- Permite dar valor agregado, dado que la miel pasa de comercializarse como materia prima a miel procesada y fraccionada.
- Apuntar a dar denominación de origen a la miel nacional.

Desventajas

- Deficiencia de infraestructura y tecnología de proceso.
- Ingreso a la red comercial a través de Supermercado, con sus desventajas respectivas.
- Escaso consumo de miel per capita.
- Competencia desleal con mercado informal de miel.

Aplicabilidad en Chile

- Es completamente aplicable a corto plazo, contando con la tecnología de producción e infraestructura necesaria.
- ES necesario además educar al consumidor respecto de las características del producto y sus bondades alimenticias.
- Canadá posee un Programa gubernamental y privado al respecto.

7. Alta valorización de la asociatividad entre los apicultores.

Ventajas

- Poder comercializar en conjunto.
- Acceder a mejores precios.
- Dar valor agregado a sus productos.
- Adquirir insumos a menor valor.
- Contar con asesoría técnica.
- Eliminar la competencia desleal entre productores.
- Comercializar mayores volúmenes.

Desventajas

- Frenar las individualidades.



- Pérdida de "poder" relativo.

Aplicabilidad en Chile

- Es completamente aplicable, de hecho existen ejemplos de ello.
- En Canadá existe mayor experiencia en el tema, de lo cual es posible aprender.

8. Separación producción de proceso – comercialización de miel.

Ventajas

- Poder optimizar cada uno de los procesos por separado.
- Aplicar gestión empresarial, tendiente a aumentar facturación y reducir costos.

Desventajas

No se observan.

Aplicabilidad en Chile

Es altamente aplicable para las EAC, es más está siendo aplicado progresivamente en empresas como la Cooperativa Apícola Santa Bárbara Limitada.

9. Producción óptima de miel por colmena.

Ventaja

- Aumento rentabilidad.
- Aumento de ingresos por colmena.
- Reducción de costos proporcionales.

Desventaja

- No se observan.

Aplicabilidad en Chile

- Es altamente aplicable mejorando y unificando sistema de manejo productivo (manejo sanitario), aumentando acceso investigación, mecanizando y agregando valor a la miel.
- En manejo productivo, un mejor control de enfermedades como varroa, acariosis, nosemosis.
- Establecer alianzas con universidades para incorporar el interés de los



apicultores a los programas de investigación.

- En el tema mecanización, automatizar procesos permitirá ser más eficientes en el trabajo. Esto permite aumentar el número de colmenas.
- En agregación de valor, desarrollar tecnologías e infraestructuras de fraccionamiento de miel para mercado interno y externo.

10. Alto número de colmenas por apicultor.

Ventajas

- Reduce los costos.
- Aumenta eficiencia (sala extracción miel).
- Aumentan los ingresos.
- Producción de una mayor cantidad de miel.
- Optimización tiempo de proceso.

Desventajas

- No se observan.

Aplicabilidad en Chile

- Altamente aplicable.
- Esto está asociado a mecanizar y automatizar proceso.

11. Implementación de Buenas Prácticas Manufactureras BPM y HACCP.

Ventajas

- Les permite asegurar calidad de la miel en las distintas etapas del proceso productivo.
- Es un requisito para plantas de proceso de alimentos.
- Reduce contaminaciones microbianas en la miel.
- Produce diferenciación con otras empresas.
- Incorpora los Manuales de Procedimientos y Registros en el proceso, facilitando la trazabilidad del producto.

Desventajas

- No se observan.

Aplicabilidad en Chile

- Es necesario la masificación de estos Protocolos en Chile.

12. Recambio de abejas reinas.

Ventajas

- Cambian las abejas reinas cada dos años a lo más.
- Contrarresta efecto de enfermedades.
- Siempre se mantienen reinas jóvenes en la colmena.
- Estas son más productivas.
- Tienen más defensas.

Desventajas

- No se observan.

Aplicabilidad en Chile

- Está siendo aplicado en Chile en forma progresiva y con buenos resultados.
- Debemos intensificar la medida.

13. Alto nivel de tecnificación en proceso.

Ventajas

- Permite disponer de más contar con un mayor número de colmenas.

Desventajas

- Costo económico.

Aplicabilidad en Chile

- Cada productor apícola debe tratar de mecanizar al máximo sus procesos.
- Altamente aplicable.

14. Uso de marcos para láminas estampadas plásticas.

Ventaja

- Reduce contaminación con productos fitosanitarios.
- Mayor facilidad de preparación del marco.
- Mayor resistencia y duración.
- Permite producir ceras con bajos índices de contaminación destinado a comercialización.
- Posee altos índices higiénicos y escasa transmisión de enfermedades.
- Utilizando distintos colores (negro y miel) es posible identificar marcos, cámara de cría y alzas mieleras.

Desventaja

- En su construcción se requiere un buen flujo de néctar.

Aplicabilidad en Chile

- Alta posibilidades de aplicar en Chile, importando cera plástica asociativamente.

15. Uso de pisos tipo pallets.

Ventajas

- Se utilizan pisos pallets con capacidad de 2 y 4 colmenas.
- Se utilizan maquinarias en carga y descarga (utilización de cargador o montacargas).
- Facilidad de maniobra y rapidez.
- No es necesario utilizar caballetes o banquillos.
- Es posible incorporarles malla para control de varroa.
- Permite aislar las colmenas entre sí y de la humedad.

Desventajas

- No se observan desventajas

Aplicabilidad en Chile

- Es factible de implementar el sistema contando con equipo de carga.
- Se sugiere la incorporación de los pisos pallets en los apiarios progresivamente.



16. Uso de pez castilla más parafina sólida para impermeabilización de material apícola.

Ventajas

- Fácil limpieza y desinfección.
- Reduce contaminación por pinturas con plomo.
- Mayor durabilidad de la madera.

Desventajas

- Es necesario contar con equipos para impregnar el material.

Aplicabilidad en Chile

- Al contar con el equipo necesario, es factible de implementar a corto plazo.
- Se sugiere su implementación como una forma de reducir la contaminación por pinturas con plomo.
- Es factible de utilizar en reemplazo, aceite de linaza doble cocido.

17. Captura y procesamiento de pólen en forma comercial.

Ventajas

- Diversifica de la producción apícola de una colmena.
- Apicultores especializados en la producción de polen, utilizando la miel como alternativa.
- Aumenta los ingresos.
- Producen en tiempo que no hay flujo de néctar.
- Cuentan con la infraestructura y tecnología para el secado, clasificado y envasado de polen.
- Polen no comercializado es utilizado en la alimentación de las colmenas como suplemento proteico.

Desventajas

- No se observan desventajas.

Aplicabilidad en Chile

- Alta posibilidad de ser implementado un sistema de cosecha de polen en



nuestros apiarios.

- Se requiere la infraestructura mínima necesaria.

18. Implementar sistema de procesamiento de cera.

Ventajas

- Cuentan con una Industria de proceso de cera altamente especializada (orgánica).
- Con ello, incorporan valor agregado a la cera como por ejemplo velas, cera en bloques para uso cosmético y domestico.

Desventajas

- No se observan desventajas.

Aplicabilidad en Chile

- Alta aplicabilidad contando con infraestructura necesaria.

19. Sistema de extracción mecanizado de miel.

Ventajas

- Contar con una línea de extracción automática y altamente tecnificada que además de extraer cuenta con un sistema de eliminación de humedad.
- Se realiza una mejor y más rápida extracción de la miel.
- No rompe marcos.
- Permite carga y descarga más fácil por disponer de canastillos cambiables.
- Reduce costos en la extracción.
- Se reduce mano de obra.

Desventajas

- Alto costo de la inversión para implementar el sistema.
- La tecnología no está disponible en Chile.

Aplicabilidad en Chile

- Es posible de implementar a mediano – largo plazo.



- Se puede incorporar en salas de extracción de miel asociativas.
- Es posible aprovechar la oportunidad por bajo valor del dólar.

20. Profesionalización de los apicultores y que se encuentre dispuestos a implementar tecnología de punta.

Ventajas

- Cuentan con una apicultura altamente tecnificada y desarrollada en el país.
- Acceden mejor a los tratados de libre comercio suscritos por Canadá (EE.UU).
- Cuentan con apicultores desarrollando las especialidades dentro de la apicultura, como por ejemplo criadores de reina, productores de miel y polen etc...

Desventajas

- No se observan.

Aplicabilidad en Chile

- Ya se han hecho esfuerzos en instituciones como INDAP con el Programa de BPA, alfabetización digital etc.
- En misiones de captura tecnológicas u otros Programa de FIA.
- Programas Centro de Gestión tendiente a mejorar la gestión de la Pequeña Agricultura Familiar.
- Creación del Centro Nacional Apícola.
- Universidades como de Concepción, Austral, PUC.
- Sin embargo es necesario redoblar los esfuerzos en este ámbito.

21. Renovación paulatina de los Directorios.

Ventajas

- Cuentan con un Directorio de gran experiencia y claridad en sus procesos.
- Incorporar a los apicultores en tema gestión del Directorio.
- Todos están informados del funcionamiento de la Empresa.
- Los apicultores se involucran aportando con tiempo y trabajo al desarrollo de su organización.
- Existe esta norma en la legislación provincial

Desventajas

- No se observan desventajas.

Aplicabilidad en Chile

- Alta aplicabilidad en las empresas de la Pequeña Agricultura Familiar.
- Se sugiere dar un impulso a su implementación.
- Incorporar en los Estatutos de las Organizaciones es una alternativa de poder hacerlo.

Detección de nuevas oportunidades y aspectos que quedan por abordar

Señalar aquellas iniciativas que surgen como vías para realizar un aporte futuro para el rubro y/o temática en el marco de los objetivos iniciales de la propuesta, como por ejemplo la posibilidad de realizar nuevas actividades.

Indicar además, en función de los resultados obtenidos, los aspectos y vacíos tecnológicos que aún quedan por abordar para ampliar el desarrollo del rubro y/o temática.

En función de los resultados obtenidos es posible indicar que el camino que debiera seguir el sector apícola nacional debe estar orientado a desarrollar un manejo sanitario acorde a los requerimientos de los mercados –externos-, la tecnificación de los procesos, incorporar Programas de Aseguramiento de Calidad tanto a nivel de apiario –Buenas Prácticas Agrícolas- como de sala de extracción de miel –Buenas Prácticas de Manufacturas; fortalecer alianza público-privada y de universidades y desarrollar el mercado doméstico o mercado interno. En este punto es posible desarrollar en conjunto una estrategia de potenciar el consumo de miel en el país, teniendo en consideración que Chile consume 83 gramos per cápita de miel versus 2,5 kilos en países como Alemania.

Creemos que es importante abordar de mejor forma las alternativas de infraestructura existente en el país y la que es posible importar para contar con una red de salas de extracción y de fraccionamiento de miel comunitaria.

Finalmente estrechar vínculos con universidades del país de modo de que la investigación realizada sea acorde a los requerimientos del sector apícola.



4. ASPECTOS RELACIONADOS CON LA EJECUCIÓN DE LA PROPUESTA

Programa Actividades Realizadas

		SE ADJUNTA ADELANTE.	

Detallar las actividades realizadas en cada una de las Iniciativas, señalar y discutir las diferencias con la propuesta original, y rescatar lo más importante de cada una de ellas. Por ejemplo, en el caso de Giras discutir las actividades de cada visita; Becas, analizar las exposiciones más interesantes; Consultores, detallar el itinerario y comentarios del consultor; Eventos, resumir y analizar cada una de las exposiciones; y Documentos, analizar brevemente los contenidos de cada sección.

GIRAS

FECHA (Día-mes-año)	ACTIVIDAD	OBJETIVO	LUGAR (Institución/ Empresa / Productor)
30-09-2005	Encuentro con Rhéal Lafreniere y David Ostermann Del laboratorio Apícola Provincial	Proporcionar una descripción del rol y responsabilidad del gobierno en el soporte del desarrollo y crecimiento de la industria apícola local. Conocer algunos requerimientos y procedimientos para realizar análisis en laboratorios para el diagnóstico de las enfermedades apícolas. Conocer tratamientos y remedios de problemas sanitarios comunes.	Manitobe Agriculture, Food & Rural Initiatives, Winnipeg.
30-09-2005	Encuentro con Dr. R.W. Currie, Profesor Entomología (Apicultura)	Proporcionar una descripción de la relación entre la Universidad y la industria Apícola local, su forma de interacción y participación en programas de desarrollo de la investigación requerida	Universidad de Manitoba, Winnipeg.
26-09-2005	Encuentro con Gordon Marks CEO of Bee Maid Money Ltd. Y	Proporcionar información acerca de las organizaciones productivas (Cooperativas) en el Mercado domestico y exportable de miel.	Cooperativa de productores de miel de Manitoba,



GOBIERNO DE CHILE
FUNDACIÓN PARA LA
INNOVACIÓN AGRARIA

27-09-2005	Visita a las instalaciones comunes de productores artesanos de Cera y Miel de Abeja.	Familiarizar a la delegación con algunos éxitos de oportunidades de agregación de valor de la industria de la miel	Winnipeg
27-09-2005	Encuentro con Murray Lewis, en las instalaciones de manufacturas de equipos comerciales.	Ver las instalaciones, maquinarias y requerimientos necesarios para la fabricación de equipos comerciales usados en la producción, extracción, procesamiento y envasado de la miel. Tomar conocimiento de los requerimientos necesarios para la implementación de maquinarias y procesos de agregación de valor de los productos apícolas.	Lewis Farms, Localidad de Portage la Prairie
27-09-2005	Encuentro con Keith & Kathy Lloyd	Conocer una planta de procesamiento de cera, su rendimiento comercial, procesos de fabricación y ver las múltiples formas de productos posibles de comercializar.	MacGregor Wax Works, Localidad de la Prairie
27-09-2005	Encuentro con Mike Hill en la tienda de abastecimientos apícolas	Demostrar como una pequeña tienda de abastecimiento apícola puede llenar un nicho de mercado	Tienda de Bee Basics Ltd., Localidad de la Prairie
28-09-2005	Encuentro con Todd Yakimishen, Presidente Asociación de Apicultores	Conocer una planta de extracción de miel de gran escala productiva pertenecientes a la Asociación de Apicultores, conocer la forma de organización y funciones de los socios y hacer además un tour a una gran operación del comercio apícola.	Sala de extracción de miel de la Asociación de Apicultores de Manitoba Localidad de Dauphin
28-09-2005	Encuentro con Bryan Ash, para hacer tour del apiario e instalaciones.	Visitar y conocer una empresa apícola muy grande, con su propia planta procesadora y envasadora comercial de miel. Conocer las técnicas de manejo productivo, uso eficiente de mano de obra, manejo sanitario y como se distribuyen las actividades de la empresa a través del año.	Apiarios Ash Ltda., Localidad de Dauphin
29-09-2005	Encuentro con Merv Marlon y hacer tour de los apiarios	Mostrar un criador comercial de reinas y discutir la función de la asociación de Criadores de Reina de Manitoba. Hacer un tour de su apicultura y operaciones en crianza de reinas.	Apiarios Kemmay Ltda. Localidad de Brandon.
29-09-2005	Encuentro con James (Bev) Clark, Tour en instalaciones de criadero de reinas	Conocer a un criador comercial de reinas y discutir la función de la asociación de Criadores de Reina de Manitoba. Hacer un tour de su apicultura y operaciones en crianza de reinas	Apiarios Ferry, Localidad de Brandon.



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INNOVACIÓN AGRARIA

BECAS

CONSULTORES

EVENTOS

DOCUMENTOS

Contactos Establecidos

Presentar los antecedentes de los contactos establecidos durante el desarrollo de la propuesta (profesionales, investigadores, empresas, etc.), de acuerdo al siguiente cuadro:

Institución Empresa Organización	Persona de Contacto	Cargo	Fono/Fax	Dirección	E-mail
Manitota Beekeepers Asociation	Todd Yakimishen	Ashley Presidente Asociación	204-548-4060	Ashville MB ROL 0A0 Canadá	info@o aknook honey.c om
Agricultura, Food and Rural Initiative	Réal Lafrenière	Soils and Crops Branch	204-945-4825	Ag Service Complex 204- 545 University Cr. Winnipeg, MB R 3T 5S6	RLafre nier@g ov.mb.c a
Universidad de Manitota	Dr. Rob W. Curri	Profesor de Apicultura Universidad	204-474-9380	Universidad de Manitoba, Manitoba	currier @ms.u manito ba.ca
Beekeepers	Ryan Yakimishen	Apicultor, criador reinas	204-638-1379	125 Veterans Drive Dauphin, Manitoba	Ryan y akimish en@hot mail.co m
Sunshine Valley Honey	Bryan Ash	Empresario Apícola	204-548-2112		



GOBIERNO DE CHILE
FUNDACIÓN PARA LA
INNOVACIÓN AGROARIA

Sharon's Finest	Sharon Isbister	Empresario apícola	204-685-2674	PO Box 715 Mc Gregor, Manitoba	bister@ mts.net
Podolski Honey Farms	Bruce Podolski	Empresário y apicultor	204-742-3737	PO Box 1, Ethelbert, MB Rol OTO	podolsk ihoneyf arms@ hotmail. com
Bee Maid Honey Ltda..	Gordon Marks	CEO	204-786-8977	Bee Maid Honey	gmarks @beem aid.com

Material elaborado y/o recopilado

Entregar un listado del material elaborado, recibido y/o entregado en el marco de la propuesta. Se debe entregar adjunto al informe un set de todo el material escrito y audiovisual, ordenado de acuerdo al cuadro que se presenta a continuación.

También se deben adjuntar fotografías correspondientes a la actividad desarrollada. El material se debe adjuntar en forma impresa y en un medio electrónico (disquet o disco compacto).

Elaborado

Tipo de material	Nombre o identificación	Preparado por	Cantidad
Resumen	Resumen Jornada Difusión Misión de Captura Tecnológica Valor Agregado y Gestión Apícola a Maniotota Canadá	Ramón E. Paredes Vega	Un ejemplar por empresa

Recopilado

Tipo de Material	Nº Correlativo (si es necesario)	Caracterización (título)
Libro	1	Money Bee Diseases & Pest, 2ª Edition Revised
Libro	2	Beekeeping Supplies Price List Bee Maid
Libro	3	Honey Bee Diseases & Pest, Anadian Asociation of Professional Apiculturist
Folleto	1	OAKNOOK Money Product Ltda.



Programa de difusión de la actividad

En esta sección se deben describir las actividades de difusión de la actividad, adjuntando el material preparado y/o distribuido para tal efecto.

En la realización de estas actividades, se deberán seguir los lineamientos que establece el "Instructivo de Difusión y Publicaciones" de FIA, que le será entregado junto con el instructivo y formato para la elaboración del informe técnico.

FECHA (Día-mes-año)	TIPO DE ACTIVIDAD	OBJETIVO	LUGAR	Nº Y TIPO BENEFICIARIOS	INFORMACIÓN A ENTREGAR
23-03-2006	Seminario Regional (Jornada Difusión)	Dar a conocer experiencia Gira a Canada	Santa Bárbara	Productores Apícolas, entidades gubernamentales (SAG, INDAP) y Red Nacional Apícola	Tecnología apícola aplicada en Canada, forma de relaciones entre agrupaciones de apicultores y entidades Gubernamentales
01/02/2006	Confección de cartilla divulgativa, la que se entregará en la Jornada Difusión y consistirá en un resumen de las exposiciones.	Dar a conocer a conocer aspectos generales de los potenciales económicos y tecnológicos entre Canada y Chile	Centro de Gestión	Productores apícolas asociados al centro de Gestión Empresarial de Nuble S.A.	Potenciales mercados a los productos apícolas Nacionales y desafíos para el sector
12-2005	Publicación en Medio masivo de difusión	Dar a conocer a todos los sectores participantes del sector apícola de las experiencias de la delegación Chilena a Canada	Diario La Discusión y Página WEB de INDAP	Productores, exportadores, Red Nacional Apícola	Potenciales mercados a los productos apícolas Nacionales y desafíos para el sector

5. PARTICIPANTES DE LA PROPUESTA

GIRAS, BECAS: Ficha de Participantes

CONSULTORES: Ficha de(l) Consultor(es)

EVENTOS: Ficha de Expositores y Organizadores

DOCUMENTOS: Ficha de Autores y Editores

Nombre	Ramón Enrique
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Dirección, Comuna y Región	Bulnes 377 Chillán VIII Región
Fono y Fax	42/221766
E-mail	cegenuble@entelchile.net
Nombre de la organización, empresa o institución donde trabaja / Nombre del predio o de la sociedad en caso de ser productor	Centro de Gestión Ñuble S.A.
RUT de la organización, empresa o institución donde trabaja / RUT de la sociedad agrícola o predio en caso de ser agricultor	96.873.740-6
Cargo o actividad que desarrolla	Gerente
Rubro, área o sector a la cual se vincula o en la que trabaja	Gestión

6. PARTICIPANTES DE LA PROPUESTA

GIRAS, BECAS: Ficha de Participantes

CONSULTORES: Ficha de(l) Consultor(es)

EVENTOS: Ficha de Expositores y Organizadores

DOCUMENTOS: Ficha de Autores y Editores

Nombre	Elia
Apellido Paterno	Navarrete
Apellido Materno	Garrido
RUT Personal	9.523.460-7
Dirección, Comuna y Región	Camino Pinto S/N, VIII Región
Fono y Fax	8/2329930
E-mail	No Posee
Nombre de la organización, empresa o institución donde trabaja / Nombre del predio o de la sociedad en caso de ser productor	Comité de Apicultores Futuro de Chillán
RUT de la organización, empresa o institución donde trabaja / RUT de la sociedad agrícola o predio en caso de ser agricultor	75.626.300-5
Cargo o actividad que desarrolla	Directora
Rubro, área o sector a la cual se vincula o en la que trabaja	Apicola

7. PARTICIPANTES DE LA PROPUESTA

GIRAS, BECAS: Ficha de Participantes

CONSULTORES: Ficha de(l) Consultor(es)

EVENTOS: Ficha de Expositores y Organizadores

DOCUMENTOS: Ficha de Autores y Editores

Nombre	Luis
Apellido Paterno	Villarroel
Apellido Materno	Iraira
RUT Personal	6.264.501-6
Dirección, Comuna y Región	Manuel Rodríguez 10, Santa Bárbara VIII Región
Fono y Fax	43/589206
E-mail	coasba@terra.cl
Nombre de la organización, empresa o institución donde trabaja / Nombre del predio o de la sociedad en caso de ser productor	Cooperativa Apícola Coasba Limitada
RUT de la organización, empresa o institución donde trabaja / RUT de la sociedad agrícola o predio en caso de ser agricultor	72.837.400-4
Cargo o actividad que desarrolla	Presidente
Rubro, área o sector a la cual se vincula o en la que trabaja	Apicola

8. PARTICIPANTES DE LA PROPUESTA

GIRAS, BECAS: Ficha de Participantes

CONSULTORES: Ficha de(l) Consultor(es)

EVENTOS: Ficha de Expositores y Organizadores

DOCUMENTOS: Ficha de Autores y Editores

Nombre	Alex
Apellido Paterno	Fernández
Apellido Materno	Fernández
RUT Personal	13.886.403-0
Dirección, Comuna y Región	Vicente Méndez S/N, Chillán VIII Región
Fono y Fax	42/208773
E-mail	No Posee
Nombre de la organización, empresa o institución donde trabaja / Nombre del predio o de la sociedad en caso de ser productor	Universidad de Concepción
RUT de la organización, empresa o institución donde trabaja / RUT de la sociedad agrícola o predio en caso de ser agricultor	81.494.400-K
Cargo o actividad que desarrolla	Investigador
Rubro, área o sector a la cual se vincula o en la que trabaja	Apícola



9. PARTICIPANTES DE LA PROPUESTA

GIRAS, BECAS: Ficha de Participantes

CONSULTORES: Ficha de(l) Consultor(es)

EVENTOS: Ficha de Expositores y Organizadores

DOCUMENTOS: Ficha de Autores y Editores

Nombre	Juan Carlos
Apellido Paterno	Plaza
Apellido Materno	González
RUT Personal	6.180.647-4
Dirección, Comuna y Región	Ginebra 43, Población 20 Diciembre Los Ángeles VIII Región
Fono y Fax	43/314427
E-mail	Jcplaza54@yahoo.es
Nombre de la organización, empresa o institución donde trabaja / Nombre del predio o de la sociedad en caso de ser productor	Cooperativa Miel de Los Ángeles Limitada
RUT de la organización, empresa o institución donde trabaja / RUT de la sociedad agrícola o predio en caso de ser agricultor	65.470.550-K
Cargo o actividad que desarrolla	Asesor
Rubro, área o sector a la cual se vincula o en la que trabaja	Apicola

10. PARTICIPANTES DE LA PROPUESTA

GIRAS, BECAS: Ficha de Participantes

CONSULTORES: Ficha de(l) Consultor(es)

EVENTOS: Ficha de Expositores y Organizadores

DOCUMENTOS: Ficha de Autores y Editores

Nombre	Miguel
Apellido Paterno	Campamá
Apellido Materno	Orhanovic
RUT Personal	7.034.554-4
Dirección, Comuna y Región	Camino San Nicolás S/N, VIII Región
Fono y Fax	42/208773
E-mail	mcampama@hotmail.com
Nombre de la organización, empresa o institución donde trabaja / Nombre del predio o de la sociedad en caso de ser productor	Apícola del Sol San Nicolás
RUT de la organización, empresa o institución donde trabaja / RUT de la sociedad agrícola o predio en caso de ser agricultor	No Posee
Cargo o actividad que desarrolla	Productor Apícola
Rubro, área o sector a la cual se vincula o en la que trabaja	Apicola

Participantes en actividades de difusión

Es necesario registrar los antecedentes de todos los asistentes que participaron en las actividades de difusión. El listado de asistentes a cualquier actividad deberá al menos contener la siguiente información:

Nombre	Alex
Apellido Paterno	Fernández
Apellido Materno	Fernández
RUT Personal	13.886.403-0
Dirección, Comuna y Región	Avenida Vicente Méndez S/N, Chillán VIII Región
Fono y Fax	42/208773
E-mail	No Posee
Nombre de la organización, empresa o institución donde trabaja / Nombre del predio o de la sociedad en caso de ser productor	Universidad de Concepción
RUT de la organización, empresa o institución donde trabaja / RUT de la sociedad agrícola o predio en caso de ser agricultor	81.494.400-K
Cargo o actividad que desarrolla	Investigador
Rubro, área o sector a la cual se vincula o en la que trabaja	Apicola

PARTICIPANTE EN ACTIVIDAD DE DIFUSION

Nombre	Luis
Apellido Paterno	Villarroel
Apellido Materno	Iraira
RUT Personal	6.264.501-6
Dirección, Comuna y Región	Manuel Rodrigue 10, Santa Bárbara VIII Región
Fono y Fax	43/589206
E-mail	<u>coasba@terra.cl</u>
Nombre de la organización, empresa o institución donde trabaja / Nombre del predio o de la sociedad en caso de ser productor	Cooperativa Apícola Coasba Limitada
RUT de la organización, empresa o institución donde trabaja / RUT de la sociedad agrícola o predio en caso de ser agricultor	72.837.400-4
Cargo o actividad que desarrolla	Presidente
Rubro, área o sector a la cual se vincula o en la que trabaja	Apicola



PARTICIPANTE EN ACTIVIDAD DE DIFUSION

Nombre	Javier
Apellido Paterno	Cáceres
Apellido Materno	Soto
RUT Personal	5.269.354-3
Dirección, Comuna y Región	Avenida Vicente Méndez S/N, Chillán VIII Región
Fono y Fax	42/208773
E-mail	javiercaceres@udec.cl
Nombre de la organización, empresa o institución donde trabaja / Nombre del predio o de la sociedad en caso de ser productor	Universidad de Concepción
RUT de la organización, empresa o institución donde trabaja / RUT de la sociedad agrícola o predio en caso de ser agricultor	81.494.400-K
Cargo o actividad que desarrolla	Director Investigación
Rubro, área o sector a la cual se vincula o en la que trabaja	Apicola

PARTICIPANTE EN ACTIVIDAD DE DIFUSION

Nombre	Juan Carlos
Apellido Paterno	Plaza
Apellido Materno	González
RUT Personal	6.180.647-4
Dirección, Comuna y Región	Ginebra 43 Población 20 Diciembre, Los Ángeles VIII Región
Fono y Fax	43/314427
E-mail	Jcplaza54@yahoo.es
Nombre de la organización, empresa o institución donde trabaja / Nombre del predio o de la sociedad en caso de ser productor	Cooperativa Miel de Los Ángeles Limitada
RUT de la organización, empresa o institución donde trabaja / RUT de la sociedad agrícola o predio en caso de ser agricultor	65.470.550-K
Cargo o actividad que desarrolla	Asesor
Rubro, área o sector a la cual se vincula o en la que trabaja	Apicola

11. EVALUACIÓN DE LA PROPUESTA

Evaluación de la actividad para cada INICIATIVA

En esta sección se debe evaluar la actividad en cuanto a los siguientes ítems:

a) Efectividad de la convocatoria (cuando corresponda)

No Corresponde

b) Grado de participación de los asistentes (interés, nivel de consultas, dudas, etc)

Alto

c) Nivel de conocimientos adquiridos por los participantes, en función de lo esperado (se debe indicar si la actividad contaba con algún mecanismo para medir este punto y entregar una copia de los instrumentos de evaluación aplicados)

Alto, los apicultores llegaron con una visión de la apicultura y de las metas que debe alcanzar el sector.

d) Problemas presentados y sugerencias para mejorarlos en el futuro (incumplimiento de horarios, deserción de participantes, incumplimiento del programa, otros)

No se detectaron grandes problemas dado que realizamos reuniones previas donde se insistió en puntualidad, cumplimiento de programa etc.

Aspectos relacionados con la postulación al programa de Captura y Difusión

a) Información recibida por parte de FIA para realizar la postulación

___ amplia y detallada ☒ aceptable ___ deficiente

Justificar: Antes de presentar la información es difícil obtener información a través del mail indicado en las bases.

b) Sistema de postulación al Programa de Formación o Promoción (según corresponda)

☒ adecuado ___ aceptable ___ deficiente

Justificar:

c) Apoyo de FIA en la realización de los trámites de viaje internacionales (pasajes, seguros, otros) (sólo cuando corresponda)

☒ bueno ___ regular ___ malo

Justificar: Se produjo una descoordinación al no enviar el sobre con los pasajes aéreos a nombre del COORDINADOR de la propuesta.

d) Recomendaciones (señalar aquellas recomendaciones que puedan aportar a mejorar los aspectos administrativos antes indicados)

Resolver de otra forma el gasto incorporado en tomar Póliza de Garantía y hacer más amigables y resumidos los Informes a entregar a FIA.

12. Conclusiones Finales de la Propuesta Completa

En el caso de Giras Tecnológicas, en lo posible presentar conclusiones individuales por participante.

Para el grupo haber podido acceder a participar en una Misión de esta envergadura es algo muy importante, dado por el apoyo prestado por Fundación para Innovación Agraria FIA como por el apoyo del Gobierno Provincial de la Provincia de Maniitota como de su Universidad. Creemos que existen grandes retos que debemos asumir al mirar hacia delante los que se vinculan al desarrollo profesional de la apicultura en el país lo que se ha transformado en una meta personal de cada uno de los participantes en la Misión.

Finalmente indicar que los resultados obtenidos en la Misión son en un 90% replicables en el país y que depende de nosotros y del esfuerzo que hagamos por difundir lo que adquirimos en que estos resultados se apliquen en un breve plazo.



Centro de Gestión Empresarial de Ñuble



GOBIERNO DE CHILE
FUNDACIÓN PARA LA
INNOVACIÓN AGRARIA

Hernán Meza Carrasco, Presidente del Directorio del Centro de Gestión Empresarial de Ñuble S.A., y la Fundación para la Innovación Agraria, FIA, tienen el agrado de invitar a usted a participar de una Jornada de Difusión sobre la Misión de Captura Tecnológica a Canadá. Esta se realizará el jueves 23 de marzo de 2006 a partir de las 10:45 horas, en el Salón de Eventos Hogar Indígena, ubicado en calle Carrera S/N, Santa Bárbara.

La actividad que se enmarca en el proyecto “Misión de Captura Tecnológica de Valor Agregado y Gestión Apícola a Manitoba, Canadá”, financiado por la Fundación para la Innovación Agraria (FIA), a través del Programa de Captura y Difusión Tecnológica, comenzará con una charla a cargo de los apicultores participantes en la misión.

*Mayores informaciones y confirmación de asistencia al teléfono
42/221766 o al mail: cegenuble@entelchile.net
Actividad sin costo.*

Programa Jornada Difusión

“Misión de Captura Tecnológica valor agregado Maniotota - Canadá”



11:00 Horas

Bienvenida, Sr. Hernán Meza Carrasco, Presidente Directorio Centro de Gestión.

Bienvenida, Sra. Claudia Fernández, Ejecutiva Proyecto FIA



Bienvenida, Sr. Rubén Gutiérrez, Vicepresidente Cooperativa Apícola Santa Bárbara Ltda.

11:15 Horas



Exposición de resultados de Misión de Captura Tecnológica valor agregado Maniotota - Canadá.



• *Sr. Javier Cáceres, Universidad de Concepción “La apicultura en Canadá, situación actual y perspectivas”*

• *Sra. Elia Navarrete, Comité Apicultores Futuro de Chillán, “Manejo sanitario y desarrollo productivo de apiarios en la apicultura canadiense”.*

• *Sr. Juan C. Plaza, Cooperativa Miel de Los Ángeles, “Infraestructura y mecanización en la apicultura canadiense”.*

• *Sr. Luis Villaroel, Cooperativa Apícola Sta. Bárbara, “Asociatividad y Comercialización en la apicultura canadiense”*



13:30 Horas

Ronda de preguntas.

14:00 Horas

Cocktail



Buenos Días

INICIO

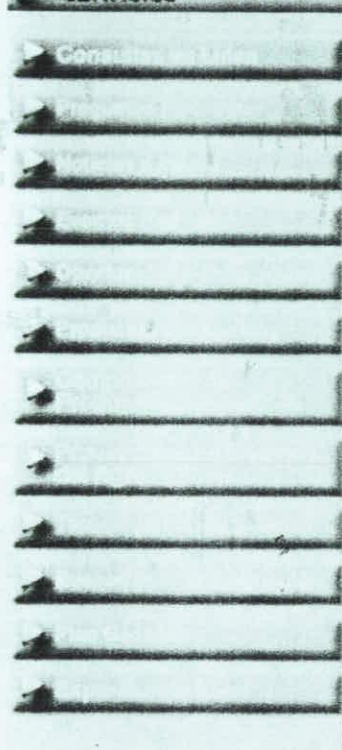
¿QUIENES SOMOS?

PRODUCTOS Y SERVICIOS

MAPA DEL SITIO

ABRIL 12TH, 2006

SERVICIOS



• OPORTUNIDADES COMERCIALES

Necesito Ajos Rosados para comprador en el Extr.

EVENTOS RELEVANTES


**JORNADA DE DIFUSIÓN, MISIÓN CAPTURA
TECNOLÓGICA VALOR AGREGADO Y GESTIÓN
APÍCOLA, MANITOBA, CANADÁ**

13/03/2006

Se invita a la comunidad apícola a una jornada de difusión de la misión de captura tecnológica de valor agregado y gestión apícola en Manitoba, Canadá.

Esta actividad permitirá observar los avances y nuevas tecnologías posibles de incorporar al sector apícola chileno. Persona contacto: Sr. Ramón Paredes, Gerente de CEGE Ñuble. Fono/Fax: 042-221766 Correo: cegenuble@entelchile.net, Dirección: BUInes 377, Chillán.



Atras

Apicultura

Cereales

Emergentes

Flores

Frutas

Ganadería

Hortalizas y Chacras

Leguminosas

Orgánicos

Papas

Vitivinicultura

Biblioteca

INDICADORES ECONÓMICOS	
UF hoy	(\$) 17.921,18
UF mañ.	(\$) 17.924,75
Dólar ob	(\$) 516,08
Dólar cp.	(\$) 511
Dólar vta	(\$) 518
Euro	(\$) 624,18
UTM	(\$) 31.413

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INSTITUCION

ProChile en el Mundo

ProChile en Regiones

ChileInfo

Direcon

CAPACITACION

Capacitación (nuevo)



Oficina Regional Bío - Bío

AGENDA REGIONAL

Jornada de Difusión Misión de Captura Tecnológica Apícola a Canadá.

El encuentro tiene como objeto difundir la Misión de captura Tecnológica de Valor Agregado y gestión Apícola a Manitota, Canada.

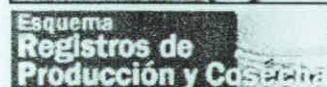
El taller, organizado por el centro de Gestión Empresarial de Ñuble S.A. y la Fundación para la Innovación Agraria FIA, se realizará el jueves 23 de marzo, a las 10:45 hrs., en el Salón de Eventos Hogar Indígena (Carrera s/n Santa Bárbara).

Más información en el teléfono (42) 221766 o al e-mail cegenuble@entelchile.net

23-3-2006

← volver

MENU PRINCIPAL

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Jornada de Difusión sobre la Misión de Captura Tecnológica a Canadá

viernes, 17 marzo 2006

Interesante invitación, es gratis.

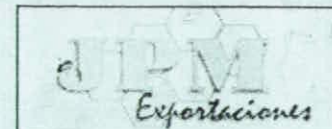
"Jornada de Difusión sobre la Misión de Captura Tecnológica a Canadá"

Esta se realizará el jueves 23 de marzo de 2006 a partir de las 10:45 horas, en el Salón de Eventos Hogar Indígena, ubicado en calle Carrera S/N, Santa Bárbara.

[DESCARGAR INVITACIÓN](#)

Mas información con:

Ramón E. Paredes Vega
Gerente Centro de Gestión Nuble
cegenuble@entelchile.net

[< Anterior](#)[Siguiente >](#)

ULTIMOS TITULARES

- » Investigadores desarrollan abejas más productivas
- » El SAG, buscará apoyo FNDP para realizar Estudio científico Apícola en la Región.
- » Discutirán sobre la Apicultura
- » Apicultores piden implementar barreras
- » Apicultores de Putaendo recibirán 50 millones de pesos para daños de Loque Americano

ENCUESTAS

¿ha recibido respuesta positiva en los avisos clasificados que ha publicado?

Si, conseguí mi objetivo
si, pero sólo sirvió para establecer contactos
no, no recibí respuesta

[Vote](#)[Resultados](#)

Viajarán catorce personas

Misión apícola de captura tecnológica a Canadá

El Centro de Gestión Ñuble, CEGE-Ñuble, la Universidad de Concepción y tres empresas asociativas campesinas, clientes del CEGE, presentaron una propuesta al Fondo de Innovación Agraria (FIA) para realizar una Misión de Captura Tecnológica en Gestión y Valor Agregado en Miel a Manitoba, Canadá.

La entidad finalmente aprobó la iniciativa, cofinanciando el 70 por ciento de los costos, en tanto que el 30 por ciento restante será aporte de los participantes.

En la gira participarán 14 personas, entre profesionales, docentes y apicultores. Viajarán el gerente del Centro de Gestión, la coordinadora de la Unidad de Asesoría Técnica del centro, tres personeros de la Universidad de Concepción, cuatro apicultores socios de la Cooperativa Apícola Santa Bárbara Limitada, tres apicultores (un hombre y dos mujeres) de Comité de Apicultores Coapi Futuro de Chillán, un socio de la Cooperativa Apícola Santa

Bárbara Limitada y un apicultor vinculado al Comité de Apicultores de San Nicolás.

Entre los objetivos de la Misión

está el poder capturar tecnologías vinculadas a la gestión y administración de empresas asociativas en Canadá; conocer

apicultores para analizar y comparar el manejo sanitario que ellos realizan; visitar salas de cosecha y extracción de miel, para ver la

cosecha y pos cosecha; ir a la Universidad de Manitoba para estudiar la investigación que se está realizando; visitar plantas de proceso de miel, para barajar la posibilidad de incorporar valor a las mieles nacionales; y supermercados para analizar envases y embalajes, finalizando la gira tecnológica con un encuentro con profesionales de ProChile en Canadá.

BREVE HISTORIA

Esta iniciativa surgió de una visita que profesionales y apicultores canadienses realizaron a comienzos del 2005 a la Universidad de Concepción, y ésta solicitó poder visitar las empresas apícolas clientes del Centro de Gestión. En dicha visita se extendió una invitación de parte de los canadienses, la que se fue gestando hasta llegar a la presentación de la Propuesta a FIA. En un comienzo la misión partía el 24 de septiembre, sin embargo se está solicitando iniciarla el 1º de octubre, lo que está por confirmarse.



La delegación del CEGE-Ñuble, podrá conocer cómo enfrentan la actividad apícola productores e investigadores de Canadá.

Chillán - Chile 14 de Septiembre de 2005

PORTADA EDITORIAL ECONOMICOS CARTAS COCINA REDACCION GUÍA PROFESIONAL SOCIALES DEPORTES OBITUARIO CRONICA

Crónica



Misión apícola de captura tecnológica a Canadá

Martes 13 de septiembre de 2005.

El Centro de Gestión Ñuble, CEGE-Ñuble, la Universidad de Concepción y 3 empresas asociativas campesinas clientes del CEGE, presentaron una propuesta al Fondo de Innovación Agraria (FIA) para realizar una Misión de Captura Tecnológica en Gestión y Valor Agregado en Miel a Manitoba, Canadá.

La entidad finalmente aprobó la iniciativa, cofinanciando el 70% de los costos, en tanto que el 30% restante será aporte de los participantes.

En la gira participarán 14 personas, entre profesionales, docentes y apicultores. Viajarán el gerente del Centro de Gestión, la coordinadora de la Unidad de Asesoría Técnica del centro, 3 personeros de la Universidad de Concepción, 4 apicultores socios de la Cooperativa Apícola Santa Bárbara Limitada, 3 apicultores (1 hombre y 2 mujeres) de Comité de Apicultores Coapi Futuro de Chillán, 1 socio de la Cooperativa Apícola Santa Bárbara Limitada y un apicultor vinculado al Comité de Apicultores de San Nicolás.

Entre los objetivos de la Misión está poder capturar tecnologías vinculadas a la gestión y administración de empresas asociativas en Canadá; conocer apicultores para analizar y comparar el manejo sanitario que ellos realizan; visitar salas de cosecha y extracción de miel, para ver la cosecha y postcosecha; ir a la Universidad de Manitoba para ver la investigación que se está realizando; visitar plantas de proceso de miel, para ver la posibilidad de incorporar valor a las mieles nacionales; y supermercados para ver envases y embalajes, finalizando la gira tecnológica con un encuentro con profesionales de ProChile en Canadá.

BREVE HISTORIA.

Esta iniciativa surgió de una visita que profesionales y apicultores canadienses realizaron a comienzos del 2005 a la Universidad de Concepción, y ésta nos solicitó poder visitar las Empresas Apícolas Clientes del Centro de Gestión.

En dicha visita se extendió una invitación de parte de los canadienses, la que se fue gestando hasta llegar a la presentación de la Propuesta a FIA.

En un comienzo la Misión partía el 24 de septiembre, sin embargo se está solicitando iniciarla el 1 de octubre, lo que está por confirmarse.

Hoy: Desp
Tº Mínima
Tº Máxima

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Anoche quedaron zanjadas listas parlamentarias. »
Duro golpe a piratas. »
Ganaderos se unen en "Profo Cría" para exportar carne bovina. »

CEGE Ñuble suma y sigue



El concepto de Centro de Gestión, no sólo en este caso, sino en una situación que se multiplica a nivel nacional, ha profesionalizado el actuar de los ejecutivos que determinan el quehacer de pequeñas empresas asociativas.

Cinco empresas campesinas de la Región del Bío Bío, clientes del Centro de Gestión Ñuble, viajaron a Canadá, Brasil y Alemania, con el apoyo de Indap, ProChile y el Fondo de Innovación Agraria.

Elia Navarrete de la Sociedad Coapi Futuro de Chillán, Juan Carlos Plaza de la Cooperativa Miel de Los Ángeles, Miguel Campamá de Apícola del Sol de San Nicolás, Luis Villarroel de Apícola Coasba de Santa Barbara, Alex Fernández apicultor individual de Chillán, Javier Cáceres director de Investigación de la Universidad de Concepción, y Ramón Paredes gerente del Centro de Gestión Ñuble, viajaron entre el 26 y 30 de septiembre, en una Misión de Captura Tecnológica en Gestión y Valor Agregado Miel, a la ciudad de Manitoba en Canadá.

