



GOBIERNO DE CHILE
FUNDACION PARA LA
INNOVACION AGRARIA



INFORME TÉCNICO

**PROGRAMA DE GIRAS TECNOLÓGICAS
INTERNACIONALES**

**‘AVANCES TECNOLÓGICOS EN EL CULTIVO
DEL ARÁNDANO EN LA ZONA DEL PACÍFICO
DE NORTEAMÉRICA’**

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CONTENIDO DEL INFORME TÉCNICO GIRAS TECNOLÓGICAS

1. Antecedentes de la Propuesta

Título: AVANCES TECNOLÓGICOS EN EL CULTIVO DEL ARÁNDANO EN LA ZONA DEL PACÍFICO DE NORTEAMÉRICA.

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Entidad Responsable: UNIVERSIDAD DE CONCEPCIÓN

Coordinador: RUPERTO HEPP G.

Destino (País, Región, Ciudad, Localidad): CALIFORNIA, OREGON, WASHINGTON (USA) Y BRITISH COLUMBIA (CANADÁ)

Fecha de Ejecución: 30 DE JULIO AL 13 DE AGOSTO

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Problema a Resolver:

PONER EN CONOCIMIENTO DE UN GRUPO DE PRODUCTORES DE ARÁNDANO, EMPRESARIOS AGRÍCOLAS E INVESTIGADORES DE LAS ZONAS CENTRO SUR Y SUR DEL PAÍS DE LOS ADELANTOS EN INVESTIGACIÓN, VIVEROS, MANEJO PRODUCTIVO TANTO CONVENCIONAL COMO ORGÁNICO Y DE LA INDUSTRIALIZACIÓN DEL ARÁNDANO BAJO CONDICIONES EDAFOCLIMÁTICAS DE LOS ESTADOS DE CALIFORNIA, OREGON Y WASHINGTON DE ESTADOS UNIDOS DE NORTEAMÉRICA Y BRITISH COLUMBIA EN CANADÁ.

Objetivos de la Propuesta:

- CONOCER LAS CONDICIONES DE MANEJO Y COMPORTAMIENTO DEL ARÁNDANO EN LAS ZONAS COSTERA Y DEL VALLE CENTRAL DE CALIFORNIA;
- CONOCER LA INVESTIGACIÓN QUE LLEVA A CABO LA EMPRESA DRISCOLL EN ARÁNDANO, TANTO EN CALIFORNIA COMO EN EL ESTADO DE WASHINGTON;
- CONOCER LA FORMA DE OPERACIÓN DEL VIVERO DE ARÁNDANOS MÁS IMPORTANTE DE NORTEAMÉRICA, FALL CREEK NURSERY, EN OREGON;
- CONOCER LA INVESTIGACIÓN QUE DESARROLLA LA OREGON STATE UNIVERSITY EN ARÁNDANO;
- CONOCER EL MANEJO CONVENCIONAL (OREGON, WASHINGTON, B.C.) Y ORGÁNICO (WASHINGTON) LLEVADO A CABO POR PRODUCTORES DE ARÁNDANO;
- CONOCER LA OPERACIÓN DE PLANTAS DE PROCESAMIENTO DE ARÁNDANO EN OREGON Y WASHINGTON;
- VISITAR EL REPOSITORIO DE GERMOPLASMA DE *Vaccinium* DEL DEPARTAMENTO DE AGRICULTURA EN CORVALLIS, OREGON.

2. Antecedentes Generales: describir aspectos de interés y cifras relevantes del país o región visitada, con énfasis en la situación agrícola y la situación del rubro que aborda la propuesta en particular (no más de 2 páginas).

El arándano es uno de los berries que ha experimentado un auge en los últimos años en el mundo entero. Entre 1995 y 2003, la superficie cultivada con este frutal ha aumentado en un 51%, de 29.000 a 43.000 há aproximadamente. La producción total de fruta de arándano alto ha aumentado en un 33%, de 93.440 ton a 125.190 ton. Al respecto, en este mismo período, la producción de fruta fresca ha aumentado de 49.000 ton a 80.000 ton., lo que representa un aumento de 61%. En Estados Unidos, la superficie plantada se ha incrementado desde 1995 en un 30%, o sea, de 20.200 há a 27.000 há. La producción de fruta de arándano alto en Norteamérica en la temporada 2003 fue de 103.500 ton., representando un 83% de la producción total mundial. De este total, la Zona del Pacífico de Norteamérica (California, Oregon, Washington y British Columbia,B.C) aportó con 36.600 ton de arándano, provenientes de una superficie cercana a las 8.200 há, de las cuales un 56% correspondió a fruta fresca.

El desglose del área plantada y de la producción de arándano alto en la Zona del Pacífico en la temporada 2003 es la siguiente:

	Sup(há)	Ton fresco	Ton proceso	Total
British Columbia	5.000	13.200	5.000	18.200
California	590	1.360	0	1.360
Oregon	1.680	4.545	6.360	10.905
Washington	910	1.360	4.770	6.130
Total zona	8.180	20.465	16.130	36.595

En los estados de Washington, Oregon y en B.C., las variedades de arándano que tradicionalmente se han plantado corresponden al arándano alto del norte, que requieren entre 800 a 1000 horas frío, y donde encontramos de maduración temprana, intermedia y tadia. Aquí se destacan Bluecrop, Duke, Elliott, Berkeley, Bluejay, Earliblue, Jersey, Brigitta y Blueray, entre otras. Recientemente se han incorporado Ozarkblue (Oregon), Chandler y Bluegold en B.C. Las nuevas variedades del programa de Michigan State, Liberty, Draper y Aurora están siendo evaluadas.

En California, donde esta especie es de reciente introducción, las variedades que se plantan son de madurez temprana y corresponden al arándano alto del sur, con requerimientos de 200 a 450 horas frío. Las variedades que se han plantado han sido O'Neal, Misty y Sharpblue, y están en etapa de evaluación las variedades nuevas del programa de Florida como Star, Emerald, Sapphire, Southmoon, Jewel, Bluecrisp, Millennia y Santa Fe. En la actualidad existen alrededor de 700 há. plantadas, y la mayoría de los huertos se encuentran concentrados en los alrededores de la ciudad de Fresno.

En todo USA existen alrededor de 200 há de arándanos bajo manejo orgánico, de las cuales cerca de un 51% se encuentran en la Zona del Pacífico.