Ramón Paredes, gerente del Centro de Gestión o CEJE Ñuble, sostuvo que esta gira surgió de una propuesta presentada al Fondo de Innovación Agraria, por el Centro de Gestión, tres empresas campesinas clientes de Indap y CEGE Ñuble, y la Universidad de Concepción, que les permitió conocer experiencias asociativas, mediante la visita a apicultores para analizar y comparar el manejo sanitario. "Pudi-

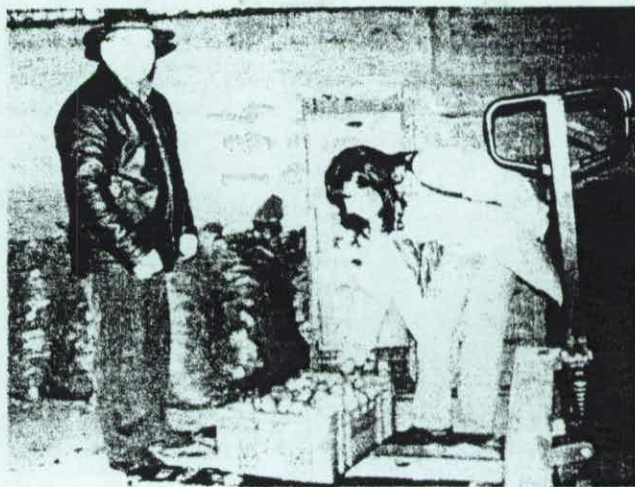
mos conocer el manejo en las salas de cosecha y extracción de miel, el desarrollo tecnológico alcanzado por las investigaciones de la Universidad de Manitoba, y el uso de envases y embalajes empleados en los supermercados".

A través de un convenio entre CEGE Ñuble y ProChile, dirigido a la agricultura familiar campesina, Dorian Fuentes de la Sociedad Agrícola Campesinos de Diguillín de la comuna de San Ignacio, viajó a Brasil con una muestra de papas, a la "Feria Nacional de Agricultura Familiar y Reforma Agraria", que se reali-

zó entre el 1 y 3 de octubre en la ciudad de Brasilia. En la ocasión, aprovechó de dar a conocer la producción de papas de la empresa y generar alianzas para eventuales exportaciones del tubérculo y sus derivados. De igual forma Juan Carlos Espinoza de la Sociedad Apícola Coipin de la comuna de San Nicolás, viajó a Alemania, entre el 8 y 12 de octubre, a la Feria Internacional de Anuga, catalogada como la primera feria del mundo en el rubro alimentario, donde pudo acceder a información comercial, manejo del mercado de la miel en la Unión Europea, utilización de envases y producción innovadora de derivados de la miel.

César Rodríguez, director regional de Indap, sostuvo que estas instancias permitieron acercar experiencias exitosas a la pequeña agricultura, "esto les sirvió para establecer lazos de cooperación técnica con otros productores y generar así igualdad de oportunidades que se traducen en mejores negocios".

Durante la primera quincena de noviembre, estas cinco empresas campesinas, se reunirán en el Centro de Gestión Ñuble, ubicado en Chillán, a dar a conocer los alcances teóricos y visuales de estas experiencias.



MANITOBA APICULTURAL TOUR – SEPTEMBER 26 - 30, 2005

Monday, September 26th – Location Winnipeg area

10:00 a.m. Meeting with Gordon Marks, CEO of Bee Maid Honey Ltd. and tour the Bee Maid Honey processing facility and equipment supply outlet

Objective: To provide information about producer organizations (Coop) in the domestic and export honey market

3:30 p.m. Meet with Phil Veldhuis, President of the Manitoba Cooperatives Honey Producers

Objective: To familiarize the delegates with commercial production and value added opportunities for apicultural products at "Farmers Markets"

Tuesday, September 27th - Location Portage la Prairie area.

9:30 a.m. Meet with Murray Lewis from Lewis Farms and tour the equipment manufacturing facility.

Objective: To showcase commercial equipment fabrication and marketing

12:00 p.m. Meet with Keith & Kathy Lloyd from MacGregor Wax Works and tour the wax rendering facility

Objective: To showcase commercial wax rendering and marketing

2:00 p.m. Meet with Mike Hill from Bee Basics Ltd. and tour the beekeeping equipment supply outlet

Objective: To demonstrate how a small beekeeping supply store can fill a niche market

3:30 p.m. Meet with Marc Nichol from Nichol Honey Farms and tour their pollen processing facility

Objective: To showcase commercial pollen collecting, processing and marketing

Wednesday, September 28th – Location Dauphin area

9:30 a.m. Meet with Bryan Ash, Ash Apiaries Ltd. and tour his honey processing and packing facilities

Objective: To showcase a very large beekeeping operation with its own commercial honey packing plant.

12:30 p.m. Meet with Bruce Podolski, Podolski Honey Farms and tour his large commercial beekeeping operation

Objective: To showcase a very large beekeeping operation that currently uses foreign workers from Nicaragua

4:00 p.m. Meet with Todd Yakimishen, President of Manitoba Beekeepers' Association and tour his honey extracting facility.

Objective: To discuss the function of the Manitoba Beekeepers' Association and tour a large commercial beekeeping operation

Thursday, September 29th – Location Brandon area

11:30 a.m. Meet with Merv Maylon, Kemnay Apiaries Ltd. and tour his beekeeping and queen rearing operation

Objective: To showcase a commercial queen breeder and discuss the function of the Manitoba Queen Breeders Association

4:00 p.m. Meet with James (Bev) Clark, Ferry Apiaries and tour his queen rearing facilities

Objective: To showcase one of Manitoba's premiere queen breeders and queen rearing teacher

Friday, September 30th – Location Winnipeg area

10:00 a.m. Meet with Dr. R.W. Currie, Professor of Entomology (Apiculture) and tour of the apicultural research facilities at the University of Manitoba

Objective: To provide an overview of the relationship between University and the beekeeping industry.

2:30 p.m. Meeting with Rhéal Lafrenière & David Ostermann, Manitoba Agriculture, Food and Rural Initiatives Apiarists and Don Dixon, Director of the Crops Branch to tour the Provincial Apicultural Laboratory

Objective: To provide an overview of the role and responsibility of the government in supporting the development and growth of the local beekeeping industry



GIRA TECNOLÓGICA MANITOBA-CANADA

JAVIER CACERES S..
Universidad de Concepción.

INDUSTRIA APICOLA EN MANITOBA



Industria Apícola de Canadá

- Numero de Apicultores: 10.000
- Numero de Colonias: 600.000
- Apicultores Comerciales 2000
- Colonias comerciales 480.000

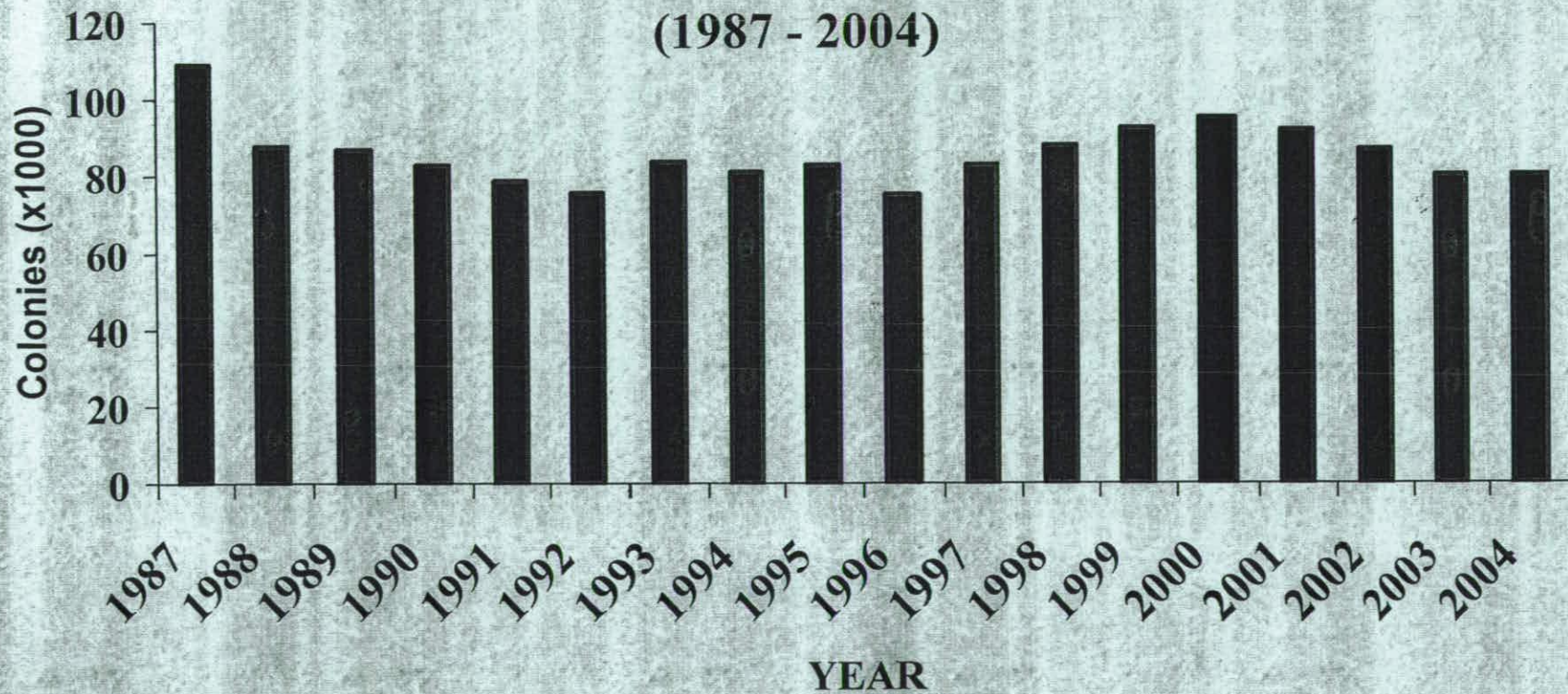
Industria Apícola de Canadá

- Colonias Prairies Provinces 475.000
- Producción Prairies Provinces 80% Canadian crop
- Colonias de Apicultores comerciales 500-13000
- Promedio Colonias por Apicultor comercial 2.000

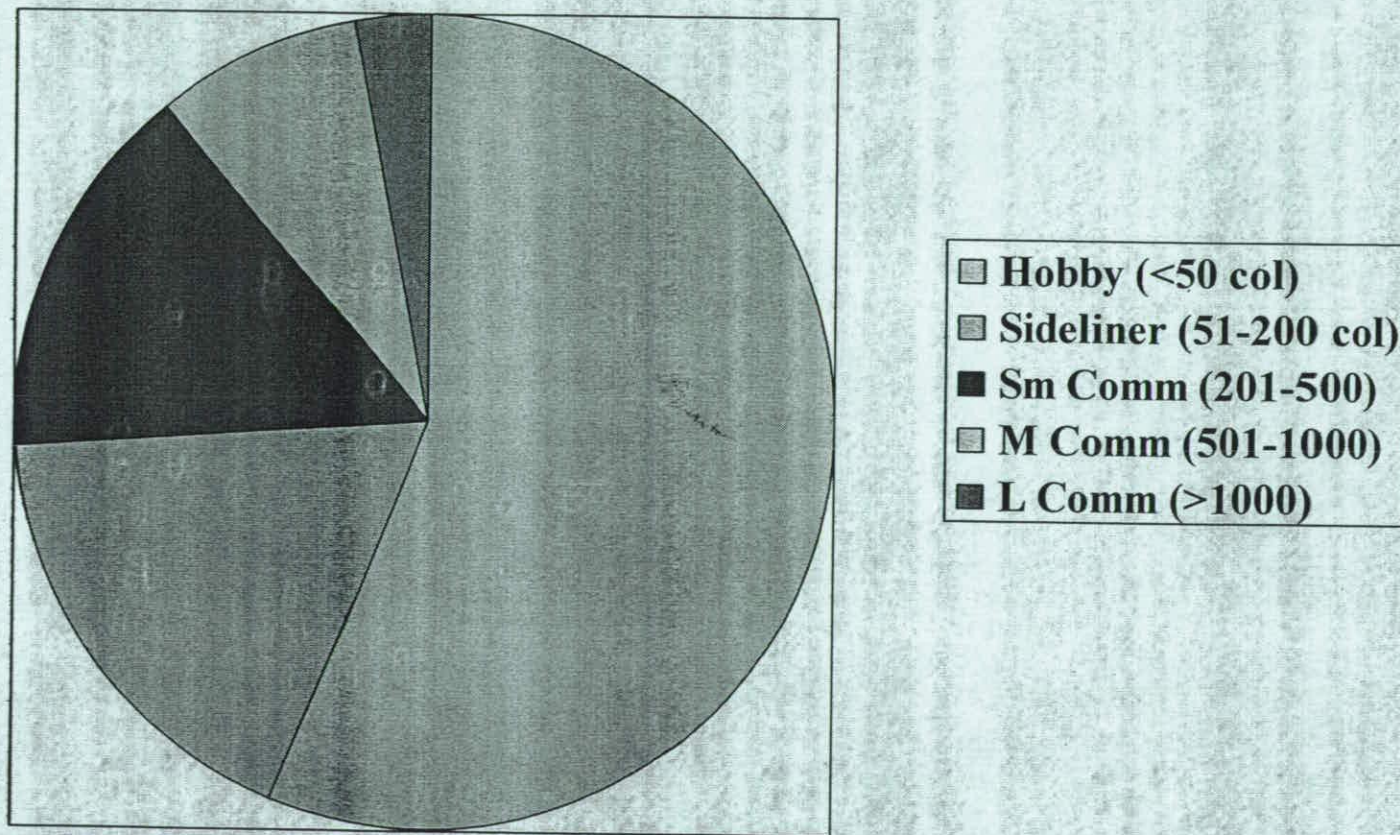
Industria Apícola de Canadá

• Producción anual	33.000 toneladas
• Producción de Alberta	11.000
Manitoba y Saskatchewan	11.000
• Resto del país	11.000
toneladas	
• Exportación la producción	50%
• Mercado	Estados Unidos.
• Rendimientos	
Promedio Nacional por Colmena	100 – 150 Kilos

Honey Bee Colonies - Manitoba



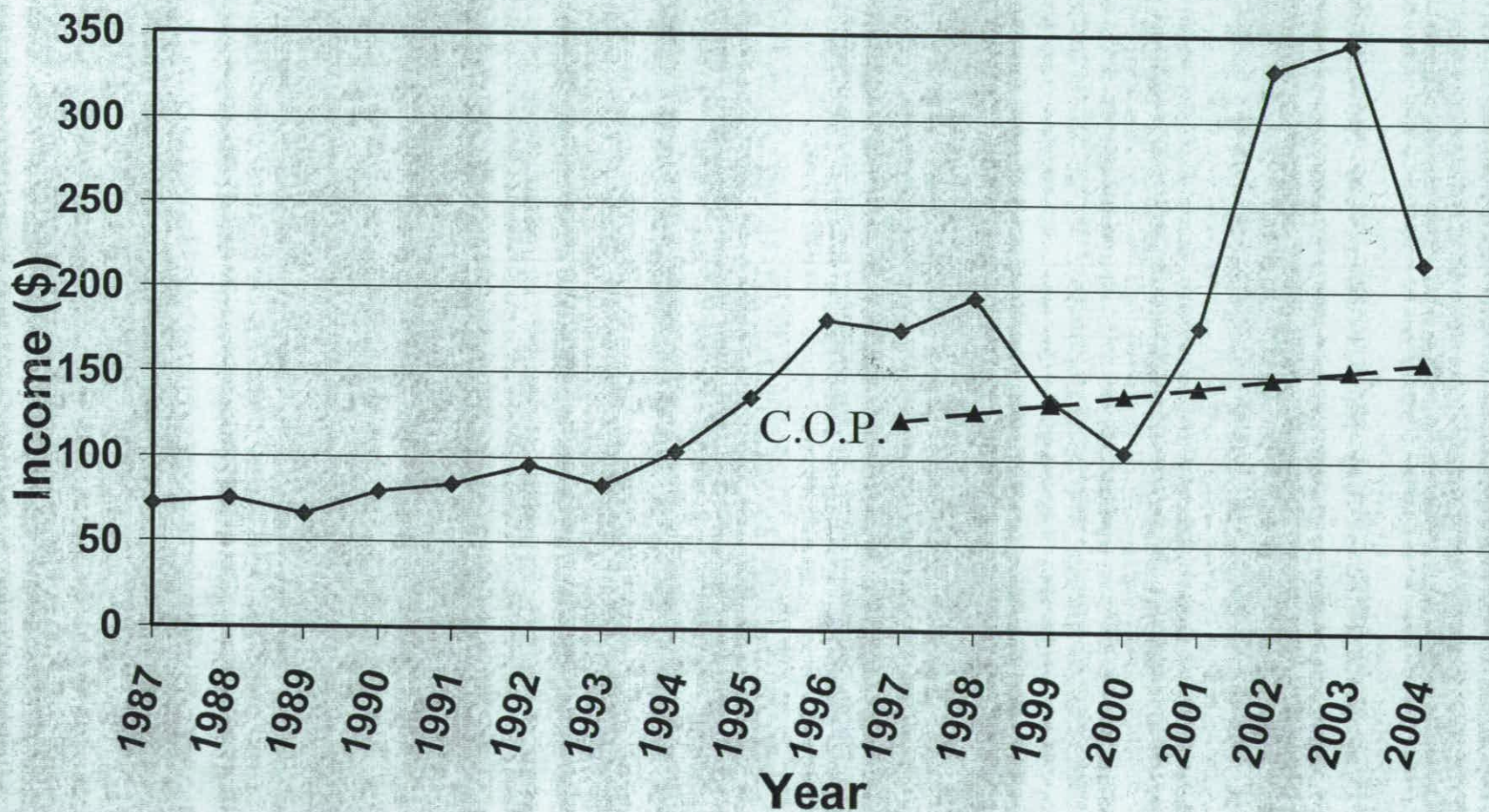
Beekeepers in Manitoba



Approx. 600 Active Beekeepers in Manitoba

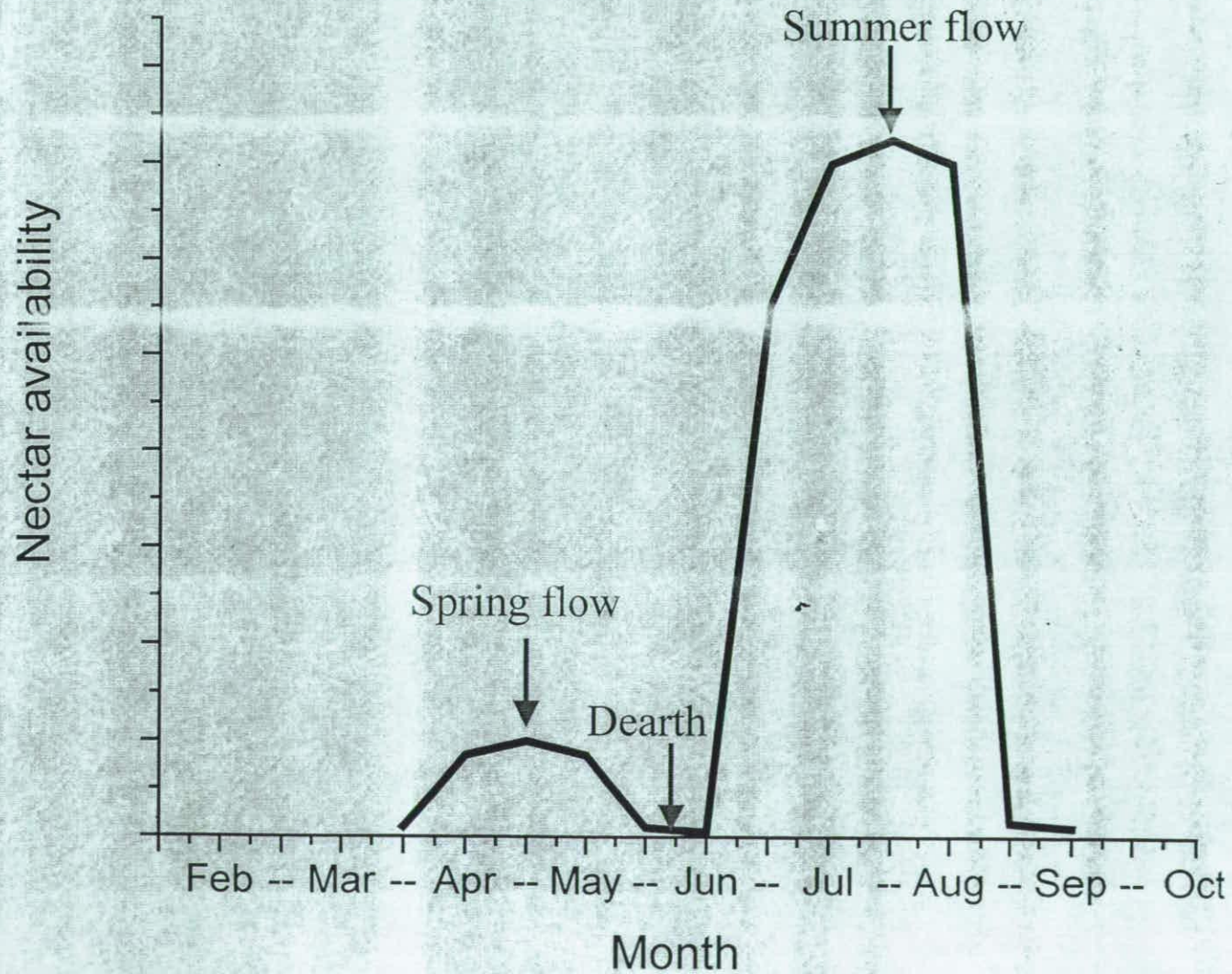
Income Per Colony - Manitoba

(Average Production x Price of Honey)



Note: C.O.P. is the Cost of Production Value

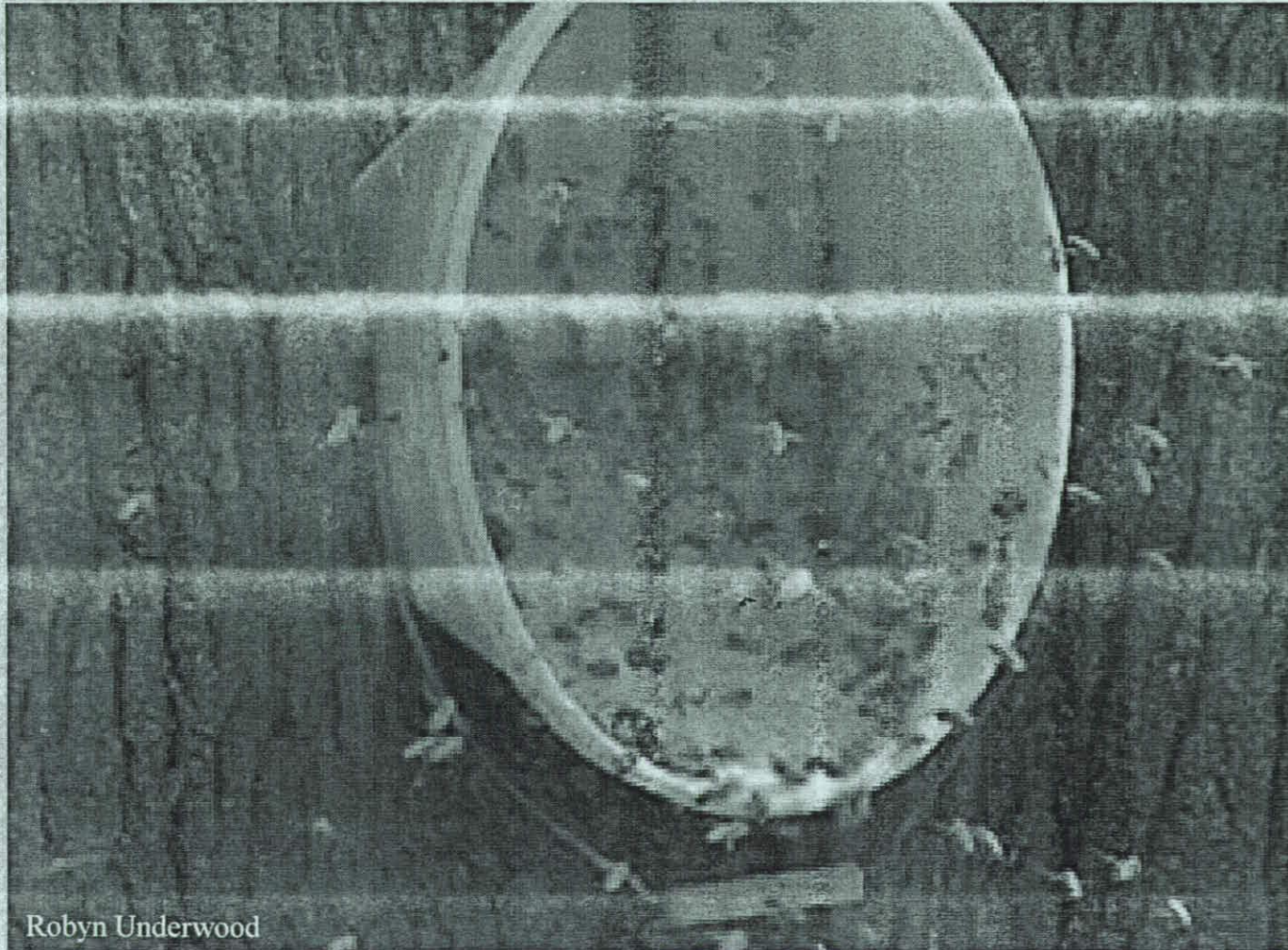
Nectar flow



Spring Feeding

- Check food stores
 - Honey and pollen
- If required, feed:
 - Pollen supplement
 - Pollen substitute
 - Honey in frames
 - Sugar syrup

Pollen Substitutes



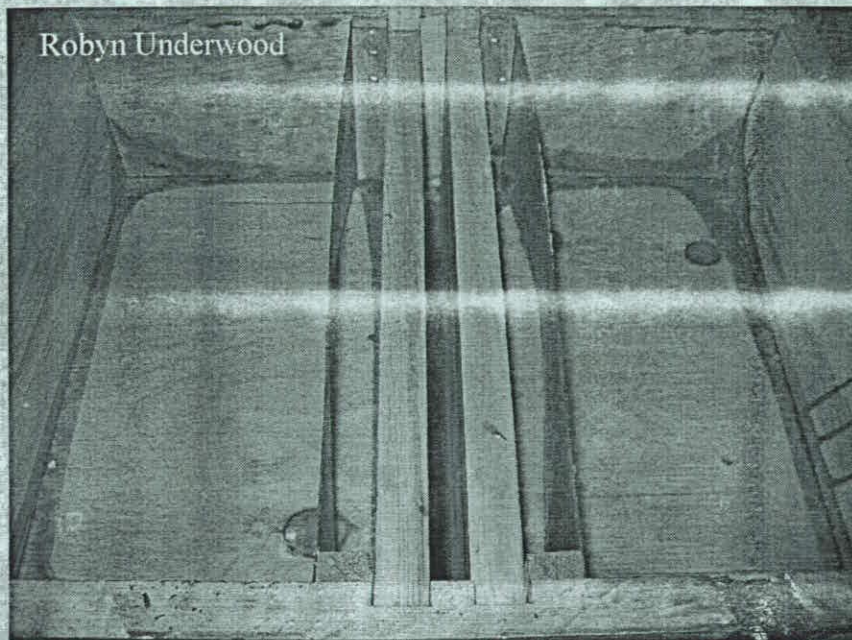
Robyn Underwood

Sugar Syrup

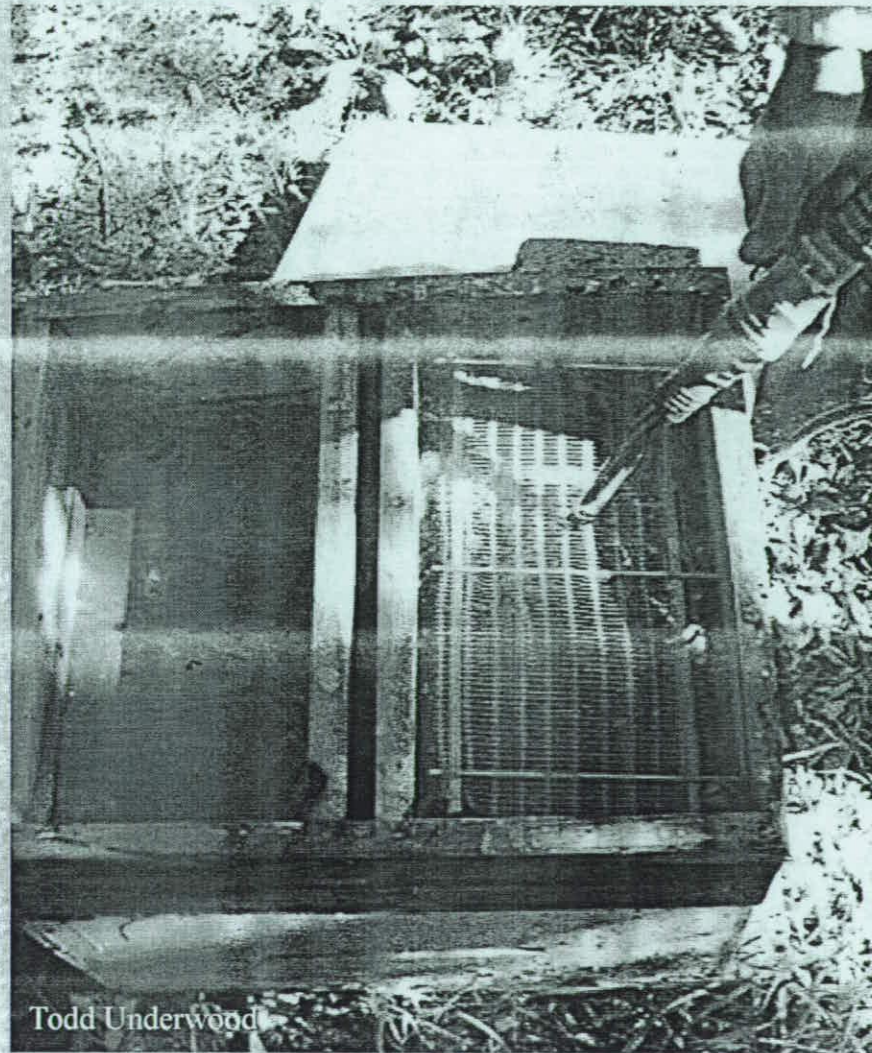


Robyn Underwood

Feeding Sugar Syrup



Hivetop feeder



Bee Blower

- One trip
- Works under most conditions (cold, cloudy, & when there is brood in the super).

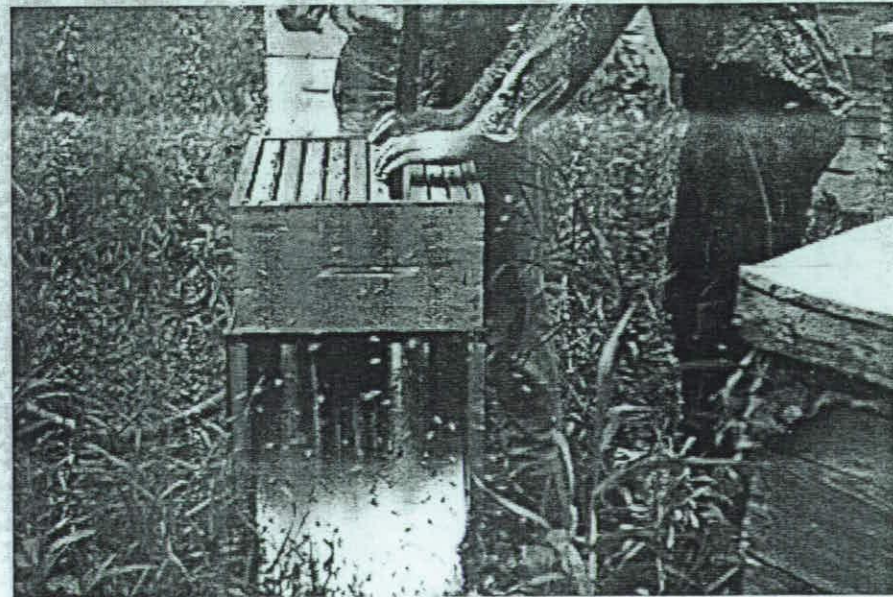


FIGURE DAYS TO EXTRACT SUPERS FOR DIFERENT EXTRACTION SYSTEMS
(Note: Candian beekeepers)

Scale	Supers (Alzas)	EXTRACTION SYSTEM				
		One 28 Frame	One 60 Frame	One 120 Frame	Two 60 frame	Two 120 frame
HOBBY	400	4				
	500	5				
	750	8				
SMALL	1000	10	4			
	1500	16	6	4		
	2000	21	8	5	4	
	3000	31	13	8	6	4
	3750	39	16	9	8	5
MEDIUM	4000	42	17	10	8	5
	5000	52	21	13	10	6
	6000	63	25	15	13	8
	7000		29	18	15	9
	7500		31	19	16	9
LARGE	8000		33	20	17	10
	10000		42	25	21	13
	15000		63	38	31	19
	20000			50	42	25
	30000			75	63	38
	40000					50
	50000					63

Note:

Size of Beekeepers

Less than 100 hives = Hobby

Less than 500 hives = Small

500 to 1000 hives = Medium commercial honey producer

More than 1000 hives = Large commercial honey producer

7,5 Super per Hive or colony

Extractor Systems from Cowen Manufacturing

28 Frame Extractor = 12 boxes per hour

60 Frame Extractor = 30 boxes per hour

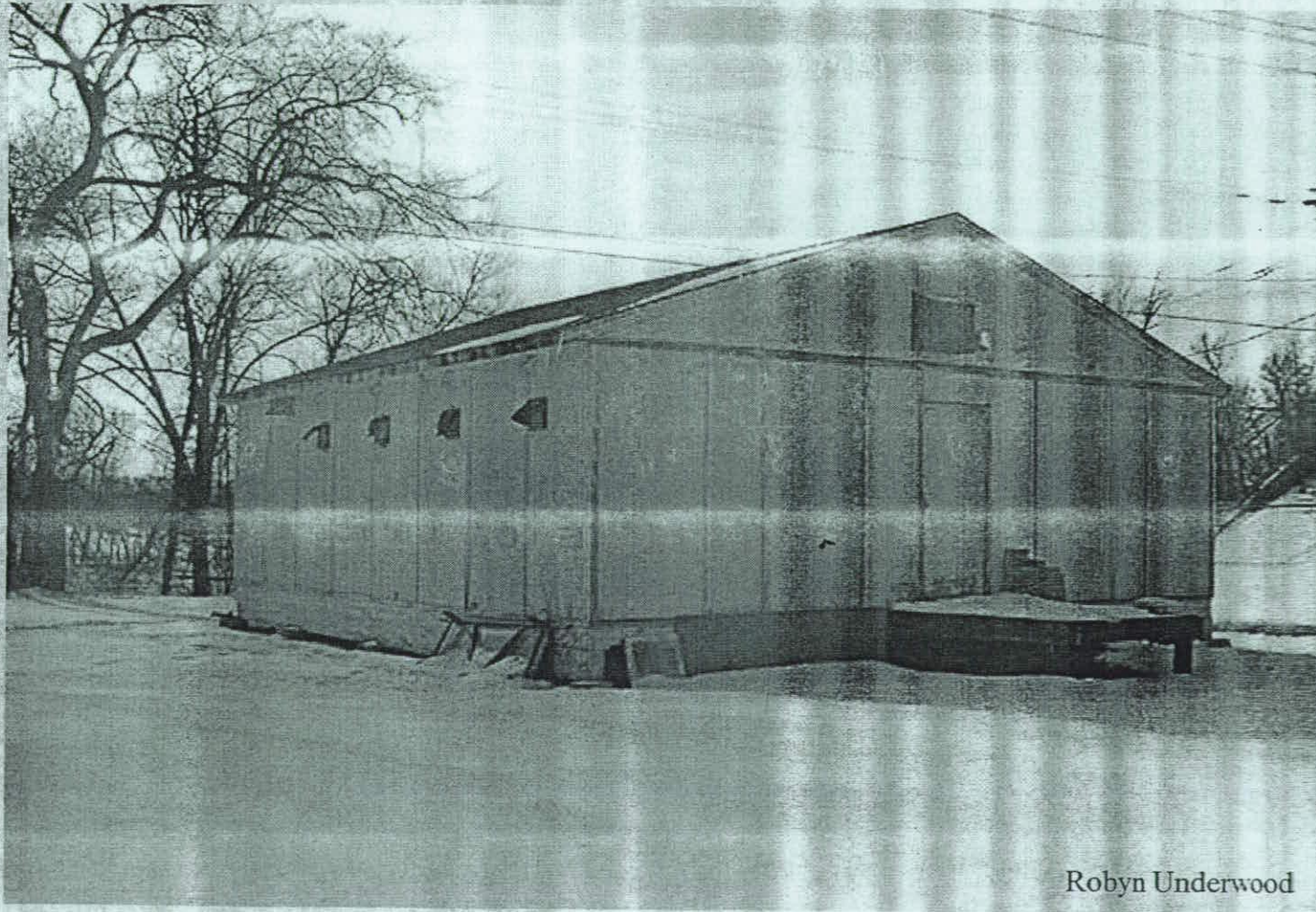
Industry Issues

- Importation of U.S. Queens
- West Nile Virus
- Resistant Varroa mites — *treatment rotation*
- Resistant AFB - *antibiotics & sanitation*
- Food Quality & safety — *antibiotic WRL , BMPs*

Industry Issues

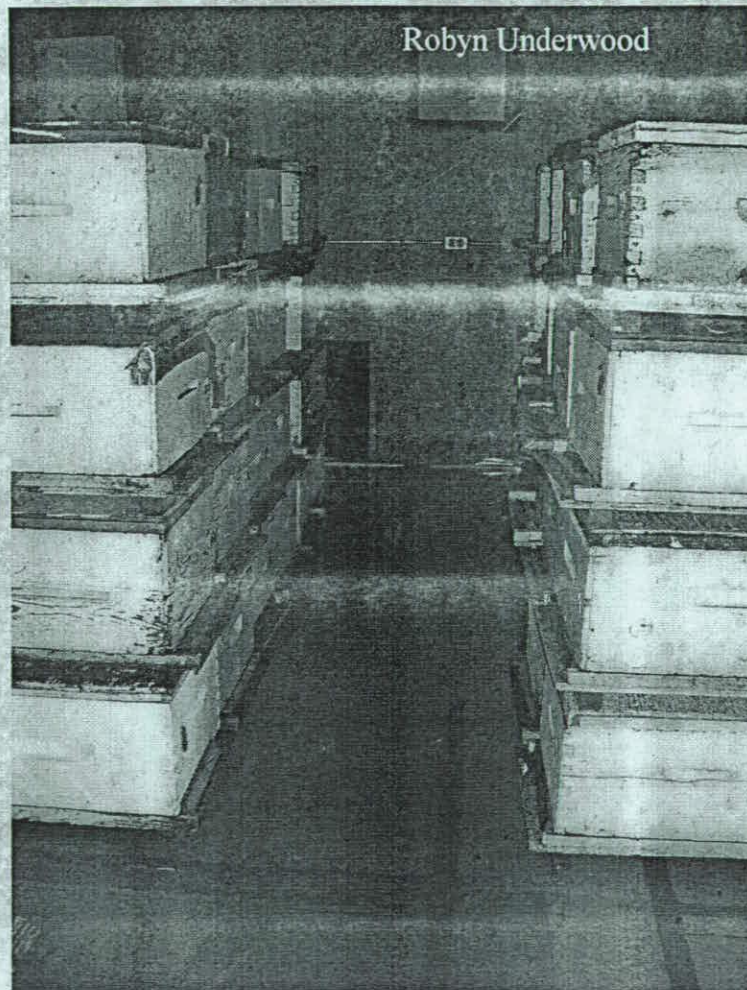
- Honey Labeling — *regulation & promotion*
- Wildlife Damage Prevention
- Apiary Inspection cost recovery
- Business Development Initiatives
- Commercial Beekeeping Training Courses

Indoor wintering



Robyn Underwood

Indoor wintering



Start Again



Wrapping

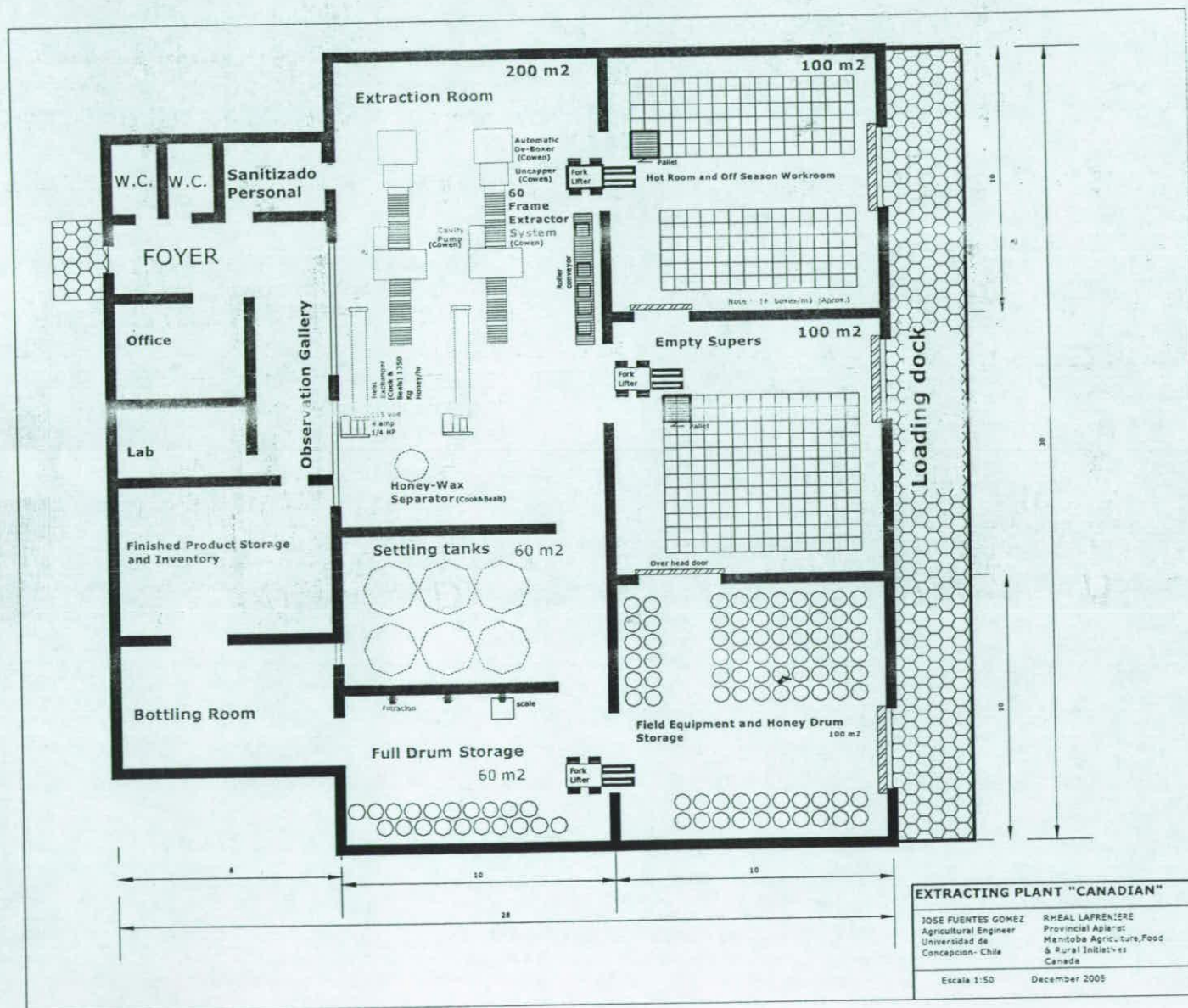


Rheal Lafreniere

Outdoor wintering

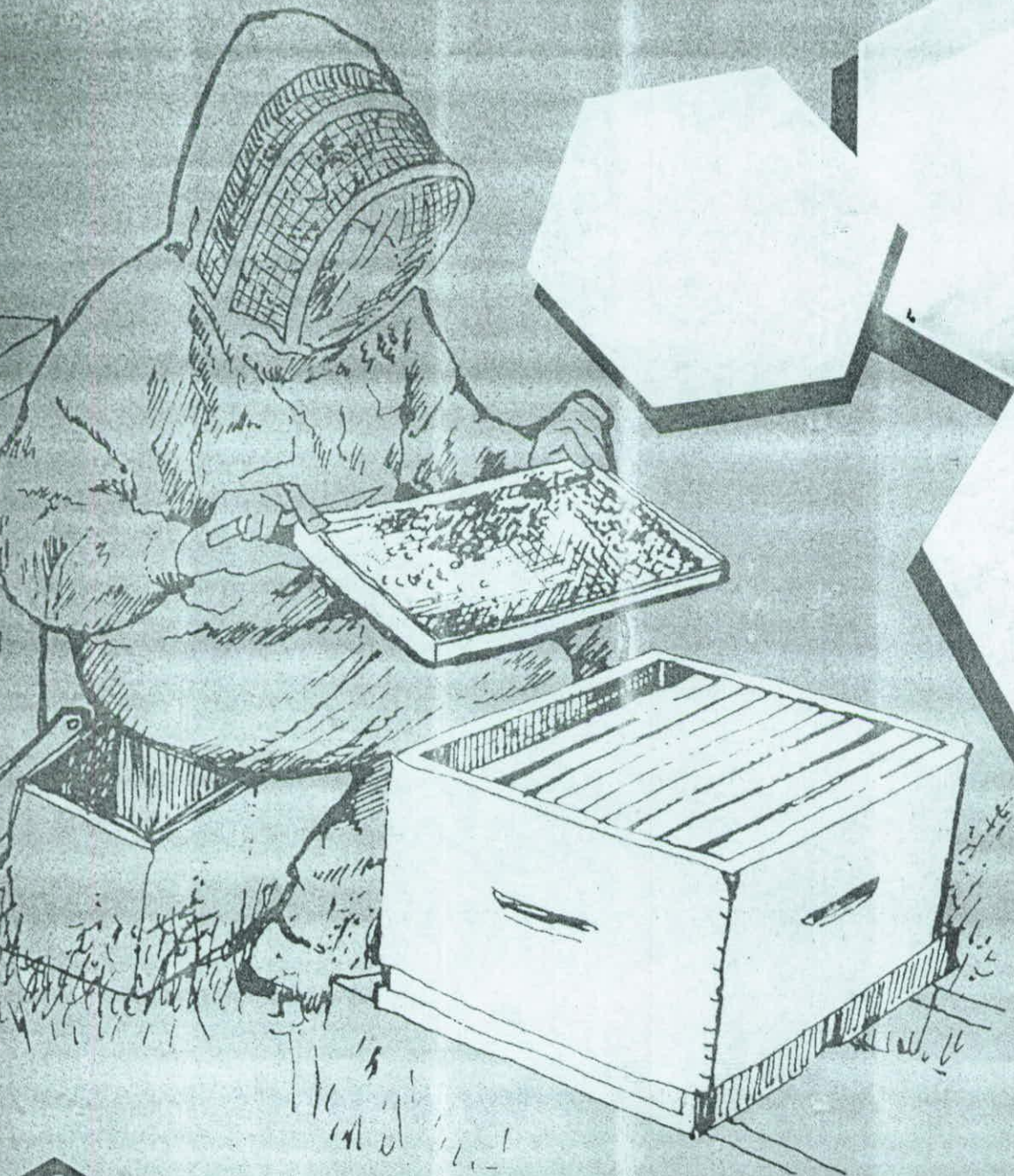


Robyn Underwood



Honey Bee Diseases & Pests

2nd Edition
Revised



Canadian Association of Professional Apiculturists

**ERRATUM SHEET
for
Honey Bee Diseases and Pests
2nd Edition Revision**

Page 13 – PARASITIC MITES

1. Varroa jacobsoni – end of first paragraph

By 1999, Varroa had been detected in all Canadian provinces with the exception of Newfoundland. With the discovery of Varroa in New Zealand in May, 2000, Australia and Hawaii are the only major exporters of bees and queens that remain free of this mite pest. We recommend that you consult your provincial or state apiculturist for up-to-date information on the parasitic mite situation in beekeeping countries throughout the world.

HONEY BEE DISEASES AND PESTS

2nd Edition Revised

C. Scott-Dupree (Editorial Chair)

Acknowledgements

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TABLE OF CONTENTS

INTRODUCTION	1
NORMAL HONEY BEE DEVELOPMENT	1
The Honey Bee Colony	1
The Honey Bee Life Cycle	2
BACTERIAL DISEASES	4
American Foulbrood	4
European Foulbrood	6
FUNGAL DISEASES	7
Chalkbrood	7
VIRUSES	9
Sacbrood	9
Chronic Paralysis Virus	10
Acute Bee Paralysis Virus	10
Kashmir Bee Virus	10
Black Queen Cell Virus	11
Deformed Wing Virus	11
PROTOZOA	11
Nosema Disease	11
Amoeba Disease	13
PARASITIC MITES	13
Varroa jacobsoni	13
Acarapis woodi	14
Tropilaelaps clareae	16
MITE CONTROLS	16
Varroa Mites	16
Honey Bee Tracheal Mites	17
PESTS AND PREDATORS	18
Waxmoths	18
Ants	19
Rodents	20
Skunks	20
Bears	20
Africanized Honey Bees	21
Small Hive Beetle	21
OTHER COLONY ABNORMALITIES	23
Chilled Brood	23
Gassed Brood	24
Scattered or Spotty Brood Pattern	24
Drone-Laying Queen	24
Multiple Eggs Per Cell	24
Queenlessness	25
Dysentery	25
Pollen and Honey Shortages	25
PESTICIDE HAZARDS AND BEE POLLINATORS	26
PESTICIDES AND HONEY BEES	26
Chemistry	26
Measures of Toxicity	26
Formulation	27
HOW TO AVOID PESTICIDE POISONING	27
REFERENCES	

INTRODUCTION

Honey bees, like virtually all living organisms, are susceptible to a variety of diseases, pests and predators that may have harmful effects on normal colony development and productivity.

Beekeepers, being involved in the unique form of animal husbandry that they are, have the primary responsibility of promoting the development of strong, healthy colonies of bees to coincide with the onset of plant nectar availability in the field. Given strong, healthy colonies and good flying conditions during the nectar flow period, maximum levels of honey production and pollination should be the result.

Standardized hive equipment, coupled with modern management techniques, have resulted in large numbers of colonies being kept in close proximity to each other. This results in frequent exchange of hive equipment between individual colonies. Together with frequent relocation of large numbers of package bees, queens and colonies over long distances, these practices tend to facilitate the spread of honey bee diseases. This is particularly true once a disease or pest has found its way into a beekeeping outfit or geographical area where large numbers of colonies are kept.

Protecting honey bee colonies from disease and predation continues to be a critical component of beekeeping management. Beekeepers should have a basic understanding of disease identification, prevention and control procedures.

This publication has been prepared to assist beekeepers in preventing serious disease and pest-related damage to their beekeeping businesses. For more information on this subject or other aspects of beekeeping management, beekeepers are encouraged to contact the beekeeping extension specialist employed with their local provincial or state Department of Agriculture.

NORMAL HONEY BEE DEVELOPMENT

Understanding the normal development of a healthy colony of honey bees is the first step in identifying and controlling bee diseases and pests. Recognition of a breakdown in normal colony development will alert a beekeeper to a problem even though the specific cause may not be immediately identified. The beekeeper can then closely examine the colony,

contact a bee inspector or submit samples for analysis.

Some problems in colony development are the result of environmental, management or biological influences, not diseases or pests. They can be just as serious to the survival of the colony or the livelihood of a beekeeper and must be identified quickly. See the section "Other Colony Abnormalities" for more information.

This section presents a brief overview of life in the honey bee colony. Because there is no substitute for direct experience, beekeepers must also take time to gain a clear understanding of life in a healthy honey bee colony by making observations of conditions and behaviour within the colony. As well, beekeepers should be prepared to attend courses and seminars to stay abreast of the latest developments in bee disease and pest control.

The Honey Bee Colony

Under normal conditions a honey bee colony consists of one queen (reproductive female), several thousand workers (unmated females) and, depending on the season, a few to several hundred drones (males). The sex of a honey bee is determined by egg fertilization; generally, fertilized eggs develop into females and non-fertilized eggs develop into males. During mating a queen receives a supply of several million spermatozoa that are stored in the spermatheca, a small spherical organ that is connected to the oviduct by its own small duct. The queen, by releasing or withholding spermatozoa from the sperm duct as an egg passes down the oviduct, is able to selectively fertilize or not fertilize eggs.

Adult workers and queens both develop from fertilized eggs but they are distinct in both their anatomy and behaviour. Normally the queen is the main egg layer. Therefore, all of the other bees are her offspring. Workers do not usually lay eggs but, if they do, drones, not workers, are produced. In nature, a queenless colony that develops laying workers usually dies. Workers perform most of the tasks in a colony. These include activities such as comb building, hive cleaning, feeding and caring for larvae, feeding and grooming the queen, foraging and colony defense.

Drones are very important members of the honey bee society although they perform few, if any, tasks within their colonies. Their primary function is to mate with virgin queens from other colonies while flying in

drone congregation areas located at some distance from their hives. By this behaviour inbreeding is avoided. Most colonies maintain at least a few drones, which helps to ensure extreme mixing of genes throughout the bee population. The absence of drones or drone brood in a mature colony in late spring and summer is usually the result of a pollen shortage.

Differences in anatomical and behavioural characteristics between adult workers and queens are the result of the food that each receives during larval development. Larvae that are being reared as queens receive a surplus of a special type of food called "royal jelly" throughout their development. Larvae being reared as workers receive royal jelly for only 3 days after hatching; following this their food is mixed with pollen and nectar from flowers.

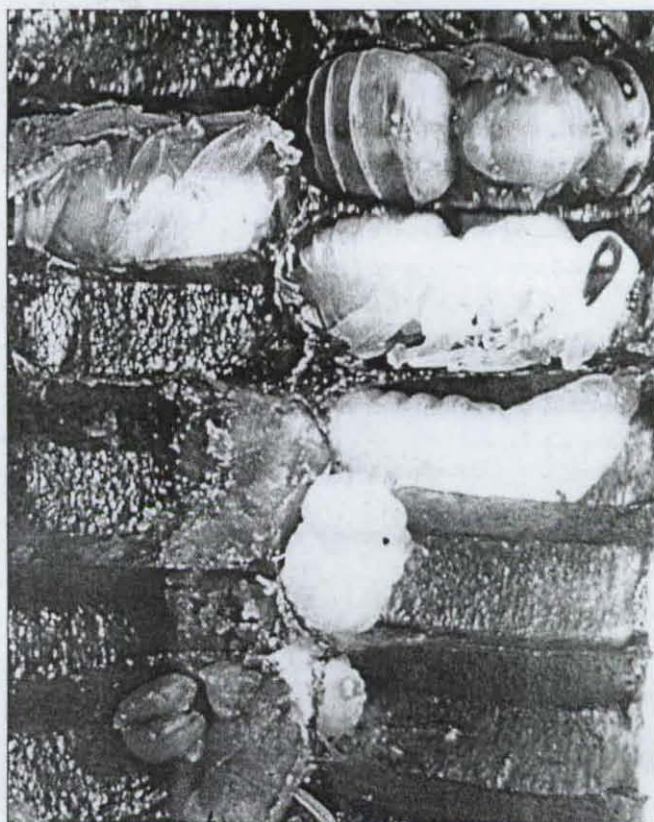
A honey bee hive should give off a sweet, beeswax odour. Foul or fermenting smells usually indicate a problem.

A colony of honey bees has been likened to a "superorganism". The behaviour and biology of all its members is directed towards the survival of the colony, not the individual. Although workers and drones live a few months at most and queens for two to three years on average, a colony can survive much longer because its individuals are constantly being replaced. The social order of a colony results in a behaviour more like that of a single organism than a group of individuals.

The Honey Bee Life Cycle

The development of the honey bee follows a pattern of growth and metamorphosis that is typical of many other insects. The life cycle of the honey bee begins when a queen deposits a single egg near the centre of the bottom of a wax cell. Initially the egg extends straight out from the cell base but as it matures it gradually leans over. After three days the egg hatches into a larva, which lies at the bottom of the cell in a curled position. The developing larva consumes food directly from nurse bees or deposited in its cell (Figure 1). Surplus food can usually be seen as a milky white liquid surrounding the larva for up to 2-1/2 days after the egg hatches. During its rapid growth and development the larva molts four times.

All honey bee larvae should have a full-bodied, firm appearance, with distinct segmentation. A healthy larva is always pearly white and moist in appearance



E.S. Ross

Figure 1 – Various developmental stages of the honey bee.

although it is quite dry to the touch. Good queens lay eggs in concentric bands usually starting from the centre of a frame. Very few cells should be left vacant and ideally, all of the larvae in each band should be of similar age. When queen and worker larvae are approximately eight days old and drone larvae ten days old, worker bees seal their cells with wax cappings.

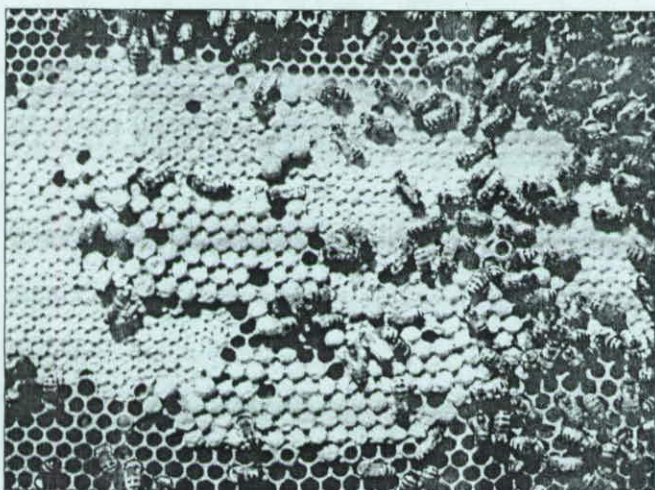
The larvae then begin spinning silk cocoons along the inside walls and ends of their cells. Until this time the larvae have remained curled on the cell bases. After the spinning stage, they straighten out along the length of their cells with their heads pointing towards the capped ends. This is the beginning of the prepupal stage.

The larva enters its pupal stage following a fifth molt. During pupation, the bee gradually develops an adult shape. Adult physical characteristics such as head, thorax, abdomen, eyes and legs now appear clearly for the first time. The wings, however, appear as small pads on the thorax. The pupa begins with a generally white appearance and gradually acquires more pigmentation throughout its development. This process is particularly evident in the development

of the compound eyes, which are initially white, then change through light pink, red, purple and eventually to dark brown at maturity.

In a normal colony during the active season when honey and nectar are available, all brood stages (eggs, larvae, prepupae and pupae) should be present.

Sealed cells of the three castes have their own unique appearances. Worker cells are the smallest of the three, with their wax cappings slightly domed and almost level with the surface of the comb. Individual sealed cells range from light tan to dark brown in colour, depending on the age of the comb, and are dry in appearance. Drone cells are wider and deeper than worker cells. Their cappings are "bullet" shaped and protrude noticeably from the face of the comb. Drone cells should appear in groupings, not scattered individually over the face of the comb (Figure 2). Once capped, all cells should remain sealed with no small holes evident until the young adults begin chewing their way out.

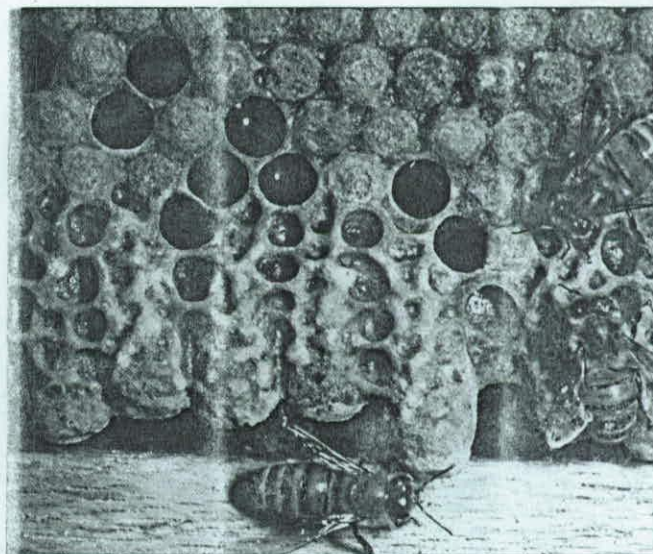


D. Dixon

Figure 2 – Sealed worker and drone brood.

Queen cells are distinct from the other two types because they hang downward from the bottom or face of the comb and when sealed are peanut-like in both colour and texture with highly convex cappings (Figure 3). In a normal supersedure situation the workers will build a few queen cells. If many queen cells appear, particularly at the bottom of the combs, the colony is probably preparing to swarm.

A pupa undergoes one final molt to become an adult, which then proceeds to chew its way out of its cell to emerge into the active life of the colony. Complete development from egg to adult is approximately 21



S. Camazine

Figure 3 – Sealed queen cells on the bottom of a frame.

days for the worker, 16 days for the queen and 24 days for the drone.

The newly emerged adult bee is at first lighter in colour than older bees and its hairy covering is usually quite apparent. As the adult bee ages it gradually loses much of this hair, exposing more of the underlying shiny cuticle (e.g., outer covering). The presence of a high proportion of very shiny, small bees can signal a problem in a colony or bee yard.

The life expectancy of an adult worker will vary with the season; during the active summer period a worker will live from 4-6 weeks. During the winter she will usually live for several months.

To remain healthy and productive a honey bee colony must always have adequate reserves of both honey and pollen. If not, it will reduce or curtail its activities and may cannibalize its brood or even die. Although death usually occurs during the late winter months, a colony can suddenly and unexpectedly die during extreme dearth periods at any time of the year.

Any unusual conditions within a colony that do not conform to the description of normal bee development above can indicate a problem in the colony. Hive entrance inspections can also alert a beekeeper to colony problems. Pollen and honey, collected from colonies whose disease history is unknown, should not be used as feed as this may result in the introduction of a disease to healthy colonies.

BACTERIAL DISEASES

1. American Foulbrood

American Foulbrood disease (AFB) is caused by a bacterium, *Paenobacillus Larvae*. The disease affects only the immature stages of the honey bee and can be highly contagious. If left untreated, AFB can develop very rapidly within a colony, and can also be spread from colony to colony within an apiary, and from apiary to apiary due to robbing and by interchanging diseased equipment (e.g., frames). In addition, if diseased equipment is left outdoors, it may become a source of infection for foraging bees to carry back to their hives.

Before the advent of antibiotics to control this disease, AFB was a serious threat to the beekeeping industry. The only methods of AFB control were constant inspection of colonies and burning of diseased equipment. The discovery of antibiotics and their integration into infectious disease management programs for honey bees substantially reduced the threat of AFB. However, in recent years, the incidence of antibiotic-resistant AFB (r-AFB) has increased in parts of Canada and the United States. Future control of AFB will depend on continued beekeeper vigilance and the development of Integrated Pest Management (IPM) programs for bee diseases.

Life Cycle

An AFB infection begins when bacterial spores are ingested by young larvae along with their food. When the spores reach the gut, they germinate and begin to grow and multiply rapidly. During this time, the larvae will continue to grow and may even reach the pupal stage. However, the bacteria may invade the body tissues and eventually kill the developing bee. As the bacteria multiply in the infected larva or pupa, it turns from a pearly white colour to brown (Figure 4). The infected larva or pupa continues to deteriorate, eventually forming a dry, dark brown or black "scale". This

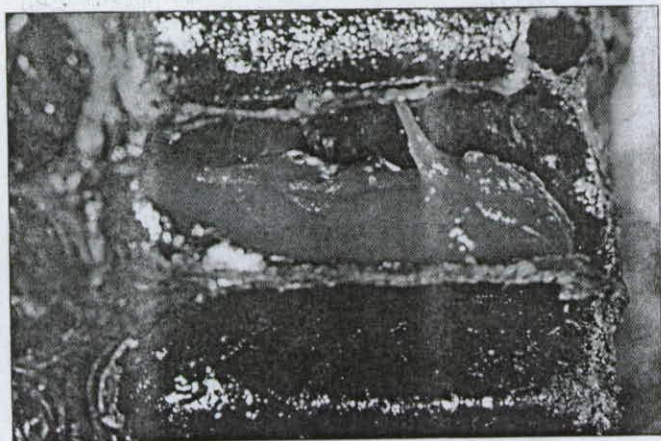


Figure 4 – AFB-infected larvae.

M.V. Smith

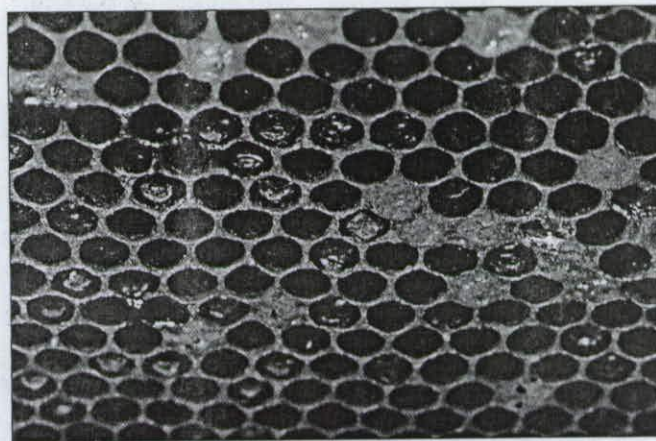
scale is the remains of the immature bee and contains 5 to 10 million or more bacterial spores, which are capable of causing infections for decades.

Once a larva has died, the housecleaning bees will attempt to remove either it or the resulting scale. In the process of this housecleaning they will contaminate their mouth parts with bacterial spores. The food sharing that takes place between bees in the hive may then spread this contamination to many other bees within the hive, including those that are feeding young larvae. Thus, even one scale can result in widespread larval infections within a colony.

If left untreated, the infection will spread rapidly within the hive. Within a few weeks, larval mortality may reach a level that will result in a decline in colony population. At the end of the honey season, colonies infected with AFB disease may have smaller populations than non-infected colonies. In fall, after the honey flow has ceased, strong, healthy colonies may rob disease-weakened ones. Consequently, the infection may spread to other colonies and apiaries within flying range of the diseased colony.

Identification

Beekeepers should look for AFB disease by examining their brood combs. All brood comb that is stored for the winter should be examined for the presence of scale in the cells. The scale is usually dark brown or black in colour and forms a thin layer on the bottom of the cell along its entire length (Figure 5). If the young bee dies in the pupal stage, sometimes the pupal tongue can be seen sticking out from the scale. A scale is quite flat, clings to the cell wall, and is difficult to remove without breaking the cell wall.



S. Camazine

Figure 5 – Black AFB "scales" visible on the bottoms of cells.

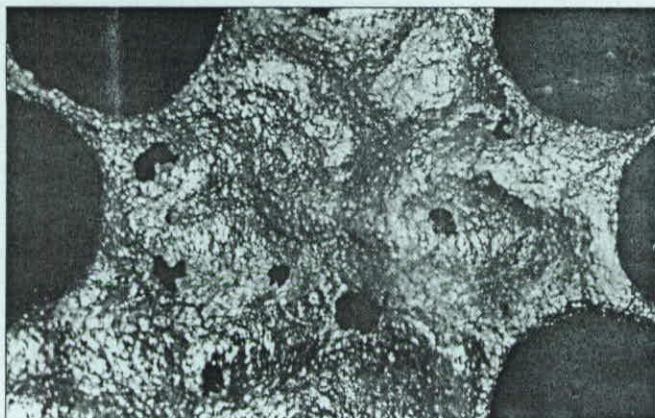
By comparison, chilled or gassed brood is usually much larger and easier to remove from the cell.

When examining brood combs for scale, good lighting is essential and natural sunlight is preferable. Without proper light, it is easy to overlook a dark-coloured scale in a dark-coloured comb. It is also important to hold the frame by the top bar, at a slight angle, so that all of the lower sides of the cells can be seen clearly.

During the active spring and summer season, the brood area should be inspected regularly for any indications of disease. Any discoloured brood should be examined closely. Discolouration of mature larvae or pupae is one of the main indicators of AFB infection.

AFB disease usually does not kill the larvae until the late larval stage when the larvae have stretched out along the lower sides of their cells. This can often be used to differentiate AFB from European foulbrood, which usually kills larvae while they are still coiled at the bottom of the cell.

In advanced cases of AFB, the cappings over the older brood may be perforated with one or two small holes, be sunken and have a greasy appearance. Diseased brood combs will also have a characteristic putrid odour. If a high proportion of the brood is dying with AFB, the sealed brood will have a scattered appearance (Figure 6).

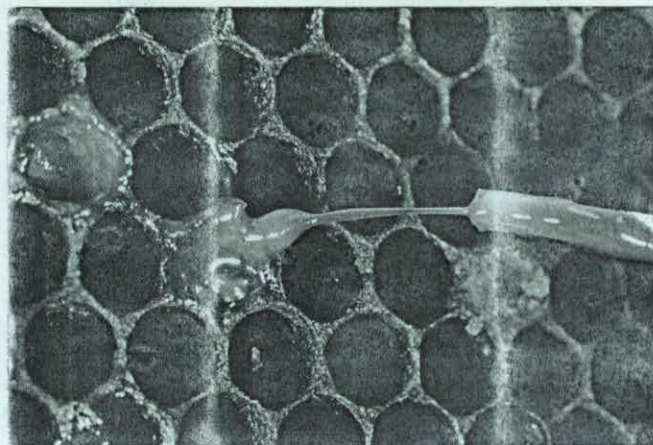


M.V. Smith

Figure 6 – Brood cells heavily infected with AFB.

If the larva has died of AFB, a toothpick will sink into it without resistance. If the larval remains are stirred and the toothpick is withdrawn slowly the remains have a glue-like consistency and will “string out” more than one centimeter (1/2 inch) when the toothpick is slowly withdrawn (Figure 7). This is commonly referred to as the “ropiness test” and will distinguish

AFB from most other brood diseases, which do not result in the dead larva showing the same glue-like consistency. This characteristic should be checked last because it will destroy the diseased bee.



S. Camazine

Figure 7 – The “ropiness” test for AFB.

AFB disease can be readily diagnosed by examining infected material with a microscope. Beekeepers who suspect that their colonies are infected with AFB can collect samples simply by removing suspect brood with a toothpick. Place them in wax paper and forward them with your name and address to the provincial or state apiculturist's office for microscopic analysis.

Prevention

Apiary hygiene, early detection and prompt remedial action are the most effective strategies in the control of AFB. Regular monitoring of colonies and the beekeeper's ability to identify early signs of the disease are essential in ensuring the effectiveness of the prevention strategies. AFB is highly infectious and can spread rapidly between colonies and apiaries. Beekeepers must adopt management practices that minimize disease spread, from cleaning hive tools to minimizing the exchange of equipment.

To assist in the prevention of AFB infection the antibiotic oxytetracycline hydrochloride (e.g., Terramycin or TM25) should be fed according to recommendations from your provincial or state apiculturist. Antibiotics do not kill AFB spores, but prevent the growth and multiplication of the bacteria in the gut of a larva. This allows it to grow and develop into an adult bee. Colonies can be protected from AFB by providing the antibiotic through the spring in a manner that ensures constant protection. Antibiotic feeding should stop at least 3 weeks before the summer honey flow to ensure that none of the extracted honey will contain antibiotic residue.

Antibiotic resistant AFB (r-AFB) is becoming increasingly problematic in North America. Additional antibiotics need to be registered for use against AFB so that the medications for this disease can be used on a rotational basis in an IPM program, thus slowing the process of resistance development.

Treatment and Control

During the spring, each time a colony is opened, at least one comb of brood should be closely examined for abnormalities that characterize AFB (Figure 6). The beekeeper can perform a "ropiness test" on suspected cells or a sample can be collected and sent to the nearest Apicultural Office for identification. Once AFB infection of a colony has been confirmed, the most important step in control of this disease is to destroy the source of the infection. Accordingly, any comb showing visible signs of AFB, either infected larvae and pupae, should be removed and destroyed immediately and the rest of the hive inspected carefully. Equipment that has been exposed to AFB may have to be burned. The extent of burning and the exact procedures may vary from region to region and therefore your provincial or state apiarist should be contacted before proceeding.

Even after burning, there is still a high probability that AFB spores remain in other untreated hives in the yard, and these can provide a source for further disease outbreaks. For this reason regular inspections combined with preventative antibiotic treatments are necessary.

2. European Foulbrood

Although European Foulbrood (EFB) affects the brood of honey bees on a worldwide basis, it is not usually considered to be a serious disease of honey bees. However, in some areas and under certain environmental conditions, EFB has been known to cause severe losses in brood, resulting in lower honey yields. Although the highest incidence of EFB usually occurs in the spring, it has been known to persist into autumn.

Although there are several bacterial organisms associated with EFB that may infect the larvae, *Mellisococcus pluton* is generally considered to be the primary causative agent. Another bacterial organism, *Bacillus alvei*, is often seen when a sample of EFB-infected larvae is prepared for microscopic examination. The other bacterial organisms generally associated with EFB are saprophytes that play no role in the disease's infectious cycle.

Life Cycle

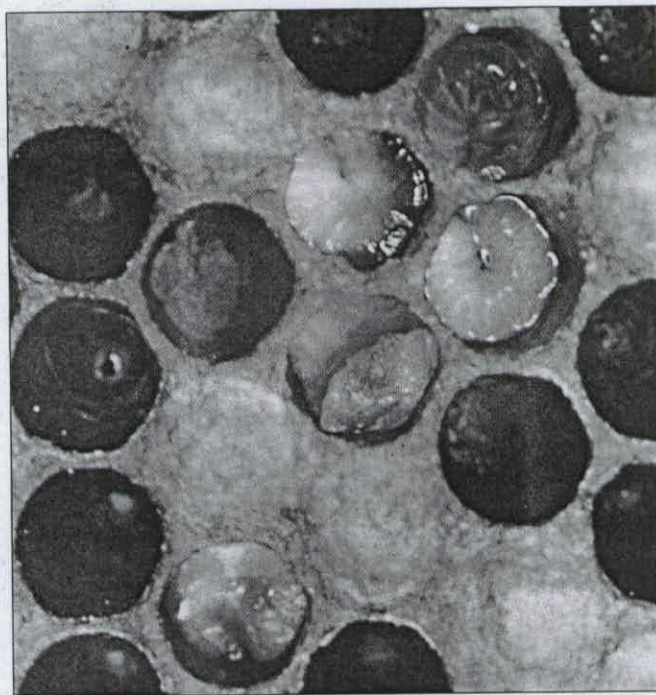
Young larvae (less than 2 days old) are infected when they consume brood food contaminated with bacterial spores. The bacteria then multiply rapidly in the

midguts of the larvae—particularly when they are 3–4 days old. House bees may carry bacterial spores on their mouth parts after removing brood from cells. The spores may be passed from bee to bee during food exchange, and then transferred to larvae while they are being fed by the nurse bees.

If a colony has a high population of nurse bees and a sufficient work force to eliminate infected larvae, it can usually sustain a mild to moderate infection. In some situations, young larvae become infected, die and are removed by house bees so that the disease is not visible. In most colonies that are kept in localities with no dearth periods, EFB infections usually remain slight; colonies end the season with no apparent disease and surplus honey.

Identification

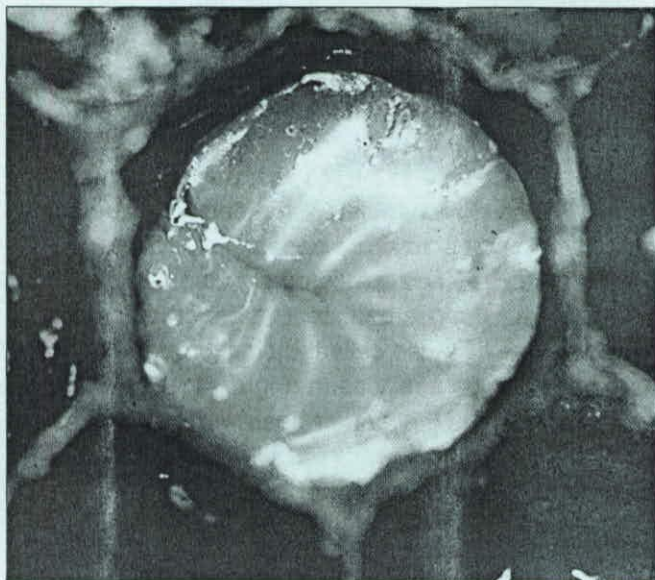
Normal larvae, in sealed cells, are pearly white in colour and lie in "C" shape at the base of the cell. Most EFB-infected larvae die before their cells are capped, although a few may die after the cappings are in place. The larvae usually assume unnatural positions at the base, or along walls, of the cells (Figure 8).



M.V. Smith

Figure 8 – EFB-infected larvae exhibiting typical discolouration and contorted positioning in cells.

EFB-infected larvae turn yellow at first and then brown, at which time the tracheal system becomes visible as a glistening vein-like network throughout the larval body (Figure 9). The larvae eventually decay to a point where they form a dry, rubbery scale in the cell; the scale can be removed quite easily by the bees.



D. Dixon

Figure 9 – EFB-infected larvae showing silvery tracheae and discolouration.

Prior to forming a dry scale the larvae become somewhat softened and granular and can be tested for "ropiness" using a match stick or toothpick. After dipping the "stick" into the larval mass it will appear rather dry and will not exhibit the "gluey" or "ropy" characteristics typical of AFB disease. This ropiness test is a key distinguishing characteristic between AFB and EFB. Larvae infected with EFB give off an offensive, sour or rotten fish-like odour.

If EFB is widespread in a colony the brood pattern takes on a "scattered" appearance. A scattered brood pattern will also occur in AFB- infected colonies (Figure 6). In a few cases, when EFB-infected larvae die after capping, the cappings take on a sunken, darkened, perforated appearance as compared to normal cappings which are slightly rounded (convex), light in colour and unperforated. Because cappings covering AFB infected larvae have a similar appearance, identification of EFB may be made more difficult. However, other signs of EFB are usually present to differentiate it from AFB.

Prevention

Healthy colonies are usually infected either by the bees robbing contaminated equipment or by the bee-

keeper transferring contaminated equipment from one hive to another. Thus it is important to store all unused equipment in bee-tight buildings to prevent robbing of the equipment by bees. All frames containing brood should be inspected periodically during the spring and early summer for signs of EFB. Further, pollen collected from colonies whose disease history is unknown should not be used as feed as this may result in the introduction of the disease to healthy colonies.

Treatment and Control

Colonies that have EFB should be isolated. It is important that no robbing of these colonies occurs nor should any frames from these colonies be transferred to other colonies. If only a few diseased cells are found on a comb, it should be marked and checked periodically for further spread of the disease. If many cells on any frame show signs of EFB the affected frames should be removed and burned.

EFB-infected colonies should be treated with the prescribed antibiotic, oxytetracycline hydrochloride (e.g., Terramycin - TM₂₅), which is also used to control AFB. As with AFB, this antibiotic does not kill the EFB spores, but prevents the growth and multiplication of the bacteria in the gut of the larva. For best results, it is important to feed antibiotics at the recommended amounts and at the correct time intervals (e.g., see recommendations for AFB). Consult your provincial or state apiculturist for antibiotic feeding guidelines.

FUNGAL DISEASES

Chalkbrood

Chalkbrood disease of honey bees has spread throughout the United States, Canada, and Mexico since it was first detected in the early 1970's. The levels of infection vary from year to year, and in some years may be economically important. Chalkbrood disease is caused by the fungus *Ascosphaera apis*, which infects the larvae. Chalkbrood disease has been reported to be primarily a disease of temperate climates and occurs more frequently and severely in colonies that are first weakened or stressed by other conditions.

Life Cycle

The spores of *A. apis* constitute the infectious stage of the organism. It is believed that the infection of the larvae results mainly from ingestion of spores. The

larvae are most susceptible to chalkbrood disease when they are 3-4 days old. Mycelia grow from the spores and develop in the hind gut of the larvae or prepupae, eventually engulfing them entirely. The dead larvae first become mummified with a fluffy white growth of mycelia and later become hard, shrunken and chalk like. These mummies remain white or turn dark grey or black in colour. The whitish mummies represent larvae that have been infested by only one strain, either the positive or negative form of the fungus, whereas the grey or black mummies have been infected by both strains (Figure 10). The dark colour is caused by the formation of black spore-producing bodies on the surface of the white mummy.



S. Camazine

Figure 10 – Chalkbrood “mummies” are easily removed from the cells by housecleaning bees and are often seen at the entrance of a hive; black spores form on the surface of some infected larvae.

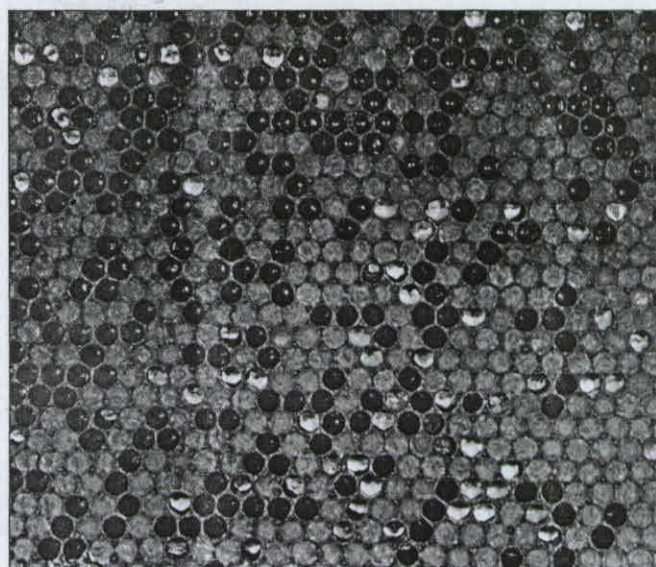
Studies indicate that many factors are probably involved in the infection, maintenance and spread of chalkbrood disease. These factors include: genetics of the queen and drones to which she is mated, environmental conditions (especially cool, moist conditions), drifting of bees from infected colonies, residual spores in combs of previously infected colonies and spore-contaminated food sources (e.g., pollen, water, nectar and honey). Some producers have attributed the increase in chalkbrood disease to the use of antibiotics, which may upset the equilibrium of the intestinal flora and thus allow fungi to develop. However, research results indicate that Terramycin neither inhibits nor enhances chalkbrood infections. Inbred bees appear to be more susceptible to chalkbrood than hybridized bees.

Chalkbrood appears to be a stress-related disease, because infections have been noted when one or more of the following conditions exist: excessive hive

moisture, cool, wet weather with poor foraging conditions; weak colonies; poor management; or the weakening of colonies by other diseases or pests (e.g., Varroa). The ability of the infection to spread seems low compared to that of other diseases (e.g., AFB). However, the spores can remain infectious for at least 15 years. When conditions are favourable for growth of the fungus, the disease may express itself again.

Identification

Chalkbrood is perhaps the easiest bee disease to identify. Bees evidently detect the dead larvae and chew small pin holes in the cappings. These small holes in the cappings are commonly the first sign of the disease for the beekeeper. If the beekeeper uncaps some of these cells the chalkbrood mummies can be easily seen (Figure 11). Left to their own devices the worker bees will uncap the cells and remove the mummies, discarding them on the bottom board or in front of the colony (Figure 10). If the mummies dry under the cappings, they may produce a rattling sound if the frame is shaken.



S. Camazine

Figure 11 – The presence of chalkbrood in a colony can easily be detected on brood frames.

Prevention and Control

There is no registered control agent for use against chalkbrood disease in Canada or the U.S. Although most reports indicate that chalkbrood does not cause serious economic losses, diseased colonies can have reduced populations and reduced honey production. Since adult bees can remove chalkbrood mummies, the disease often disappears as colonies increase in population and/or a nectar flow commences.

Combs containing large numbers of chalkbrood mummies should be destroyed to reduce the spore load in the colony. Other methods of reducing chalkbrood levels include strengthening weak, infected colonies by adding bees and/or healthy brood, and requeening with genetic stock that is less susceptible to the disease or has better hygienic behaviour. Beekeepers can avoid the spread of chalkbrood by not interchanging combs between diseased and disease-free colonies, and by using pollen from chalkbrood-free colonies for supplemental pollen feeding.

A beekeeper's best protection from high levels of infection is the use of young queens of resistant genetic stock, culling of older combs that may harbour residual spores and the practice of good management resulting in strong colonies.

VIRUSES

Economic losses due to honey bee viruses are rare in the North American beekeeping industry. However, the ability to distinguish symptoms in honey bees caused by viral infections from those caused by the other infectious honey bee diseases is extremely important. In the field, beekeepers must rely on observed symptoms to diagnose the presence of a viral infection in a colony. This reliance on observed symptoms may not always detect the presence of the disease organism because many viruses are capable of remaining dormant for extended periods of time without exhibiting any visible signs in the host bee. Verification of a virus or viruses in honey bees requires the use of sophisticated laboratory equipment and highly technical procedures.

The viruses that have been detected in Canada and the United States are sacbrood, chronic paralysis virus, acute bee paralysis virus, Kashmir bee virus (Canadian strain), black queen cell virus, cloudy wing virus, filamentous virus, bee viruses X and Y, Arkansas bee virus, and slow paralysis virus. In this review we will deal only with those viruses most commonly found in North America or that are transmitted by the parasitic mite, *Varroa jacobsoni*.

1. Sacbrood

Sacbrood disease derives its name from the sac-like appearance of the diseased larvae resulting from an accumulation of moulting fluid between the body and unshed skin (Figure 12). Diseased brood usually die during the prepupal stage. They tend to darken prematurely from white to yellow, and finally change to a



S. Camazine

Figure 12 – A sacbrood-infected larva showing typical discolouration.

dark brown colour once they are dead. In heavily infected colonies, sacbrood will result in partially uncapped cells scattered among capped brood or some cells remaining capped after the surrounding brood has emerged. Typically, when a larva dies from sacbrood, it will be found lying along the length of the cell with its head darkened in colour and slightly raised. As the disease progresses, the skin of the larva becomes tough and leathery and the larva can be easily removed from the cell intact. If left long enough the larval remains will eventually dry and settle into a brittle scale that can easily be removed from the cell.

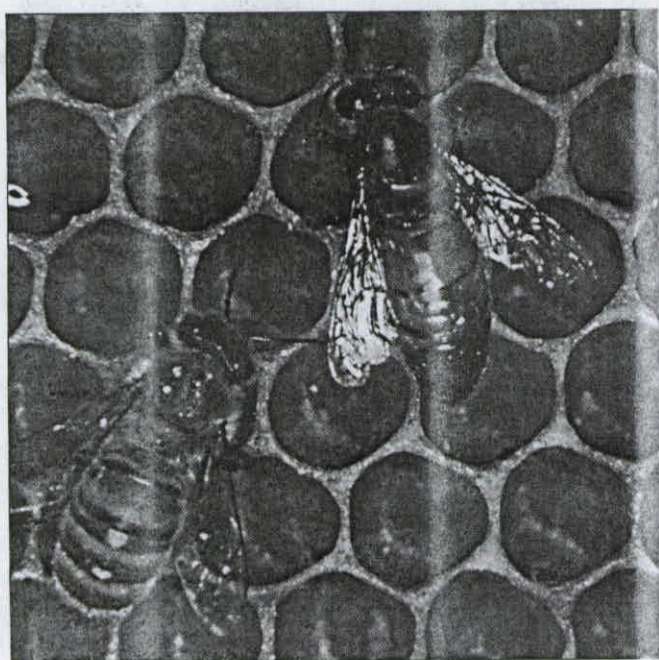
The initial spread of sacbrood within a colony occurs when nurse bees become contaminated while removing larvae killed by the virus from their cells

During this activity, the nurse bees ingest virus laden fluids from sacbrood-infected larvae that are damaged in the process. Virus particles collect in the hypopharyngeal glands of these bees. Infected nurse bees can then spread the virus throughout the colony by feeding uninfected 1-2 day old larvae, exchanging food with other adult bees and contaminating food stores.