3. Itinerario Realizado:

Fecha Visita	Ciudad y/o Localidad	Institución/Empresa	Actividad Programada	Actividad Realizada
2-8-2004	WATSONVILLE-CALIFORNIA	DRISCOLL STRAWBERRY ASSOC.	VISITAR INSTALACIONES DE INVESTIGACIÓN Y ENSAYOS DE ARÁNDANOS	SE CONOCIERON LAS INSTALACIONES DE INVESTIGACIÓN Y OFICINAS CENTRALES, LAS LÍNEAS DE INVESTIGACIÓN EN ARÁNDANO Y FRUTILLA, Y LOS JARDINES DE VARIEDADES Y LÍNEAS PROPIAS PROMISORIAS DE ARÁNDANO
3-8-2004	FRESNO, CALIFORNIA	EST. EXP. KEARNY, U. OF CALIFORNIA - DRISCOLL'S	VISITAR ENSAYOS DE DRISCOLL Y PRODUCTORES DE ARÁNDANO	SE VISITARON LOS ENSAYOS DE INVESTIGACIÓN DESARROLLADOS POR LA U. DE CALIFORNIA EN CONJUNTO CON DRISCOLL EN ARÁNDANO (JARDINES DE VARIEDADES, ENSAYOS DE DENSIDAD DE PLANTACIÓN, MULCH, FERTILIZACIÓN, PODA, RIEGO, ETC.)
5-8-2004	FALL CREEK, OREGON	FALL CREEK NURSERY	VISITA DE VIVERO DE ARANDANOS FALL CREEK	SE VISITÓ LAS INSTALACIONES DEL VIVERO, EL JARDÍN DE VARIEDADES Y LOS SISTEMAS DE PRODUCCIÓN DE PLANTAS
5-8-2004	CORVALLIS, OREGON	ARS-USDA/OREGON STATE UNIVERSITY	VISITA PROGRAMA DE PATOLOGÍA DE ARÁNDANOS	SE TOMÓ CONOCIMIENTO DE LOS VIRUS MÁS IMPORTANTES QUE AFECTAN AL ARÁNDANO EN LA ZONA DEL PACÍFICO, Y EL PROGRAMA DE INVESTIGACIÓN QUE SE DESARROLLA AL RESPECTO
6-8-2004	CORVALLIS, OREGON	USDA-ARS NATIONAL CLONAL GERMPASM REPOSITORY	VISITA AL REPOSITORIO DE GERMOPLASMA DE VACCINIUM	SE VISITÓ EL REPOSITORIO, Y SE CONOCIÓ LAS DIFERENTES FORMAS CÓMO SE MANTIENEN LAS DIFERENTES ESPECIES DE <i>Vaccinium</i> Y

				VARIEDADES DE ARÁNDANO EN EL BANCO DE GERMOPLASMA
6-8-2004	AURORA, OREGON	AGR. EXP. STATION, OREGON STATE UNIVERSITY	VISITAR ENSAYOS Y JARDINES DE VARIEDADES DE ARÁNDANOS	SE RECORRIÓ EL JARDÍN DE VARIEDADES DE ARÁNDANOS Y LOS ENSAYOS QUE SE REALIZAN SOBRE MANEJO DEL ARÁNDANO
9-8-2004	SALEM, OREGON	VAN CLEAVE FARMS, OVERLAKE FOODS CORPORATION	VISITAR HUERTO DE ARÁNDANOS Y PLANTA PROCESADORA	SE VISITÓ HUERTO DE ARÁNDANOS COSECHADO CON MÁQUINA Y PLANTA PROCESADORA DE ARÁNDANOS
9-8-2004	SALEM, OREGON	OREGON BLUEBERRY GROWERS	VISITAR HUERTO DE ARÁNDANOS	SE VISITÓ LA PLANTA DESHIDRATADORA DE FRUTOS 'MEDURI FARMS', LA PLANTA SELECCIONADORA Y EMPACADORA Y HUERTO DE 'HURST'S FARMS' Y UN HUERTO ORGÁNICO DE 1 AÑO DE EDAD ADMINISTRADO POR GREEN LEAVES CONSULTANTS.
10-8- 2004	ROCHESTER, WASHINGTON	NORTHLAND PLANT, OVERLAKE FOODS CORPORATION	VISITAR HUERTO Y PLANTA PROCESADORA DE ARÁNDANOS	SE VIO UN HUERTO ANTIGUO DE ARÁNDANOS, Y LA PLANTA SELECCIONADORA Y PROCESADORA DE ARÁNDANOS DE OVERLAKE FOODS CORP.
11-8- 2004	MOUNT VERNON, WASHINGTON	SAKUMA BROTHERS Y DRISCOLL'S	VISITAR ENSAYOS DE VARIEDADES DE ARÁNDANOS Y HUERTO DE ARÁNDANOS	SE VISITÓ HUERTOS (ANTIGUO Y NUEVO) ORGÁNICOS DE ARÁNDANOS, HUERTO NO ORGÁNICO DE ARÁNDANOS Y JARDÍN DE LÍNEAS PROMISORIAS DE DRISCOLL'S
12-8- 2004	FRASER VALLEY, BRITISH COLUMBIA, CANADÁ	FRASER VALLEY PACKERS INC.	VISITAR HUERTOS DE ARÁNDANO EN BRITISH COLUMBIA	SE VISITÓ PLANTA SELECCIONADORA, PROCESADORA Y EMPACADORA DE ARÁNDANOS DE LA EMPRESA FRASER VALLEY PACKERS INC., Y HUERTOS DE ARÁNDANO CONVENCIONAL COSECHADOS CON MÁQUINA

4. Resultados Obtenidos: descripción detallada de las tecnologías conocidas (rubro, especie, tecnología, manejo, infraestructura, maquinaria, aspectos organizacionales, comerciales, etc.) y de la tendencia o perspectiva de dichas tecnologías en su lugar de origen. Explicar el grado de cumplimiento de los objetivos propuestos, de acuerdo a los resultados obtenidos. Incorporar en este punto fotografías relevantes que contribuyan a describir las tecnologías. Todas las unidades de medidas utilizadas en el informe deben ser expresadas en unidades comúnmente utilizadas en Chile (ha, m², m³, litros, Km, m, mm, ton, Kg, gr, etc.). Los montos deben ser expresados en dólares y en la moneda del país de origen, de acuerdo al tipo de cambio del momento en que realizó la gira.