As with most viral infections, there are no chemical cures. However, the use of less susceptible honey bee stocks in addition to minimizing stress through good management can alleviate the problem. *Varroa jacobsoni*, the Varroa mite, may be a vector of this virus.

2. Chronic Paralysis Virus

Chronic paralysis virus (CPV) causes abnormal trembling in adult bees, partial paralysis resulting in crawling and limited flight ability, and bloated abdomens. In serious cases, thousands of bees can be seen crawling on the ground at the hive entrance. In addition, infected bees sometimes have reduced amounts of body hair and will appear darker and shiny. Hence, this viral disease is often referred to as "hairless black syndrome" (Figure 13).



M.V. Smith

Figure 13 – The adult bee on the right exhibits the symptoms of chronic paralysis virus or "hairless black syndrome".

Severe outbreaks of chronic paralysis virus do not coincide with the season, but rather with incidents that impair the normal foraging activities of bees. Poor weather, dearth and high numbers of colonies per unit area are factors that reduce foraging activity and result

in crowded conditions in the colony, thereby increasing bodily contact between infected and healthy bees.

CPV has a world wide distribution but is as yet of little economic importance in Canada and the United States. Requeening an infected colony with a more resistant queen often helps to eliminate disease symptoms.

3. Acute Bee Paralysis Virus

Although the nature of acute bee paralysis virus (ABPV) is very similar to that of CPV, the viruses themselves are very different. ABPV, the more virulent of the two viruses, spreads as inapparent disease most likely by way of salivary gland secretions of adult bees and in food stores to which these secretions are added.

In North America and Continental Europe, ABPV has been known to kill adult bees and larvae in colonies infested with the Varroa mite. As the Varroa mite parasitizes an infected bee, it damages tissue and releases ABPV particles into the honey bee's blood.

Once in the blood, the virus is fatal, with bees first becoming semi-paralytic and then dying in 3 to 5 days. It has been suggested that the Varroa mite's digestive enzymes may stimulate replication of ABPV and that the mite can act as a vector by transferring the virus from infected to healthy bees. This virus can be transferred between colonies by drifting bees that are carrying female Varroa mites infected with ABPV.

4. Kashmir Bee Virus

In 1977, Kashmir bee virus -Type Strain (KBV) was discovered in eastern honey bees (*Apis cerana*) originating from Kashmir. Since then it has been discovered in European honey bees (*Apis mellifera*) in Australia, Canada, Spain, New Zealand and the United States. There is much discussion over the potential virulence of this virus. In Australia and New Zealand, KBV exists in all life stages of the honey bee as a harmless, non-damaging pathogen. Similarly, in the laboratory, honey bee larvae and adults show no effects when fed the virus. However, they are quickly killed when the virus is injected into their body cavity.

On occasion, KBV has been known to cause minor colony losses during simultaneous infection with Nosema disease and European Foulbrood. It is possible that these diseases damage the bee's gut,

allowing KBV to move from the gut region into other tissues where it is capable of rapid replication that causes death. Because KBV is pathologically similar to ABPV, it may also cause losses when associated with the Varroa mite. Control of Varroa mites, Nosema disease and European Foulbrood disease in colonies may help to avoid potential losses by KBV.

5. Black Queen Cell Virus

Black queen cell virus (BQCV), identified in bees from Britain, Europe, North America and Australia, affects developing queen pupae in the capped-cell stage primarily during the spring and early summer. Diseased pupae are initially pale yellow and have a tough sac-like skin similar to that seen in sacbrood-infected larvae. BQCV-infected pupae rapidly darken following death and eventually the walls of the queen cell become dark brown to black in colour. This virus generally multiplies in the pupal stage of the honey bee. However, it is also known to multiply rapidly in adult bees infected with Nosema disease. Nosema disease infects the adult bee's midgut tissues, increasing the susceptibility of the alimentary tract to infection by BQCV. Adult bees infected with both BQCV and Nosema disease have shorter life spans than those infected with Nosema disease alone. The Varroa mite sometimes acts as a vector of BQCV. If this virus is present in colonies to be used for queen-rearing, it can be quickly spread to developing queens, which results in poor queen hatch.

6. Deformed Wing Virus

Deformed Wing Virus (DWV) has been detected in *A. mellifera* brood and adults in most European countries, Saudi Arabia, Iran, Vietnam, Argentina and China. This virus multiplies slowly and pupae infected at the white-eyed stage of development are able to emerge as adults but have deformed or poorly developed wings and soon die. Varroa transmits DWV in the same way as ABPV.

PROTOZOA

1. Nosema Disease

Nosema disease is an adult honey bee disease caused by the single celled protozoan, *Nosema apis*. Nosema disease is found in most beekeeping regions, but causes damage mainly in temperate climates characterized by cool, unsettled springs. Colonies suffering from Nosema disease often exhibit spring dwindling or poor spring build up, resulting in

reduced honey production. The disease can also be responsible for a high proportion of early queen supersedure.

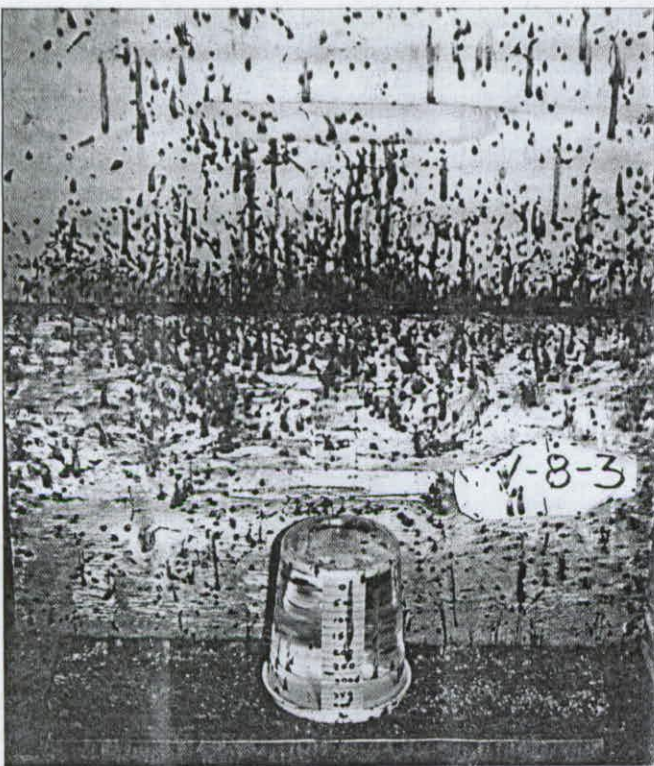
Life Cycle

Nosema apis forms resistant spores that remain viable over long periods of time. If Nosema spores are ingested by the adult bee, they will germinate in the midgut (e.g., ventriculus). Following germination, the spore emits a long tube or polar filament that penetrates a cell of the midgut lining or epithelium. The contents of the spore then travel through the hollow filament, enter an epithelial cell, and proceed to grow and multiply.

In the process of growth and multiplication, the contents of the epithelial cells are utilized by the disease organism. After the organism has completed its growth and multiplication, sporulation occurs, resulting in the formation of many Nosema spores in the cell. The Nosema-infected cells rupture and release the spores, which either penetrate other epithelial cells or are voided with the feces. If defecation should occur within the hive, these spores may infect other bees in the colony through their house-cleaning and food sharing activities. However, most defecation normally occurs on or outside of the hive (Figure 14). The disease may be transmitted to other bees in water sources located near the apiary.

Heavily infected bees are unable to properly digest their food as the epithelial cells of the midgut have been damaged by the disease organism. Such bees have shortened life spans and, as they cannot digest pollen, are unable to produce the protein-rich brood food (e.g., royal jelly) needed by larvae. In fact, the hypopharyngeal glands responsible for brood food production are seen to atrophy in heavily diseased bees. This results in poor growth of colonies in spring, or even a population decrease in severe cases. There is an increased incidence of queen supersedure in Nosema-infected colonies.

The incidence of Nosema disease is generally the highest in the spring following long winter confinement and variable spring weather conditions. Wintered hives may suffer when populations are low and pollen supplies have been depleted. Package bees may be particularly susceptible soon after hiving, especially if foraging conditions in the region where the packages were produced were poor. As foraging conditions improve and the aging population is replaced by young bees, Nosema infections usually decline



B. Fingler

Figure 14 – Fecal deposits on a hive resulting from dysentery often indicate that the colony is infected with *Nosema* disease.

Hive equipment containing spores may be a source of infection when stressful conditions return. Although *Nosema* is usually at a low level in the fall, stress and poor weather may cause an outbreak at this time.

Identification

Adult bee diseases generally are more difficult to diagnose than brood diseases as diseased adults often show few changes in outward physical appearance. Heavily infected colonies may have crawling bees in front of the hives, bees with uncoupled wings or bees with distended abdomens. However, these symptoms may also be confused with pesticide poisoning, bee paralysis and other adult abnormalities. Sometimes *Nosema*-diseased bees may not exhibit any obvious symptoms.

Nosema disease is often confused with dysentery, a situation where fecal matter is deposited within the hive and around the entrance. Dysentery may result from a variety of conditions including poor quality food stores, the presence of *Nosema* or a combination of both. If *Nosema* is present, dysentery may help spread the *Nosema* spores to other bees.

Nosema may be diagnosed by taking a sample of foraging or crawling bees and examining their digestive tracts. By pulling the tip of the abdomen and the thorax of a bee in opposite directions, the digestive tract will string out. A normal digestive tract is tan to brown in colour with distinct annulations (rings). If the stomach is whitish and lacks annulations, the bee is usually heavily infected with *Nosema*. If 10-20 bees are examined in this manner, a percentage of infected bees may be determined. This method, however, only indicates the most heavily infected individuals, as less infected bees appear to have normal digestive tracts.

The only reliable diagnosis for *Nosema* disease is through microscopic examination of adult bees. A sample of bees can be collected from the hive and preserved in 50% alcohol, frozen or dried for later analysis. For the analysis, 1 ml of water is added for each dried bee in the sample and the mixture is ground up using a mortar and pestle. Then, one droplet of the resulting mixture can be placed on a special microscope slide called a hemocytometer and placed under the microscope for examination at 400x magnification. Usually a sample of 25 bees is used for estimating the *Nosema* spore levels in a colony.

Prevention and Control

The beekeeper can employ various management practices to prevent serious outbreaks of *Nosema* disease. Careful selection of wintering sites is important. Sites should be sheltered against cold winds and open to the south to allow cleansing flights when winter weather permits. Hives should be kept off the ground to ensure sufficient air circulation especially in areas with humid winter conditions. Hives should also be tilted slightly forward to prevent water accumulation on the bottom board. Hives entering winter must have strong populations with a vigorous queen and should be provisioned with adequate stores of honey and pollen. Adequate insulation and entrance reducers should also be used. In the spring, package bees should have at least two full frames of pollen upon hiving in addition to adequate honey stores or syrup feed.

Fumagillin is the antibiotic used in the prevention of *Nosema* disease. It has no effect on the spores but is effective against the actively growing stages. Fumagillin is available under several trade names. It is effective when fed in the proper amount of sugar syrup at the recommended concentration, but should not be mixed in hot syrup, as this promotes breakdown of the antibiotic.

Colonies should receive Fumagillin with a full feeding of sugar syrup in the fall. Package bees may receive medicated syrup upon hiving or with the syrup used to feed the packaged bees during transit. To prevent Nosema infection of queens in storage, queen banks should be fed medicated syrup throughout their use.

2. Amoeba Disease

Amoeba disease is caused by the protozoan, *Malpighamoeba mellificae* which affects the malpighian tubules of adult honey bees. Amoeba disease has a similar seasonal cycle to Nosema disease and they often occur together. Since the Amoeba disease has no clear symptoms, it often goes undetected. There are no chemical treatments available, but its incidence can be lowered through improved management practices aimed at reducing stress on the bees. Amoeba disease is widely distributed in temperate climates.

PARASITIC MITES

About 100 species of mites have been found in honey bee colonies in various parts of the world. Of these, the three species of most concern to beekeepers in Canada are *Varroa jacobsoni*, *Acarapis woodi* and *Tropilaelaps clareae* (*Tropilaelaps* is not currently present in Canada, but there is concern about its potential impact if accidentally imported). *Varroa rindereri*, *Varroa underwoodi* and *Tropilaelaps koenigerum* are not well known and are still restricted to their native environments, but are likely similar to their species in the same genus.

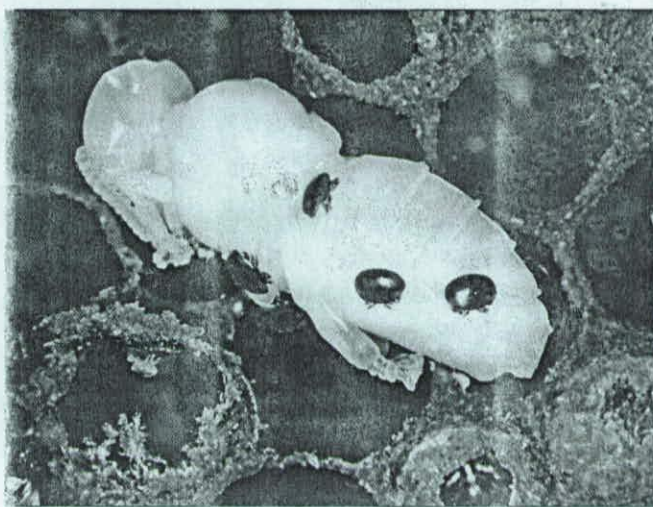
1. *Varroa jacobsoni*

Originally described as a parasite of the eastern honey bee, *Apis cerana*, from Asia, Varroa was apparently transferred to *Apis mellifera* by beekeepers about 1940. Varroa was inadvertently transported to Europe and South America in the 1970's. It now occurs over most of those continents, including Great Britain where it was first detected in 1992. In 1987, Varroa mites were detected in the eastern United States, and Canada discontinued importation of U.S. bees. By 1992, Varroa had been found in most of the U.S. and was becoming established in several Canadian provinces near their border with the U.S.

By 1995, Varroa had been detected in all Canadian provinces with the exception of Prince Edward Island and Newfoundland. In May 2000, Varroa was detected in colonies in New Zealand. Unfortunately packages had already been shipped from New Zealand to Canada and the result was positive finds of this mite in Prince Edward Island. With the discovery of Varroa in New Zealand, only Australia and Hawaii, as major exporters of bees and queens, remain free of this mite pest.

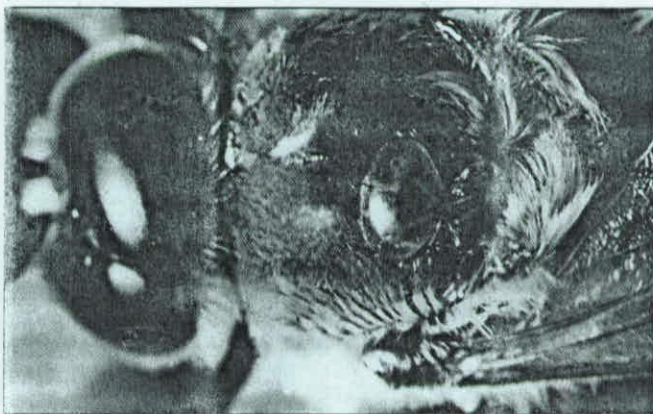
Identification

Detection of Varroa mites can be accomplished by removal and examination of drone pupae, examination of hive debris (especially after use of a miticide) to detect any mites that have died, or by washing adult bees and straining the fluid to recover mites which have been detached. Mature Varroa females are reddish brown and large enough to be easily seen on white larvae or pupae (Figure 15). They are visible but often less conspicuous on adult bees (Figure 16). Deformed and nonfunctional wings on newly-emerged adult bees may result from feeding by Varroa on the bud area of bee pupae or by infection by Deformed Wing Virus. Bees with such deformed wings are sometimes seen crawling at the entrances of infested colonies.



J. Kalish

Figure 15 – Adult female Varroa mites on a developing honey bee pupa that has been removed from its cell.



S. Camazine

Figure 16 – An adult female Varroa mite on a drone.

Impact

Apis mellifera, particularly worker bees, that emerge after being fed upon by Varroa are smaller and have shorter lives. Beekeepers in temperate regions usually report high mortality of colonies within 2 or 3 years after detection of Varroa in an area. Distribution of the mites among colonies in an apiary, and to apiaries considered to be relatively isolated, is often remarkably rapid and uniform. It is commonly observed that colonies that were strong enough to store surplus honey in summer become almost devoid of bees in fall as summer bees die and are not replaced. As Varroa becomes established in a beekeeping area, efforts at control may be complicated by high rates of reinfestation from bees robbing weakened, unmanaged bee colonies. At least part of the colony mortality associated with infestation by Varroa may result from ABPV or other infections, which can be made worse by the mites. Currently in temperate areas where Varroa has been present for several years, survival of *A. mellifera* appears to depend on beekeeper intervention to continually reduce the Varroa population. Variability in impact of Varroa on *A. mellifera* is related to climate, bee subspecies, attractiveness of brood to mites and other factors.

Life Cycle

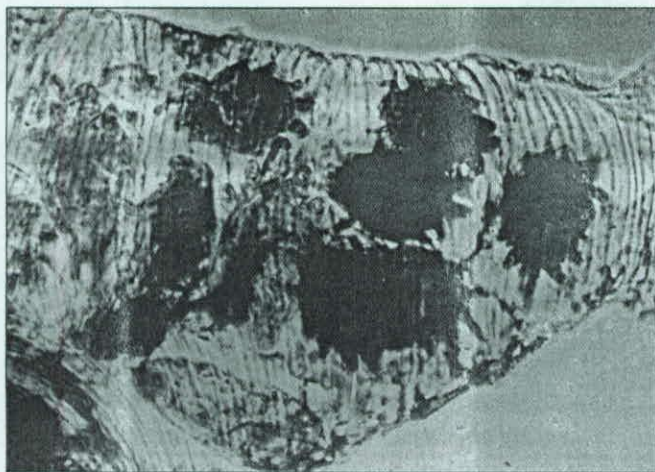
Fertile Varroa females detach from their adult honey bee host, enter brood cells (particularly drone cells) just before capping and lay 2-7 eggs near a bee larva. The first egg laid is normally not fertilized and so develops into a male mite, while the rest of the eggs are fertilized and develop into females. Newly hatched mites are initially immersed in the bee's food, but soon begin to feed on the developing bee and remain with it as the bee pupates in the closed cell. The mites mature and mate in the cell, and fertile females leave the cell when the bee emerges. Immature females and the smaller males do not survive long after the cell is vacated. In drone cells, 2 to 5 mature daughter varroa emerge for each mother mite in the cell. In worker cells, an average of fewer than 2 daughter mites mature. When females are not seeking another cell for egg laying, they remain on adult bees and feed on their hemolymph (blood). Adult female mites are thought to be carried to other bee colonies by drifting bees (especially drones) or possibly by transfer to new bee hosts at flowers or other food sources. Colonies weakened by Varroa are subject to robbing in fall. Robbing bees carrying mites from infested colonies back to their own hive may represent the largest means of local spread of Varroa.

Acarapis woodi

The honey bee tracheal mite, *Acarapis woodi*, was described in England in 1919 by J. Rennie. At that time the tracheal mite was considered to be the cause of widespread mortality of honey bee colonies that began in 1904 on the Isle of Wight. For unexplained reasons *A. woodi* did not become established in early importations of honey bees to North America. By 1981, however, tracheal mites were reported in much of South America, parts of Africa and Asia and throughout almost all of Europe and Mexico. Although a major survey for bee mites throughout the U.S. in 1982 detected no *A. woodi*, by 1986 it had become widely distributed in much of the U.S. By 1990, all states except Hawaii had detected tracheal mites. Beekeepers in Canada imported 200,000-300,000 packages of bees from the U.S. each year up to and including 1987, when importation ended. Tracheal mites were found in Canadian colonies derived from packages in a few locations in 1987, and in additional apiaries in several provinces in 1988 and 1989. Between 1990 and 1995 the mite became established in widespread locations in the western provinces and Ontario, and was found sporadically in other eastern provinces along the U.S. border. Less attention may have been paid to tracheal mites during this period as Varroa mites became a major concern to the beekeeping community.

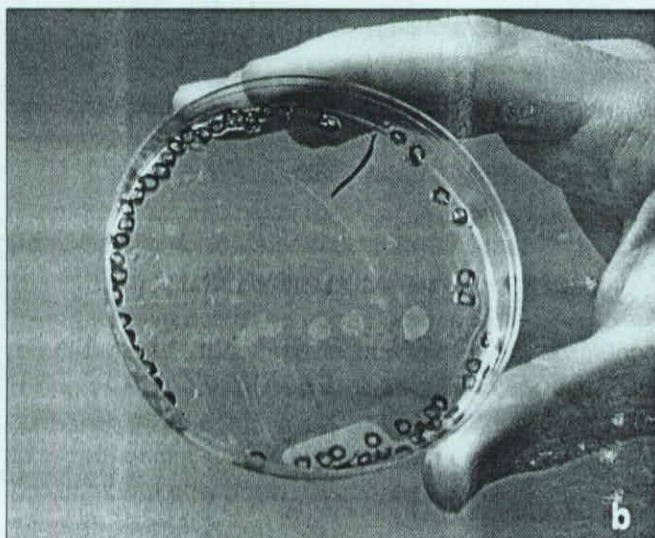
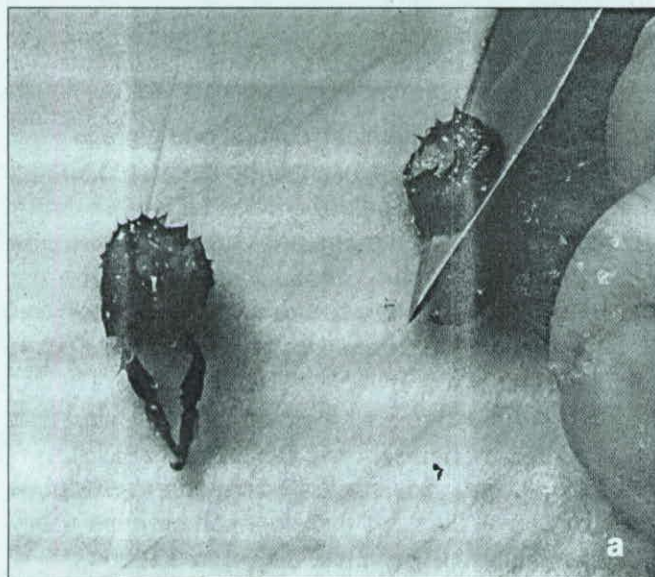
Identification

Acarapis mites are too small to be observed on bees without the aid of a microscope. An ELISA (Enzyme Linked Immuno-Sorbent Assay) test that reacts specifically to tracheal mites has been developed and would be suited to processing of large numbers of samples. The assay provides a method for estimating the total number of mites in a sample, but has a lower limit of detection of about six infested bees (about 60 mites) per 100 bee sample, so it is not suitable for early detection purposes. *A. woodi* is mostly found inside the tracheae (Figure 17). A sample of adult bees, preferably of foraging age, can be collected in alcohol and stored for laboratory examination. Examination may be by dissection and observation of the main tracheal trunks, or by cutting from each bee a slice or disc that includes these parts (Figure 18). The discs are placed in 5% potassium hydroxide solution for 24 hours at 43°C (108°F) until the muscle tissue is dissolved and the tracheae are clearly



C. Peng

Figure 17 – Several life stages of stained honey bee tracheal mites are visible in the cleared trachea of an adult honey bee.



D. Hamilton

Figure 18 A dissection procedure for detecting honey bee tracheal mites -
a) The head is removed and the thoracic disc is cut,
b) muscular tissue in the thoracic discs are cleared to expose the tracheae of the bee

visible. This procedure can be followed by optional staining for about ten minutes in one percent methylene blue and rinsing in clear water. Examination under a dissecting microscope at about 30x magnification or higher will allow detection of the mites.

They appear as darker ovals inside the trachea, or in groups as mottled, cloudy or darkened tracheae (Figure 19). For confirmation, such tracheae may be removed, mounted under a cover slip and examined closely with a compound microscope. Any mites inside the tracheae are almost certainly to be *A. woodi*.



D. Hamilton

Figure 19 – Cleared tracheae of a honey bee. There are several tracheal mites in the left trachea; the right trachea is heavily infested with mites as indicated by its cloudiness and discolouration.

Impact

In areas where tracheal mites have become established, poor summer foraging conditions have been associated with higher mite prevalence in fall and lower survival of colonies in the following winter. Higher mite prevalence (above about 20% of bees) causes no apparent symptoms in summer or fall, and may not be recognized by a beekeeper early enough to take effective steps to ensure a high proportion of healthy bees for successful wintering. Highly infested colonies (some have mites in virtually all bees) usually die in mid- to late winter, often with adequate honey stores still present and an abnormally small number of bees remaining in the hive. Two other species of *Acarapis* mites, *A. dorsalis* and *A. externus*, live in small numbers externally and without known harm on honey bees. Both are present in North America and are considered to exist practically everywhere bees are kept.

Life Cycle

Fertile *A. woodi* females assume "ambush" position (anchored on their hind legs, front legs extended) on the hair tips of infested adult honey bees. After transferring to another bee the mite "assesses" the potential new host, based in part on the "odour", or profile of hydrocarbons of the bees cuticle. Bees with the unique odour of young (less than 4 days) bees are most readily accepted as hosts. Only when young bees are not available will mites enter older bees. When a suitable bee is encountered, the mite enters the bees tracheal system through the large first thoracic spiracle (opening). After feeding on the new host bee's hemolymph, the female mite lays numerous eggs in the main tracheal tubes.

Both immature and adult mites feed on the bee's hemolymph by piercing the tracheal walls with their mouthparts. Darkening of the tracheae near feeding mites is often but not always observed. This darkening may be caused by modified hemolymph that leaked from mite-inflicted wounds made in the tracheal tube walls, mite excretory products, or micro-organisms living on these materials. A heavily infested bee may have over 100 mites of various ages in its tracheae.

Tracheal mites of the new generation begin to mature by the time the infested bee is about 10 days old. Mature females mate in the tracheal tubes and emigrate through the spiracle. This emigration may occur from bees as young as 13 days old, reaches a peak in bees 15 to 30 days old and may continue over the life of the bee. Some daughter mites may remain and lay eggs to begin a second generation within the same host, especially in longer-lived bees during the winter.

Drones and queens are also susceptible to mite infestation. Infested queens could serve as the source of new infestations if shipped to areas free of tracheal mites. Drifting bees (especially drones) are likely the usual means of mite transfer from colony to colony, although movement of bees by beekeepers is undoubtedly responsible for rapid long distance distribution.

3. *Tropilaelaps clareae*

Tropilaelaps clareae is a brood parasite of the giant or rock honey bee, *Apis dorsata*, in southeast Asia. This mite also infests colonies of *A. mellifera* and has been found in many Asian countries including Afghanistan, China and the Philippines. It has not yet

been detected in North America

Tropilaelaps mites are about half the size of female Varroa mites, somewhat rectangular to oval in shape, and light brown in colour. Detection techniques are similar to those described for Varroa mites.

Life Cycle

The life cycle of this Asian mite is similar to that of Varroa, but a detailed description has yet to be published. In tropical areas, *Tropilaelaps* is at least as damaging as Varroa to colonies of *A. mellifera*. Preliminary observations indicate that unlike Varroa, it feeds on brood but not on adult bees. It is not expected to become as serious a pest to *A. mellifera* colonies in areas with a nearly broodless winter period.

MITE CONTROLS

As with any pests, chemical, cultural and genetic management approaches should be integrated to reduce populations of parasitic mites to non-economical levels. From the beekeeper's perspective, one must balance the cost and efficacy of various treatments to achieve a solution that gives satisfactory results.

1. Varroa Mites

Although Varroa mites are large enough to be easily seen by beekeepers and therefore can be more easily diagnosed than tracheal mites, they pose some different problems for control. For example, when colonies are actively rearing brood a large proportion of the mites cannot be seen or readily killed because they are in capped brood cells. Also, due to the migration of mites from neighbouring colonies, the number of mites in a hive can quickly increase from non-economic to highly injurious levels over a short period of time. When Varroa is suspected or confirmed in a region, beekeepers should routinely check their hives for mites. Once the presence of Varroa mites is confirmed in an apiary, all hives must be treated to maintain healthy, productive colonies.

Since Varroa was first reported as a significant pest of honey bees, most beekeepers worldwide have utilized chemical treatments during non-honey-flow periods to control this mite. A wide variety of chemicals have been tested, and many have proven to be efficacious. However, a recurrent concern is the real possibility of chemical residues in honey. By far the most

frequently utilized chemical control in North America at present is fluvalinate (Apistan®). Fluvalinate is a nonvolatile contact chemical that moves onto the waxy cuticle of bees and kills the Varroa; it is ineffective against tracheal mites. Apistan® is sold in plastic strips that are suspended in the bee cluster at the rate of one strip per five frames of bees. (Insufficient numbers of strips will result in inadequate mite control.) It does not penetrate brood cappings, so to be effective it must remain in the colony for more than one brood cycle (the manufacturer recommends 6 weeks). If used properly there are no residues in honey; however, other formulations of the chemical, while they may control Varroa mites, have been shown to leave chemical residues in honey and are not recommended. Some populations of Varroa mites in Europe and the United States have developed resistance to fluvalinate and can no longer be controlled with this miticide. It is likely that the same problem will arise in Canada over time. To slow the development of fluvalinate resistance by Varroa mites, beekeepers should remove Apistan® strips after the 42-day recommended treatment period and try to alternate between available registered miticides.

In Canada, 65% formic acid has been registered for control of Varroa in bee hives. (It cannot yet be legally used in the United States.) Colonies are treated as described above for tracheal mites. However, because it readily volatilizes and most mites are in sealed brood cells, 3-6 treatments at 2-4 day intervals are required (total treatment time of at least 14 days). **Formic acid can be dangerous; people using it should avoid skin contact and inhaling the fumes.**

Several additional products are registered in various countries for control of Varroa. These include Bayvarol®, Perizin®, Folbex VA New®, Sineacur® and Mitacur®. Beekeepers are advised to contact regulatory agents in their area to learn which products are registered for use and effective.

There has recently been renewed interest in the use of essential oils for Varroa control. Some examples of these natural products are cinnamon oil, clove oil, thymol, eucalyptol, menthol and camphor. Various combinations of these products are effective in controlling varroa, and possibly tracheal mites as well. Further developments in the use of essential oils are anticipated.

Drone brood removal is the only cultural control currently available. Because Varroa mites preferentially parasitize drone brood, repeated removal of drone brood can substantially reduce Varroa populations. A strong colony of bees will usually construct drone

comb on an empty frame placed in the centre of the brood nest. Once the queen has laid eggs on that comb and the cells have been sealed, the comb can be cut away and destroyed, thereby removing all the mites that parasitized the brood. This method may prove effective when Varroa populations are still fairly low, but at higher infestations chemical treatments will be necessary.

It is hoped that bee breeding efforts will eventually produce a strain of *Apis mellifera* resistant to Varroa mites. Several genetic traits are known to increase the degree of resistance of a colony to Varroa. These include: (1) grooming behaviour, whereby worker bees detect and injure mites on adult bees; (2) hygienic behaviour, by which bees detect and remove infested brood; (3) physiological factors that reduce or inhibit the reproduction of female mites in brood cells; (4) the relative attractiveness of larvae to mites; 5) the duration of the capped brood stage; and 6) seasonal patterns in worker and drone brood rearing.

Unfortunately, there have been no bee strains identified yet that can naturally limit Varroa populations to non-economic levels in temperate climates without chemical treatments of one kind or another.

Achieving Varroa-tolerant strains of bees may be possible, but will probably result from the co-ordinated efforts of several breeding projects.

2. Honey Bee Tracheal Mites

Honey bee tracheal mites (HBTM) are microscopic and impossible to detect by visual inspection of adult bees. Consequently, even highly infested bee hives appear normal in summer and fall. Beekeepers who suspect their bees are infested with mites are encouraged to contact their local authorities and arrange to have samples analyzed. If the infestation is confirmed, the beekeeper is encouraged to consider the following potential controls and adopt those that are appropriate to their management system and geographic location.

It has long been known that menthol kills tracheal mites. Natural or synthetic crystals of food-grade menthol (L-isomer) should be placed inside the hive in a porous container. Fifty grams (1.8 oz., or about 1/3 cup) are needed for two-storey hives; lesser amounts are needed for smaller units. When ambient temperatures increase above 21°C (70°F), the menthol vaporizes and kills the mites. Because menthol fumes are heavier than air, beekeepers in cooler climates usually place the menthol above the bee cluster. However, under hot conditions it is preferred

to place the menthol on the bottom board because the rapid vaporization can severely disrupt or damage the bees. The requirement to avoid treatments during a honey flow, combined with the temperature dependence of menthol vaporization, restricts use to only a few periods in temperate climates.

Some beekeepers treat HBTM-infested colonies with vegetable oil. Vegetable oil on the bees' bodies acts by reducing the transfer of mites from older infested bees to newly emerged bees. Treatment is done by placing grease patties made from one part hydrogenated vegetable oil mixed with two parts granulated sugar (225 g or 1/2 lb) per patty) on top of the frames in close proximity to the bee cluster. To achieve a reduction in mite populations, the bees must acquire a thin coating of oil by contacting the patty. The success of oil treatments will improve as better methods of delivering oil onto the bees are devised.

One successful treatment combines the menthol and oil treatments. Menthol is added to an equal weight of vegetable shortening that has been heated to 65°C (150°F). Pieces of corrugated cardboard (30cm x 30 cm; 1 ft²) are soaked in this solution, then placed in bee hives once or twice per week. The treated cardboard can be stored in a freezer until needed.

Formic acid is the only other chemical approved for use in Canada (but not in the USA) for tracheal mite control. Interestingly, formic acid is a natural component of honey. Treatment consists of 30-40 ml (1.05-1.40 fl. oz.) of 65% formic acid applied onto paper towels or other absorbent material placed on the bottom board or top bars. During treatment the hive entrance should be open. Three treatments at 5-7 day intervals when outside temperatures are 10 -25°C (50 -75°F) should prove effective. **Caution: Avoid breathing or contacting formic acid; wear protective clothing (e.g., chemically resistant or rubber goggles, gloves, boots and apron).**

All chemical treatments of hives should be discontinued at least two weeks before the honey-flow to avoid chemical residues in honey.

The rate of brood rearing of a colony influences the number of young bees that are available as potential hosts of mites. Beekeepers can take advantage of this by adopting management programs that utilize nucleus colonies with young queens. These units will continue to increase in bee numbers until brood rearing ceases in fall, thereby greatly reducing the con-

centration of mites in winter bees that occurs in fall. The use of nucleus colonies has the added advantage that chemical treatments, if required, are less expensive because of the smaller hive volume and bee population.

The physical setting of apiaries can have a strong effect on the development of HBTM infestations. Unfortunately, this phenomenon is poorly understood at present. Beekeepers are advised to keep accurate records and discontinue the use of sites where overwintering success is poor, hives are weak in spring and/or heavy infestations of mites are known to occur.

Fortunately, genetic solutions to tracheal mite problems may reduce the mite's impact. Bees of different genetic backgrounds can vary substantially in their relative resistance to tracheal mite infestations. A few resistant strains of bees that require little or no HBTM control are now available commercially in North America. Although the mechanisms underlying this resistance are unknown, they probably involve the physiology of the bee, the external chemical signals that influence migration of mites between host bees, bee behaviour within the hive, brood rearing patterns and/or the ability of the bee to tolerate the presence of mites without being adversely affected.

PESTS AND PREDATORS

1. Waxmoths

Larvae of several moth species infest beekeeping equipment, causing serious economic damage through their feeding activities. Serious moth pests in the Canadian beekeeping industry include the greater wax moth (*Galleria mellonella* L.), the lesser wax moth (*Achroia grisella* F.) (Figure 20) and the dried fruit moth (*Vitula edmandsae* L.). Infestations in strong, active colonies are effectively controlled by worker bees; however, extensive losses can occur in queenless colonies or in those weakened through contact with pesticides, disease or parasites. Stored equipment containing comb and debris is particularly vulnerable to invasion by wax moths.

Life Cycle

A mated female moth can lay several hundred eggs in cracks between frames, lids, and boxes. Upon hatching, larvae move toward the comb midrib, forming feeding tunnels lined with layers of silk material. The thick silk webbing that results from developing infestations makes effective removal of the larvae by

worker bees difficult (Figure 20). Mature larvae spin tough, white cocoons between the supers or underneath the hive lid. Equipment previously infested with wax moths contains characteristic gouges where cocoons were attached to wood surfaces.



M.V. Smith

Figure 20 - A close-up of brood comb showing wax moths and the tunnels and debris caused by their feeding.

After a period of pupation, adult moths emerge and mate, continuing the infestation cycle. In temperate regions, the greater wax moth overwinters as mature larvae and pupae in cocoons (often in large masses). The other wax moth species have been observed to overwinter in the egg or larval stages. Wax moths surviving the winter in temperate climates provide a source of infestation the following year. The number of generations per year depends on nutrition and climatic factors such as temperature and humidity. During peak periods of infestation, all life stages may be observed simultaneously.

Control

1) Apiary Management

Wax moths are seldom the direct cause of colony mortality. Serious levels of infestation in active colonies, signalled by large numbers of developing larvae and damage to comb, indicate the health of the honey bee population has been compromised. Procedures to prevent substantial losses from wax moths include: (1) maintaining vigorous colonies with adequate food stores; (2) controlling diseases and other pests, 3) annually removing wax and debris from the bottom board of the hive; and (4) avoiding exposure to pesticides.

2) Management of Stored Equipment

General recommendations to alleviate infestations include the separation of light and dark brood comb prior to storage of equipment, and ensuring that comb is not stored for more than a season without being placed on an active colony of honey bees. Control methods have included exposure of equipment to temperature extremes, fumigation and biological control.

Cold treatment of comb and beekeeping equipment is relatively effective in eliminating all life stages of the greater and lesser wax moths. The dried fruit moth appears to be more tolerant to cold and its life stages are more difficult to kill using cold treatment. Overnight exposure in a deep freezer, 10 day exposures at 2°C (36°F) or 21 days at 5°C (41°F) kills all life stages. Loosely stacked supers improve the circulation of cold air. Heat treatments of 46 to 49°C (115 to 120°F) are similarly effective, but care must be taken as excessive temperatures can cause comb to sag or melt.

There are currently no chemical fumigants registered specifically for control of wax moths in stored beekeeping equipment.

Biological agents such as the bacterium *Bacillus thuringiensis* (B.t.), a nuclear polyhedrosis virus, a protozoan and a parasitic wasp have been identified as potential controls. A B.t. formulation, CERTAN® (Sandoz Inc., San Diego, CA) is available to licensed operators for use on stored comb products.

Traps loaded with sex pheromone lures may prove effective tools in the future for monitoring wax moth populations. These species-specific, natural chemicals are released by moths as part of their communication system and in the future could potentially be used as attractants in monitoring and control programs.

2. Ants

Ants are not usually considered to be a major pest of honey bee colonies in Canada. They may become a nuisance to beekeepers who keep their colonies in heavily wooded areas or on light sandy soil.

Ants are attracted to hives by the presence of honey and pollen, and may attempt to nest in warm, dry areas inside or beneath the hives. If they regularly enter the hives in search of food, the bees may become irritated, increasingly defensive and ultimately

more aggressive toward the beekeeper. On rare occasions, some ant species may cause structural damage to hive parts while others may conduct periodic foraging raids on hives, preying upon the larvae and pupae.

Prevention and Control

Apiaries should be maintained to prevent the accumulations of grass, brush and rotting wood, all of which are common nesting sites for ants.

If ants become a problem in the apiary, their nests may be treated with a 1% solution of Diazinon 12.5% Emulsifiable Concentrate (EC) at a rate of 100 mL/L (2 fl. oz./pt.). Spray the solution directly onto the nest surface, ensuring that both the nest and the surrounding ground are thoroughly soaked. Hives can be protected by placing them on stands with the legs set in water-filled cans.

3. Rodents

Mice are undoubtedly the most serious of all rodent pests of honey bee colonies. They feed on pollen, honey and dead bees, and may destroy large numbers of frames and combs while building their nests. Mice will readily move into stored hive equipment and outdoor wintered hives, often destroying insulation packed around the latter. Deer mice (*Peromyscus maniculatus*) and probably other rodents have been identified as vectors for the human disease known as "Hantavirus". There have been a few reported cases of Hantavirus in Canada and the United States in the last few years. Beekeepers with serious mouse and rodent problems should be aware of the potential for contracting this disease. For more details on Hantavirus contact your provincial or state apiculturist or medical doctor.

Rats and squirrels seldom pose serious problems to honey bee colonies in Canada. Occasionally they do get into stored equipment and gnaw through frames, combs and supers in search of food.

Prevention and Control

To prevent rodent damage, stored equipment should be piled neatly on closed bottom boards, and the stacks covered with queen excluders or hive lids. Commercially available poison bait stations and/or rodent traps may be located throughout the storage area.

Hives wintered outdoors should have their bottom

entrances reduced to approximately 1.3 cm (1/2 inch) in width to prevent entry of mice. Barriers such as queen excluders and screens should be used with caution as they may limit the bees' ability to remove debris. The resulting build-up of debris at the entrances may reduce ventilation in the hives. Poison bait may be placed on top of the inner covers and below the hives to reduce the possibility of rodent damage to the insulation.

4. Skunks

Skunks are pests of honey bee colonies throughout North America. They are usually active at night, preying on honey bees by scratching at hive entrances and eating the bees that come out to investigate the disturbances. Colonies that are visited frequently by skunks often become quite aggressive and may be seriously weakened. Obvious signs of skunk damage include destroyed vegetation and small holes dug in front of the hive entrances, scratches on the fronts of hives, dirt on the entrance boards and entrance reducers removed from the fronts of the hives.

Prevention and Control

Barriers placed in front of hive entrances may be used to prevent skunk damage. Wire screens attached to the bottom boards so that they extend outward and upward from the entrance will make it difficult for skunks to scratch the hives without exposing their bellies to bee stings. Small wire fences, such as those used along the edges of flowerbeds and gardens, or boards with rows of nails driven through them, may be placed in front of hives to deter them. "Smooth Edge" or "Tackless", used by carpet installers, can be screwed onto the hive entrance board so that the sharp points deter skunks from scratching. Use of these thin strips reduces the danger of stepping on nails placed in front of the hives.

Trapping may be used to control skunks in apiaries. Wire cage traps or box traps may be used but skunks may release their scent in such traps. Caution should be used when handling skunks as they are known to be a common rabies carrier.

5. Bears

Bears have long been recognized as serious pests of beehives. The most common of these, the black bear, causes thousands of dollars worth of damage to apiaries annually. Bears will commonly enter apiaries

at night and topple and smash the hives to get at the brood and honey inside. Once they have acquired a taste for this food, they tend to return repeatedly to apiaries. Bear damage is generally evidenced by broken frames and other hive parts scattered throughout the apiary. In some cases, bears may even drag full supers for several yards to the nearest bush before removing and eating the contents.

Prevention and Control

Bear damage may be avoided by locating apiaries away from the typical bear habitat. Apiaries should be kept clean and not have old comb and broken frames laying about to attract bears. Electric fences may be used to prevent bears from entering apiaries. To be most effective, these fences should be erected around the apiaries prior to the occurrence of any bear problems. In some regions, trapping and shooting bears are legal means of protecting apiaries. Information on electric bear fence construction and regulations governing bear control and removal may be obtained from your provincial or state wildlife or natural resources office.

6. Africanized Honey Bees

Beekeepers in North, Central and South America are now faced with a curious dilemma: although honey bees are considered beneficial insects, the Africanized variety of honey bee is thought of as a pest, at least by the general public. These so-called "killer bees" originated in Africa and were imported to Brazil in 1956 in order to cross them with the European honey bees then present in South America. The African bees escaped into the wild, and since then have spread throughout most tropical regions of the new world. The feral bees remain largely African, although some hybridization has occurred with managed and feral European colonies to create the Africanized bee of the New World.

Africanized bees cause problems for beekeepers because they swarm frequently, and colonies often do not grow to the large populations necessary for commercial beekeeping. These bees readily abandon their nests (abscond), which is especially problematic for migratory beekeeping and pollination management because the movement of Africanized bee colonies is a prime cause of absconding. Both beekeepers and the public also are concerned about these bees' aggressive behaviour, as massive stinging following minimal provocation is not unusual with Africanized bees.

Although the Africanized bees are unlikely to spread naturally to the northern U.S. and to Canada, beekeepers and government regulatory agencies are worried that migratory beekeeping may move these bees beyond their normal tropical range. However, most problems with managed Africanized bees can be avoided by annual requeening of all colonies with queens from certified European stock, as well as requeening any colonies that became aggressive between annual requeenings. Beekeepers need to become sensitive to public concerns about Africanized bees, and be especially careful that hive placement, transport of bees and urban beekeeping are conducted in a manner designed to minimize potential interactions between people and bees. It is important to remember that, although the Africanized bees initially proved devastating to beekeeping in many parts of South and Central America, most beekeeping regions have recovered as beekeepers have learned to better select and manage Africanized colonies. Africanized bees have the potential to negatively impact both the public perception and vitality of the North American beekeeping industry if they are improperly managed.

7. The Small Hive Beetle

The small hive beetle, *Aethina tumida* Murray, is a scavenger beetle belonging to the insect family Nitidulidae (sap beetle). It is native to the tropical and subtropical regions of Africa where it is commonly found in honey bee hives but seldom considered a major pest in this area. It was first identified in North America in Florida in 1998 and has since spread to several other States. To date, the small hive beetle has not been found in Canada, but there is concern about its potential impact if it enters Canada. Despite its modest pest status in Africa, U.S. beekeepers report that the small hive beetle has been responsible for the destruction of approximately 30 000 honey bee colonies since its arrival in North America.

Life Cycle

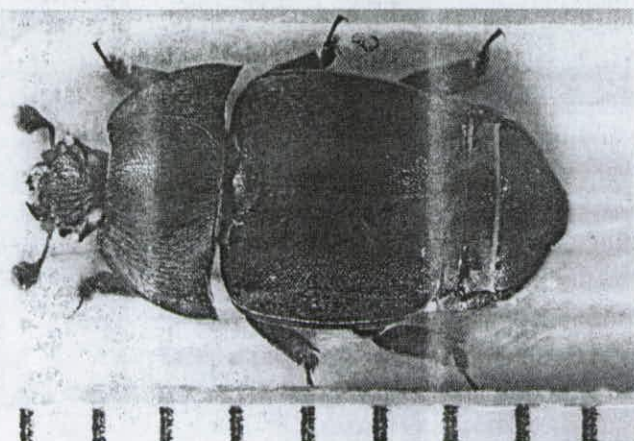
The female adult beetles lay their eggs in irregular masses (3-5 eggs/mass) on or near the combs in the hive. They especially like to lay their eggs in cracks and crevices, where the eggs are protected from predators. Each female beetle is capable of laying up to 100-1000 egg masses. Eggs hatch in 2-4 days. The developing larvae feed on pollen, bee brood, and honey. Once the larvae are fully developed (10-16

days), they leave the hive to pupate in the soil. The mature larvae do not travel very far from the hive to pupate; it is generally within 30 cm from the hive entrance and less than 10 cm deep in the soil. Pupae require 15-30 days to become adults. Adult beetles emerge from the soil and fly back to the bee hives. Female beetles will start laying eggs approximately one week after they have emerged from the soil.

Adult beetles can live up to 6 months and are capable of wintering inside the cluster of a honey bee colony. Observations in South Africa indicate that the developmental rate is rather variable, the life cycle from egg to adult requires anywhere between 38-81 days and that the small hive beetle may have up to five generations per year. Like most insects, the small hive beetle requires a specific set of conditions relating to nutrition and environmental factors, such as temperature and soil humidity, in order to successfully complete its development.

Identification

An adult small hive beetle has clubbed-shaped antennae and is reddish brown to black in colour with an oval to oblong body that is covered with fine hair (Figure 21). Adult beetles show great variations in size but most of them are approximately 5-7mm long.



J. Lotz

Figure 21 - Adult small hive beetle, *Aethina tumida* Murray (dorsal view).

The eggs are pearly-white in colour and similar in appearance to honey bee eggs except they are smaller (approximately 1.5mm long). The larvae are elongated, whitish grubs with numerous spines (i.e. protuberances) all over their body. The larvae are similar in appearance to wax moth larvae except they only have three pairs of legs (i.e. no prolegs) and do not produce silk (Figure 22).



J. Lotz

Figure 22 - Small hive beetle larvae in the cells of a brood frame.

The pupae are the same size as the adults and are white in colour but turn darker as they mature.

Impact

Similar to wax moth, it is the larval stage that causes the greatest amount of damage. The beetle larvae tunnel through combs feeding on pollen, brood and honey. The small hive beetle typically attacks weakened or small colonies, but because the beetles are not easily ejected from the hive even strong colonies can be severely affected once the beetles gain access. Therefore, unlike wax moth, it is generally not recommended that infested supers be placed on strong colonies for pest control and clean up. As the larvae feed, they defecate on the honey causing it to ferment and bubble out of the cells. Fermented honey and beetle secretions produce a slime that contaminates the equipment causing the bees to stop raising brood and abandon the infested hive. The fermented honey smells like rotting oranges and is unsuitable for human consumption. Contaminated hives can not be repopulated with bees until the slime has been removed.

The small hive beetle can also be a major problem in honey houses, where stored comb, supers of honey, and wax cappings are all potential breeding areas for the beetles. Environmental conditions generally associated with honey houses, such as high temperature and humidity, provide optimal conditions for beetle development, therefore proper management of stored honey, wax and comb are essential in the prevention of beetle infestations.

Small hive beetles can kill thousands of colonies within a short period of time. Reports of damage caused

by the small hive beetle in the U.S. indicates that this beetle may be a more serious pest for European honey bee stocks than its native African bee hosts, *Apis mellifera scutellata* and *A. mellifera capensis*.

Potential geographical limits of the small hive beetle are unknown. Currently, the small hive beetle has been reported in several states in the USA. Although it has not been found in Canada, some reports have indicated that small hive beetle adults have wintered inside clusters of honey bee colonies in some of the northern States.

Research indicates that beetles can be dispersed via the movement of infested honey bee colonies for pollination, shipment of package bees and queens, and swarming of feral and commercial colonies. Adult beetles can also disperse quickly since they can fly and are capable of surviving up to 5 days without food and water. They can also survive on a number of alternative food sources and hosts such as fruit (e.g. cantaloupe) and other bee species (bumble bee colonies). Ultimately, environmental conditions such as climate, type and condition of the soil where the beetles pupate and availability of food sources will dictate whether or not the small hive beetle will be classified as a serious North American pest.

Prevention and Control

To reduce the spread and damage caused by the small hive beetle, beekeepers are recommended to regularly inspect their colonies to detect early infestations. To detect the beetles, place a piece of corrugated cardboard (15 x 15 cm), with one surface peeled to expose the ridges, on the bottom board of a bee hive with the ridged side down.

Begin monitoring when temperatures are warm enough that colonies are no longer clustered during the day and when bees are using their bottom hive entrances. One day later, adult beetles can be found under the cardboard if they are present. In a heavily infested colony, hundreds of beetle larvae and adults can be seen on the comb and bottom boards, especially towards the rear of the hive. Another sign of beetle infestation is the odour of fermented honey, which often drips from the opened cells and runs out of the hive entrance.

In the United States, the Bayer pest strip, CheckMite+™ (10% Coumaphos, not registered in Canada) is recommended for the control of the small hive beetle in honey bee colonies. Also a soil treatment using Y-TeX, GardStar® 40% EC, which contains 40% permethrin is recommended as a soil drench treatment to control the beetles in the soil around the hives. Chemical applica-

tion should be in accordance to label instructions. Contact your local state or provincial apiarist to determine approved treatments for this pest.

For prevention and control of the small hive beetle in honey houses, beekeepers should promptly extract their supers as soon as possible after they have been pulled from bee hives. Keeping the relative humidity in the stored supers below 50% by circulating air through the boxes has proven successful for preventing beetle eggs from hatching. Extracted honey should be stored in tightly sealed drums and wax cappings should be quickly processed. The honey house and extracting equipment have to be kept clean. Beekeepers are also advised to store honey supers in a closed, cool well area or place them back on the hives as soon as the honey has been extracted.

Some beekeepers also place nucleus hives near the honey house as traps and then control the beetles in the hives. Research is currently being done to develop pheromone traps and alternative chemical controls to protect honey bee colonies and stored supers from these pests.

OTHER COLONY ABNORMALITIES

There are several abnormal colony conditions that are not caused by disease organisms but by environmental, management or biological factors. Some of these conditions can be as serious as a disease in their effect on colony health and honey production. The beekeeper should be familiar with both diseases and other abnormalities, in order to distinguish between the two and be able to correct the problem.

1. Chilled Brood

When a colony is rearing brood, the brood is kept warm by the adult bees on each comb that maintain a brood nest temperature of about 35°C (95°F). When a colony has fewer adults than needed to cover each comb of brood, chilling of the brood can result. This condition is common during early spring, when the brood nest is rapidly expanding and cold spells may cause the bee cluster to contract, leaving peripheral brood exposed. Prolonged exposure to temperatures below 14°C (57°F) will cause death, with young brood being more temperature sensitive than capped brood. Chilled brood may also be noticed in weak colonies, in splits and in colonies which have lost many adult bees as the result of insecticide poisoning or tracheal mites.

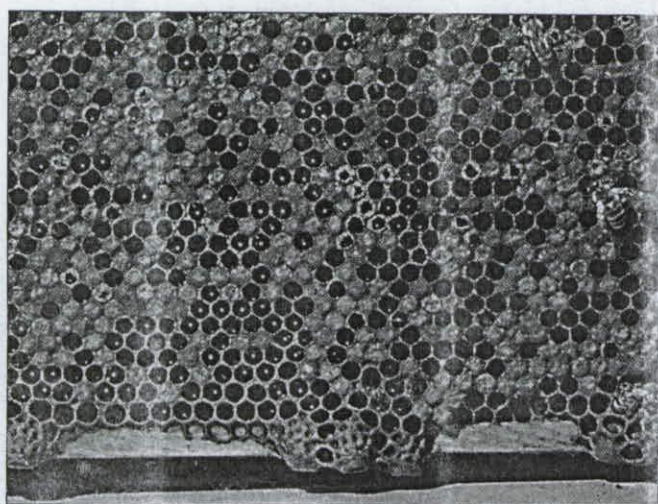
Maintenance of colonies with adequate adult numbers, the use of entrance reducers in the spring and insulative hive wraps will help to prevent the occurrence of chilled brood. Once the colony is stronger, the adult bees will remove dead brood from the combs.

2. Gassed Brood

When colonies are killed off with hydrogen cyanide gas the uncapped brood will die, either from the cyanide fumes or from subsequent chilling or starvation. This dead brood is usually noticed when the beekeeper is sorting combs for brood chambers. It becomes dark and flattened, and will often superficially resemble larvae that have died from American foulbrood. When there is doubt, samples may be submitted to the provincial or state apiculture office for diagnosis. A small amount of gassed brood does not pose a problem to package bees, which will clean out any dead larvae in the combs. Generally, however, the first brood chamber should not contain combs that are full of dead brood, as this will delay egg-laying and colony build-up. Such combs can be placed in the second brood chamber when the colony is stronger.

3. Scattered or Spotty Brood Pattern

A scattered or spotty brood pattern is often evidence of a failing queen (Figure 21). Instead of a solid pattern of eggs, young larvae or capped brood, many cells are empty. Spotty brood may also indicate the presence of a brood disease such as American foulbrood, European foulbrood, sacbrood or chalkbrood.



M.V. Smith

Figure 21 – A scattered or spotty brood pattern is often an indication of a failing queen; supersedure queen cells are evident at the bottom of the comb.

A spotty brood pattern is also very common in wintered colonies in early spring but is not necessarily an indication of a queen problem. The reason for this is unclear, although it may result from a shortage of pollen. This problem generally corrects itself once pollen becomes available.

When a spotty brood pattern is observed, the beekeeper should examine the colony to check for other disease symptoms or signs of supersedure. If supersedure cells are found, the problem is likely due to a failing queen and she should be destroyed. The colony can then be requeened after all remaining queen cells have been removed and 3-5 days have elapsed. Alternatively, the remaining workers can be united with another colony.

4. Drone-Laying Queen

Normally a queen will only lay unfertilized eggs in drone cells. However, when she uses up the sperm that have been stored in her spermatheca she will begin to regularly lay unfertilized eggs, even in worker cells. Signs of a drone-laying queen include a spotty brood pattern and the presence of protruding, rounded cappings on worker brood combs. Both are evidence of unfertilized eggs being laid in worker cells.

If the colony is still strong, the beekeeper may requeen it after removing the old queen and any queen cells. If the colony has dwindled in size, the bees may be united with another colony after removing the old queen. Otherwise the bees may be shaken on the ground and allowed to drift to other hives in the apiary after their own queen has been removed.

5. Multiple Eggs Per Cell

In early spring when the space available for egg laying is restricted, a queen may lay several uniformly placed eggs in the bottom of a single cell. A normal worker will develop in a cell that originally contained several queen-laid eggs so no management action needs to be taken to correct this situation. This problem typically will be alleviated as the colony population expands and space available for egg laying increases.

In contrast, after a colony has been queenless for several weeks, workers will lay eggs in large numbers. These eggs are not fertilized and will develop into drones. Signs of laying workers include a spotty brood pattern, drone brood in worker cells and multiple eggs per cell, with many laid on the sides (Figure 22) rather than in the bottoms of cells.



S. Camazine

Figure 22 – One of the signs of laying workers in a colony is multiple eggs per cell.

It is difficult to find egg-laying workers because they are similar in appearance to other workers. Requeening a colony that has laying workers is not usually successful. The bees should be shaken onto the ground in the apiary and their hive removed. The bees will gradually drift to other colonies. The development of laying workers in a queenless colony can be delayed by adding comb with unsealed brood that has been removed from a healthy colony.

6. Queenlessness

Signs of a queenless colony include a lack of eggs, larvae or all brood, and in most cases the presence of emergency queen cells on comb faces. In addition, the colony emits a peculiar, loud buzzing sound, and the workers run on the combs, often with their wings spread.

Depending on the time of year, a queenless colony may be requeened. This is best done with either a mated queen or a queen cell, but if neither is available the emergency cells can be allowed to develop and hatch.

If the colony has dwindled to a nonproductive size then it should be united with a queenright colony.

7. Dysentery

Honey bees normally defecate in flight. If they are confined over a long period, such as a cold winter, or are feeding on poor quality food, the accumulation of indigestible matter in the rectum may cause dysentery and defecation within the hive. Dysentery can cause premature death of adult honey bees, leading to weakening or death of colonies.

Signs of a dysentery problem are fecal spotting of top bars, combs and entrances, especially in the early spring (Figure 14).

Dysentery problems can be prevented by providing good quality feed in the autumn. Only syrup made from refined white sugar should be fed. Burnt honey, honeydew, molasses and brown sugar should not be used. In addition, feeding pollen supplement before the bees are flying in the spring or the fall may do more harm than good if the bees are subsequently confined to the hive for extended periods.

8. Pollen and Honey Shortages

Shortages of honey and pollen can occur at any time during the year. It is imperative that the beekeeper recognize the symptoms of food shortage so that this problem can be corrected without delay. Proper management should prevent the occurrence of a food shortage, since shortage of pollen and honey will cause curtailment of brood rearing and may cause colony death.

Honey shortages commonly occur in late winter and during nectar dearth periods throughout the beekeeping season. Signs of such shortages include the lack of stored honey in the hive. Symptoms of a starving colony include cessation of brood-rearing, slow-moving and trembling adult bees, and dying and dead bees found head first in cells.

Colonies should have at least four to six frames of honey at all times during the beekeeping season, and far more at the beginning of the winter, to avoid slowing colony build-up. Honey stores may be moved within the hive during early spring, or colonies may be fed with syrup when conditions allow. A starving colony should be fed immediately with sugar syrup (2:1 sugar:water by volume).

Pollen shortages may occur at any time during brood rearing. Occasional temporary shortages may occur when colonies are confined to their hives by bad weather during spring and early summer. However, a longer dearth of pollen can have serious effects on the colony population, especially when brood-rearing is at its peak and pollen is used as quickly as it comes in. At this time, a cessation of the pollen flow will cause brood starvation.

Signs of a pollen shortage include a floral dearth period, lack of incoming pollen and combs devoid of stored pollen. Symptoms in the colony include: the presence of eggs but no uncapped brood; the presence of young larvae with no food provisions; a complete lack of brood; the presence of larvae and pupae on the bottom board and on the ground in front of the hive; and the presence of pupae that have been partly cannibalized.

Pollen shortages may be corrected by feeding the colony with a high quality pollen supplement, preferably before the shortage affects the colony.

The beekeeper must become familiar with pollen and nectar plants and their blooming sequence and duration, in order to know when to expect dearth periods and thus be prepared for them.

PESTICIDE HAZARDS AND BEE POLLINATORS

Chemical pesticides are important tools in agricultural production, but their use is sometimes incompatible with insect pollination. Correct choices of pest control materials, proper application techniques and co-operation between beekeepers, growers and pesticide applicators are necessary to minimize potential problems. Awareness and implementation of the principles of integrated pest management will lessen dependence on calendar spray schedules and optimize spray timing to reduce hazards to pollinators.

PESTICIDES AND HONEY BEES

Chemistry

Pesticides can be classified according to the type of pest they control (insecticides, herbicides, fungicides). Insecticides are the most hazardous to pollinating bees. The major chemical classes of insecticides are organophosphates (e.g., Diazinon®), carbamates (e.g., Carbaryl®), synthetic pyrethroids (e.g., Permethrin®) and organochlorines (e.g., DDT®). In addition to these, other compounds do not fit into

discrete chemical groups but are classified according to their mode of action (e.g., insect growth regulators) or origin (botanicals such as rotenone; microbial insecticides such as B.t.).

Insecticides belonging to the same chemical group often share similar properties that determine toxicity, persistence and overall hazard. However, there are some compounds within each class that do not share common properties and present hazards that are difficult to predict. For example, dichlorvos (e.g., the active ingredient in Vapona no-pest strips) is an insecticide that is formulated into solid strips and released slowly for long-term insect control. However, dichlorvos also has a high affinity for wax and must never be used in buildings where honeycomb is being stored.

Measures of Toxicity

Toxicity following short-term exposure is usually expressed as LD₅₀: the lethal dose that kills 50% of the treated insects in a specified period of time, usually 24 hours. Lower LD₅₀ values indicate more toxic insecticides; less material is required to kill 50% of the insects. LD₅₀ is usually expressed as micrograms (mg) of insecticide per insect, or in terms of concentration as parts per million (ppm = one part insecticide in one million parts tissue) (Table 1).

Table 1. LD₅₀'s and general pesticide hazard ratings for honey bees.

LD ₅₀ Value (mg/kg)	HAZARD RATING FOR HONEY BEES
> 1000	very low
500-999	low
350-499	mod-low
150-349	moderate
100-149	mod-high
20-99	high
< 20	extremely high

Insecticides remain toxic in the environment for a period of time following application. This residual activity depends on temperature, humidity, exposure to direct sunlight and other environmental factors, as well as the chemistry of the insecticide. Residual activity and acute toxicity combined give a good measure of hazard. A highly toxic insecticide with short residual activity can be used with relative safety if applied at the proper time, such as in the evening

after foraging has ceased. Conversely, a moderately toxic material with long residual activity can remain hazardous for extended periods.

Formulation

Commercial pesticides are formulations that contain the active ingredient in combination with solvents, dusts, emulsifiers, stickers and other inert ingredients. Formulation greatly influences the hazard of an insecticide to bees. Dusts and microcapsules are more hazardous than wettable powders, which are more hazardous than liquid formulations (emulsifiable concentrates). Granular formulations are the least hazardous. Dusts and microcapsules are particularly toxic because they are approximately the size of pollen grains and can be picked up by foragers and transported back to the colony. Some formulations reduce the hazard by including stickers, which decrease the risk of bees picking up material from plant surfaces.

Most insecticides are nerve poisons that are effective by contact and oral exposure. Bees encounter these toxins in the field by walking on surfaces covered by spray residues, flying through drifting spray droplets, consuming contaminated water, or foraging on plants that have been sprayed with systemic insecticides. Only foraging workers contact sprays in these ways; hive bees and brood, as well as the queen, contact insecticides when foragers carry toxins back to the hive. Colony exposure to low doses of insecticide may have serious long-term consequences, including depletion of hive bees followed by starvation or brood chilling, poor egg laying and eventual superseding of the queen, or death of the entire colony. Sublethal insecticide doses also affect individual bees by shortening their life spans and disrupting their ability to communicate locations of nectar and pollen sources.

Worker bees exposed to insecticides exhibit a variety of symptoms, including aggressiveness, erratic movements, regurgitation of honey sac contents causing the bees to appear wet, trembling or spinning on the back, and inability to fly with the look of being chilled. Dead bees can also be seen in piles at the hive entrance in cases of severe poisoning by relatively slow-acting toxins. Highly toxic, fast acting materials such as synthetic pyrethroids usually kill the bee before she can return to the hive. Co-operation between beekeepers, growers and pesticide applicators is the most important safeguard against bee poisoning. In particular, an understanding between grower and beekeeper that each contributes to

the other's success goes a long way towards solving problems. The best protection for hives is to place them in areas that are isolated from insecticide applications. This is difficult if the hives are used to provide pollination services or if they are situated in areas where crops are grown commercially. Unmarked colonies should never be left near orchards or fields likely to be sprayed. A telephone number posted in large print so you can be contacted regarding upcoming sprays.

If pesticide spraying is imminent, move the colonies out of the area if feasible. If not, cover the entire hive with burlap or similar material, pulling out and securing the edges like a tent. It is essential that an internal source of fresh water be provided to allow the bees to cool the colony during its confinement. More information on these procedures can be obtained from your provincial apiculture office.

Growers and pesticide applicators can help prevent losses by following proper spray procedures. They should always read and understand the information on the pesticide label, and never apply insecticides to crops in bloom. If possible, pesticides should be applied in the evening after foraging has ceased. If several registered products are available the material least hazardous to bees can be used if this is consistent with other pest management considerations. Use of liquid formulations instead of dusts will reduce hazards when appropriate. In orchards, mowing dandelion blooms before applying insecticides will reduce bee mortality.

If poisoning occurs, collect a sample of dead bees in a glass jar as soon as possible. Keep it frozen and label it with the date and as much other information as possible. Find out what was sprayed from the grower/applicator, and report the incident to the apiculture office. This information is useful in determining how to avoid future poisoning incidents. Feed poisoned colonies pollen supplement and sugar syrup to stimulate brood rearing.

Little information is available on the effects of pesticides on alternative pollinators, particularly at sublethal doses. Alfalfa leafcutting bees can be protected by storing nests in a cool room or basement during spraying. Nests can be moved at night, and bees are almost completely inactive at 15°C (60°F). Nest shelters also can be designed to be closed or covered for short periods during the spray operation. Other pollinators such as bumblebees can be protected by conserving nesting sites in hedgerows and adjacent uncultivated land. Herbicides should not be applied to such areas unless absolutely necessary for noxious weed control.

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Honey Bee Diseases & Pests



Canadian Association of Professional Apiculturists

TABLE OF CONTENTS

Introduction	2
Normal Honey Bee Development	2
Bacteria	
American Foulbrood	3
European Foulbrood	4
Fungi	
Chalkbrood	6
Viruses	
Sacbrood	7
Protozoa	
Nosema	9
Mites	10
Wax Moths	12
Pests and Predators	13
Other Colony Abnormalities	14
Suggested Reading List	Inside Back Cover

HONEY BEE DISEASES AND PESTS

INTRODUCTION

Honey bees, like virtually all living organisms, are susceptible to a variety of diseases, pests and predators that may have harmful effects on normal colony development and productivity.

Beekeepers, being involved in the unique form of animal husbandry that they are, have the primary responsibility of promoting the development of strong, healthy colonies of bees to coincide with the onset of plant nectar availability in the field. Given strong, healthy colonies and good flying conditions during the nectar flow period, maximum levels of honey production and pollination should be the result.

Standardized hive equipment, coupled with modern management techniques, have resulted in large numbers of colonies being kept in close proximity to each other. This results in frequent exchange of hive equipment between individual colonies. Together with frequent relocation of large numbers of package bees, queens and colonies over long distances these practices tend to facilitate the spread of honey bee diseases. This is particularly true once they have found their way into a beekeeping outfit or geographical area where large numbers of colonies are kept.

Protecting honey bee colonies from disease and predation continues to be a critical component of beekeeping management. Beekeepers should have a basic understanding of disease identification, prevention and control procedures.

This publication has been prepared to assist beekeepers in preventing serious disease and pest related damage to their beekeeping businesses. For more information on this subject or other aspects of beekeeping management, beekeepers are encouraged to contact the beekeeping extension specialist employed with their local provincial or state Department of Agriculture.

NORMAL HONEY BEE DEVELOPMENT

Introduction

In order to recognize symptoms of bee diseases and thus be alerted to the possible presence of disease in a honey bee colony, it is first necessary to have a basic understanding of the normal development and behaviour of a healthy colony of bees. Although the specific cause of a given

problem may not be immediately identified by the beekeeper, at least the recognition of a breakdown in normal development is the first step in identifying, and later rectifying, a possible disease problem in a colony.

This section presents a brief overview of life in the honey bee colony. There is however, no substitute for direct experience. Therefore it is recommended that all beekeepers should take the time to gain a clear understanding of life in a healthy honey bee colony. This should be done by making direct observations of the various stages of honey bee development and behaviour within a colony.

The Honey Bee Colony

Under normal conditions a honey bee colony is comprised of three distinct castes: one queen, several thousand workers and, depending on the season, a few to several hundred drones. Caste determination in bees is partially a function of sex determination and, where female larvae are concerned, the environment.

The sex of a honey bee is determined by whether or not an egg is fertilized by a spermatozoon; generally, fertilized eggs develop into females and non-fertilized eggs develop into males. During mating a queen receives a supply of several million spermatozoa that are stored in a small spherical organ (the spermatheca), which is connected to the oviduct by its own small duct. The queen, by releasing or withholding spermatozoa from the spermatheca as an egg passes down the oviduct, is able to selectively fertilize or not fertilize eggs.

Adult workers and queens both develop from fertilized eggs but they are distinct in both their anatomy and behaviour. The queen, which is normally the only reproductive female in the colony, has the task of producing eggs and thus future generations of bees. The workers do not usually perform a reproductive function, but are responsible for most of the activities necessary to produce a vital colony. These include activities such as comb building, hive cleaning, feeding and caring for larvae, feeding and grooming the queen, foraging and colony defense. The primary contribution of drones to colony life is to mate with queens.

The anatomical and behavioural differences between adult workers and queens are largely an indirect result of both qualitative and quantitative differences in the food that each receives during larval development.

Larvae that are being reared as queens receive a surplus of a special type of food called "royal jelly" throughout their development. Larvae being reared as workers receive a surplus of royal jelly for only 3 days after hatching; following this their food is mixed with pollen and nectar from flowers.

The activity, development and productivity of a colony of bees has been likened to a "superorganism" in which the underlying purpose of the individual behaviour of each bee is to support the health and growth of the many thousands of individuals that comprise the colony as a whole. In this way, a dynamic social order exists among the bees which results in the overall colony behaviour being more like a single organism than a group of individuals.

Honey Bee Life Cycle

The development of the honey bee follows a pattern of growth and metamorphosis that is typical of many other insects. The life cycle of the honey bee begins when a queen deposits a single egg at the bottom of a wax cell. After three days the egg hatches into a larva which lies at the bottom of the cell in a typically curled position. The developing larva is nourished by adult nurse bees that feed it directly or deposit larval food in the cell for the larva to consume. In the case of larvae being reared as workers, this food can usually be seen as a milky white liquid surrounding the larva for up to 2½ days after the egg hatches. During development as a larva the immature bee molts four times during a period of rapid growth.

The general appearance of a healthy larva is the same for all three castes. Typically, the larva has a full bodied and firm appearance, with distinct body segments. A healthy larva is always pure white, and while the skin appears to have a moist, glistening appearance, it is quite dry to the touch.

After approximately 8 days for queen and worker larvae and 10 days for drone larvae the cell is sealed with a wax capping by the adult workers in the colony. The larva now begins spinning its silk cocoon along the inside walls and ends of the sealed cell. Up until this time the larva has remained in its curled position in the base of the cell. After the spinning larva stage, it lies on its back along the length of the cell and the internal changes preceding the pupa stage begin. This is usually referred to as the prepupal stage.

The larva enters the pupal stage following a fifth molt. Adult physical characteristics such

as head, thorax, abdomen, eyes, legs, etc., are now clearly apparent for the first time. The wings, however, appear as small pads alongside the body. During the period of pupation, the bee gradually acquires the physical appearance of the mature adult bee. The pupa begins with a generally white appearance and gradually acquires more pigmentation throughout its development. This process is particularly evident in the development of the compound eyes which begin as a very light pink colour, gradually progressing to red, purple and eventually dark brown at maturity. Figure 1 illustrates these developmental periods, from the egg to the pupal stage.

The sealed cells of the three castes have their own unique appearance. The sealed worker cells are the smallest of the three, with the wax capping being flat and almost level with the surface of the comb. The cappings of the individual sealed cells appear light brown in colour, dry in appearance, and are slightly convex from the face of the comb. Drone cells are wider and longer than worker cells while cappings are "bullet" shaped and protrude from the face of the comb (Figure 2). Queen cells are distinct from the other two types in that they hang downward from the bottom or face of the comb and when sealed are "peanut-like" in both colour and appearance with highly convex cappings (Figure 3).

The pupa undergoes one final molt to become an adult, then proceeds to chew its way out of the cell to emerge into the active life of the colony. Complete development from egg to adult is approximately 21 days for the worker, 16 days for the queen and 24 days for the drone.

The newly emerged adult bee is at first lighter in colour than older bees and its hairy covering is usually quite apparent. As the adult bee ages it gradually loses much of this hair, exposing more of the underlying shiny cuticle (i.e. outer covering).

The life expectancy of adult workers varies with the season; during the active summer period the workers will only survive from 4 – 6 weeks. During the winter they may live for several months.

BACTERIA

AMERICAN FOULBROOD

Introduction

American foulbrood disease (AFB) is caused by a bacterium, *Bacillus larvae*. The disease affects only the immature stages of the honey bee and can be highly contagious. If left untreated, AFB can develop very rapidly within a colony, and can also be spread from colony to colony within an apiary, and from apiary to apiary due

to robbing. In addition, if diseased equipment is left outdoors, it may become a source of infection for foraging bees.

Before the advent of antibiotics to control this disease, American foulbrood was a serious threat to the beekeeping industry. The only method of control was constant inspection and burning of diseased equipment. The disease can be controlled by the use of broad-spectrum antibiotics and with proper management is no longer the serious threat it once was. However, constant vigilance on the part of beekeepers is still required to keep American foulbrood under control.

Life Cycle

An American foulbrood infection begins when bacterial spores are ingested by young larvae along with their food. When the spores reach the gut, they germinate and begin to grow and multiply rapidly. During this time, the larvae will continue to grow and may even reach the pupal stage. However, the bacteria may invade the body tissues and eventually kill the developing bee. As the bacteria multiply in the infected larvae or pupae it turns from a pearly white colour to brown (Figure 4). The infected larvae or pupae continues to deteriorate, eventually forming a dry dark brown or black "scale" (Figure 5). This scale is the remains of the immature bee and contains 5 to 10 million or more bacteria spores which are capable of causing infections for decades.

Once a larva has died, the housecleaning bees will attempt to remove it, or the resulting scale. In the process of this housecleaning they will contaminate their mouth parts with bacterial spores. The food sharing which takes place between bees in the hive may then spread this contamination to many other bees within the hive including those that are feeding young larvae. Thus, even one scale can result in widespread larval infections within a colony.

If left untreated, the infection will spread rapidly within the hive. Within a few weeks, larval mortality may reach a level which will result in a decline in colony population. At the end of the honey season, colonies infected with American foulbrood disease may have much smaller populations than non-infected colonies. In the fall, after the honey flow has ceased, strong healthy colonies may rob disease-weakened ones. Consequently, the infection may spread to other colonies and apiaries within flying range of the diseased colony.

Identification

Beekeepers should look for American foulbrood disease by examining their brood comb. All brood comb which is stored for the winter should be examined for the presence of scale in the cells. The scale is usually dark

brown or black in colour and forms a thin layer on the bottom of the cell along its entire length. If the young bee dies in the pupal stage, sometimes the pupal tongue can be seen sticking out from the scale. A scale is quite flat, clings to the cell wall, and is difficult to remove without breaking the cell wall. By comparison, chilled or gassed brood is usually much larger and easier to remove from the cell.

When examining brood combs for scale, good lighting is essential and natural sunlight is preferable. Without proper light, it is easy to overlook a dark-coloured scale in a dark-coloured comb. It is also important to hold the frame by the top bar, at a slight angle, so that all of the lower sides of the cells can be seen clearly (Figure 6).

During the active spring and summer season, the brood area should be inspected regularly for any indications of disease. Any discoloured brood should be examined closely. Discolouration of mature larvae or pupae is one of the main indicators of AFB infection.

American foulbrood disease usually does not kill the larvae until the late larval stage when the larvae have stretched out along the lower sides of their cells. This can often be used to differentiate AFB from European foulbrood which usually kills larvae while they are still coiled at the base of the cell.

Any discoloured larva should be probed with a toothpick. If the larva has died of AFB, a toothpick will sink into it without resistance. If the larval remains are stirred and the toothpick is withdrawn slowly, the remains have a glue-like consistency and will "string out" when the toothpick is withdrawn slowly from the cell (Figure 7). This is commonly referred to as the ropiness test and will distinguish AFB from most other brood diseases which usually do not result in the dead larva showing the same glue-like consistency. This characteristic should be checked last because it will destroy the diseased bee.

In advanced cases of American foulbrood, the cappings over the older brood may be perforated with one or two small holes, be sunken and have a greasy appearance (Figure 8). Diseased brood combs will also have a characteristic odour. If a high proportion of the brood is dying with AFB, the sealed brood will have a scattered appearance (Figure 9).

American foulbrood disease can be readily diagnosed by examining infected material with a microscope. Beekeepers who suspect AFB can send samples to their provincial apiculturist for microscopic diagnosis. These samples may be collected simply by removing suspect brood with a toothpick, placing them in wax paper and

forwarding them (with name and address) to the provincial or state apiculturist's office.

Prevention

Because AFB is highly infectious, beekeepers should inspect their brood combs regularly for evidence of infection. During the spring, each time a colony is opened at least one comb of brood should be examined for any abnormalities. Early detection will prevent the disease from spreading and will make control much easier.

Beekeepers reusing empty brood combs have the opportunity to examine all of their combs when preparing brood chambers for spring use. It is important that this inspection be done with good lighting to ensure that combs with AFB scales are not overlooked. Exchanging brood combs between different brood chambers should be done with caution because undetected infections can be spread to many hives by moving these combs.

Treatment and Control

The most important step in the control of AFB is the destruction of the long-lived bacterial spores by burning. Equipment which has been exposed to AFB will have to be burned, however, the extent of burning and the exact procedures vary from region to region and therefore your provincial or state apiculturist should be contacted before proceeding.

Even after burning, there is still a high probability that AFB spores remain in other untreated hives in the yard, and these can provide a source for further disease outbreaks. For this reason regular inspections combined with preventive antibiotic treatments are necessary.

To assist in the prevention of AFB infection the antibiotic oxytetracycline hydrochloride (e.g., Terramycin TM²⁸) should be fed according to recommendations from your provincial or state apiculturist. Antibiotics do not kill AFB spores, but prevent the growth and multiplication of the bacteria in the gut of a larva. This allows it to grow and develop into an adult bee. Colonies can be protected from AFB by providing the antibiotic every 10 to 14 days during the spring to ensure constant protection. Antibiotic feeding should stop at least 3 weeks before the summer honey flow to ensure that none of the extracted honey will contain antibiotic residue.

EUROPEAN FOULBROOD DISEASE

Introduction

Although European Foulbrood (EFB) affects

the brood of honey bees on a worldwide basis, it is not usually considered to be a serious disease of honey bees. However, in some areas and under certain environmental conditions, EFB has been known to cause severe losses in brood, resulting in lower honey yields. Although the highest incidence of EFB usually occurs in the spring it has been known to persist into autumn.

There are several bacterial organisms associated with EFB that may infect the

larvae, but *Streptococcus pluton* is generally considered to be the main causative agent, the others being saprophytes that play no role in the infectious cycle. Another organism, *Bacillus alvei*, is often seen when a sample of EFB-infected larvae is prepared for microscopic examination.

Life Cycle

Young larvae (less than 2 days old) are infected when they consume brood food contaminated with bacterial spores. The



Figure 1 — Various developmental stages of the honey bee.

E.S. Ross

bacteria then multiply rapidly in the mid-guts of the larvae – particularly when they are 3-4 days old. House bees may carry bacterial spores on their mouth parts after removing brood from cells. These spores may be passed from bee to bee during food exchange, and then transferred to larvae while they are being fed by the nurse bees.

If a colony has a high population of nurse bees and a sufficient work force to eliminate infected larvae, it can usually sustain a mild to moderate infection. In some situations,

young larvae become infected, die, and are removed by house bees so that the disease is not visible. In most colonies that are kept in localities with uninterrupted nectar flows, EFB infections usually remain slight; colonies end the season with no apparent disease and surplus honey.

Identification

Normal larvae, in unsealed cells, are pearly white in colour and lie in a curled ("C" shape) at the base of the cell. Most EFB

infected larvae die before their cells are capped, although a few may die after the cappings are in place (Figure 10). The larvae usually assume unnatural positions at the base, or along the walls, of the cells (Figure 11). EFB infected larvae turn yellow at first and then brown, at which time the tracheal system becomes visible as a glistening vein-like network throughout the larval body (Figure 12). The larvae eventually decay to a point where they form a dry rubbery scale in the cell; the scale can be removed quite easily by the bees.

Prior to forming a dry scale, the larvae become somewhat soft and granular and can be tested for "ropiness" using a match stick or a toothpick. After dipping the "stick" into the larval mass it will appear rather dry and will *not* exhibit the "gluey" or "ropy" characteristics typical of American Foulbrood disease. This ropiness test is a key distinguishing characteristic between AFB and EFB. Larvae infected with EFB give off an intense sour or rotten fish-like odour.

If EFB is widespread in a colony the brood pattern takes on a "scattered" appearance. In a few cases, when EFB-infected larvae die after capping, the cappings take on a sunken, darkened, perforated appearance as compared to normal cappings which are slightly rounded (convex), light in colour and unperforated. Because cappings covering larvae may also be sunken, darkened and perforated, identification of the disease may be made more difficult. However, other signs of EFB are usually present to confirm the disease.

Prevention

Healthy colonies are usually infected by either the bees robbing contaminated equipment or by the beekeeper transferring contaminated equipment from one hive to another. Thus it is important to store all unused equipment in bee tight buildings to prevent robbing of the equipment by bees. All frames containing brood should be inspected periodically during the spring and early summer for signs of EFB. Further, no pollen from unknown sources should be fed to colonies as it may introduce the disease to healthy colonies.

Treatment and Control

Colonies that have EFB should be isolated. It is important that no robbing of these colonies occurs nor should any frames from these colonies be transferred to other colonies. If only a few diseased cells are found on a comb, it should be marked and checked periodically for further spread of the disease. Meanwhile, the colony should be treated with the prescribed antibiotic. If many cells on any frame show signs of EFB it should be removed and burned.

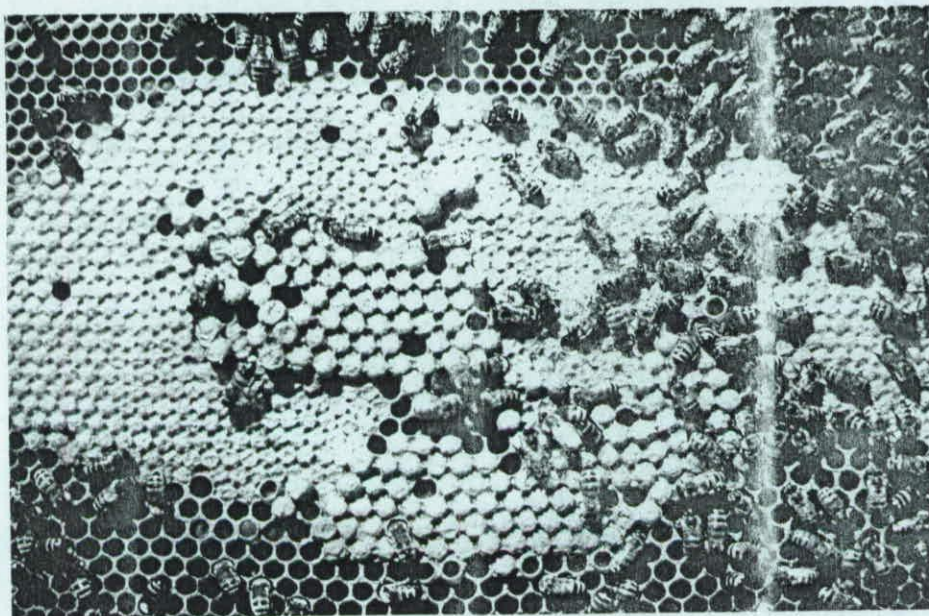


Figure 2 — Sealed worker and drone brood.

D. Dixon

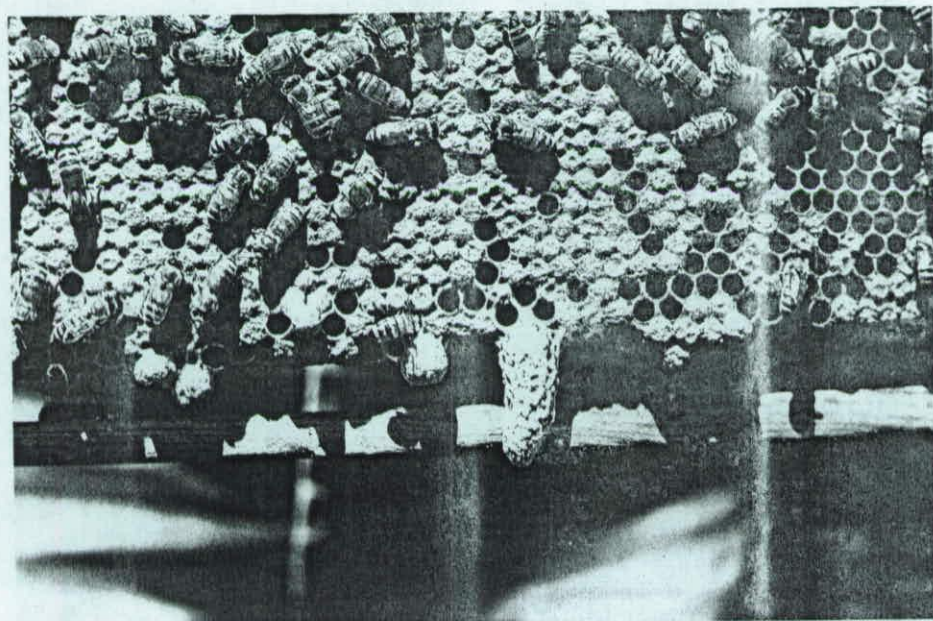


Figure 3 — Queen cups and a sealed queen cell on bottom of frame.

D. Dixon

Prevention and control of EFB can be accomplished by feeding colonies oxytetracycline hydrochloride (e.g., Terramycin, TM₂₆). As with AFB, this antibiotic does not kill the disease-causing spores, but assists in controlling bacterial growth in the larval gut. For best results, it is important to feed antibiotics at the recommended amounts and at the correct time intervals. Consult your provincial or state apiculturist for antibiotic feeding guidelines.

FUNGI

CHALKBROOD DISEASE

Introduction

Chalkbrood disease of honey bees is

caused by a fungus (*Ascosphaera apis*) which affects the larvae. The disease was first identified in Canada in 1972 and since then it has been found throughout the country. The levels of infection vary from year to year, and in some years may be economically important.

After infection, larvae become "mummified" and are either white or grey to black in colour. The mummified larvae are uncapped by the bees and are readily removed from the cells. The mummies are often seen in the cells, on the bottom board or on the ground in front of the colony. Chalkbrood disease has been reported to occur more frequently and at

higher levels in colonies that are first weakened or stressed by other problems (e.g., disease, inclement weather, poor management and/or food shortages).