Las tecnologías conocidas durante la gira se pueden agrupar de la siguiente manera para su descripción:

1. producción de plantas
2. aspectos sanitarios
3. mejoramiento y nuevas variedades
4. manejo del huerto – mallas antipájaros, producción bajo plástico, control de temperatura de la canopia
5. valor agregado de la fruta
6. producción orgánica

1. Producción de plantas: la visita al vivero Fall Creek Nursery en Oregon dejó de manifiesto que es uno de los mejores en su rubro. Se encuentra ubicado en un lugar aislado, rodeado de bosques y colinas, y la clave del éxito ha sido entre otras cosas que se ha dedicado exclusivamente a la producción de plantas de arándano; aquí no se ha combinado la producción de fruta con la producción de plantas, evitando así la contaminación de las plantas madres por enfermedades principalmente de origen viral. Se pudo apreciar que la calidad de las plantas que produce es superior, gracias a los años de experiencia en el tema y a la tecnología que se usa en el proceso. Si originalmente producían plantas principalmente por enraizamiento de estacas, hoy día lo están realizando por cultivo de tejidos (in vitro), con lo que se aseguran una planta sana, todas muy parejas, capaces de producir un gran volumen en un corto tiempo (8 a 10 meses). Esto, sumado a la excelente infraestructura que poseen (invernaderos, riego tecnificado, etc.) les permite proveer en la actualidad de excelentes plantas no solamente al mercado local o interno sino que además al mercado internacional, como Argentina, Chile, países europeos, Asia, entre otros (Foto 1).
2. Aspectos sanitarios: llamó la atención la importancia que se le dan esa zona de USA al estudio de enfermedades producidas por virus en arándano. Este tema está muy relacionado con el punto anterior, que es la producción de plantas sanas. Por ello, existe un trabajo estrecho entre viverista, investigador y productores, de manera de estar al tanto de los diferentes virus que pueden amenazar la producción de viveros y huertos en un momento dado, y llevar a cabo las medidas de control necesarias en el momento oportuno. Es así que la misma asociación de productores de arándanos financia la investigación llevada a cabo por el Dr. Bob Martin del USDA, quien ha monitoreado la presencia de los virus más importantes en este frutal, el Scorch virus y el Shock virus, sabiendo exactamente en qué zonas se encuentran, qué variedades son las más susceptibles, cuál es el efecto

en la producción, cómo avanza la infección año a año, qué técnicas de detección son las más apropiadas, etc. De este trabajo ganamos también los chilenos, ya que las variedades que se recomiendan en nuestro país provienen principalmente del vivero de Fall Creek, el que al estar asociado con el trabajo del Dr. Martin nos asegura que el material que se envía está sano (Foto 2).

3. Uno de los temas más importantes hoy día en arándano es el relacionado con el mejoramiento y desarrollo de nuevas variedades. Durante toda la gira se pudo comprobar que existen variedades nuevas provenientes de los programas de la U. de Florida, de la U. estatal de Michigan y de Arkansas, las que se encontraban en etapa de prueba en todos los jardines de variedades visitados, vale decir en California, Oregon y Washington. Si bien las variedades de Florida son todas del tipo arándano alto del sur, con muy bajo requerimiento de frío, las de Michigan corresponden al tipo arándano alto del norte que requieren un alto número de horas frío. Llamó la atención que todas ellas producen gran cantidad de fruta, de excelente tamaño y calidad de post cosecha, y que llevan varios años ya de estudio y prueba en las diferentes condiciones edafoclimáticas de la zona del Pacífico, como lo ha demostrado la variedad Star (Fotos 3 y 4). Sin embargo, ya han sido adquiridas sus patentes por empresas particulares, entre ellas chilenas, que exportan fruta, con lo cual se aseguran que solamente ellas pueden propagar esas variedades patentadas. Ante esta situación, han reaccionado empresas particulares como Driscoll, desarrollando en forma independiente un excelente programa de mejoramiento de arándano para así poder independizarse del sistema y ofrecer a sus productores sus propias variedades que han sido mejoradas para las condiciones de esa zona productiva.
4. Manejo del huerto: en este tema llamó la atención varios aspectos, entre ellos la colocación de mallas en algunos huertos sobre las plantas para evitar el daño por pájaros, quienes comen o destruyen la fruta al momento de maduración. Esta medida es un costo más que debe asumir el productor dentro del proceso productivo, pero si no lo asume le puede significar pérdidas bastante grandes (Foto 5).

El otro tema visto en diferentes lugares fue la producción de arándanos bajo plástico, esto con el fin de modificar la época de madures de la fruta, en este caso adelantar la cosecha, y así llegar al mercado con fruta fresca en un momento en que existe poco volumen y consiguiendo por lo tanto mejores retornos. Esta práctica está siendo cada vez más común, ya que permite aprovechar ventanas que se producen donde llega poca fruta fresca en un mercado altamente demandante de ella (Foto 6).

Llamó la atención en la localidad de Fresno un sistema de neblina que se está probando para bajar la temperatura de la canopia de las plantas, evitando así daño por temperatura en los frutos y excesiva evapotranspiración de las plantas. El sistema consta de cañerías de plansa y nebulizadores que se ubican sobre el follaje de las plantas, conectado a un termostato que permite que este funcione automáticamente cuando la temperatura en el follaje es muy alta. Las temperaturas en el verano en la localidad de Fresno pueden llegar a los 40°C, razón por la cual se justificaría el sistema siempre que las plantas tuviesen fruta madurando (Foto 7).

5. Valor agregado: en la zona visitada, específicamente en Oregon y Washington, se pudo constatar que a la fruta sobremadura y que no cumple con los estándares de calidad para fresco, se le está sometiendo a un proceso de deshidratado y azucarado, usando en este último caso azúcar de arroz, haciéndolo apto para el consumo por personas con problemas de diabetes. Estas 'pasas de arándano' son enviadas a países como Japón, aprovechando así toda la fruta, y en este caso, con un valor agregado, llegando a un mercado oriental, exigente, y a un consumidor que de otra manera no puede consumir este fruto y aprovechar todos los beneficios que aporta a la salud (Foto 8).
6. Producción orgánica: durante la gira pudimos constatar que la superficie de arándanos manejados orgánicamente en la zona visitada es muy pequeña, pero que sin embargo hay gran interés por aumentarla, debido a que existe un mercado para esta fruta que va en aumento, y a que la fruta orgánica se tranza en el mercado al doble de la fruta convencional. Además pudimos constatar en terreno que la mayoría de los huertos orgánicos fueron establecidos originalmente en forma convencional, y que una vez que alcanzaron cierto desarrollo, pasaron por la etapa de transición para convertirse en orgánicos. Solamente vimos uno (de un año de edad) que había sido establecido desde un comienzo en forma orgánica, y que estaba siendo manejado con aplicaciones de té de compost, derivados de algas y sub productos de la industria pesquera. Llamó la atención que, siendo este un tema muy de moda y con todas las ventajas que acarrea, no se está realizando investigación al respecto, a diferencia de nuestro país en que la U. de Concepción ya está realizando investigación en el tema a través de un proyecto Fondef. Aquellos que están en el sistema de manejo orgánico de arándanos van experimentando en terreno con productos disponibles para otras especies frutales, sin importar el costo que ello implica, situación similar a la que existe hasta el momento en Chile (Foto 9).

5. Aplicabilidad: explicar la situación actual del rubro en Chile (región), compararla con la tendencias y perspectivas en el país visitado (región) y explicar la posible incorporación de las tecnologías capturadas, 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).