Life Cycle

The spores of *Ascosphaera apis* are the infectious stage of the organism. It is believed that the infection of the larvae results mainly by ingestion of spores, but can also occur by the growth of the fungus through the cuticle. The larvae are most susceptible to Chalkbrood disease when they are 3-4 days old. The spores usually germinate in the hind gut. After the cells are capped, mycelia (from the spores) develop in the hind gut of the larvae or prepupae and eventually engulf the whole bee. The dead bee first becomes covered with a fluffy white growth of mycelia. Later the mummified bee dries, becomes hard, shrunken, and chalk-like. These mummies remain white or turn grey to black in colour. The whitish mummies indicate that the larvae have been infected by only one strain (+ or -) of the fungus, whereas the grey or black mummies indicate that the larvae have been infected by both strains. The dark colour is caused by the formation of spore-producing bodies on the surface of the mummy.

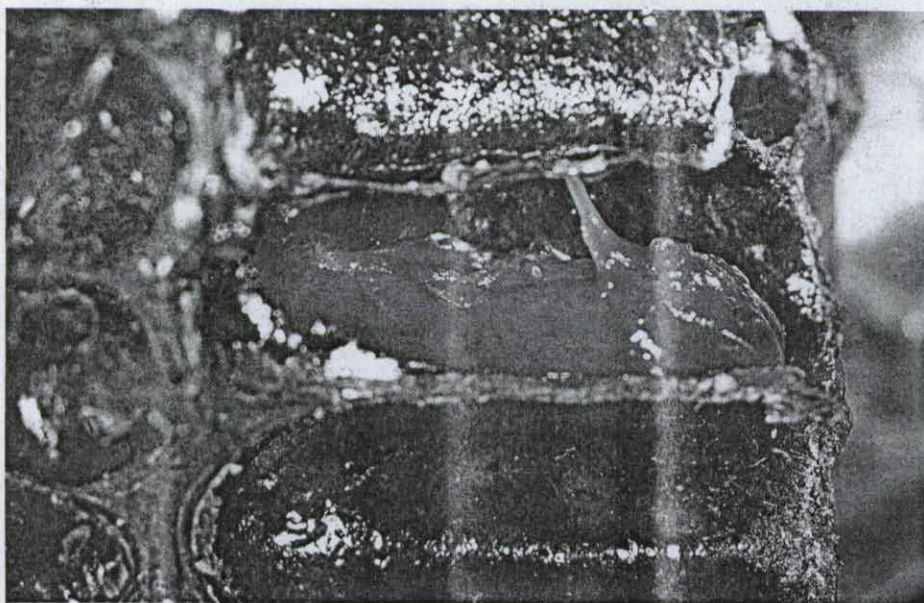


Figure 4 — AFB-infected pupa.

M.V. Smith



J. Gruszka

Figure 6 — Proper manner of checking for AFB "scale".

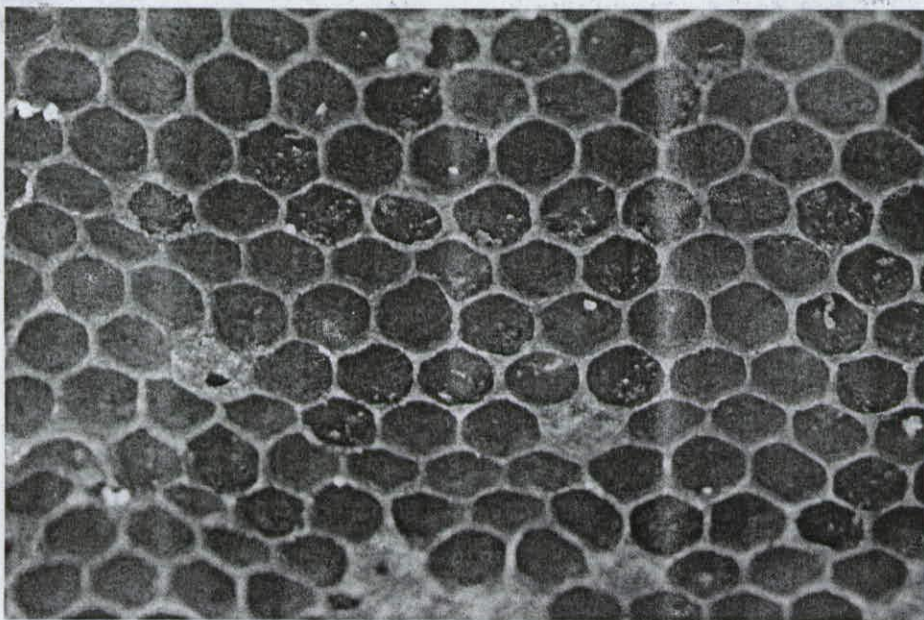


Figure 5 — Black AFB "scale" lining the bottoms of cells.

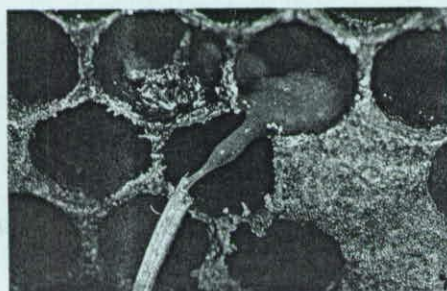
R. Long

Bees evidently detect the dead larvae under the capping and chew small pin holes in the cappings. These small holes in the capping are commonly the first sign of the disease for the beekeeper. Later, bees remove the cappings and dead larvae from the cells. The mummies are usually removed from the cells in less than 10 days, although colonies seem to vary in their ability to detect and/or remove mummies. Colonies with good hygienic behaviour have demonstrated control of Chalkbrood disease by increased and rapid removal of dead or diseased brood. Studies indicate that many factors are probably involved in the infection, maintenance and spread of Chalkbrood disease. These factors include: spore-contaminated pollen, queens, genetics of the queen, environmental conditions (especially cool, moist conditions), drifting of bees from infected colonies, spore levels in combs of previously infected colonies and spore-contaminated food sources, (e.g.,

water, nectar and honey). Some people have attributed the increase in Chalkbrood disease to the use of antibiotics, which may upset the equilibrium of the intestinal flora and thus allow fungi to develop. However, recent research demonstrated that Terramycin neither inhibited nor enhanced Chalkbrood infections.

Chalkbrood appears to be a stress-related disease, as infections have been noted when one or more of the following conditions exist: excessive hive moisture; cool, wet weather with poor foraging conditions; weak colonies; poor management; or prior weakening of colonies by other diseases (e.g., *Varroa*). In addition, a possible relationship between Sacbrood and Chalkbrood has been suggested. Inbred bees appear to be more susceptible to Chalkbrood than hybridized bees.

Although the ability of the infection to spread seems low compared to other diseases (e.g., AFB), the spores are quite resistant and remain infectious for at least 15 years. Therefore, when conditions are favourable, the disease may express itself.



M.V. Smith

Figure 7 — The "ropiness" test for AFB.

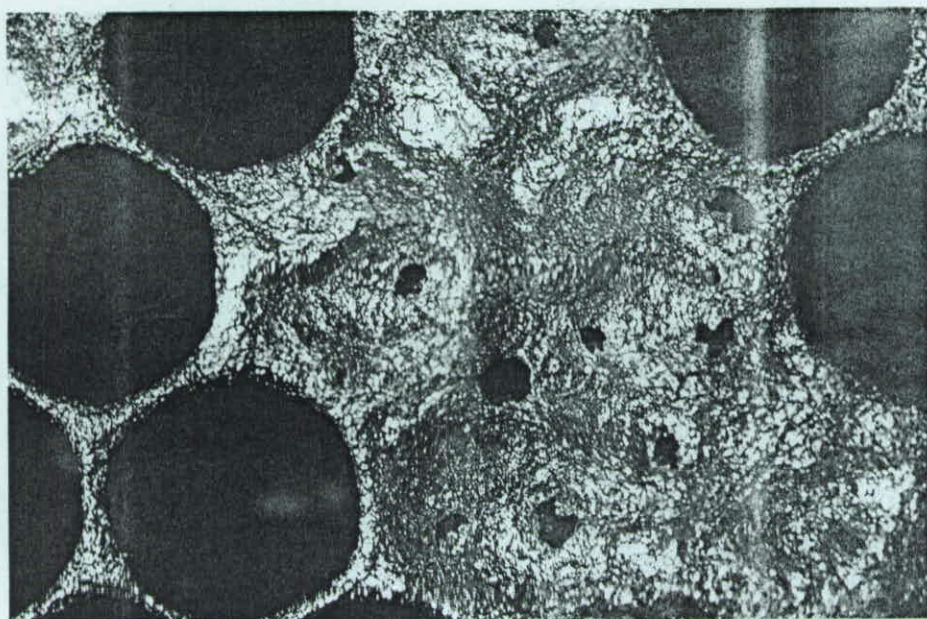


Figure 8 — Close up of sunken, perforated cells containing AFB infected larvae

M.V. Smith

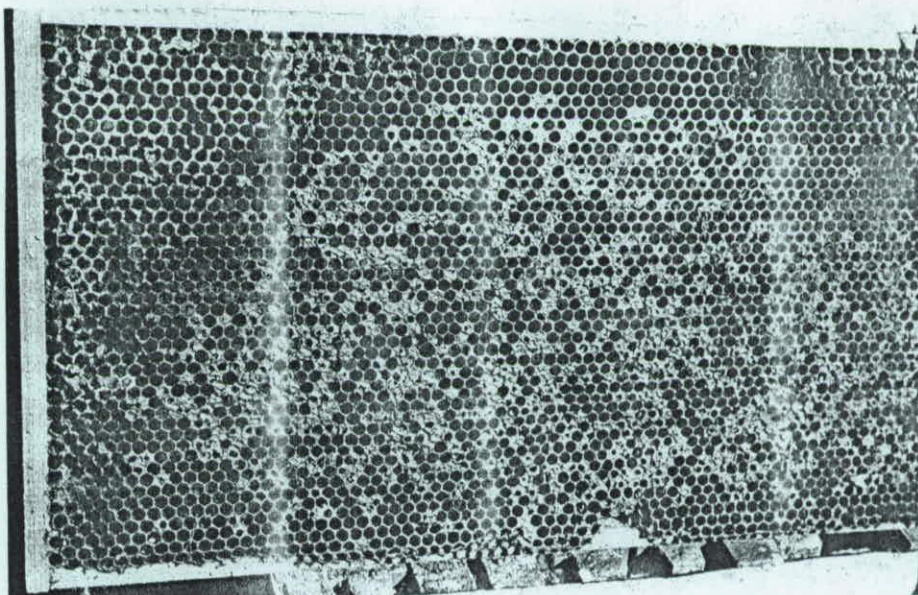


Figure 9 — Brood frame heavily infected with AFB.

M.V. Smith

Identification

Chalkbrood disease is relatively easy to distinguish from other bee diseases. The first sign is usually small perforations in the cappings. If these cells are uncapped by the beekeeper, dead larvae either partly or wholly engulfed by mycelia will be evident (Figure 13). At first the mummies are sponge-like but as they dry they become hard and chalk-like in appearance; the dried mummies will either remain whitish or turn grey or black (Figure 14). These will usually be seen in the cells on the bottom board or in front of the colony. If the mummies dry under the cappings, they will produce a rattling sound if the frame is shaken.

Prevention and Control Procedures

There is no registered control agent for use against Chalkbrood disease in Canada. Although most reports indicate that Chalkbrood does not cause serious economic losses, diseased colonies can have reduced populations and honey production. Since adult bees can easily remove chalkbrood mummies, the disease often disappears. It is usually less noticeable in strong colonies.

Combs containing large numbers of chalkbrood mummies should be destroyed. Other methods of control include strengthening of badly diseased colonies (by adding bees and brood) and requeening with stock that is less susceptible or has better cleaning behaviour for removing diseased brood.

Beekeepers can avoid spreading Chalkbrood by not interchanging combs between diseased and disease-free colonies, and by using only pollen from disease-free colonies for pollen supplements.

A beekeeper's best protection from high levels of infection are the use of young, productive queens, new combs, and good management systems which result in strong colonies.

VIRUSES

Introduction

Several viruses are known to be associated with honey bees. In some instances viral infections will cause death and/or paralysis of both immature and adult bees. Dr. L. Bailey in his book *Honey Bee Pathology* (1981) lists 18 different viruses that have been found in association with honey bees.

Virus identification usually requires sophisticated and expensive laboratory equipment plus highly technical procedures. Thus, confirmation of the presence of viruses in a honey bee colony is usually difficult to achieve. In addition, the occurrence of disease-causing viruses in bees appears to be sporadic and usually unpredictable.

Economic losses in honey bees resulting from viral infections are usually rare in most parts of North America. However, the ability to identify conditions most likely resulting from viral infections is an important means to distinguish these diseases from those caused by other pathogens, such as bacteria. The two most commonly diagnosed viral diseases are Sacbrood and Paralysis.

Life Cycle

Sacbrood

Larvae infected with Sacbrood virus usually die during the prepupal stage, either just before or just after the cell has been capped. Normally, larvae which die from the virus ingest it when they are 1-2 days old. However, older larvae may also succumb to a sacbrood infection, especially if they are exposed to large amounts of the virus.

The virus is probably spread within the colony after the adult bees remove dead sacbrood larvae. In so doing they contaminate themselves, other bees and the feed stores with the virus. Some researchers also believe that the adult bees may act as a reservoir for the virus.

Bee Paralysis

It is believed that adult bee paralysis is caused by two distinct viruses: Chronic Bee Paralysis Virus and Acute Bee Paralysis Virus. Chronic Bee Paralysis Virus is generally considered to be the main causative agent of adult viral paralysis when it is observed in the field. Although this virus can be commonly found in both healthy and paralyzed bees in North America and other regions, its transmission from bee to bee, or colony to colony and why some colonies suffer serious losses from the virus, while others do not, is not well understood.

Identification

Sacbrood

In a heavily infected colony, Sacbrood will result in uncapped or partially uncapped cells being scattered among capped or uncapped cells containing healthy brood. When a larva dies from Sacbrood, typically it will be found lying along the length of the cell with its head slightly raised; the colouration will generally darken from white to yellow, light brown and eventually turn dark brown (Figures 15 and 16). As the name

implies, the skin of the larva becomes tough and leathery as the disease progresses. If left long enough the larval remains will eventually dry and settle into a brittle scale which can easily be removed from the cell.

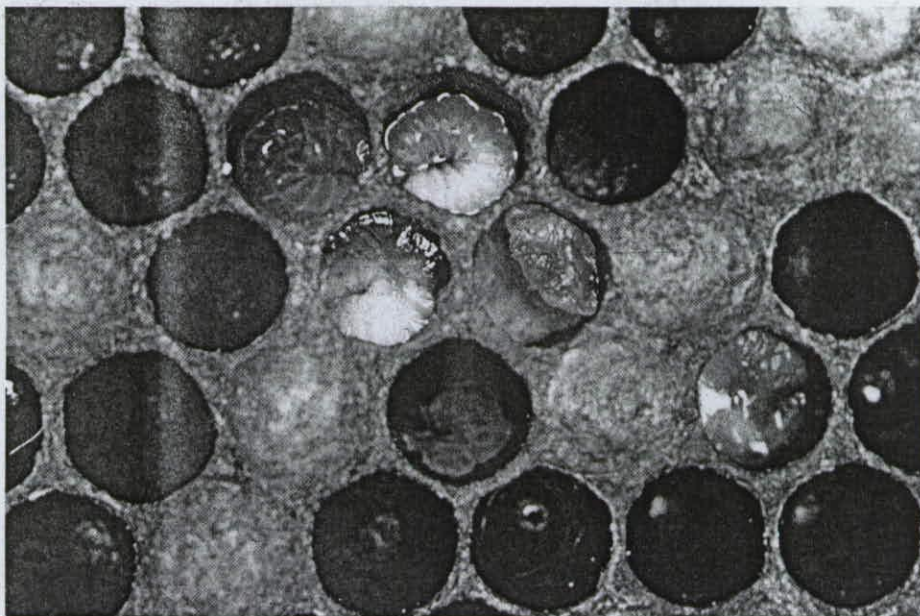
Unusual forms of Sacbrood-like disease are sometimes observed; these usually result in the infected immature bees dying at a very early stage of development (i.e. before the prepupa stage) or much later after the bee has fully completed its transformation into a pupa. Confirmation of the presence of a viral infection is usually difficult, therefore most beekeepers and apiary inspectors will usually conclude that Sacbrood is the problem after they have eliminated the possibility of other causes such as fungal or bacterial infections.

Bee Paralysis

The main symptom of viral bee paralysis is the presence of crawling, partially paralyzed adult bees on or near the hive entrance. Healthy workers will sometimes be seen



M.V. Smith
Figure 10 — Cell opened to show EFB-infected larva.



M.V. Smith
Figure 11 — EFB-infected larvae exhibiting contorted positioning in cells and discolouration.



M.V. Smith
Figure 12 — EFB-infected larva showing silvery tracheae and discolouration.

removing the partially paralyzed bees from the hive. In addition, infected bees will sometimes have reduced amounts of body hair and will appear darker in colour than normal. Hence, this disease is sometimes referred to as "hairless black syndrome."

Treatment and Control

Virus diseases generally cannot be controlled with antibiotics, and any drugs that may be effective on bee viral infections probably will not be registered for use on bee diseases in the near future. The best means of control may be achieved by weeding out any stocks of bees found to be especially susceptible and replacing them with others.

Honey bee viral infections sometimes show a seasonal variance, appearing for example at a low level in the spring and then diminishing as the season progresses. Since the sacbrood scales are probably the main source of reinfection in the colony, any comb showing large numbers of dead larvae from Sacbrood disease should probably be removed and destroyed to assist the colony in overcoming the infection.

PROTOZOA

NOSEMA DISEASE

Introduction

Nosema disease is an adult honey bee disease caused by the single-celled protozoan, *Nosema apis*. Nosema disease is found in most beekeeping regions, but causes damage mainly in temperate climates characterized by cool unsettled springs. Colonies suffering from Nosema disease often exhibit spring dwindling or poor spring build-up resulting in reduced honey production. The disease can also be responsible for a high proportion of early queen supersedure.

Life Cycle (see diagram on Page 11)

Nosema apis forms resistant spores which remain viable over long periods of time. If Nosema spores are ingested by the adult bee, they will germinate in the mid-gut (i.e. ventriculus). Following germination, the spore emits a long tube or polar filament which penetrates a cell of the mid-gut lining or epithelium. The contents of the spore then travels through the hollow filament and enters the epithelial cell where it proceeds to grow and multiply.

In the process of growth and multiplication, the contents of the epithelial cells are utilized by the disease organism. After the organism has completed its growth and multiplication, sporulation occurs, resulting in the formation of many Nosema spores in the cell.

These Nosema-infected cells rupture and release the spores which either penetrate other epithelial cells or are voided with the feces. If defecation should occur within the hive, these spores may infect other bees in the colony through their housecleaning and food sharing activities. However, most defecation normally occurs outside of the hive where the disease may be transmitted to other bees in water sources located near the apiary.

Heavily infected bees are unable to properly digest their food as the epithelial cells of the mid-gut have been damaged by the disease organism. Such bees have shortened life spans and, as they cannot digest pollen, are unable to produce the protein-rich brood food (royal jelly) needed by larvae. In fact, the hypopharyngeal glands responsible for brood food production are seen to atrophy or disintegrate in heavily diseased bees. This results in poor spring build-up, or a population decrease in severe cases. Queens may also be superseded in Nosema-infected colonies.

Outbreaks of Nosema disease are usually associated with periods of stress. As the hive is under most stress during the extended

periods of winter confinement and variable spring weather conditions, outbreaks are often observed at these times. Package bees may be particularly susceptible soon after hiving, especially during poor spring conditions in the package-producing regions of the U.S. Wintered hives may also suffer from the disease if populations are low and pollen supplies have been depleted. As foraging conditions improve and the aging population is replaced by young bees, Nosema infections usually decline. Hive equipment containing spores may be a source of infection when stressful conditions return.

Although Nosema is usually at its lowest level in the fall, sometimes outbreaks occur at this time.

Identification

Adult bee diseases are generally more difficult to diagnose than brood diseases as diseased adults often show few changes in outward physical appearance. Heavily infected colonies may have crawling bees in front of the hive, bees with unhinged wings, or bees with distended abdomens. However, these symptoms may also be confused with pesticide poisoning, bee paralysis and other adult abnormalities. Sometimes Nosema diseased bees may not exhibit any obvious symptoms.

Nosema disease is often confused with dysentery, a situation where fecal matter is deposited within the hive and around the entrance (Figure 17). Dysentery may result from a variety of conditions including poor quality food stores, the presence of Nosema or a combination of both. If Nosema is present, dysentery may help spread the

Nosema spores to other bees.

Nosema may be diagnosed by taking a sample of foraging or crawling bees and examining their digestive tracts. This is done by grasping the bee by the head in one hand and tip of the abdomen in the other and then gently pulling. The digestive tract will then string out. A normal digestive tract is tan to brown in colour with distinct annulations (rings). If the stomach is whitish and lacking annulations, then the bee is usually heavily infected. If 10-20 bees are examined in this manner, a percentage of infected bees may be determined. This method, however, only indicates the most heavily infected individuals, as less infected bees appear to have normal digestive tracts.

The only reliable diagnosis for Nosema disease is the microscopic examination of a sample of adults. A sample of 25 bees should be collected from the hive and preserved in 70% alcohol, frozen or dried for later analysis. The analysis is performed by first grinding the bees with a mortar and pestle in a small amount of water and then examining a drop of the resulting mixture under the microscope at 400x for the presence of Nosema spores (Figure 18).

Prevention and Control Procedures

The beekeeper, through various management practices, can prevent serious outbreaks of Nosema disease. Wintering sites should be sheltered but open to the south to allow occasional cleansing flights when winter weather permits. Hives entering winter should be strong in populations, headed by vigorous queens and should be provisioned with adequate stores of honey and pollen. Adequate insulation and

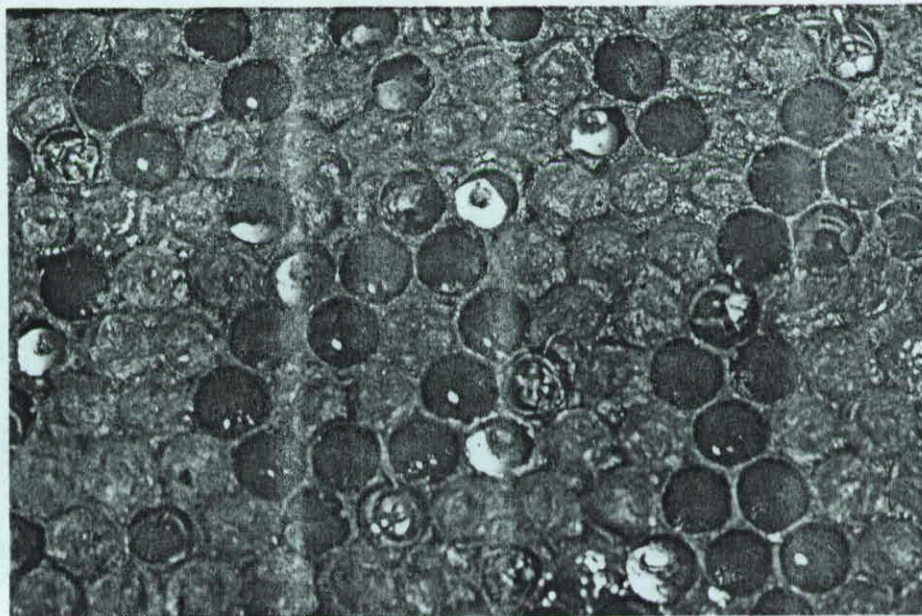
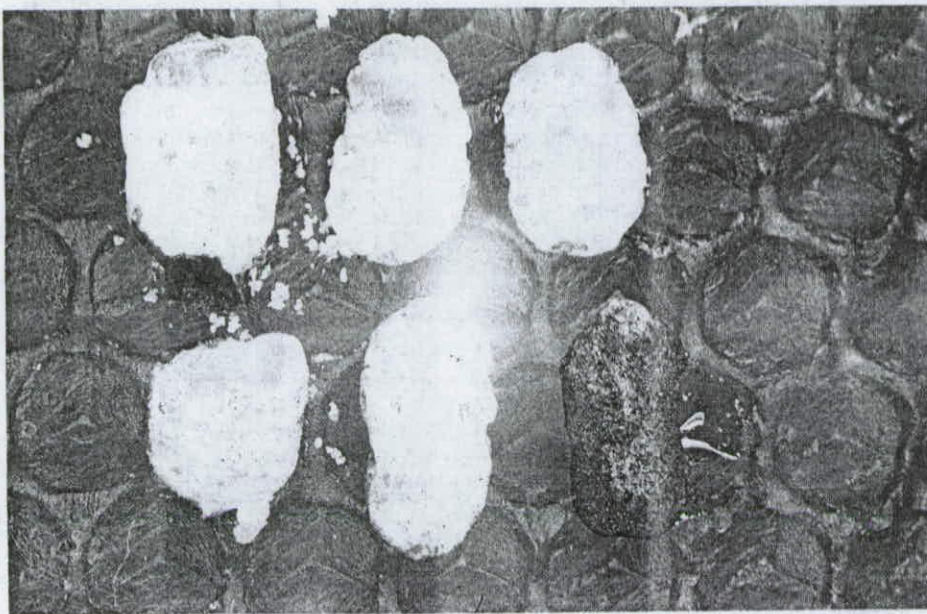


Figure 13 — Chalkbrood-laden frame

R. Long



M.V. Smith

Figure 14 — Chalkbrood "mummies", lower right example shows black spore formation on the surface.

entrance reducers should also be used. Package bees should have at least two full frames of pollen upon hiving in addition to adequate honey store.

Fumagillin is the antibiotic used as preventive treatment against *Nosema* disease. It has no effect on the spore stage but is effective against the actively growing stages. Fumagillin is manufactured and available under several trade names. It is effective when fed in the proper amount of sugar syrup at the recommended concentration, but should not be mixed in hot syrup, as this promotes breakdown of the antibiotic.

Colonies to be wintered should receive fumagillin with a full feeding of sugar syrup. Package bees may receive medicated syrup upon hiving or with the syrup used to feed the packaged bees during transit. To prevent *Nosema* infection of queens in storage, queen banks should be fed medicated syrup throughout their use.

MITES

About 100 species of mites have been found in honey bee colonies in various parts of the world. Of these, three mite species are of concern to beekeepers in Canada: *Varroa jacobsoni*, *Acarapis woodi* and *Tropilaelaps clareae*.

Varroa Jacobsoni

Background

Originally a parasite of the eastern honey bee *Apis cerana* from Asia, *Varroa jacobsoni* was apparently transferred to *Apis mellifera* by beekeepers in about 1940. The *Varroa* mite was transported on bees to Europe

where it expanded in distribution through the 1970s and 1980s. In the 1970s, *V. jacobsoni* was inadvertently taken from Japan to South America, where it now occurs through most of the continent. In 1987, detections of *Varroa* were made in several eastern states of the U.S.A. As a result, further importation of bees into Canada from the U.S. was prohibited. By 1990, *Varroa* mites had been found in over 30 states in all regions of the U.S. with the exception of Hawaii and Alaska.

Life Cycle

Fertile *V. jacobsoni* females detach from their adult honey bee host, enter brood cells (particularly drone cells) and lay 2 to 8 eggs near a young bee larva. Mites which hatch from these eggs are initially immersed in the bee's food, but soon begin to feed on the developing bee and remain with it as the bee pupates in the closed cell. The mites mature and mate in the cell, and fertile females leave the cell when the bee emerges. When females are not seeking another cell for egg laying, they remain on adult bees, feeding on the bee's hemolymph (blood). At least part of the mortality associated with infestation by *V. jacobsoni* may result from Acute Bee Paralysis Virus infections which are made worse by the mite. Adult female mites are thought to be carried to other bee colonies by drifting bees or possibly by transfer to new bee hosts at flowers or other food sources.

Identification

Detection of this mite can be accomplished by removal and examination of drone pupae, examination of hive debris (e.g., after using a miticide) to detect any mites which have died, or by washing adult bees and strain-

ing the fluid to recover mites which have been detached.

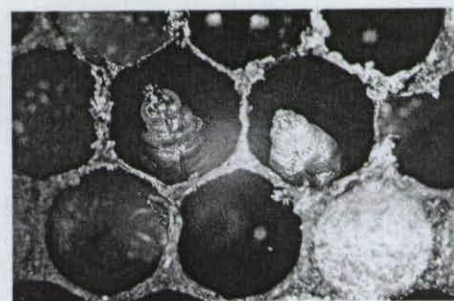
Mature *V. jacobsoni* are reddish-brown (Figure 19) and large enough to be easily seen on white larvae or pupae (Figure 20). They are visible but less conspicuous on adult bees. Large *A. mellifera* drone larvae are preferred by *Varroa* females, but smaller worker larvae also support mite reproduction. Feeding by *V. jacobsoni* on the wing bud area of bee pupae may result in deformed and nonfunctional wings of adult bees that emerge. These bees may be seen crawling at the hive entrance.

Acarapis woodi

Background

The honey bee tracheal mite, *Acarapis woodi* (Figure 21), was described in England in the early 1920s by J. Rennie. At that time the mite was considered to be the cause of widespread mortality of honey bee colonies beginning in 1904 on the Isle of Wight. *A. woodi* is a naturally occurring parasite of *Apis mellifera* in Europe. For unexplained reasons it did not become established in North America during importation of bees from Europe over a period of 100 years up to 1920. By 1981 however, it was reported in much of South America, parts of Africa and Asia and throughout almost all of Europe and Mexico.

Although a major survey for bee mites throughout the U.S. in 1981-82 showed no *Acarapis woodi*, by 1986 it had become widely distributed in much of the U.S. By 1990, all states except Hawaii had detected tracheal mites. Beekeepers in Canada imported 200 to 300 thousand packages of bees from the U.S. each year up to and including 1987, when importation ended. Tracheal mites were found in Canadian colonies derived from packages in a few locations in 1987, and in associated apiaries in several provinces in 1988 and 1989. By 1990, the mite was established in widespread locations in the western provinces, and found sporadically along the U.S. border in the eastern provinces.



M.V. Smith

Figure 15 — Sacbrood-infected larva in cells — front view.

Two other species of *Acarapis* mites, *A. dorsalis* and *A. externus*, live externally and without known harm on honey bees. Both are present in Canada, particularly in B.C., and are considered to exist practically everywhere bees are kept.

Life Cycle

Fertile *A. woodi* females transfer from the hair tips of infested adult honey bees to a potential new host bee. When a suitable young adult bee is encountered, the mite climbs on the bee and enters its tracheal system through the large first thoracic spiracle (opening). After feeding, the female mite lays several eggs in the main tracheal tubes. Immature mites and adults feed on the bee's hemolymph by piercing the tracheal walls. Darkening of the tracheae near feeding mites is often observed. This may result from the presence of bacteria or fungi living on mite excretory products. A heavily infested bee may have over 100 mites of various ages in its tracheae.

After mating in the tracheae, mature females leave through the spiracle and assume "ambush" positions on the bees' hairs, ready to transfer to a new, young bee host. Drones and queens are also susceptible to mite infestation.

Offspring of the mites begin to mature by the time the infested bee is 10-12 days old, and can continue over the life of the bee.

Drifting bees (especially drones) are likely the normal means of mite transfer from colony to colony, although movement of bees by beekeepers is undoubtedly responsible for rapid long distance distribution of the mite.

Identification

All three *Acarapis* species are too small to be observed with the naked eye on bees. *A. woodi* is most readily distinguished when detected inside the tracheae (Figure 23). A sample of adult bees, preferably of foraging age, can be collected in alcohol and stored for laboratory examination. Examination may be by dissection and observation of the main tracheal trunks, or by cutting from each bee a slice or disc which includes these parts (Figure 22a). These discs are cleared in 5 to 10% KOH for up to 24 hours at 30 to 45°C until the muscle tissue is dissolved and the tracheae are clearly visible. Following clearing, optimal staining for about 10 minutes in 1% methylene blue, and rinsing in clear water, examination under a dissecting microscope at about 30x magnification will allow detection of the mites. They appear as darker ovals inside the trachea, or in groups as mottled, cloudy or darkened tracheae (Figure 22b). Such tracheae should be removed, mounted under a cover slip and examined closely with a compound microscope. Any mites inside the tracheae

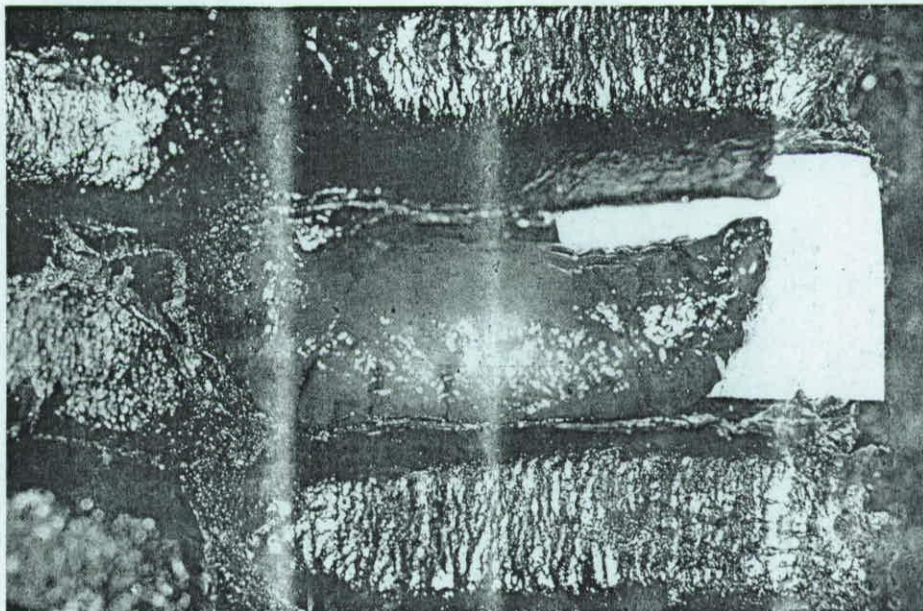


Figure 16 — Sacbrood-infested larva in cell showing general discoloration.

M.V. Smith

are almost certainly to be *Acarapis woodi* (Figure 23).

Tropilaelaps clareae

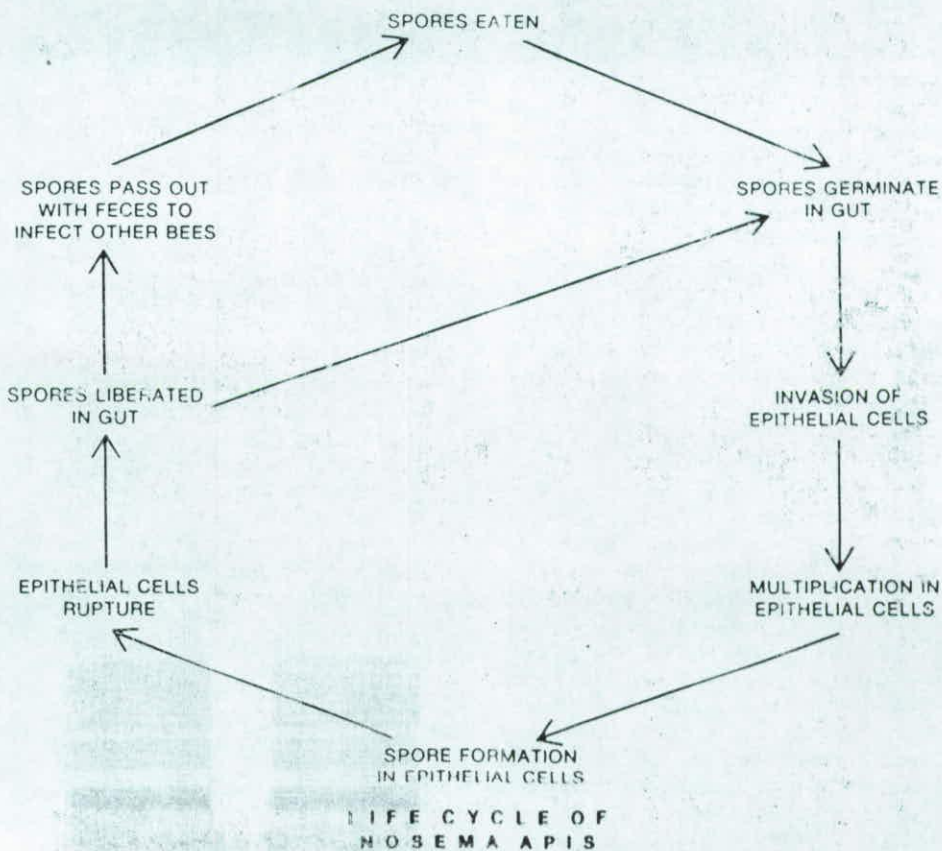
Background

This species was originally a brood parasite of the giant or rock honey bee *Apis dorsata* in southeast Asia. It was discovered in the Philippines in 1961 in colonies of *A. mellifera*

and has been recorded from Afghanistan to China. It has also been found in colonies of *A. cerana*.

Life Cycle

The life cycle of this Asian mite has been described as similar to that of *Varroa* but a detailed description has yet to be published. Preliminary observations indicate that unlike *V. jacobsoni*, it feeds on brood but not on



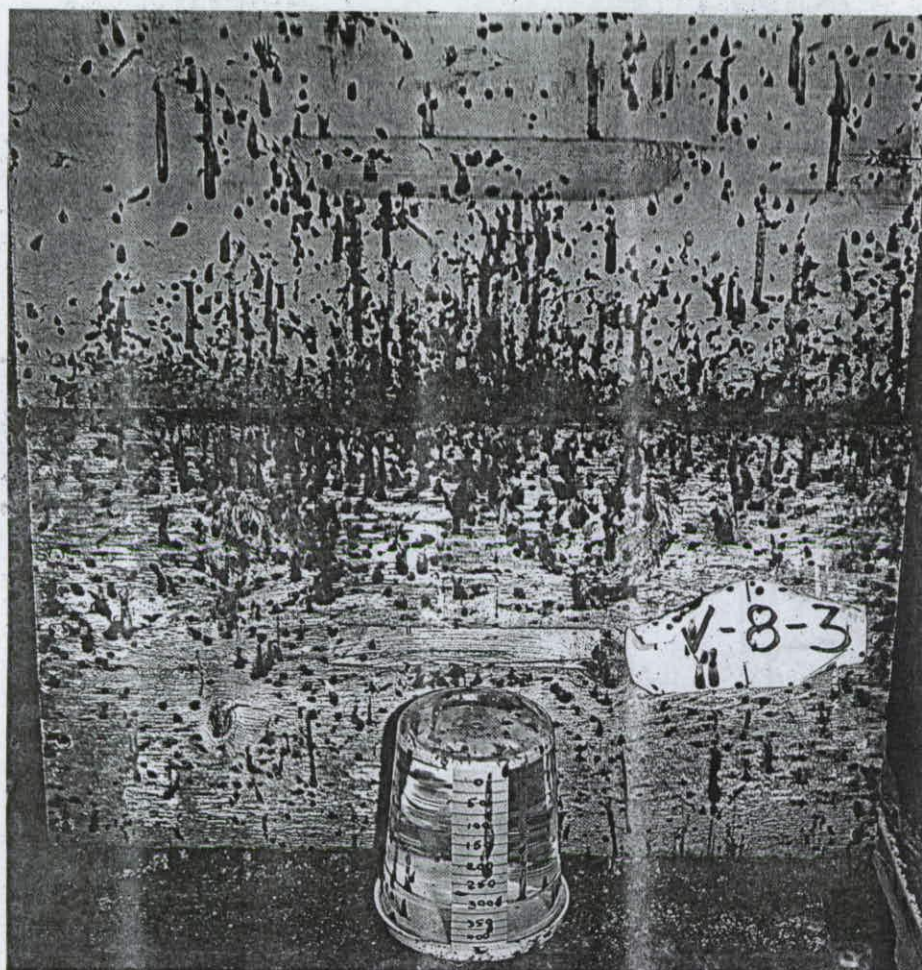


Figure 17 – Dysentery on hive front.

B. Fingler

adult bees, and therefore may not become as serious a pest to beekeeping areas with a winter broodless period.

Identification

Tropilaelaps mites are about half the size of *Varroa*, oval in shape, and light brown in colour. Detection techniques are similar to those described for *V. jacobsoni*.

Prevention and Control of Mites

For areas where these mite species are known to be absent, the first preventative measure is to avoid their introduction from an infested area. Hive equipment without bees has little risk of carrying parasitic mites, since the mites will not usually live apart from live bee hosts for more than a few days. Under certain conditions of temperature and humidity however, some could survive for a week or more. Leaving equipment for two weeks without bees will ensure that the equipment is mite-free. For any of the mites that do become introduced, early detection and containment attempts, and precautions to reduce contact between infested and susceptible un-infested bees, may reduce the spread or growth of mite populations and delay or prevent widespread infestation. In

one bee operation these precautions may involve:

- reducing drift of bees between colonies by utilizing an appropriate layout of hives;
- avoiding confused bee flight in yards with large numbers of closely spaced colonies;
- netting truckloads of supers or hives during transport;
- minimizing movement of bees from the honey house back to the bee yards;
- purchase of bees and queens from mite-free suppliers where possible;
- avoiding unnecessary exchange of bees with other operations; and,
- the establishment of mite-free colonies in separate yards from infested ones.

Attempts to develop strains of bees resistant to mites are underway and could provide a simple long-term solution. Although many

methods for killing mites in bee colonies have been developed, safe and effective long term chemical control may depend on various conditions including climate, and some methods may not be approved or effective in some regions. Current information about recommended treatment and management methods should be obtained from the appropriate regional apiculture office.

WAX MOTHS

Introduction

The larvae of various moths infest bee brood, honey, pollen and beeswax and may cause serious economic losses to beekeepers. Three moths, the greater wax moth (*Galleria mellonella* [L.]), the lesser wax moth (*Achroia grisella* [F.]) and the dried fruit moth (*Vitula edmandsae* [R.]) are known pests in the Canadian beekeeping industry, particularly where combs have been stored in the honeyhouse or in other heated buildings.

Life Cycle

Female moths usually lay their eggs in small cracks between frames, lids, and boxes of weak or diseased colonies or inside empty hives. The young larvae form tunnels in wax comb and line them with loose layers of silk material (Figure 24). These tunnels are enlarged as the larvae grow so that eventually the comb is damaged. If affected by enough moth larvae, the comb becomes



Figure 18 — Nosema spores.

R. Graham

covered with large amounts of silk webbing and fecal pellets (Figure 25). It appears that the greater and lesser wax moths can digest wax but it is not known if the dried fruit moth can do so. Mature larvae usually spin tough, white silken cocoons on the inside or outside of the boxes. After a period of pupation in these cocoons the adults emerge as moths. The greater wax moth overwinters in the pupal stage while the other two moths overwinter in the egg or larval stages. It should be noted that during infestation both larvae and adult moths may be seen in the beekeeping and storage facilities.

Control

Proper management of colonies can assist in the prevention of losses due to wax moths. This can be done by maintaining strong, well-fed, disease-free colonies in which wax and organic debris are removed periodically from the bottom boards of the hives.

Cold treatment (e.g., deep freezers, refrigerators, winter storage) of comb and beekeeping equipment is quite effective in killing all stages of most moths. If the equipment is loosely stacked overnight, exposure in a deep freezer is very effective. Alternatively 10 day exposures at 2°C or 21 days at 5°C are also known to be effective in eliminating moth infestations. Heat treatments (46 - 49°C) are also effective but precautions must be taken to protect the combs from sagging or melting.

Various fumigants may be available for control of moth infestations in stored equipment. Contact your provincial or state apiculture office to determine which fumigants are registered for this use and how they should be used for maximum control and safety.

PESTS AND PREDATORS

ANTS

Ants are not usually considered to be a major pest of honey bee colonies in Canada. They may however, become a nuisance to beekeepers who keep their colonies in heavily wooded areas or on light sandy soil.

Ants are attracted to hives by the presence of honey and pollen, and may attempt to nest in warm, dry areas inside or beneath the hives. If they regularly enter the hives in search of food, the bees may become irritated, increasingly defensive and ultimately more aggressive toward the beekeeper. On rare occasions, some ant species may cause structural damage to hive parts while others may conduct periodic foraging raids on hives, preying upon the larvae and pupae.

Prevention and Control

Apiaries should be maintained to prevent the accumulations of grass, brush and rotting wood, all of which are common nesting sites for ants.

If ants become a problem in the apiary, their nests may be treated with a 1% solution of Diazinon 12.5% EC, at a rate of 2 fl. oz. / pt. (100 mL/L). Spray directly onto the nest surface, ensuring that both the nest and the surrounding ground are thoroughly soaked.

RODENTS

Mice are undoubtedly the most serious of all rodent pests of honey bee colonies. They feed on pollen, honey and dead bees, and may destroy large numbers of frames and

combs while building their nests. Mice will readily move into stored hive equipment and outdoor wintered hives, often destroying insulation packed around the latter.

Rats and squirrels seldom pose serious problems to honey bee colonies in Canada. Occasionally they do get into stored equipment and gnaw through frames, combs and supers in search of food.

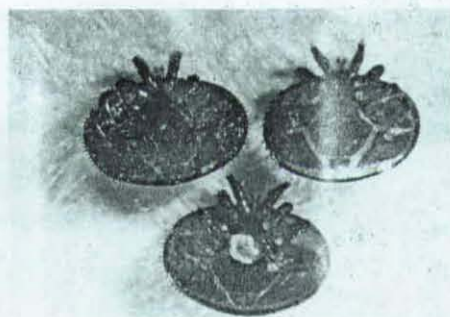
Prevention and Control

To prevent rodent damage, stored equipment should be piled neatly on closed bottom boards, and the stacks covered with queen excluders or hive lids. Commercially available poison bait stations and/or rodent traps may be located throughout the storage area.

Hives wintered outdoors should have their bottom entrances reduced to approximately 1/2 inch (1.3 cm) in width to control mouse infestation. Barriers such as queen excluders and screens should be used with caution as they may limit the bees' ability to remove debris. The resulting build-up of debris at the entrances may reduce ventilation in the hives. Poison bait may be placed on top of the inner covers and below the hives to reduce the possibility of rodent damage to the insulation.

SKUNKS

Skunks are pests of honey bee colonies throughout Canada. They are usually active at night, preying on honey bees by scratching at hive entrances and eating the bees that come out to investigate the disturbances. Colonies that are visited frequently by skunks often become quite aggressive and may be seriously weakened. Obvious signs of skunk damage include destroyed



Ciba Geigy

Figure 19 — Ventral view of *Varroa jacobsoni* (adults).

vegetation and small holes dug in front of the hive entrances, paint scratched from the fronts of hives, dirt on the entrance boards and entrance reducers removed from the fronts of the hives.

Prevention and Control

Barriers placed in front of hive entrances may be used to prevent skunk damage. Wire screens attached to the bottom boards so that they extend outward and upward from the entrance will make it difficult for skunks to scratch the hives without exposing their bellies to bee stings. Small wire fences, such as those used along the edges of flowerbeds and gardens or boards with rows of nails driven through them may be placed in front of hives to deter them.

Trapping may be used to control skunks in apiaries. Wire cage traps or box traps may be used but skunks may release their scent in such traps. Caution should be used when handling skunks as they are known to be a common rabies carrier.

BEARS

Bears have long been recognized as serious

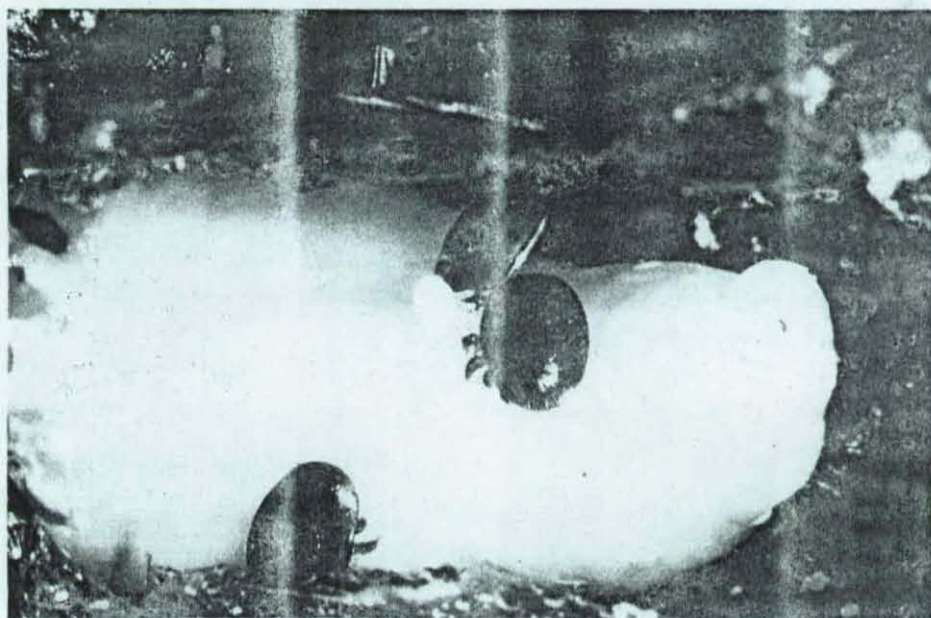
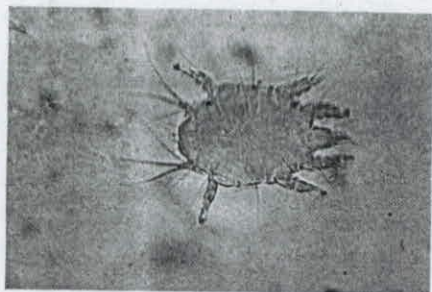


Figure 20 — *Varroa jacobsoni* (on larva).

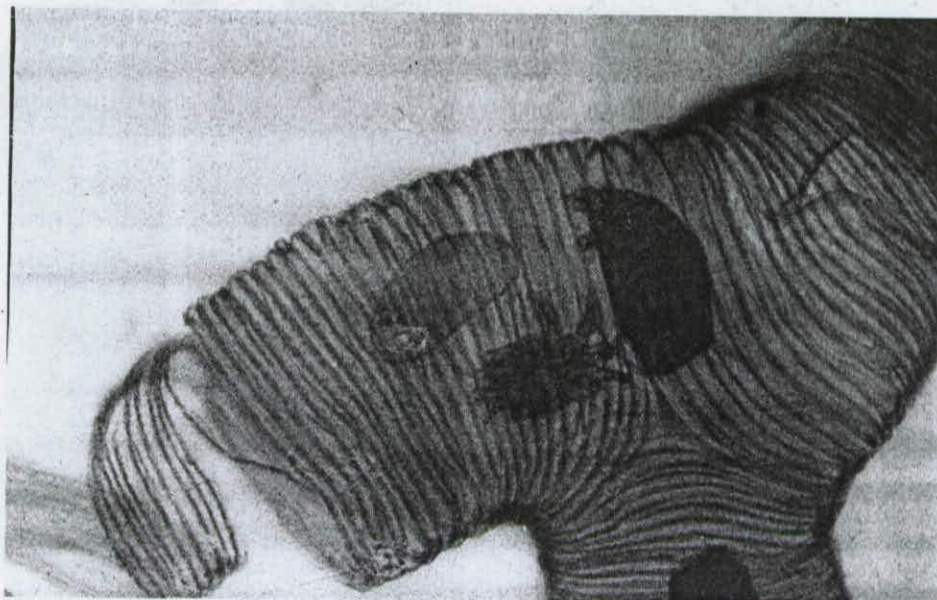
Ciba Geigy



M.V. Smith

Figure 21 — *Acarapis woodi* (adult).

pests of the beekeeping industry in Canada. The most common of these, the black bear, causes thousands of dollars worth of damage to apiaries annually. Bears will commonly enter apiaries at night and topple and smash the hives to get at the brood and honey inside. Once they have acquired a taste for this food, they tend to return repeatedly to apiaries. Bear damage is generally evidenced by broken frames and other hive parts scattered throughout the apiary. In some cases, bears may even drag full supers for several yards to the nearest bush before removing and eating the contents.



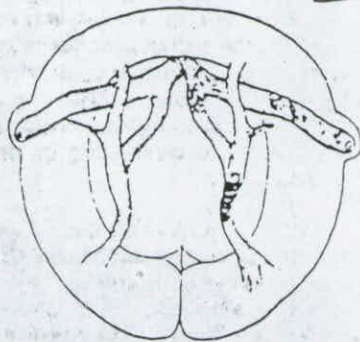
W.T. Wilson

Figure 23 — Various stages of *Acarapis woodi* in trachea. Upper left — egg; Upper right — immature, middle — adult.

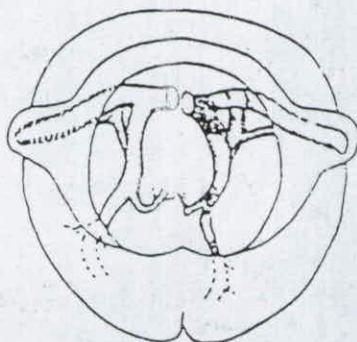


Clearing in 5 % KOH solution

up to 24 hours at 30 - 45° C.



Posterior view



Anterior

b Mottled or darkened tracheae indicate *Acarapis woodi*

Figure 22 — a. Dissection procedure for detecting *A. woodi*.

b. Thoracic disc indicating presence of *A. woodi*.

K. Clark

Prevention and Control

Bear damage may be avoided by locating apiaries away from the bear's habitat, such as near wooded areas and streams. Apiaries should be kept clean and not have old comb and broken frames laying about to attract bears. Electric fences may be used to prevent bears from entering apiaries. To be most effective, these fences should be erected around the apiaries prior to the occurrence of any bear problems. In some regions, trapping and shooting bears are a legal means of protecting apiaries. Information on electric bear fence construction and regulations governing bear control and removal may be obtained from your provincial or state wildlife or natural resources office.

OTHER COLONY ABNORMALITIES

There are several abnormal colony conditions that are not caused by disease organisms but by environmental, management or biological factors. Some of these conditions can be as serious as a disease in their effect on colony health and honey production. The beekeeper should be familiar with both diseases and other abnormalities, in order to distinguish between the two and be able to correct the problem.

CHILLED BROOD

When a colony is rearing brood, the brood is kept warm by the presence of adult bees on each comb, maintaining a brood nest temperature of about 35°C. When a colony has fewer adults than needed to cover each comb of brood, chilling of the brood can result. This condition is common during early spring, when the brood nest is rapidly expanding and when cold spells may cause the cluster to contract, leaving peripheral

brood exposed. Prolonged exposure to temperatures below 14°C will cause death, with young brood being more temperature sensitive than capped brood. Chilled brood may also be noticed in weak colonies, in splits, and in colonies which have lost many adult bees as the result of insecticide poisoning or tracheal mites.

Maintenance of colonies with adequate adult numbers and the use of entrance reducers in the spring will help to prevent the occurrence of chilled brood. Once the colony is stronger, the adult bees will clean out dead brood from the combs.

GASSED BROOD

When colonies are killed off with hydrogen cyanide gas the uncapped brood will die, either from the cyanide fumes or from subsequent chilling or starving. This dead brood is usually noticed when the beekeeper is sorting combs for brood chambers. This dead brood will become dark and flattened, and will often superficially resemble larvae which have died from American foulbrood. When there is doubt, samples may be submitted to the provincial or state apiculture office for diagnosis. A small amount of gassed brood does not pose a problem to package bees, which will clean out any dead larvae in the combs. Generally, however, the first brood chamber should not contain combs which are full of dead brood, as this will delay egg-laying and colony build-up. Such combs can be placed in the second brood chamber, when the colony is stronger.

SCATTERED OR SPOTTY BROOD PATTERN

A scattered or spotty brood pattern is often evidence of a failing queen. Instead of a solid pattern of eggs, young larvae or capped brood, many cells are empty. Spotty brood

may also indicate the presence of a brood disease such as American Foulbrood, European Foulbrood, Sacbrood or Chalkbrood. When seeing a spotty brood pattern, the beekeeper should examine the colony more closely for other disease symptoms or signs of supersedure, then take the appropriate action to correct the problem.

A spotty brood pattern is very common in wintered colonies in early spring but is not necessarily an indication of a queen problem. The reason for this is unclear, although it may result from a shortage of pollen. This problem generally corrects itself once pollen becomes available.

DRONE-LAYING QUEEN

Normally a queen will only lay unfertilized eggs in drone cells. However, when she uses up the sperm which have been stored in her spermatheca she will begin to regularly lay unfertilized eggs, even in worker cells. Signs of a drone-laying queen include spotty brood and the presence of protruding, rounded cappings on brood combs. Both are evidence of unfertilized eggs being laid in worker cells.

If the colony is still strong, the beekeeper may supply a new queen after removing the old queen and any queen cells. If the colony has dwindled in size, the bees may be united with another colony, after removing the old queen. Otherwise the bees may be shaken on the ground and allowed to drift to other hives in the apiary.

LAYING WORKERS

When a colony is queenless for a long period, the ovaries of one or more workers may begin to develop, and these workers begin to lay eggs which are not fertilized. Signs of laying workers include spotty brood,



M.V. Smith
Figure 25 — Close-up showing heavy infestation of wax moth. Note thick webbing and presence of adult moths and pupae.

drone brood in worker cells, multiple eggs per cell, and eggs laid on the sides of cells rather than in the bottom of each cell.

It is difficult to find the worker(s) which is laying eggs, as she is similar in appearance to other workers. Requeening a colony which has laying workers is not usually successful. The bees should be shaken onto the ground in the apiary and their hive removed. The bees will gradually drift to other colonies. Prevention of the development of laying workers in a queenless colony can be temporarily accomplished by adding comb with unsealed brood which has been removed from a normal colony.

QUEENLESSNESS

Signs of a queenless colony include a lack of eggs and young larvae, a lack of brood altogether, and the presence of emergency queen cells on comb faces. In addition, the colony emits a peculiar loud buzzing sound, and the workers run on the combs, often with their wings spread.

Depending on the time of year, a queenless colony may be requeened. This is best done with either a mated queen or a queen cell, but if neither is available the emergency cells can be allowed to develop and hatch. If the colony has dwindled to a non-productive size then it may be united with a queenright colony.

DYSENTERY

Honey bees normally defecate in flight. If they are confined over a long period, such as a cold winter, or are feeding on poor quality feed, the accumulation of indigestible matter in the rectum may cause dysentery and defecation within the hive. Dysentery can cause premature death of adult honey bees, leading to weakening or death of colonies.

Signs of a dysentery problem are fecal spotting of top bars, combs and entrances, especially in the early spring.

Dysentery problems can be prevented by avoiding poor quality feed in the autumn. Only syrup made from refined white sugar

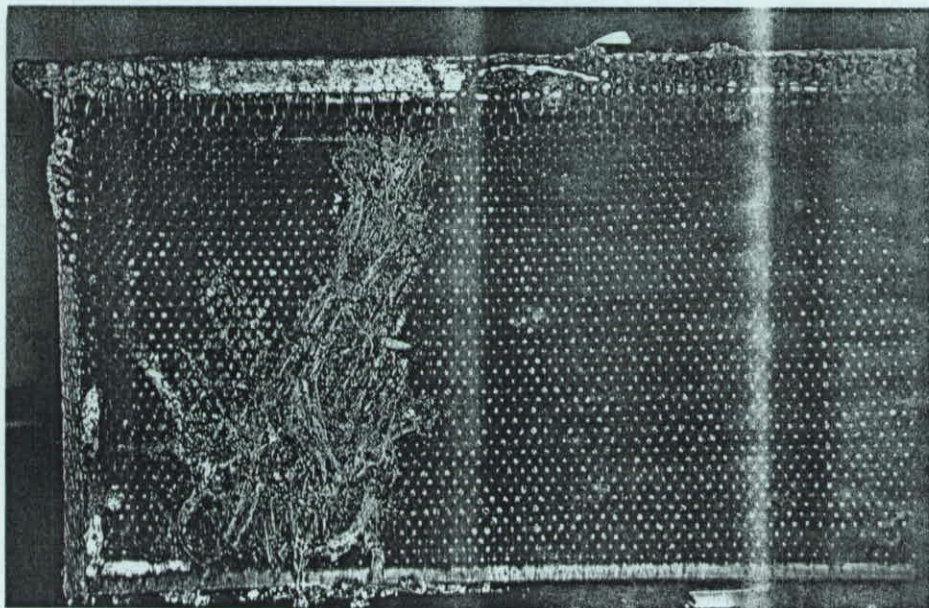


Figure 24 — Brood frame showing light infestation of wax moth.

M.V. Smith

should be fed. Burnt honey, honeydew, molasses, and brown sugar should not be used. In addition, feeding pollen supplement before the bees are flying in the spring or in the fall may do more harm than good if the bees are then confined to the hive for extended periods.

POLLEN AND HONEY SHORTAGES

Shortages of honey and pollen can occur at any time during the year. It is imperative that the beekeeper recognize the symptoms of food shortage so that this problem can be corrected without delay. Proper management should prevent the occurrence of a food shortage; since shortage of pollen and honey will cause curtailment of brood rearing and may cause colony death.

Honey shortages commonly occur in late winter and during nectar dearth periods throughout the beekeeping season. Signs of such shortages include the lack of stored honey in the hive. Symptoms of a starving colony include cessation of brood-rearing, slow-moving and trembling adult bees, and dying and dead bees found head first in cells.

Colonies should have at least four to six frames of honey at all times during the beekeeping season, and far more at the beginning of the winter to avoid colony setback or starvation. Honey stores may be moved within the hive during early spring, or colonies may be fed with syrup when conditions allow. A starving colony should be fed immediately with 2:1 sugar syrup.

Pollen shortages may occur at any time during brood-rearing. Occasional temporary shortages may occur when colonies are confined to their hives by bad weather during spring and early summer. However, a longer dearth of pollen can have serious effects on the colony population, especially when brood-rearing is at its peak and pollen is used as quickly as it comes in. At this time, a cessation of the pollen flow will cause brood starvation.

Signs of a pollen shortage include a floral dearth period, lack of incoming pollen and combs devoid of stored pollen. Symptoms in the colony include: the presence of eggs but no uncapped brood; the presence of dry young larvae which are lacking their complement of worker jelly; a complete lack of brood; and the presence of larvae and pupae on the bottom board and on the ground in front of the hive.

Pollen shortages may be corrected by feeding the colony with a pollen supplement, preferably before the shortage affects the colony.

The beekeeper must become familiar with pollen and nectar plants and their blooming sequence and duration, in order to know when to expect dearth periods and thus be prepared for them.

PESTICIDE POISONING

The non-selective nature of most insecticides makes them a potential hazard to honey bees. It is the beekeeper's responsibility to take an active role in protecting honey bee colonies from the effects of insecticides.

Most bee poisoning occurs through one or more of the following:

- application of insecticide to crops in bloom
- drift of spray over flowering crops or apiaries
- contamination of flowering weeds in target fields
- bees contacting insecticide residues on plants or in water
- bees collecting contaminated pollen and nectar.

Pesticides usually affect honey bees by direct contact, through contact with spray droplets in the air and with sprayed plant surfaces. Pesticides may also enter orally or through the respiratory system. Once inside, the pesticide may affect the digestive tract, so that the adult bee can no longer nourish itself, or the nervous system, so that legs, wings and organ systems no longer function properly. Death may be immediate, in which case bees die in the field, or delayed, so that they die in or near the hive. House bees and brood may also be affected if pesticides are carried back to the hive. Pesticides may also have sublethal effects on the colony, disrupting egg-laying and normal colony functioning, and causing chilling or starvation of brood.

The formulation of the pesticide is a major factor affecting both its immediate and residual toxicity to honey bees. Any formulation which increases the amount of pesticide contacted by honey bees will generally increase its toxicity. Thus dusts and sprays of wettable powders are often more toxic than sprays of liquid formulations such as emulsifiable concentrates. Coarse sprays are more toxic than fine sprays while granular formulations are usually very low in toxicity because the toxic compound is not available for direct contact.

Some insecticides such as chlordane and dichlorvos (Vapona "no-pest strips") have a high affinity for wax. They will be absorbed by exposed beeswax combs, subsequently being released in lethal doses and killing both adult bees and brood. Dichlorvos strips should never be used in honey houses or sheds where combs are stored. Use of any insecticide to control ants under hives in an apiary should be done with caution; the bottom board must be solid so that no pesticide can enter the hive.

Many pesticides are minimally hazardous to honey bees if applied in the evening after foraging has ceased, or in some cases in the

early morning before the bees are flying. These insecticides have a short residual period, and by the time the foragers reach the treated areas the chemical has broken down to a non-hazardous level. Some insecticides, however, have a longer residual period and will be toxic to honey bees for several days. Unusually low temperatures during and following application of some chemicals, such as malathion, causes them to remain toxic for a much longer period than normal. High evening temperatures will extend the foraging period and should be taken into account when insecticides are applied.

Symptoms of insecticide poisoning vary depending on the type of pesticide used. Large numbers of dead bees in front of hives is typical, as is sudden and severe dwindling of the adult population. Dying bees may appear paralyzed, unable to fly or walk without tumbling, wings may be unhooked or held away from the body, honey sac contents may be regurgitated, causing bees to look wet, the abdomen may be swollen and the bees may be very aggressive. Abnormal brood patterns may be seen or the queen may stop egg laying altogether, and house bees may be seen building supersedure cells. Chilled and dead brood may also be seen in combs or in front of the hive. Severity of effect ranges from a minimal loss of the forager population, to complete forager loss or colony death.

Prevention of insecticide kills begins with beekeeper-grower communication, regarding apiary locations, potential insect pest problems and solutions which are satisfactory to both grower and beekeeper. Often there are alternate insecticides and formulations which are just as effective against the target organism while being much less hazardous to bees. Spray timing is also important, as is advance warning to give the beekeeper time to move hives or confine colonies.

Should spraying be imminent and movement of colonies impractical, bees may be confined to the hive to minimize contact with the pesticide. Care must be taken that plenty of water is available for cooling. This should be done by supplying a super of water-filled combs to the colony or, for a short confinement, by covering the hive with wet burlap and keeping it wet. For prolonged confinement the entrance and lid should be screened for ventilation, and the hive covered with a tent of burlap to prevent flight either in or out. Length of confinement will depend on the residual toxicity of the pesticide in use.

Pesticide kills should be reported to the provincial apiculture office, and most provincial offices have bee poisoning report forms outlining the necessary information. If bee and foliage samples are collected for analysis they must be kept frozen, as pesticide residues break down very quickly. These reports are useful in determining the severity of the overall situation and ways in which similar situations can be avoided.

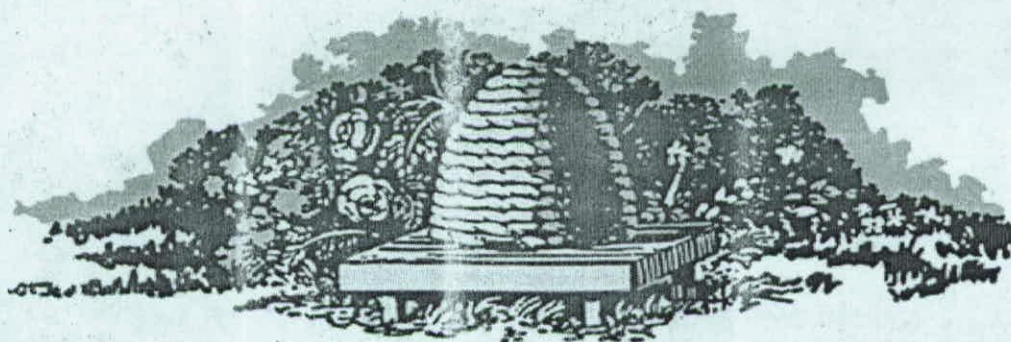
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	1000-2400	ea.	0.73
	2500-4900	ea.	0.72
	5000-9900	ea.	0.69
Standard Frames (Jones)	10's	ea.	0.90
	100-900	ea.	0.75
Lots of 100	1000-2400	ea.	0.74
	2500-4900	ea.	0.73
	5000-9900	ea.	0.70
Lewis 3/4 Depth Frames (6 1/4")	NEW!	ea.	0.68
Shallow Frames & 3/4 Depth (Jones)	10's	ea.	1.05
	50's	ea.	1.00
	100+	ea.	0.82
Alliance Standard Frames	100-400	ea.	0.88
(Radiata Pine - New Zealand)	500-1900	ea.	0.78
Boxes of 100	2000+	ea.	0.74
Hive Bottoms	1-4	ea.	8.30
	5+	ea.	7.80
Hive Bottoms-Wax Dipped	1-4	ea.	9.30
	5+	ea.	8.80
Lewis Sloped & Dipped Bottom Board	NEW!	ea.	9.80
Metal Frame Savers	1-99	ea.	0.42
Lots of 100	100+	ea.	0.35
Plastic Frame Savers	1-99	ea.	0.35
Lots of 100	100+	ea.	0.29
Frame Spacer Rests	1-99	ea.	0.44
	100-999	ea.	0.39
	1000+	ea.	0.34
Metal Rests	1-99	ea.	0.39
	100-999	ea.	0.33
	1000+	ea.	0.28
Wiring Jig		ea.	55.00
Frame Nailer		ea.	16.75
King Size Wintering Case		ea.	Inquire
Top & Side Winter Wrap (Inland)		ea.	55.00
Queen Excluders (Metal)	1-49	ea.	8.55
	50-99	ea.	8.25
	100+	ea.	7.75
Plastic Queen Excluders		ea.	6.95

Queen & Drone Trap		ea.	6.95
Wire Screening 48" rolls			
5x5 Screen/Linear Foot	1-99	ea.	2.75
	100+	ea.	2.50
6x6 Screen/Linear Foot	1-99	ea.	2.75
	100+	ea.	2.50
8x8 Screen/Linear Foot	1-99	ea.	3.00
	100+	ea.	2.80

QUEEN REARING			
Chinese Grafting Tool		ea.	5.95
Manual Grafting Tool		ea.	17.50
Automatic Grafting Tool		ea.	45.00
Extra Tongues		ea.	3.95
Queen Marking Pen		ea.	10.95
EZI Larvae Transfer System		ea.	249.00
Jenter Queen Rearing kits		ea.	149.00
Yellow Cup Holder		ea.	0.40
Small Cell Plugs/100		ea.	22.95
Large Cell Plugs/100		ea.	22.95
Queen Cell Protector	1-99	ea.	0.12
	100+	ea.	0.10
JZ/BZ Plastic Queen Cells	1-99	ea.	0.11
	100+	ea.	0.09
	1000+	ea.	0.08
JZ/BZ Battery Box		ea.	3.15
JZ/BZ Shipping/Banking Bar		ea.	2.75
Plastic Queen Cage	1-99	ea.	0.25
	100+	ea.	0.22
	1000+	ea.	0.19
Carricell Queen Cell Incubator (70)		ea.	Inquire
Carricell Queen Cell Incubator (144)		ea.	545.00
Mini-Mating Nuc (Styrofoam)		ea.	23.00
Cardboard Nuc Box	1-49	ea.	3.95
(Holds 4 Standard Frames)	50+	ea.	3.40

FOUNDATION			
WIRED 8 1/2"	12 1/2 -20	ea.	5.95
(PRICED PER POUND)	21-99	ea.	5.65
	100-999	ea.	5.35
	1000+ lb.	ea.	5.20
Wired 5 3/8"	1-24 lb.	ea.	6.20
	25	ea.	5.85
Cut Comb (4" & 5 3/8")	Per lb.	ea.	7.35
Drone Comb Foundation	Per sheet	ea.	1.60
Permadent Plastic Foundation	1-99	ea.	1.15
(8 1/2" x 16 3/4" Waxed)	100-999	ea.	0.88
	1000-4999	ea.	0.85
	5000+	ea.	0.82
Permadent Plastic Foundation	1-149	ea.	1.03
(5 5/8" x 16 3/4" Waxed)	150+	ea.	0.85
Pierco 1-Pce Frame & Foundation	1-51	ea.	2.60
(Standard Size)	52-519	ea.	2.20
52 Frames Per Box	520-1039	ea.	2.14
Pierco 1-Pce Frame & Foundation	1-71	ea.	2.50
(Shallow Size)	72-359	ea.	2.05
	360+	ea.	1.95
Pierco Snap-In Foundation (Waxed)	1-99	ea.	1.35
(8 3/8" x 16 3/4")	100-999	ea.	1.10
	1000-2999	ea.	1.05
Pierco 1-Pce. Drone Foundation (Std.)		ea.	2.60
Bee Basics Foundation (Unwaxed)	Per sheet	ea.	Inquire
Boxes of 100			

**ADDITIONAL VOLUME PRICING IS AVAILABLE
ON PLASTIC FRAMES & FOUNDATION.
CALL YOUR NEAREST BRANCH FOR DETAILS.**

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BEEKEEPING BOOKS & COOKBOOKS

Beekeeping in Western Canada	ea.	27.50
Contemporary Queen Rearing	ea.	17.95
First Lessons in Beekeeping	ea.	7.25
Bees, Their Chemical Senses	ea.	10.25
ABC & XYZ of Bee Culture	ea.	59.95
The Hive and the Honey Bee	ea.	69.95
Super Formulas	ea.	29.95
Wick, Wax, & Talk	ea.	5.95
Coloring Books	ea.	0.55
How to Keep Bees & Sell Honey	ea.	11.50
Honey Bee Brood Diseases	ea.	15.85
Propolis Power Plus	ea.	7.25
Bee Pollen, Royal Jelly, Propolis & Honey	ea.	7.95
Complete Wax Book	ea.	29.95
Honey Kitchen	ea.	18.95
Canadian Honey Recipe Book	ea.	1.50
Honey of a Cookbook Vol. III	ea.	11.95
Honey Cookbook - Nature's Golden Treasure	ea.	23.50
The Story of Honey	ea.	0.50

NOVELTY ITEMS

A Year in the Bee Yard (Poster)	ea.	19.95
Bee Lifecycle (Poster)	ea.	13.95
The Beekeeper's Year (Poster)	ea.	13.95
Beekeeping Study Prints	ea.	48.95
Pottery Honey Pot	ea.	16.95
Observation Hive - With Glass	ea.	69.95
C.H.C. Wooden Sign (16" x 48")	ea.	29.95
Honey For Sale (Sign)	ea.	2.50
C.H.C. Bumper Sticker	ea.	1.00
Bee Keeper Greeting Cards	Pack of 5	ea. 3.95
Chocolate Bees	ea.	0.60
Honey Stix Assorted Flavors	ea.	0.25
Honey Candies (Six Flavors)	Bags of 100	ea. 0.20
	Per lb.	ea. 6.00

BEEKEEPING APPAREL

Excelsior Veil	ea.	22.50
Alexander Veil	ea.	22.50
Zippered Veil	ea.	23.50
Dadant Folding Wire Veil	ea.	22.50
Tulle Veil	ea.	16.95
Mann Lake Folding Polyester Veil	ea.	27.50
Mann Lake Square Wire Veil With String	ea.	22.00
Deluxe Mosquito Head Net	ea.	7.50
Woven Helmet	ea.	15.95
Plastic Helmet	ea.	11.95
Hair Net	1-99	ea. 0.29
	100+	ea. 0.25
Beesuit (Regular & Tall)	ea.	39.85
TLS Beesuit With Hood (Regular)	ea.	120.00
TLS Beesuit With Hood (XL & XXL)	ea.	130.00
Sheriff S-28A Countryman Smock	ea.	118.50
Sheriff S-21 Veil	ea.	87.50
Sheriff S-36 Apiarist Suit (S-XL)	ea.	199.00
Sheriff S-41 Honey Rustler (S-XL)	ea.	161.95
Drybrow	ea.	0.85
Neoprene Apron	ea.	19.95
Cloth Apron	ea.	5.25
Cowhide Gloves	1-5	ea. 19.95
(Sizes 7-12)	6+	ea. 17.95
Goatskin Gloves	1-5	ea. 23.25
(Sizes 7-12)	6+	ea. 21.25
Ventilated Gloves (S,M,L,XL)	ea.	32.00
Leather Glove (Mann Lake)	M, L & XL	ea. 18.50
Economy Bee Gloves	SM, M, & L	ea. 18.50

HONEY CONTAINERS

500g Containers & Lids	ea.	0.59
Lots of 250	ea.	0.48
Lots of 2500	ea.	0.45
1kg Containers & Lids	ea.	0.77
Lots of 250	ea.	0.64
Lots of 2500	ea.	0.59
2kg Containers & Lids	ea.	1.60
3kg & 2 Litre Pails & Lids	ea.	1.65
Lots of 100	ea.	1.44
Lots of 1000	ea.	1.33
7kg Pails & Lids	ea.	2.77
Lots of 50	ea.	2.40
Lots of 500	ea.	2.24
15kg Pails & Lids	1-191	ea. 3.60
	192+	ea. 3.35
5 Gallon Pails & Lids	ea.	5.65
Lots of 96	ea.	5.22
4L Ice Cream Pails & Lids	1-119	ea. 1.39
	120+	ea. 1.17
4L Heavy Duty Pails & Lids	1-64	ea. 2.55
	65+	ea. 2.24

HONEY CONTAINERS (BC RESIDENTS)

BC Residents (Honey Containers) Prices for pickup in Burnaby, B.C. PLEASE NOTE: Case and pallet lots only. Orders to placed in Spruce Grove 2-3 days prior to pickup.

2 Litre Pails & Lids	Lots of 100	ea.	1.49
3kg Pails & Lids	Lots of 100	ea.	1.49
7kg Pail & Lids	Lots of 50	ea.	2.45
15 kg Pail & Lids	Lots of 192	ea.	3.50
30Kg Pails & Lids	Lots of 96	ea.	5.50

500g Reshipping Cartons	1-99	ea.	1.05
	100+	ea.	0.95
1kg Reshipping Cartons	1-99	ea.	1.05
	100+	ea.	0.95
500g Plastic Jars & Lids	Case of 12	ea.	6.95
1kg Plastic Jars & Lids	Case of 12	ea.	7.95
90ml Sample Bottles	1-99	ea.	0.35
	100+	ea.	0.30
500g Glass Jars & Lids	1-19	ea.	7.95
(Case of 12)	20+	ea.	7.50
390ml Dominion & Grimm c/lid (Alberta Only)	12/case	ea.	11.95
780ml Dominion & Grimm c/lid (Alberta Only)	12/case	ea.	15.75
45ml Oval/hex Glass jar & lids	24/case	ex	16.35
190ml Oval/hex Glass jar & lids	12/case	ea.	10.75
9oz oval/hex jar w/lid	12/case	ea.	11.25
45ml Hex Glass Jars & Lids	24/case	ea.	7.75
190ml Hex Glass Jars & Lids	12/case	ea.	7.50
4oz. Salt & Pepper Jars & Lids	1-23	ea.	0.95
	24+	ea.	0.85
375g & 12oz Squeeze Bears	1-99	ea.	0.55
And Lids	100-399	ea.	0.50
	400+	ea.	0.46
2lb Squeeze Bears & Lids	1-99	ea.	1.30
	100+	ea.	1.15
8 oz. & 12 oz. Bee Maid	1-99	ea.	0.50
Clear Plastic Bears With Lids	100-399	ea.	0.43
	400+	ea.	0.39
265ML Glass Bears With Lids	Case of 12	ea.	7.50

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BEEKEEPING TOOLS

Frame Grips	ea.	16.75
Spur Embedder	ea.	16.50
Frame Cleaner Tool	ea.	7.25
Eyelet Punch	ea.	1.25
Electric Wire Embedder	ea.	24.95
8" Hive Tool	ea.	5.60
10" Hive Tool	ea.	5.95
10" Heavy Duty Hive Tool	ea.	8.50
11" Maxant Hive Tool	ea.	16.85
Hive Scraper	ea.	6.65
Bridge Comb Hive Tool	ea.	10.95
9-Frame Spacing Tool	ea.	24.95
Lid Remover	ea.	6.75
4" x 7" N/S S/S Smoker	ea.	45.75
4" x 7" W/S S/S Smoker	ea.	49.95
4" x 10" W/S S/S Smoker	ea.	54.50
Bee Basics 7" Smoker W/S S/S	ea.	27.50
Bee Basics 10" Smoker W/S S/S	ea.	32.50
Smoker Bellows	ea.	16.50
Refractometer (Ancansco) Metal	ea.	225.00
Bee Brush	ea.	3.95
Parmak 6v Solar Bear Fencer	ea.	258.00
Parmak 12v Battery Fencer	ea.	128.95
Parmak 6v Gel Battery	ea.	45.00
Saco Solar Shock SS-440 Bear Fencer	ea.	188.00
Saco Battery Only	ea.	26.95
Critter Gitter	ea.	112.00
50m Flexinet Fencing	1	ea. 161.00
(Alberta Only)	2+	ea. 156.00

COMB HONEY PRODUCTION EQUIPMENT

BEE-O-PAC Comb Honey Frames	1-23	ea.	8.95
(Plastic Frame for Comb Honey	24-119	ea.	7.95
Production-16 Units/Frame)	120-263	ea.	7.65
<i>Sold in boxes of 24</i>	264-599	ea.	7.35
	600+	ea.	7.05
Ross Round Frame	1-99	ea.	4.50
Lots of	40	ea.	4.25
Ross Round Ring Set	1-199	ea.	0.40
Lots of 200		ea.	0.38
Ross Round Labels		ea.	0.20
Ross Round/Cover Set	1-199	ea.	0.85
Lots of 200		ea.	0.75
Ross Round Supers		ea.	12.40
Aluminum Trays & Lids	1-99	ea.	0.50
	100-499	ea.	0.45
	500+	ea.	0.40

EXTRACTING EQUIPMENT

Quebec Style Bee Escape Board	NEW!	ea.	10.75
Conical Bee Escape Boards		ea.	19.50
Conical Plastic Bee Escapes Only		ea.	0.65
Bee Escapes Only		ea.	2.25
Regular Black Fume Board		ea.	12.50
Solar Fume Board	1-5	ea.	19.50
	6+	ea.	18.25
Propolis Collecting Mats		ea.	10.50
650lb Storage Tank		ea.	74.95
70lb Plastic Tank, Lid & Tap		ea.	49.95
180lb. Plastic Tank, Lid & Tap		ea.	79.00
Nevastane Food Grease		ea.	7.25

EXTRACTING EQUIPMENT (CONTINUED)

8" Honey Strainer		ea.	7.95
10" Honey Strainer		ea.	18.95
Nylon Straining Cloth	Per yard	ea.	8.15
3000w Immersion Heater	240 Volt	ea.	105.95
5000w Immersion Heater	240 Volt	ea.	105.95
Elements Only (for Imm.Htr.)		ea.	19.95
1500w Immersion Heater	110 Volt	ea.	105.95
Viking 1 1/2" Honey Pump	(Winnipeg Only)	ea.	670.00
1" Jabsco Honey Pump		ea.	495.00
1 1/4" Jabsco Honey Pump		ea.	755.00
1" Repair Kit		ea.	129.00
1 1/4" Repair Kit		ea.	175.00
1" Impeller Only		ea.	62.00
1 1/4" Impeller Only		ea.	103.95
Grundfos Water Circulating Pump		ea.	139.50
Echo Bee Blower	(Winnipeg Only)	ea.	658.95
PB-603 58.2cc			
Dadant Bee Blower		ea.	625.00
Extra Blower Hose		ea.	39.00
Extra Nozzle		ea.	5.95
Heavy Duty Hose (2 1/2" dia.)	Per foot	ea.	3.95
Hive Lifter (Bentley)		ea.	365.00
Barrel Cart (Bentley)		ea.	265.00
Super Cart (Bentley)		ea.	245.00
Barrel Grabber (Bentley)		ea.	600.00
Inner Tube (2.50 x 3)		ea.	9.25
Inner Tube (4 x 4)		ea.	6.95
Tire (2.5 x 3)		ea.	19.95
Tire (4 x 4)		ea.	12.85
Fluorescent Tube Guard 4'	1-11	ea.	4.95
	12+	ea.	4.50
Fluorescent Tube Guard 8'	1-11	ea.	7.60
	12+	ea.	7.20
Sercote 7500 Bulbs	100 Watt	ea.	5.95
Sercote 7500 Bulbs	150 Watt	ea.	6.95
Sercote 7500 Bulbs	200 Watt	ea.	8.40
Capping Scratcher		ea.	9.25
Heavy Duty Capping Scratcher		ea.	14.95
Capping Scratcher (with offset teeth)		ea.	15.95
Speed King Electric Knife		ea.	137.80
2" Cappings Punch		ea.	39.50
4 1/4" Cappings Punch		ea.	54.00
5 1/2" Cappings Punch		ea.	64.50
Electric Uncapping Plane		ea.	78.75
Element / Electric Uncapping Plane	225w	ea.	43.95
Element / Electric Uncapping Plane	200w	ea.	43.95
Extra Blades / Uncapping Plane		ea.	6.50
Steam Hose 3/4"	Per foot	ea.	3.55
1 1/2" Honey Gate (Plastic)		ea.	25.95
2" Honey Gate (Plastic)		ea.	18.65
1 1/2" Plastic Perfection Gate		ea.	43.95
2" Plastic Perfection Gate		ea.	56.50
1 1/2" Honey Gate	Metal	ea.	31.95
2" Honey Gate	Metal	ea.	36.50
3" Honey Gate	Metal	ea.	94.00
4" Honey Gate	Metal	ea.	225.00
Barrel Liners	1-99	ea.	1.50
	100+	ea.	1.25
Barrel Gaskets	1-49	ea.	1.00
	50+	ea.	0.95
4" Barrel Bolt w/nut	1-99	ea.	0.65
	100+	ea.	0.50

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MEDICATION

0.5g Fumagilin B	ea.	15.50
2.0g Fumagilin B	ea.	36.00
9.5g Fumagilin B	1-11	ea. 121.00
	12-59	ea. 119.00
	60+	ea. 116.00
Oxysol 400g (Pink)	1-9	ea. 6.75
(125 Treatments)	10-24	ea. 6.25
	25+	ea. 5.75
Oxysol 10kg (Pink)	1-3	ea. 144.00
(3050 Treatments)	4+	ea. 139.00
454g Oxytet 25	1-11	ea. 9.00
(125 Treatments)	12+	ea. 8.50
10kg Oxytet 25	1-3	ea. 103.00
(2750 Treatments)	4+	ea. 100.00
454g Foul Brood Mix	ea.	5.00
10kg Foul Brood Mix	ea.	52.50

**DUE TO PRODUCTION ANIMAL MEDICINE REGULATIONS
MEDICATIONS SOLD BY THE ALBERTA BRANCH MUST
BE PICKED UP IF SOLD TO ALBERTA PRODUCERS. PLEASE
CONTACT THE BEE SUPPLY DEPARTMENT FOR INFORMATION**

MITE CONTROLS

Apistan Anti-Varroa Mite Strips	1-9	ea.	211.00
(priced per box of 100)	10+	ea.	207.00
Apistan Anti-Varroa Mite Strips	Boxes of 10	ea.	25.70
Check Mite	Box of 10	ea.	Inquire
(Apistan-Resistant Mite Treatment)	Box of 100	ea.	Inquire
Formic Acid - 65%	4L	ea.	32.50
Formic Acid - 65%	20L	ea.	113.00
Mite Wipes for Formic Acid	100's	ea.	0.10
	500's	ea.	0.07
	1000's	ea.	0.06
Mite Gone Pads	1-239	ea.	1.40
	240+	ea.	1.15
Menthol Boards (Winnipeg only)	100	ea.	1.60
(20 grams)	500	ea.	1.55
	1000+	ea.	1.50
Menthol (Crystals)	Per pound	ea.	22.75
	55 lb. box	ea.	995.50

VARROA MITE CONTROL METHODS

Varroa Sticky Board	ea.	3.95
Screen for Sticky Board	ea.	3.95
Varroa-Nator Screen Insert	ea.	12.95
(Works in Conjunction with Existing Bottom Board)		
IPM Waxed Bottom Board	ea.	18.95
(Integrated Pest Management - Varroa Control)		
Lewis Screened Bottom Board	NEW!	ea. 20.50
(Waxed, with Tray and Screen)		

CHEMICALS & PEST CONTROL

Bee Repel	500ml	ea.	10.95
	4L	ea.	66.50
	20L	ea.	252.50
Bee Go	Pint	ea.	18.95
	U.S. Gallon	ea.	82.95
Pink Pusycat Ratoxin - 50g bags	1-9	ea.	0.76
	10-24	ea.	0.71
	25-49	ea.	0.66
	50-199	ea.	0.61
	200+	ea.	0.56

CHEMICALS & PEST CONTROL (CONTINUED)