En Chile, el arándano se cultiva entre la IV y la X región. En la actualidad se estima que existen alrededor de 2.600 há., distribuidas de la siguiente manera:

Norte	Región IV	4% de la superficie
Centro	Región M, V, VI y VII	23% de la superficie
Centro-Sur	Región VIII y IX	39% de la superficie
Sur	Región X	33% de la superficie

La zona visitada es muy parecida a la zona de producción de nuestro país, ya que también encontramos zonas de producción de fruta temprana y tardía. Desde la VIII región al norte la producción es principalmente de fruta temprana, mientras que desde la VIII región hacia el sur la producción es eminentemente de fruta tardía. 95% de la fruta producida en Chile es para el mercado fresco de contra estación. Las variedades más plantadas para una producción temprana son O'Neal y Duke, mientras que para una producción semi tardía a tardía se recomiendan Bluecrop, Brigitta y Elliott. De la misma forma que en California, en el norte del país se cultivan las variedades de bajo requerimiento de frío, tales como O'Neal y Misty, mientras que en el sur (zona equivalente a Oregon y Washington) se plantan aquellas de alto requerimiento de frío como Duke, Bluecrop, Brigitta y Elliott.

De la tecnología vista durante la gira, podemos decir que casi todo lo observado se realiza acá en el país, pero con la posibilidad de ser mejorado. Así por ejemplo, en estos momentos en que la demanda por plantas es alta, se han creado numerosos viveros que se dedican a la producción de plantas de arándano, pero de no muy buena calidad. La razón está en que para producir esas plantas se ha recurrido a restos de poda, material que sanitariamente no es el mejor. No hay que desconocer que existen algunos viveros que trabajan en buena forma y han ofrecido plantas de muy buena calidad, ya sea enraizando estacas o a través de la producción in vitro, pero hay una gran cantidad de ellos que no lo cumplen. Un mayor control de estos viveros por parte del SAG permitiría que sólo los que producen plantas de buena calidad pudieran ofrecerlas a los futuros productores, ya que la calidad de planta es clave en el éxito de la plantación.

En cuanto a las variedades, todas las que se plantan en el país son originarias de los diferentes programas de mejoramiento de los Estados Unidos. Existen excelentes variedades que son de dominio público y que conforman la mayoría de los huertos actualmente establecidos, como por ejemplo O'Neal, Duke, Spartan, Bluecrop, Elliott, Brigitta, etc. Sin embargo, las empresas que han adquirido la licencia de las nuevas variedades tempranas (de Florida) y tardías (de Michigan) ya las están ofreciendo a los productores a través de contratos de exclusividad por varios años, sin haberlas probado siquiera bajo nuestras condiciones edafoclimáticas. Esta situación, igual que en el caso de Driscoll, ha llevado a la U. de Concepción a iniciar un programa de mejoramiento de arándano, con el fin de poder ofrecer a futuro a los productores, variedades de alto rendimiento, de fruta de excelente calidad y adaptables a las condiciones nuestras.

Si bien es cierto que el SAG ha regulado en forma exitosa la entrada de todas estas variedades de arándano al país, exigiendo los certificados sanitarios correspondientes, estableciendo sistemas de cuarentena al material una vez importado, y observando la situación sanitaria de esas plantas, no se descarta la posibilidad de que algunos de los virus que existen en la zona del Pacífico de Norteamérica hayan hecho su ingreso al país, o que a futuro se pueda producir esta situación. Ante ello debemos estar alertas, ya sea monitoreando los huertos, capacitando a los productores y viveristas de la sintomatología que se esperaría encontrar en caso de infecciones virales, estando en conocimiento de las técnicas de detección más adecuadas de estos patógenos, desarrollando un programa de certificación de plantas de arándano, sistemas que funcionan con éxito en la zona visitada.

El arándano es una especie frutal exótica, y ello implica que la fauna existente en los lugares donde se han establecido los huertos no conoce el fruto, no le es palatable o no se debería interesarle porque tiene otras alternativas de alimento. Sin embargo, en algunos sectores ya se ha observado daño por pájaros, el que todavía es insignificante. Quizás a futuro, los pájaros como lloicas y tordos se acostumbren al sabor de este fruto y sea entonces necesario recurrir a la malla anti-pájaros para protegerlos, lo que implica un costo adicional en el proceso productivo.

En cuanto a modificar la fecha de maduración de la fruta a través del uso de plástico y mallas de sombreamiento, algo se está realizando en el país, tanto para adelantar fecha de cosecha como para atrasarla. Pienso que a futuro esta práctica va a ser más común, una vez que los precios se estabilicen y realmente exista un plus saliendo con la cosecha un poco más temprano que la mayoría, o saliendo con la fruta un poco más tarde que el resto, aún cuando esta práctica implique un costo extra.

Nuestra producción de fruta en estos momentos es para consumo en fresco, en un mercado de contraestación en el hemisferio norte. Por lo mismo, el negocio está dirigido a la obtención de fruta para consumo en fresco, no para congelado u otro. Sin embargo, con el aumento de la superficie plantada en estos momentos, que bordea las 2600 há, se piensa que a futuro va a haber una gran producción de fruta, y no toda va a cumplir con las exigencias de exportación para consumo fresco. Entonces será importante darle a ese excedente de fruta un tratamiento que le permita una muy buena aceptación por parte de los consumidores, manteniendo sus cualidades nutritivas, y un mejor retorno al productor. Aquí la agroindustria va a jugar un papel importante, tal como se observó durante la gira, dándole un valor agregado a la fruta y realizando un muy buen marketing del producto.

En nuestro país la mayoría de los huertos existentes son manejados en forma convencional. Existen algunos en los cuales se realiza un manejo orgánico, pero son pocos. En la actualidad existe un mercado para fruta orgánica, existen consumidores que piden fruta orgánica, pagando mejores precios por ella que la fruta convencional, lo que ha llevado a que una empresa como Hortifrut esté estableciendo con algunos agricultores huertos orgánicos. Se estima que en nuestro país esta tendencia va a aumentar a futuro, con lo que los precios de esa fruta orgánica tendería a bajar. La U. de Concepción es la única institución que está realizando investigación al respecto, buscando alternativas de manejo orgánico para diferentes situaciones edafoclimáticas en arándano, acompañado de un estudio de costos e ingresos para cada caso, y comparándolos con el sistema de manejo convencional. Lo observado sobre este tema durante la gira ha sido de mucha utilidad para complementar lo planteado en el proyecto.

6. Contactos Establecidos:

Institución/Empresa	Persona de Contacto	Cargo/Actividad	Fono/Fax	Dirección	E-mail
DRISCOLL STRAWBERRY ASSOCIATES INC.	BRIAN CASTER	INVESTIGADORME JORADOR			
FALL CREEK FARM AND NURSERY, INC.	DICK MOMBELL	SALES/CUSTOMER SERVICE			
ARS-USDA HCRL	ROBERT MARTIN	INVESTIGADOR VIRÓLOGO			
ARS-USDA, NCGR	KIM HUMMER	RESEARCH LEADER, CURATOR			
OREGON STATE UNIVERSITY	BERNADINE STRIK	PROFESSOR, BERRY RESEARCH LEADER			
OVERLAKE FOODS CORPORATION	RODNEY COOK	PRESIDENT			

7. **Detección de nuevas oportunidades y aspectos que quedan por abordar:** señalar aquellas iniciativas detectadas en la gira, que significan un aporte para el rubro en el marco de los objetivos de la propuesta, como por ejemplo la posibilidad de realizar nuevas giras o cursos, participar en ferias y establecer posibles contactos o convenios. Indicar además, en función de los resultados obtenidos, los aspectos y vacíos tecnológicos que aún quedan por abordar para la modernización del rubro.

Lo ideal es poder realizar una gira hacia la costa Este de Norteamérica, donde se cultivan principalmente los arándanos ojo de conejo, y de donde provienen las nuevas variedades de arándano alto del sur que han entrado al país y que son las que se han plantado en Argentina. Es una situación diferente a la visitada, pero una zona importante desde el punto de vista de producción de arándano.

Además, está el contacto establecido con el Dr. Bob Martin para en un futuro seminario sobre este frutal, tenerlo de expositor del tema 'Virus y su importancia en el cultivo del arándano', y a la vez poder realizar con él una prospección a nivel nacional de los huertos en los que se tenga antecedentes de sospechas de presencia de virus. Es fundamental poder contar con esta información, ya que nos hemos caracterizado a nivel mundial por producir fruta de excelente calidad, en un ambiente prácticamente libre de patógenos, y esa característica es la que tenemos que salvaguardar.

8. **Resultados adicionales:** capacidades adquiridas por el grupo o entidad responsable, como por ejemplo, formación de una organización, incorporación (compra) de alguna maquinaria, desarrollo de un proyecto, firma de un convenio, etc.

Los participantes de la entidad responsable han formado recientemente en el Campus Chillán el 'Centro de Berries', el cual lo constituyen profesores de Agronomía e Ingeniería Agrícola que han trabajado ya por años en el tema berries. El objetivo es formar un grupo multidisciplinario, que permita abordar los problemas de los productores de berries en forma integral, postulando a fondos en forma conjunta. Los clientes serían productores como los que participaron de la gira, empresas exportadoras, viveristas, etc., con quienes se trabajaría en conjunto para solucionar los problemas que presentan en el proceso productivo. Además, se contempla la organización de seminarios y cursos de perfeccionamiento sobre temas específicos, días de campo, giras, etc.

9. Material Recopilado: junto con el informe técnico se debe entregar un set de todo el material recopilado durante la gira (escrito y audiovisual) ordenado de acuerdo al cuadro que se presenta a continuación (deben señalarse aquí las fotografías incorporadas en el punto 4):

Tipo de Material	Nº Correlativo (si es necesario)	Caracterización (título)
CD		Fotos tomadas durante la gira
Díptico		Nacional Clonal Germplasm Repository Corvallis
Listado Colección Germoplasma		USDA – Collection summaries
Catálogo Fall Creek Farm		Comercial growers catalog
Folleto informativo		Fall Creek Farm and Nursery Inc.
Artículo		Fertility and soil management in newly established Elliott blueberry
Artículo		Nitrogen fertilization of young and mature blueberries
Artículo		Should you crop blueberries the first two years after planting?
Foto	1	Vivero Fall Creek
Foto	2	Síntoma de Blueberry Shock
Foto	3 y 4	Variedad STAR
Foto	5	Malla anti pájaros
Foto	6	Arándanos bajo plástico
Foto	7	Neblina sobre la canopia
Foto	8	Pasas de arándano
Foto	9	Huerto orgánico

Aspectos Administrativos

10.1. Organización previa al viaje

a. Conformación del grupo

_____ muy dificultosa ☒ sin problemas _____ algunas dificultades

(Indicar los motivos en caso de dificultades)

b. Apoyo de la Entidad Responsable

☒ bueno _____ regular _____ malo

(Justificar)

El responsable de la gira tomó con mucha responsabilidad la organización de la gira, realizando para ello los contactos más idóneos sobre el tema en USA, confeccionando el itinerario de visitas, reservando con anticipación los hoteles en los cuales el grupo se alojaría, dando a los participantes la información pertinente en cuanto a los lugares a visitar, el clima, etc. Además aportó, en calidad de préstamo, con parte de los fondos necesarios para viajar de un proyecto que dirige, mientras en el FIA se solucionaba un problema de firmas.

c. Información recibida durante la gira

d.

☒ amplia y detallada _____ aceptable _____ deficiente

e. Trámites de viaje (visa, pasajes, otros)

☒ bueno _____ regular _____ malo

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

La única recomendación que tengo es que a futuro, la obtención de los pasajes debe hacerse por lo menos con una semana de antelación al viaje, ya que es muy incómodo y frustrante llegar al aeropuerto y, 90 minutos previo al vuelo, no contar con ellos.

10.2. Organización durante la visita (indicar con cruces)

Ítem	Bueno	Regular	Malo
Recepción en país o región de destino	X		
Transporte aeropuerto/hotel y viceversa	X		
Reserva en hoteles	X		
Cumplimiento del programa y horarios	X		
Atención en lugares visitados	X		
Intérpretes	X		

10. Conclusiones Finales:

La presente gira tecnológica se realizó tal cual fue planificada, cumpliendo así con el objetivo principal y con todos los objetivos específicos originalmente planteados. El grupo participante fue muy homogéneo, y demostró siempre un gran interés por los diferentes temas vistos durante el desarrollo de esta gira. Al mismo tiempo, el grupo fue siempre muy bien recibido por los diferentes anfitriones, los que no dudaron en dar a conocer todas las actividades desarrolladas por cada uno de ellos en sus diferentes empresas, y respondiendo a todas las inquietudes planteadas por los participantes.

En general se pudo constatar que, salvo circunstancias muy puntuales, las mismas tecnologías vistas en la región del Pacífico se usan en el cultivo del arándano en Chile. Presentamos todavía una gran ventaja sobre ellos, y me refiero a la mano de obra barata, lo que nos permite realizar una serie de actividades entre ellas la cosecha en forma manual y de esa manera enviar fruta en contra estación para consumo fresco, logrando así buenos retornos económicos para el productor.