Bee Boost (Queen Mandibular Pheromone)	Pk of 10	ea.	29.50
	Pk of 50	ea.	130.00
Swarm Catch with Nasonov	Pk of 5	ea.	19.50
Sting Kill Swabs		ea.	11.25
Ramik Green Bars (340g)		ea.	4.05
Liquid Rozol (Winnipeg only)	250ml	ea.	9.95
Bert "Ram" Skunk Trap	(9" x 9" x 24")	ea.	62.00
"Have-A-Hart" Live Trap	(7" x 7" x 24")	ea.	48.50

ASSEMBLING EQUIPMENT

Frame Wire 1lb		ea.	11.95
Frame Wire 5lb		ea.	22.75
Brass Eyelets- Lots of 1000	Per 1000	ea.	7.95
3/4" & 5/8" Ringed Nails	1-9	ea.	7.55
Per pound...	10-54	ea.	6.95
	55+	ea.	6.50
5/8" x 18 Nails	1-9	ea.	8.95
Per pound...	10-54	ea.	8.40
	55+	ea.	7.75
3/4" x 18 Nails	1-9	ea.	7.95
Per pound...	10-54	ea.	7.50
	55+	ea.	6.95
7/8" x 18 Nails	1-9	ea.	7.80
Per pound...	10-54	ea.	7.25
	55+	ea.	6.75
1" x 18 Nails	1-9	ea.	6.75
Per pound...	10-54	ea.	6.25
	55+	ea.	5.75
1 1/4" x 17 Nails	1-9	ea.	5.95
Per pound...	10-54	ea.	5.60
	55+	ea.	5.25
1 1/2" x 16 Nails	1-9	ea.	5.95
Per pound...	10-54	ea.	5.60
	55+	ea.	5.25
2 1/2" x 12 Nails	1-9	ea.	3.95
Per pound...	10-54	ea.	3.80
	55+	ea.	3.50
3/8" Rope (per foot)	1-629	ea.	0.10
	630+	ea.	0.09
Crating Staples	Per pound	ea.	6.95
Senco Air Stapler Model #SKS-G5562		ea.	495.00
Senco Air Stapler Model SQS		ea.	775.00

(Staple prices per box of 5000)

L10 Senco Staples 3/8" BAB	ea.	17.50
L11 Senco Staples 3/4" BRB	ea.	16.75
L12 Senco Staples 7/8" BAB	ea.	20.95
L13 Senco Staples 1" BRB	ea.	19.95
L14 Senco Staples 1 1/8" BRB	ea.	22.35
L15 Senco Staples 1 1/4" BRB	ea.	24.50
L17 Senco Staples 1 1/2" BAB	6000/Box ea.	31.80
Q21 Senco Staples 2" BRB	ea.	45.75
Q23 Senco Staples 2 1/4" BRB	ea.	55.30
Q25 Senco Staples 2 1/2" BRB	ea.	54.35

(Haubold Staples: Alberta Only)

1" Staples (Haubold)	Per 5000	ea.	19.95
1 1/4" Staples (Haubold)	Per 5000	ea.	24.50
3/4" Staples (Haubold)	Per 5000	ea.	16.75
1 1/2" Staples (Haubold)	Per 5000	ea.	28.00

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FEEDING EQUIPMENT

Boardman Feeder With Cap		ea.	3.95
Metal Cap Only		ea.	0.20
Plastic Frame Feeder		ea.	5.25
Hive Top Feeder	1-9	ea.	20.50
(5 1/2" Deep, Wax Dipped)	10-49	ea.	19.20
2.5 Gallon Feeder Pail	1-191	ea.	4.95
With Gasket Lid (No Screen)	192+	ea.	4.65
Pollen Supplement Feeder		ea.	38.00
2" Plastic Plug	WW-21	ea.	0.24
1 1/2" Plastic Plug	WW-17	ea.	0.23
2 1/2" Plastic Plug	WW-250	ea.	0.66
11/4" Plastic Plug	WW-15	ea.	0.17
1" Plastic Plug	WF-22	ea.	0.13
Stainless Steel Disc (40 Mesh Screen)	2 3/4"	ea.	0.45

FEED

40kg Sugar		ea.	Inquire
40kg Icing Sugar		ea.	Inquire
1kg Icing Sugar		ea.	Inquire
Liquid Bulk Sucrose		ea.	Inquire
Corn Syrup #55 Fructose (ADM)		ea.	Inquire

**We can arrange your sugar & fructose requirements:
Dry or liquid in small quantities or trailer loads. Call
your nearest Bee Supply outlet for pricing.**

Soybean Flour (Per LB.) 55lb bag	1-54	ea.	0.65
NOT EXPELLER (Protein 51%)	55+	ea.	0.45
Brewers Yeast (Per LB.) 50lb bag	1-49	ea.	1.50
Lots of	50	ea.	1.15
Lots of	250	ea.	1.05
All-purpose vegetable shortening	20 kg.	ea.	42.00
Natural Bee Pollen	Per pound	ea.	8.50
(1lb, 3lb, 7lb, & 15lb Pails)			
Bee Pro (Pollen Supplement)	1-49 lbs.	ea.	1.30
(50lb bag)	50-249 lbs.	ea.	0.83
	250+ lbs.	ea.	0.81
Bee Pro Patties (1 lb.)	1-39	ea.	2.00
	40-399	ea.	1.70
	400+	ea.	1.50
Global Patties (1lb.)	1-49	ea.	1.45
(Pollen Supplement)	50 +	ea.	1.10
Bee Pol (50 lb. Bags)	1-49 lbs.	ea.	1.30
(Pollen Supplement)	50+lbs.	ea.	0.90

POLYSTYRENE BEE MAX HIVES

Deep Hive Body	1-9	ea.	23.00
(9 1/2" Deep)	10-49	ea.	19.50
	50 +	ea.	16.40
Medium Hive Body	1-9	ea.	16.40
(6 3/4" Deep)	10-49	ea.	14.85
	50 +	ea.	13.90
Bottom Boards	1-9	ea.	16.80
(With built-in Varroa screen)	10-49	ea.	14.45
	50 +	ea.	13.30
Hive Covers	1-9	ea.	20.20
	10-49	ea.	19.50
	50 +	ea.	18.65

EDUCATIONAL VIDEOS/RENTALS

Early Spring Management	Per week	ea.	7.50
Spring Management #1	Per week	ea.	7.50
Spring Management #2	Per week	ea.	7.50
Honey Management	Per week	ea.	7.50
Successful Queen Rearing	Per week	ea.	7.50
Honey Bees & Beekeeping	Per week	ea.	7.50
Introduction to Beekeeping	Per week	ea.	7.50
Candle Making for Everyone	Per week	ea.	7.50
The Magic of Mead	Per week	ea.	7.50

BOOK RENTALS

Bumblebees for Fun & Profit	Per week	ea.	5.00
Health & the Honeybee	Per week	ea.	5.00
American Bee Journal	Per month	ea.	2.00
(Back Issues)			

CANDLE MAKING SUPPLIES

Beeswax Craft Sheets Assorted Colors			
Honeycomb Pattern Sheets		ea.	1.25
Flat Thin Sheets		ea.	1.35
Decorative Sheets (Floral or Basketweave)		ea.	1.69
Corrugated Pattern Sheets		ea.	1.50
Woven Pattern Sheets		ea.	1.50
Metallic Honeycomb Sheets		ea.	1.35
Wicking (by the meter)	1-99	ea.	0.25
	100+	ea.	0.15
Candlemaking Kit- Cedar Container		ea.	19.95
Candlemaking Kit - Cardboard Container		ea.	13.95

**PLEASE INQUIRE ON OUR IN-STORE
SPECIALS. WE CARRY A FULL LINE
OF DURABLE MOLDS AND
CANDLEMAKING ACCESSORIES**

BEE MAID MERCHANDISE

Bee Maid Baseball Cap	ea.	7.95
Bee Maid Sew-On Emblem	ea.	0.25
Bee Maid Ceramic Mug	ea.	4.95
Bee Maid Rain Gauge	ea.	5.50
Bee Maid T-shirts (Adult sizes)	ea.	9.95
Bee Maid T-shirts (Children's sizes)	ea.	8.95
Bee Maid Stainless Steel Travel Mug	ea.	12.95
Bee Maid Stress Ball	ea.	2.95
Bee Maid Pen	ea.	1.25
Bee Maid Deluxe Pen	ea.	2.75
Bee Maid Key Chain	ea.	2.25
Bee Maid Tote Bag	ea.	3.50
Bee Maid Mouse Pads	ea.	3.50
Bee Maid Golf Shirt	ea.	38.95
Bee Maid Jacket	ea.	68.95
Bee Maid Deluxe Cap	ea.	9.95
Bee Maid Lapel Pin	ea.	1.95

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

WE WILL MATCH ALL COMPETITOR REGULAR PRICING ON IDENTICAL ITEMS

EXTRACTING EQUIPMENT**AMERICAN FUNDS****COWEN MANUFACTURING****(CRATING CHARGES EXTRA)**

Silver Queen Uncapper with Stand	4145.00
Jumbo Uncapper with Stand	5798.00
28 Frame Extracting System (Includes extractor, uncapper, spinner, sump, and pump)	13,000.00
60 Frame Extractor	8296.00
60 Frame Extractor (Air SS)	12,659.00
120 Frame Extractor (All Air Features)	23,995.00
5ft. SS Auger	2015.00
De-Boxer	1515.00
Wax Spinner	6195.00

DADANT

2 Frame Junior Bench with Hand Drive	235.00
4 Frame Little Wonder with Hand Drive	311.00
4 Frame Little Wonder with Variable Speed Advance	535.00
6 Frame Radial Extractor with Variable Speed Advance	1060.00
20 Frame Radial Extractor with Variable Speed Advance	1345.00
60 Frame Radial Extractor with Automatic Speed Advance (Smooth Reel)	4660.00
84 Frame Extractor "Honey Master" (holds 96-120 frames)	5520.00
Electromelt Wax Melter	3900.00

MAXANT INDUSTRIES, INC.

	Manual Speed Advance	Electro Var.-Speed
10 Frame Extractor	990.00	N/A
20 Frame Extractor	1870.00	2275.00
30 Frame Extractor	2175.00	2875.00
50 Frame Extractor	2895.00	3500.00
70 Frame Extractor	3250.00	3895.00

THE WALTER T. KELLEY CO. INC.

33 Frame Extractor	1775.00
72 Frame Extractor	3200.00
#382 Water-Jacketed Sump (15" x 15 1/2" x 35")	495.00
382L Water-Jacketed Sump (15" x 15 1/2" x 47")	595.00

WESTERN WAX WORKS

Wax Screw Press (Style-Amyotte)	Clearance	Inquire
Wax Screw Press (Style-Alloy)	Clearance	Inquire

COOK AND BEALS

Separator	8400.00
Progressive Cavity Pump	2710.00
Wax Melter	4850.00
1996 Uncapper	8890.00
Auto-Load Extractor	21,000.00
Deboxer	1330.00
Heat Unit	2625.00
Heat System	2075.00

**PRICES FOR ALL EQUIPMENT ARE IN AMERICAN FUNDS,
AND DO NOT INCLUDE FREIGHT AND BROKERAGE.**

**THIS IS A PARTIAL LIST OF EQUIPMENT AVAILABLE FROM THE LISTED
MANUFACTURERS. PLEASE CALL SHOULD YOU REQUIRE FURTHER INFORMATION.**

**PRICES SUBJECT TO CHANGE WITHOUT NOTICE
WE WILL MATCH ALL COMPETITOR REGULAR PRICING ON IDENTICAL ITEMS**

OUR TERMS

PLEASE ORDER EARLY TO ALLOW TIME FOR SHIPPING & HANDLING

- GOODS & PROVINCIAL SALES TAX** - Products stated in our price lists and catalogues do not include G.S.T./P.S.T. Products that are applicable will show the G.S.T./P.S.T. separately on your invoice.
- PAYMENT** - Remit full payment by postal note, money order or cheque
Overpayments will be refunded immediately.
Interac, Visa and Mastercard also accepted.
- PRICE CHANGES** - All prices are F.O.B. branch ordered from. Prices subject to change without notice. Due to material shortages, we cannot guarantee availability of all items.
- SHIPPING INSTRUCTIONS**
- BUS** - Any orders requested to go via bus must enclose payment with order. Bus does not take C.O.D. shipments. Freight charges go collect. Shipments move at owner's risk.
- TRUCK** - Freight charges go collect. Enclose payment to avoid extra C.O.D. charges. On all truck shipments you have to pay a minimum charge. Same freight charge is usually applied up to 100 lbs. Consult your truck agent on rates (his advice is free). Try and make truck shipments as heavy as possible-small towns; pool your orders together. Shipments move at owner's risk.
- MAIL** - Payment of order plus sufficient money for postage enclosed with order. Any excess money will be refunded. Do not enclose stamps. No payment enclosed with order will move C.O.D. Shipments move at owner's risk. Post Office guarantees delivery-not condition of parcel. If shipment is to be insured, specify this along with sufficient funds.
- UNITED PARCEL SERV. CANPAR, DHL** - Payment of order plus sufficient money for shipping must be enclosed with order. Any excess money will be refunded. No payment enclosed with order will move C.O.D. Please call our Bee Supply Office for shipping charges on a per order basis. Shipments move at Owner's risk.
- FILLING OUT YOUR BEE SUPPLY ORDER FORM** - Print clearly, name, address(s), phone number. If using company name, please enclose owner name also. Please be certain to indicate your choice of payment and shipping. Your giving us **Complete** information helps us serve you quicker and better.
- RETURN** - All returns must be accompanied with original invoice. No returns accepted after 60 days from Date of order.
- Subject to 10% restocking charge when supplied as ordered. When you order the wrong item and return the merchandise to us, this merchandise has to be repacked, the cost of the carton time, etc. involved.
- CLAIMS AND SHORTAGES** - In lieu of expiry dates, no returns will be accepted on medication purchases.
- Due to transport regulations, all claims for shortages or damages must be made within five days.
- DEFECTIVE GOODS** - Must be returned within 30 days to receive a credit. We cannot accept responsibility for improper use or misuse.
- N.S.F. CHEQUES** - \$25.00 SERVICE CHARGE ON ALL N.S.F. CHEQUES.
- WE GUARANTEE** - A guarantee is only as good as the company that stands behind it. A company that will be here tomorrow to answer for the sales they made today. We have enjoyed many years in serving the beekeeping industry and look forward to the many years ahead.

- Volume pricing available - *Please telephone or write for prices

PRICES SUBJECT TO CHANGE WITHOUT NOTICE



2005 PRICE LIST

NEW ZEALAND ARATAKI QUEENS & PACKAGED BEES

PACKAGED BEES (PRICE PER 1KG. PACKAGE)

QUANTITY ORDERED	PRICE	PRICE IF ORDERED AFTER FEBRUARY 28 TH
FULL PALLET (704 PACKAGES)	\$134.00	\$136.00
176-703	\$135.00	\$137.00
100-175	\$136.00	\$138.00
10-99	\$137.00	\$139.00
1-9	\$138.00	\$140.00

EXTRA QUEENS: 5% extra queens included with order.

DEPOSIT: \$10.00 per package deposit required to confirm order. Balance due 10 days before delivery.

NEW ZEALAND PACKAGES WILL BE SENT BY COURIER AT CUSTOMER'S OWN RISK. INQUIRE ABOUT DROPS, WHICH CAN BE ARRANGED IN SASKATCHEWAN OR MANITOBA ON LARGER ORDERS.

QUEENS

QUANTITY OF QUEENS ORDERED	NEW ZEALAND QUEENS	*HAWAIIAN QUEENS		*U.S. MAINLAND QUEENS
	PRICE PER QUEEN	KONA QUEENS PRICE PER QUEEN	HAWAIIAN QUEEN COMPANY QUEENS PRICE PER QUEEN	PRICE PER QUEEN
400+	\$24.00	\$16.95	N/A	\$18.00
100-399	\$24.50	\$17.95	\$16.95	\$18.75
25-99	\$25.50	\$19.25	\$18.25	\$19.25
1-24	\$26.50	\$19.95	\$18.95	\$19.50

**PLEASE NOTE: ALL HAWAIIAN AND U.S. MAINLAND QUEENS ARE BOOKED UNTIL JUNE. PLEASE CALL IF YOU WISH TO BE PLACED UPON A TENTATIVE WAITING LIST FOR PRE-JUNE DELIVERY.*

Queens will be shipped AT BUYER'S RISK, freight collect. Bus, courier, and mail companies DO NOT GUARANTEE LIVE DELIVERIES.

Please advise us if you are not going to pick up your queens and how you would like them shipped.

Payment Methods: CASH OR CHEQUE ONLY. NO CREDIT CARDS ACCEPTED FOR BEES.

Arrival dates & prices are subject to change.

ALL SALES ARE SUBJECT TO PRODUCTION AND TRANSPORTATION BEING AVAILABLE.

625 ROSEBERRY STREET, WINNIPEG, MANITOBA R3H 0T4
PHONE: (204) 783-2240, EXT. #228 FAX: (204) 783-8468, EMAIL: JREMP@BEEMAID.COM

2005**PACKAGED NEW ZEALAND BEES & QUEENS ORDER FORM**

NAME: _____ DATE: _____

ADDRESS: _____ ORDER #: _____

CUSTOMER #: _____

POSTAL CODE: _____ PH.#: (H) _____ (W) _____

1 KILO AND 1 QUEEN TUBE OF BEES FROM NEW ZEALAND

APRIL 4-9 EARLY _____ PKGS. @\$ _____ =\$ _____

APRIL 11-16 WEEK #1 _____ PKGS. @\$ _____ =\$ _____

APRIL 18-23 WEEK #2 _____ PKGS. @\$ _____ =\$ _____

APR 25-30 WEEK #3 _____ PKGS. @\$ _____ =\$ _____

MAY 2-7 WEEK #4 _____ PKGS. @\$ _____ =\$ _____

(REFER TO PRICE LISTS) & SHIPPING AND HANDLING =\$ _____

\$10.00 DEPOSIT REQUIRED ON EACH NEW ZEALAND PACKAGE =\$ _____

\$1.00 DEPOSIT REQUIRED PER QUEEN AT TIME OF ORDER =\$ _____

NEW ZEALAND QUEENS AVAILABLE WEEKS #1- 7
HAWAIIAN & CALIFORNIAN QUEENS AVAILABLE WEEKS #1-11**QUEEN BEES**

APRIL 11-16 WEEK #1 _____ QUEENS @\$ _____ =\$ _____

APRIL 18-23 WEEK #2 _____ QUEENS @\$ _____ =\$ _____

APRIL 25-30 WEEK #3 _____ QUEENS @\$ _____ =\$ _____

MAY 2-7 WEEK #4 _____ QUEENS @\$ _____ =\$ _____

MAY 9-14 WEEK #5 _____ QUEENS @\$ _____ =\$ _____

MAY 16-21 WEEK #6 _____ QUEENS @\$ _____ =\$ _____

MAY 23-28 WEEK #7 _____ QUEENS @\$ _____ =\$ _____

MAY 30-JUNE 4 WEEK #8 _____ QUEENS @\$ _____ =\$ _____

JUNE 6-11 WEEK #9 _____ QUEENS @\$ _____ =\$ _____

JUNE 13-18 WEEK #10 _____ QUEENS @\$ _____ =\$ _____

JUNE 20-25 WEEK #11 _____ QUEENS @\$ _____ =\$ _____

TOTAL COST= \$ _____ LESS: AMOUNT WITH ORDER =\$ _____

BALANCE OWING =\$ _____Queens/Packages will be shipped AT BUYER'S RISK, freight collect. Bus, courier, and mail companies DO NOT GUARANTEE LIVE DELIVERIES.

Please advise us if you are not going to pick up your queens and/or packages and how you would like them shipped.

Payment Methods: CASH OR CHEQUE ONLY. NO CREDIT CARDS ACCEPTED FOR BEES.

Arrival dates, prices, and availability of queens and/or packages are subject to change.

SHIPPING & HANDLING CHARGES (G.S.T. INCLUDED)

# OF PACKAGES	MB	SK	N.W. ON	# OF PACKAGES	MB	SK	N.W. ON
1	30.08	31.07	31.07	6	42.94	44.71	44.71
2	32.65	33.80	33.80	7	45.49	47.44	47.44
3	35.22	36.52	36.52	8	48.06	50.17	50.17
4	37.79	39.25	39.25	9	50.63	52.90	52.90
5	40.36	41.98	41.98	10	53.20	55.62	55.62

BeeMaid

625 Roseberry Street, Winnipeg, MB R3H 0T4

Phone: 1-866-783-2240 ext. 228 Fax: 1-204-783-8468 Email: jrempel@beemaid.com

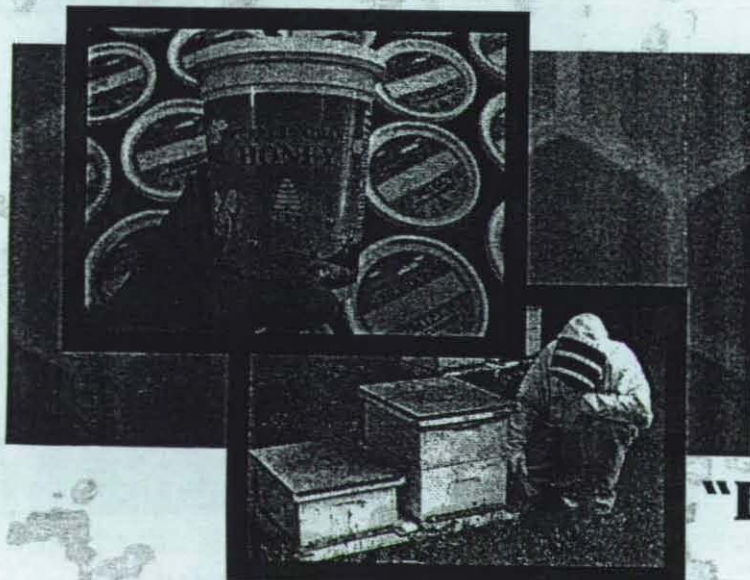
OAKNOOK

Honey Products

LTD.

OAKNOOK Honey Products has been committed to providing high quality, *Natural Pure Honey* for over 30 years. *Natural Pure Honey* is exactly that, straight from the honeycomb to you!

Our honey is naturally processed. The result is a nutritious product, having a pleasant, sweet-smooth taste. *Natural Pure Honey* tastes good and is good for you ... the perfect combination!



Did you know... many healing and health-promoting opportunities for humans begin with the busy honey bee!

Nutritional honey facts:

💧 Honey "straight from the honey comb" contains a significant amount of bee pollen.

💧 Bee pollen, a highly concentrated nutritional plant product is found only in *Natural Pure Honey* and contains nearly all the nutrients required by the human body.

💧 Bee pollen has been shown to help in a number of health and medicinal situations, including recovery from illness and surgery, and in the prevention of cancer and heart disease.

Remember... when purchasing honey, be sure it's natural! Highly processed honey has generally been heated in order to keep it in liquid form. High temperatures used during processing can destroy honey's nutritional value, not to mention its natural, floral flavour.

FACT: Honey is a healthy alternative to sugar and sweeter too.

Our Farm Gate is open to you! If it is *Natural Pure Honey* you seek, we can help. We offer a variety of container sizes (500 g, 1 kg, 3 kg, 7 kg sizes) to meet your needs.



Placing an order? Please call or email us to discuss your order and shipping options.

"Eat honey my son, it's good for your health."



Misión de Captura Tecnológica Valor Agregado y Gestión Apícola a Manitoba, Canadá



Programa

- Bienvenida, Sr. Hernán Meza Carrasco, Presidente Directorio Centro de Gestión.
- Bienvenida, Sra. Claudia Fernández, Ejecutiva Proyecto FIA
- Bienvenida, Sr. Rubén Gutiérrez, Vicepresidente Cooperativa Apícola Santa Bárbara Ltda.

Inicio Exposición

- Exposición de resultados de Misión de Captura Tecnológica valor agregado Manitoba - Canadá.
- Sr. Javier Cáceres, Universidad de Concepción "La apicultura en Canadá, situación actual y perspectivas"
- Sra. Elia Navarrete, Comité Apicultores Futuro de Chillán, "Manejo sanitario y desarrollo productivo de apiarios en la apicultura canadiense".
- Sr. Juan C. Plaza, Cooperativa Miel de Los Ángeles, "Infraestructura y mecanización en la apicultura canadiense".
- Sr. Luis Villaroel, Cooperativa Apícola Sta. Bárbara, "Asociatividad y Comercialización en la apicultura canadiense"

Introducción

- Gestación Misión.
- Empresas participantes.
- Agenda
- Financiamiento.





Resultados

Vinculo estrecho entre
Universidad de
Manitoba, Gobierno
Provincial y los
productores apícolas.

Ventajas



- Investigación de interés de los productores apícolas.
- Dado que existe un trabajo conjunto, es posible detectar problemas sanitarios y dar alerta rápidamente.
- Es posible obtener material genético mejorado y adaptado a las condiciones locales.

Aplicabilidad en Chile

- Esta alianza Público – Privada debe ser replicado a corto plazo en el país.
- El triangulo de Universidades – Productores Apícolas – Instituciones Públicas debe potenciarse.
- La investigación debe llegar al sector productivo y ser reflejo de su realidad.

Bee Maid produce miel saborizada, sin embargo no es un negocio de importancia dado los volúmenes transados.

Ventajas

- Mayor precio en mercado.
- Acceso a nuevos clientes.

Desventajas

- Mayor costo de producción.
- Inversión en investigación y Desarrollo tecnológico.
- Mercado muy pequeño.
- Se desconoce el producto en el país.
- Los canadienses consumen "miel".

Aplicabilidad en Chile

- Es posible desarrollar una industria de miel saborizada en Chile, sin embargo previo a ello se requeriría hacer Estudio de Mercado para detectar nichos en EE.UU. o UE para dicho producto.
- ES necesario que en forma paralela se invierta en Investigación y Desarrollo tecnológico que permita desarrollar esta actividad.
- En un futuro, es posible implementar este tipo de producto.

Desarrollo del mercado domestico o mercado interno.

Ventajas

- Acceder a un mayor precio en forma constante.
- Permite dar valor agregado, dado que la miel pasa de comercializarse como materia prima a miel procesada y fraccionada.
- Apuntar a dar denominación de origen (polínico) a la miel.
- Cuentan con infraestructura y tecnología de proceso apoyado por el gobierno canadiense.

Aplicabilidad en Chile

- Es completamente aplicable a corto plazo, mejorando la tecnología de producción y contando con la tecnología de proceso e infraestructura necesaria.
- Es necesario además educar al consumidor respecto de las características del producto y sus bondades alimenticias para potenciar el aumento de consumo per capita de miel.
- Se requiere para ello contar con Programas gubernamentales y privado al respecto.
- Además se requerirá el ingreso a la red comercial a través de Supermercado, con sus desventajas respectivas.
- Finalmente, la competencia desleal con mercado informal de miel deberá ser regulada.

Alta valorización de la asociatividad dentro de los apicultores.

Ventajas

- Poder comercializar en conjunto en forma directa al consumidor.
- Acceder a mejores precios.
- Dar valor agregado a sus productos.
- Adquirir insumos a menor valor.
- Contar con asesoría técnica permanente.
- Eliminar la competencia desleal entre productores.
- Comercializar mayores volúmenes.
- Apoyo financiero a los socios/apicultores con cargo a la cosecha.

Desventajas

- Frenar las individualidades.
- Pérdida de "poder" relativo.



Aplicabilidad en Chile

- Es completamente aplicable, de hecho existen ejemplos exitosos de ello.
- En Canadá existe mayor experiencia en el tema, de lo cual es posible aprender.

Separar producción de
proceso - comercialización
de miel.

Ventaja

- La parte productiva está especializada en producir la materia prima utilizada en la empresa procesadora - comercializadora.
- Potencian la producción y reducción de costos.
- Obtienen un mayor valor del producto.
- Agregan valor y tecnología de proceso y comercialización.
- Incorporan aseguramiento de calidad al producto, con el desarrollo de laboratorio de análisis en la propia planta.
- Se obtiene producto estándar que permita al consumidor confiar en él en cuanto a su calidad e inocuidad.

Aplicabilidad en Chile

- Es altamente aplicable resolviendo problemas de asociatividad y desarrollo organizacional de las empresas.
- No olvidemos que persisten problemas de desconfianzas en los apicultores.

Renovación del Directorio en forma paulatina.

Ventajas

- Cuentan con un Directorio de gran experiencia y claridad en sus procesos.
- Incorporar a los apicultores en tema gestión del Directorio.
- Todos están informados del funcionamiento de la Empresa.
- Los apicultores se involucran aportando con tiempo y trabajo al desarrollo de su organización.
- Existe esta norma en la legislación provincial.

Aplicabilidad en Chile

- Alta aplicabilidad en las empresas de la Pequeña Agricultura Familiar.
- Se sugiere dar un impulso a su implementación.
- Incorporar en los Estatutos de las Organizaciones es una alternativa de poder hacerlo.

Producción óptima de miel por colmena.

Ventajas

- Aumento rentabilidad.
- Aumento de ingresos por colmena.
- Reducción de costos proporcionales.

Aplicabilidad en Chile

- Es altamente aplicable mejorando y unificando sistema de manejo productivo (manejo sanitario), aumentando acceso investigación, mecanizando y agregando valor a la miel.
- En manejo productivo, un mejor control de enfermedades como varroa, acariosis, nosemosis.
- Establecer alianzas con universidades para incorporar el interés de los apicultores a los programas de investigación.
- En el tema mecanización, automatizar procesos permitirá ser más eficientes en el trabajo. Esto permite aumentar el número de colmenas.
- En agregación de valor, desarrollar tecnologías e infraestructuras de fraccionamiento de miel para mercado interno y externo.

Alto número de
colmenas por
apicultor.

Ventajas

- Reduce los costos.
- Aumenta eficiencia (sala extracción miel).
- Aumentos los ingresos.
- Producción de una mayor cantidad de miel.
- Optimización tiempo de proceso.

Aplicabilidad en Chile

- Altamente aplicable.
- Esto está asociado a mecanizar y automatizar proceso.



Uso cera estampada plàstica.

Ventajas

- Reduce contaminación con productos fitosanitarios.
- Mayor facilidad de preparación del marco.
- Mayor resistencia y duración.
- Permite producir ceras con bajos índices de contaminación destinado a comercialización.
- Posee altos índices higiénicos y escasa transmisión de enfermedades.
- Utilizando distintos colores (negro y miel) es posible identificar marcos, cámara de cría y alzas mieleras.

Desventajas

- En su construcción se requiere un buen flujo de néctar.

Aplicabilidad en Chile

- Alta posibilidades de aplicar en Chile, importando cera plástica asociativamente.

Utilización de piso tipo pallets.

Ventajas

- Se utilizan pisos pallets con capacidad de 2 y 4 colmenas.
- Se utilizan maquinarias en carga y descarga (utilización de cargador o montacargas).
- Facilidad de maniobra y rapidez.
- No es necesario utilizar caballetes o banquillos.
- Es posible incorporarles malla para control de varroa.
- Permite aislar las colmenas entre sí y de la humedad.

Aplicabilidad en Chile

- Es factible de implementar el sistema contando con equipo de carga.
- Se sugiere la incorporación de los pisos pallets en los apiarios progresivamente.

Se utiliza parafina sólida y pez castilla para impregnar material apícola.

Ventajas

- Fácil limpieza y desinfección.
- Reduce contaminación por pinturas con plomo.
- Mayor durabilidad de la madera.

Desventajas

- Es necesario contar con equipos para impregnar el material.

Aplicabilidad en Chile

- Al contar con el equipo necesario, es factible de implementar a corto plazo.
- Se sugiere su implementación como una forma de reducir la contaminación por pinturas con plomo.
- Es factible de utilizar en reemplazo, aceite de linaza doble cocido.

Captura y procesamiento de polen en forma comercial.

Ventaja

- Diversifica de la producción apícola de una colmena.
- Apicultores especializados en la producción de polen, utilizando la miel como alternativa.
- Aumenta los ingresos.
- Producen en tiempo que no hay flujo de néctar.
- Cuentan con la infraestructura y tecnología para el secado, clasificado y envasado de polen.
- Polen no comercializado es utilizado en la alimentación de las colmenas como suplemento proteico.

Aplicabilidad en Chile

- Alta posibilidad de ser implementado un sistema de cosecha de polen en nuestros apiarios.
- Se requiere la infraestructura mínima necesaria.

Sistema de extracción mecanizado de miel.

Ventajas

- Contar con una línea de extracción automática y altamente tecnificada que además de extraer cuenta con un sistema de eliminación de humedad.
- Se realiza una mejor y más rápida extracción de la miel.
- No rompe marcos.
- Permite carga y descarga más fácil por disponer de canastillos cambiables.
- Reduce costos en la extracción.
- Se reduce mano de obra.

Desventajas

- Alto costo de la implementación del sistema.
- La tecnología no se encuentra disponible en Chile.

Aplicabilidad en Chile

- Es posible de implementar a mediano – largo plazo.
- Se puede incorporar en salas de extracción de miel asociativas.
- Es posible aprovechar la oportunidad por bajo valor del dólar.

Implementación de Buenas Prácticas Manufactureras BPM y HACCP.

Ventajas

- Les permite asegurar calidad de la miel en las distintas etapas del proceso productivo.
- Es un requisito para plantas de proceso de alimentos.
- Reduce contaminaciones microbianas en la miel.
- Produce diferenciación con otras empresas.
- Incorpora los Manuales de Procedimientos y Registros en el proceso, facilitando la trazabilidad del producto.

Aplicabilidad en Chile

- Es necesario la masificación de estos Protocolos en Chile.

Recambio de abejas reinas.

Ventajas

- Cambian las abejas reinas cada dos años a lo más.
- Contrarresta efecto de enfermedades.
- Siempre se mantienen reinas jóvenes en la colmena.
- Estas son más productivas.
- Tienen más defensas.

Aplicabilidad en Chile

- Está siendo aplicado en Chile en forma progresiva y con buenos resultados.
- Debemos intensificar la medida.

Se observa que la ciencia
y la tecnología está
puesta al servicio del
sector productivo.

Ventajas

- Acceden a información de investigación y desarrollo en tema apícola.
- Esto mejorar la productividad de los apicultores, lo que se traduce en mejores ingresos.
- Vinculo estrecho entre gobierno y sector productivo.

Aplicabilidad en Chile

- Inmediata si existen las intenciones de hacerlo.

Cuentan con
apicultores
profesionales de la
actividad apícola y que
están dispuestos a
adquirir tecnologías de
punta.

Ventajas

- Cuentan con una apicultura altamente tecnificada y desarrollada en el país.
- Acceden mejor a los tratados de libre comercio suscritos por Canadá (EE.UU).
- Cuentan con apicultores desarrollando las especialidades dentro de la apicultura, como por ejemplo criadores de reina, productores de miel y polen etc...

Aplicabilidad en Chile

- Ya se han hecho esfuerzos en instituciones como INDAP con el Programa de BPA, alfabetización digital etc.
- En misiones de captura tecnológicas u otros Programa de FIA.
- Programas Centro de Gestión tendiente a mejorar la gestión de la Pequeña Agricultura Familiar.
- Creación del Centro Nacional Apícola.
- Universidades como de Concepción, Austral, PUC.
- Sin embargo es necesario redoblar los esfuerzos en este ámbito.

Cuentan con
implementación
sistema de
procesamiento de
cera.



Ventajas

- Cuentan con una Industria de proceso de cera altamente especializada (orgánica).
- Con ello, incorporan valor agregado a la cera como por ejemplo velas, cera en bloques para uso cosmético y doméstico.

Aplicabilidad en Chile

- Alta aplicabilidad contando con infraestructura necesaria.



EVENTO DIFUSION DE GIRA DE CAPTURA TECNOLÓGICA A CANADA

Santa Bárbara 23 de Marzo de 2006

Nº	Nombre	Dirección	Comuna	Actividad	Institución	Telefono/Mail	Firma
1	Luis Villalobos		Sta Bárbara	Apicultor	COASBA		
2	Ruben Gutierrez	Art. Prat. 430	Sta Bárbara	Apicultor	COASBA	698246	
3	JUAN CONTRERAS	Art. Prat 1065	Sta Bárbara	Apicultor	COASBA	581857	
4	Cesar Soto	Villa Lince C. 104	Sta Bárbara	Apicultor	COASBA	09-5685202	
5	JOSE HERNANDEZ	Parc. N° 106 Lince	C. Quilaco	Apicultor	COASBA	09-6691277	
6	YANET VERGARA J.	San Benito 320	J. Angeles	Apicultor	COASBA	09-3517326	
7	BRISA EMILIA S.	J. JOAQUIN Perez	Nequete	Apicultor	Ag. Apic. Nequete	09-629544	
8	BERNARDO SALAMANCA	H. J. JOSE CUEVAS	Sta Bárbara	Apicultor	APICOP	09-5941218	
9	Andrés GUZMAN	J. JOAQUIN Perez	Nequete	Apicultor	Ag. Apic. Nequete	-	
10	JUAN PABLO GANDASCO	P. 40	Nequete	Ap. "	AP. Nequete	08-9814110	
11	MIGUEL CHAVEZ	Art. Prat	Nequete	Ap. "	"	9-1516449	
12	EDGEO VELAZQUEZ	Parc. N° 12 Lince	Nequete	Ap. "	"	87333662	
13	ROMANEO CONTRERAS	Siti 10 Bureo	"	"	"	1971947	
14	ANDRÉS RODRIGUEZ	Par. N° 49	"	"	"	09-6490057	
15	RUTH SILVA M.	Pobl. Emergente	"	"	"	78394287	
16	JOSE LONAS	"	"	"	"	"	
17	ANDRÉS CUEVAS V.	H. J. Art. Prat 2	"	"	"	-	

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19	OSWALDO DOMINICAN	BERNARD 56	NEGRETE	APICULTOR	"	5590311	[Firma]
20	SECONDO VALDEZ	KILOM. 373	STA BARB.	APICULTOR	COASBA	-	R. Valdez
21	JOEL URIBE	CARRERA 230	"	"	"	5890116	[Firma]
22	SEBASTIAN SILVA M.	SEC. LOS CAPILLAS	LOS ANGELES	APICULTOR	GRUPO EL HUACHI	91807612	[Firma]
23	JOEL SANTOVAL	CERRO NEGRO EL HUACHI	STA BARB.	A "	" "	099131665	[Firma]
24	JOS. L. URRUTIA	ANT PRAT 345	"	ABONER	INDAD.	581219	[Firma]
25	JOSE CORTIJO	MANUEL R. 366	"	APICULTOR	INDIVIDUAL	082327169	[Firma]
26	FRANCISCO CONTEJENOS	QUILA PALOS	QUILACO	APICULTOR	INDEPENDIENTE	083195593	[Firma]
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28	MANUEL MARI HUEN	"	"	"	COL. EL MON BLANCO	"	[Firma]
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30	NATIA MARCELAN	EL SAN JUAN	QUILACO	"	INDIVIDUAL	-	[Firma]
31	JOSE HERNANDEZ	PAN. 106 P. NIBO	"	AP.	"	-	[Firma]
32	JOSE ESCOBAR	" 123 STA JAC	QUILACO	"	"	99045086	[Firma]
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36	JULIO GARCIA	PAS. VON 378	CHILLAN	"	"	42-228315	[Firma]
37	DIONICIO LEON	LONCO PANQUE	QUILACO	"	INDEPENDIENTE	-	[Firma]
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39	NIQUEL SANTANDER	HUACHI	STA BARBARA	"	INDIVIDUAL	93269812	[Firma]
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42	Wendy Rillo	Los Juvillos	ST. BAMB	"	INDIVIDUAL	1974324	
43	Alejandro Kibueke	"	"	"	G. API el Huachil	"	
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45	Maria Piblete	JON BUENDEZ	"	CONCERNIOTE	VEEA	581997	
46	MAXS VERAVIDEZ	BURGOS 1240	Jas. A.	ADIC	LND	361167	
47	JUAN ACUÑA	Las Camelia ⁴⁰³	St. BAMB	Tec. ADIC	PRODES	402334	
48	JOSE OSES	Av. Mayor ¹⁹⁸ D. Rio Negro	APIC	ADIC	ADIC	04355170	
49	JOSE RAMIREZ	H. Los Maiferos	ST. BAMB	ADIC	EL HUACHI	082151931	
50	"	"	"	"	"	"	
51	JULIO BELTRAN	LAJA	Los Angeles	ADIC	Pres. DIO DIO	98473291	
52	Guillermo Campos	FAY JON ⁷³¹	Los An	ADIC	ADIC	0971024	
53	ENRIQUE BARRA	BULLE 311	"	IN. HONOR	PANL	90919198	
54	SAINZ SANCHEZ	LONCO PANGU	QUILACO	ADIC	PANL	09-697930	
55	CONSALO VARIARUE	LONCO	"	"	GR. AD. FANCO	95156765	
56	TOMAS ENEDIA	SECTOR NICALQUE	QUILACO	ADIC	INDIC	09-8991212	
57	Gregorio ARRIBARRA	C. HONORIQUE	ST. BAMB	ADIC	COASBA	09-2928430	
58	BENILDE MOLINA	LONCO PANGU	QUILACO	ADIC	PRODES	99952440	
59	RITA LEON	"	"	"	GR. ADIC	993400	
60	MARCIA RILLO	"	ST. BAMB	"	LA COLUNA	581974	
61	Hector ARRIBARRA	Ca. HONORIQUE ¹³⁰	"	"	COASBA	93058381	
62	Hector ARRIENA	DELLORIS	QUILACO	ADIC	INDIC	"	
63	Miguel PINO O.	ST. ALDENJIMBA	ST. BAMB	"	COASBA	"	

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65	DORNA PALMA M.	Carre LPA	Quileco	Apicultor	PRODESAL	-	
66	EDUARDO URIBE	T. Marino 171	Sta Bar	Api	JNP	98476381	
67	EDUARDO VILHCO	Art. Pdt 345	Sta "	F. Publico	JUND	08409467	
68	JOSE ALBAÑOS	" 787	st "	Apicultor	Frnt. 6. Api.	9383139	
69	SERCIO LEO	440	st "	CONSEJOAL	Municipalidad	95186914	
70	LEO GÓMEZ	SOTO 545	MULLCHEN	Apicultor	COASBA	09-176140	
71	JUAN SOTO J.	43 Calle Barrio	Sta B.	Api.	COASBA	-	
72	Elizabeth SOTO	"	"	"	"	-	Elizabeth Soto
73	RAMON RODRIGUEZ	Carre 775	"	Api.	Comi Le	581893	
74	Isac Antonio Valdebank		Sta Barbara	Apicultor	Independiente	9-9355064	
75	Armando Uribe Gentes	guresa@btomail.com	Calera de tango	Apicultor	Apicola Tangito	9-9177305	
76	Gerardo Palma	Prodesal Quileco	Quileco	Apicultor	Prodesal Quileco	8-5514879	
77	Claudio Vidal Aera	cividal_ago10@yahoo.es	"	"	"	633631	
78	Jose Cablan Valdes		Sta Barbara	"	Coasba	8-4243258	
79	Bartolo Uribe		Sta Barbara	✓	✓		
80	Matias Mardones		Sta Barbara	"	"	8-7375617	
81	Remigio Opatra		Los Angeles	"	Independiente	323834	
82	Helsen Labrin Gargas	nlabin@vtr.net	Sta Barbara	"	Grupo Api de Hwach	98259175	
83	Lilian Cabalin		Chillan	"	Coapi Turo	214402	
84	Benedicto Navarrete		Chillan	"	Coapi Turo		
85	Ramón Urra		✓	✓	✓		
86	Coralina Catalin		✓	✓	✓		

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88	Elia Narasacke		✓	✓	✓		
89	Andres Diaz		Los Angeles	Apicultor	Independiente	318605	
90	Victor Navarro		Negrete	✓	✓	551770	
91	Placido Melo		✓	✓	✓	551466	
92	Carlos Melo		✓	✓	✓	551466	
93	Leonardo Luster		Concepción	✓	INDAP		
94	Mario Riquelme		Sta Barbara		COASBA		
95	Sebastián Jimena		"	Apicultor	Indep. Rev.		
96	Zocinda Milia	Pitruil	Palco	Apicultor	Pitruil. ISAPIC		
97	Juan D. Urnueña	"	"	"	"		Juan D. U.
98	M ^a Jose Cordova	Paquedomo 866	Sta. Barbara	Secretario	Coasba Hda	589206	
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