Existe una gran presión hoy día por variedades nuevas, de gran producción y de fruta de excelente calidad y con muy buena post cosecha. Sin embargo, estas variedades nuevas están siendo compradas por empresas particulares (entre ellas chilenas) que a su vez son exportadoras de este berry en Chile, lo que a futuro puede significar que el agricultor va a depender de ellas para adquirir plantas y para que posteriormente le compren la fruta. Frente a esta situación, se están creando nuevos programas privados de mejoramiento del arándano, tanto en USA (Driscoll) como en Chile (Universidad de Concepción), para así no tener que depender de estas empresas y a la vez poder ofrecer al productor del mañana otras alternativas de variedades, que han sido mejoradas bajo condiciones propias de clima y suelo.

11. **Conclusiones Individuales:** anexar las conclusiones individuales de cada uno de los participantes de la gira, incluyendo el nivel de satisfacción de los objetivos personales (no más de 1 página y media por participante).

Personalmente quedé muy satisfecho con la gira por diferentes razones. Por ejemplo, el grupo participante realmente demostró un gran interés por el tema, y siendo la gira bastante intensa (se recorrieron cerca de 5.000 km), nunca existió una queja por cansancio, calor u otro. Segundo, el programa se cumplió en un 100%, gracias al interés de los participantes como a la disposición por parte de las personas contactadas por atender al grupo. Esta excelente disposición de las personas contactadas demostró que existe un nexo y un reconocimiento como uno de los líderes en el tema bastante fuerte hacia la institución organizadora, con la cual ya ha habido contactos profesionales desde hace más de 10 años. Esta situación permitió que en todos los lugares visitados el grupo fuera muy bien recibido, atendiendo a todas las consultas formuladas en forma directa y honesta, de manera que así, técnicamente, todos en el grupo obtuvieron el mejor provecho de la gira.

En mi caso, el trabajo del Dr. Bob Martin relacionado con las enfermedades producidas por virus en arándano, la importancia de estos y su implicancia en la producción de plantas en vivero me ha motivado a realizar una prospección sobre el tema en nuestro país, en un momento en que numerosas personas se dedican a la producción de plantas como un negocio lucrativo sin importar la calidad de la planta que se ofrece al futuro productor.

Además, la poca información existente en relación al manejo orgánico de este frutal viene a fortalecer el trabajo que estamos realizando sobre este tema a través de un proyecto Fondef, siendo necesario buscar alternativas de manejo orgánico para diferentes situaciones de suelo y clima validadas.

Por último, hay que agradecer a la cadena de hoteles Best Western por la excelente atención que nos brindaron al alojarnos en ellos, ofreciéndonos siempre las habitaciones de mayor comodidad.



11. Conclusiones Finales

12. **Conclusiones Individuales:** anexar las conclusiones individuales de cada uno de los participantes de la gira, incluyendo el nivel de satisfacción de los objetivos personales (no más de 1 página y media por participante).

La gira cumplió largamente con lo esperado, ya que se pudo ver la producción de arándanos desde las producciones más tempranas como son las de California, hasta las producciones más tardías como son las del estado de Washington y las del sur de Canadá. En cada lugar se vio el nivel tecnológico empleado y las adecuaciones para conseguir los fines propios de cada zona, como es el empleo de neblina para bajar la temperatura en California o el empleo de malla para atrasar aún más la cosecha en Washington.

No obstante que todas las visitas fueron interesantes, quedé particularmente satisfecho con lo aprendido en el tema de enfermedades del arándano con el Dr. Martín y la visita al repositorio con la colección mundial de *Vaccinium*..

Fecha: 10/2004

Nombre y Firma coordinador de la ejecución: _____

CONCLUSIONES INDIVIDUALES

GIRA TECNOLÓGICA SOBRE ARANDANOS A EE.UU Y CANADA.

PLAN ELEGIDO: DEMOSTRO QUE EL PLAN DESARROLLADO ESTUVO DENTRO DE LAS EXPECTATIVAS. SÉ COMPROBO QUE LAS VISITAS FUERON LAS ADECUADAS, YA QUE SE TUVO LA OPORTUNIDAD DE VISITAR: HUERTOS TRADICIONALES, HUERTOS ORGANICOS, TRABAJO DE COSECHA MANUAL Y CON MAQUINA, ESTABLECIMIENTOS DE HUERTOS, CULTIVO, VIVEROS, NUEVAS VARIEDADES, PACKING PARA EMBALAR COMO FRUTA FRESCA Y PARA CONGELADO, PLANES EXPERIMENTALES, EXPERIENCIA SOBRE VIRUS Y ENFERMEDADES, REPOSITORIO DE GERMOPLASMA, ENTREVISTAS CON DESTACADOS PROFESIONALES EN GENETICA, NUEVAS VARIEDAD, RENDIMIENTOS, DIVERSOS NUEVOS PRODUCTOS CON VALOR AGREGADO Y FINALMENTE LOS PLANES EXPERIMENTALES DE LA UNIVERSIDAD DE CALIFORNIA Y OREGON.

ATENCIONES RECIBIDAS: LAS PERSONAS QUE NOS ATENDIERON EN LAS DIVERSAS VISITAS DEMOSTRARON UN GRAN CONOCIMIENTO DEL TEMA Y UNA MUY BUENA DISPOSICION PARA ATENDER NUESTRAS CONSULTAS Y REQUERIMIENTOS. EN GENERAL NO HUBO NINGUN TIPO DE RESTRICCION, PARA CONSULTAR, GRABAR, Y DEJAR TESTIMONIO ESCRITO O GRAFICO. ADEMAS FUE IMPORTANTE PARA MEJOR COMPRENSION Y ENTENDIMIENTO DE LA PARTE TECNICA LAS TRADUCCIONES DEL CASTELLANO AL INGLES Y VICEVERSA DEL SR. RUPERTO HEPP, COORDINADOR DEL PROYECTO.

CUMPLIMIENTO DEL PLAN: SÉ CUMPLIO CON TODAS LAS ACTIVIDADES PLANIFICADAS Y EXPUESTAS EN EL PLAN, CON UN ALTO GRADO DE SATISFACCION.

CUMPLIMIENTO DE LOS OBJETIVOS: LOS OBJETIVOS PERSONALES Y PROFESIONALES QUE SE TUVO EN CONSIDERACION PARA SOLICITAR SER INCLUIDO EN LA GIRA FUERON SATISFECHOS MUCHO MAS ALLA DE LAS EXPECTATIVAS.

CONCLUSIONES: GIRA TECNOLÓGICA, TRASCENDENTE QUE PERMITIO VISUALIZAR EL ESTADO ACTUAL DEL CULTIVO Y COMERCIALIZACION DEL ARANDANO Y SUS PROYECCIONES PARA EL FUTURO, ADEMAS PODER APRECIAR NUESTRA REALIDAD EN COMPARACION A LO QUE SE HACE HOY DIA EN ESTADOS UNIDOS Y CANADA, PAISES CON GRAN EXPERIENCIA SOBRE LA MATERIA Y QUE ADEMAS DURANTE LOS ULTIMOS 50 AÑOS HAN INTENSIFICADO SU CULTIVO CON NUEVAS VARIEDADES. EN RESUMEN UNA GIRA DE GRAN PROVECHO Y CONOCIMIENTO, CON POSIBILIDADES DE APLICAR EN NUESTRO MEDIO. MUCHO DE LO APREHENDIDO, LO QUE NOS PERMITIRA SER CADA DIA MÁS EFICIENTE.

SANTIAGO 23 DE AGOSTO DEL AÑO 2004.

MARIO GABRIEL ORMENO MELEZ



11. Conclusiones Finales

12. **Conclusiones Individuales:** anexar las conclusiones individuales de cada uno de los participantes de la gira, incluyendo el nivel de satisfacción de los objetivos personales (no más de 1 página y media por participante).

El participar en este giro, me permitió ampliar mi visión a lo que se refiere al cultivo del aguacate y Berries en general tanto en el ámbito tecnológico y económico.

En cuanto se refiere al grupo de participantes de la gira, se logró una cohesión y una muy buena predisposición a participar en cada uno de las actividades propuestas por los profesores a cargo de esta actividad.

El viajar a estados unidos a conocer el aguacate me permite proyectar mi negocio, ampliar mi mercado y conocer el mercado donde se consume mi producto y así producir lo que realmente requieren los mercados.

Fecha: 30 - 09 - 2004

11. Conclusiones Finales

12. **Conclusiones Individuales:** anexar las conclusiones individuales de cada uno de los participantes de la gira, incluyendo el nivel de satisfacción de los objetivos personales (no más de 1 página y media por participante).

CONCLUSION PABLO AEDO: EL ARANDANO ES UNA FRUTA CON ALTA DEMANDA EN EL MERCADO AMERICANO, EL CUAL HOY DA ESTA EXIGIENDO EL DESARROLLO DE LA OFERTA DE FRUTA FRESCA E INDUSTRIAL PARA EL NICHOS ORGANICO CUYA TASA DE CRECIMIENTO ALCANZA EL 20%.

LAS EMPRESAS AMERICANAS HOY ESTAN PROPICIANDO EL DESARROLLO DE ESTA FRUTA DIFERENCIADA QUE POTENCIA LAS CALIDADES NATURALES DEL ARANDANO, AL CARECER DE LA APLICACION DE LOS FERTILIZANTES Y AGROQUIMICOS DE SINTESIS, CUYO IMPACTO MEDIOAMBIENTAL Y SOBRE LA SALUD DE LAS PERSONAS HA SIDO UN TEMA POCAS VECES ABORDADO; PERO QUE PERMANECE LATENTE EN QUIENES NOS HEMOS VINCULADO A LA PRODUCCION ORGANICA COMERCIAL Y ADEMAS GARANTIZA EL MERCADO.

EN LO PERSONAL, LO TECNOLÓGICO Y DE MERCADO CONSTITUYE UN VALOR QUE PERMITIRA A NUESTRA AGENCIA DE AGRICULTURA LIMPIA, CONSOLIDAR ESTE TEMA EN FUTUROS PROYECTOS Y CONSULTORIAS PARA EMPRESARIOS CHILENOS QUE NUNCA Y ENTIENDAN AL ARANDANO ORGANICO COMO UNA REAL OPORTUNIDAD DE NEGOCIO, CUYOS PRECIOS PREMIUM HOY Y LA DIFERENCIACION PROPIA DE PRODUCTO, PERMITIRAN DAR SUSTENTABILIDAD A SUSTENTABLES EN EL LARGO PLAZO.

Fecha: 10/12/2014



11. Conclusiones Finales

12. **Conclusiones Individuales:** anexar las conclusiones individuales de cada uno de los participantes de la gira, incluyendo el nivel de satisfacción de los objetivos personales (no más de 1 página y media por participante).

Conclusión De Gira De Arandanos

La participación en esta gira tecnológica fue muy positiva, satisfaciendo plenamente mis objetivos sobre el cultivo, proceso industrial (congelado, deshidratado, fresco), desarrollo de variedades según zona climática y realidad agrícola en arandanos en EEUU.

Por otra parte, fue fundamental la conducción activa de los investigadores de la Universidad de Concepción (Ruperto Hepp, y Humberto Sem) ya que con gran nivel de conocimientos fueron aclarando las distintas dudas y manteniendo una comunicación fluida con los anfitriones de las distintas empresas y centros de investigación visitados.

También los excelentes contactos de visitas fueron fundamentales en el éxito de esta gira.

Otro punto muy importante que se pudo rescatar de esta gira fue la creación de conciencia fitosanitaria que pocas veces es considerada por los agricultores en relación a las enfermedades virales que puede estar adquiriendo en su cultivo cuando se establecen huertos con plantas que no son de viveros certificados. Punto a considerar que es fundamental en la iniciación de cualquier actividad agrícola.

En relación a las visitas, en general, estuvo muy bien coordinadas, prácticamente sin tiempos muertos, lo que permitió que fuera una gira muy intensiva.

Finalmente, agradezco la oportunidad de haber participado de esta gira, la cual no cabe duda que me ayudara enormemente en el desarrollo y proceso en este rubro.

Fecha: 10/2004.-

11. Conclusiones finales

12. Conclusiones individuales: anexar las conclusiones individuales de cada uno de los participantes de la gira, incluyendo el nivel de satisfacción de los objetivos personales (no más de 1 página y media por participante).

Conclusiones Marcelo Luna:

El nivel tecnológico que se utiliza en Chile en la producción de arándanos es satisfactorio de acuerdo a lo observado en la costa pacifico de los Estados Unidos. El mercado de los arándanos como fruta de exportación se proyecta en el tiempo como un negocio sustentable de acuerdo al consumo que existe en los Estados Unidos, como poder comprador de fruta de contratación.

El arándano orgánico es un buen negocio para los productores Chilenos como fruta diferenciada, con un mercado en expansión en Norteamérica, además el paquete tecnológico utilizado en la producción de esta fruta orgánica es aplicable en Chile, país que tiene buenas condiciones naturales para desarrollar la producción orgánica.

Finalmente puedo concluir que la gira cumplió satisfactoriamente con mis objetivos esperados, además se cumplió con itinerario propuesto siendo de buen nivel las visitas realizadas con apoyo en las traducciones de buena calidad. Tengo la convicción de que se realizo una gira de muy buen nivel técnico en un tema relevante para los productores de arándanos de nuestro país.

Fecha: 28 de Septiembre de 2004.

Nombre y firma coordinador de la ejecución



Conclusiones Finales

12. **Conclusiones Individuales** anexar las conclusiones individuales de cada uno de los participantes de la gira, incluyendo el nivel de satisfacción de los objetivos personales (no más de 1 página y media por participante)

Con respecto a la gira técnica realizada a Estados Unidos me encuentro muy conforme en todos los aspectos de esta, tanto en la organización como de las visitas realizadas. Encuentro que cada visita fue muy bien pensada, los laboratorios, huerto experimentales, packing, viveros y huertos en producción, todo con un altísimo nivel, el cual creo que en Chile jamás lo habría conocido.

Por otra parte creo que el apoyo y conocimientos de los encargados de la gira como don Ruperto Hepp y Humberto Serri fue fundamental para poder entender y aprovechar al máximo cada visita, sobre todo en mi caso ya que soy nuevo en este tema.

Por último vuelvo a repetir lo conforme que estoy con la gira sin otro particular

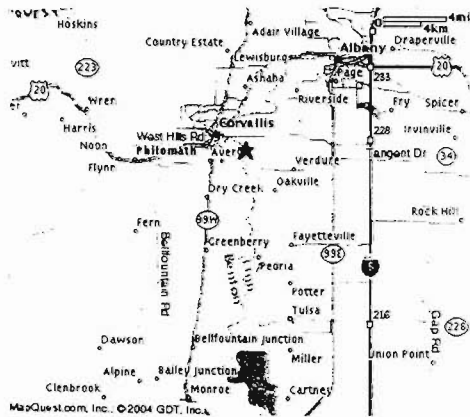
Nombre y Firma coordinador de la ejecución

STAFF

r. Kim Hummer, Research Leader/Curator
 r. Barbara Reed, Plant Physiologist;
 Cryopreservation, Tissue Culture
 r. Nahla Bassil, Plant Geneticist
 seph Postman, Plant Pathologist/Pear Curator
 ck Peters, Seed Physiologist
 uce Bartlett, Plant Distribution
 uglas Cook, Computer Specialist
 nine de Paz, Biological Science Aid
 elissa Fix, Biological Science Aid
 ymond Gekosky, Field Technician
 rbarbara Gilmore, Biological Technician
 mes Oliphant, Greenhouse Manager
 rolyn Paynter, Tissue Culture Technician
 onne Pedersen, Secretary
 borah Provenzano, Office Automation Clerk
 e Snead, Field Manager
 nnis Vandever, Facilities Maintenance

MAP TO THE REPOSITORY

The Repository is east of Corvallis on Peoria Road
 1 mile south of highway 34



USDA-ARS NCGR-Corvallis

ARS MISSION

The Agricultural Research Service conducts research to develop and transfer solutions to agricultural problems of high national priority and provides information access and dissemination to:

- ensure high-quality, safe food and other agricultural products,
- assess the nutritional needs of Americans,
- sustain a competitive agricultural economy,
- enhance the natural resource base and the environment, and
- provide economic opportunities for rural citizens, communities, and society as a whole.



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United States Department of Agriculture
 Agricultural Research Service
 in cooperation with
 Oregon State University
 Oregon Agricultural Experiment Station

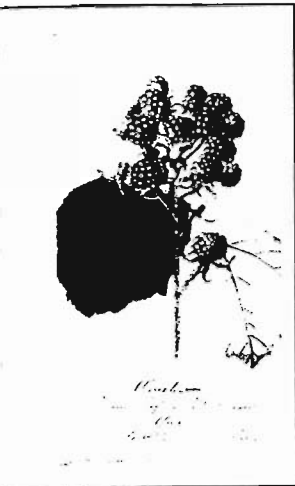
National Clonal Germplasm Repository Corvallis



For Temperate Fruits, Nuts,
 and Specialty Crops

INTRODUCTION

The Corvallis Repository is one of 30 federally funded facilities in the National Plant Germplasm System (NPGS) dedicated to the preservation of economically important crops and their wild relatives. Funding is provided by the U.S. Department of Agriculture, Agricultural Research Service (USDA-ARS) in cooperation with Oregon State University (OSU). This Repository was dedicated in 1981



with the assignment to collect, preserve, distribute, and evaluate germplasm of hazelnuts, strawberries, hops, mint, pears, currants, gooseberries, raspberries, blackberries, cranberries, blueberries and other specialty crops.

Cultivars for each crop are maintained as growing plants to preserve their genetic uniqueness. Seed and pollen represent populations from wild species. Clonal germplasm

accessions" are grown in greenhouses, screenhouses, field plantings, and in the lab as tissue cultures. Seeds, pollen, and in vitro cultures are preserved in cold storage.

The Repository collections represent wild and cultivated plants. These genetic resources are available to plant breeders and researchers throughout the world.

PLANT INFORMATION

Visit our website at <http://www.ars-grin.gov/cor> for the latest repository catalogs and information on our conservation activities. A wealth of information as well as customized links to the Germplasm Resources InfoNet (GRIN) is on our crop specific web pages. Taxonomic, historic, descriptive evaluation data and many fruit and plant images are available on GRIN.

PLANT DISTRIBUTION

NCGR-Corvallis ships plant material to national and international researchers. Research results must be provided to the Repository after plants have become established. Wild species are provided as seed or pollen.

Clones may be available as cuttings, budwood, plants, or *in vitro*. Distributed material is subject to quarantine regulations. The requester must provide plant import permits. Phytosanitary Certification will be written for foreign requests after an import permit is received from the requesting country.



PLANT HEALTH

Virus infected plants may not be obvious by casual observation. We test our collections for viruses with a technique called "ELISA" (Enzyme Linked Immunosorbent Assay). Viruses which cannot be detected by ELISA can be found by inoculating sensitive "indicator plants" and watching for characteristic

symptoms. Virus infected plants are subjected to thermotherapy and micro-propagation to produce virus-free clones. New plants resulting from this therapy are retested for viruses and checked for trueness to type before the infected clones are discarded. Many of our virus-tested plants are maintained in screenhouses to avoid reinfection.

GERMPLASM RESEARCH

Research is in progress to develop methods of germplasm storage and to evaluate the genetic resources at the repository. These research projects are collaborative efforts with international scientists.

- Long term cryogenic storage of plant germplasm.
- Molecular markers and DNA fingerprinting.
- Improved methods of virus testing.
- Phenology and growth habit analysis.
- Plant disease resistance evaluations.
- *In vitro* germplasm storage techniques.
- Seed germination of temperate fruit genera.
- Taxonomy of temperate fruit and nut crops.

NCGR invites scientists from around the world to visit and study the plant resources available in Corvallis. Funds may be available for germplasm evaluation. Research scientists wishing to submit a proposal for screening germplasm should contact the Curator.

CRYOPRESERVATION

Long term storage of clonal germplasm can be taken beyond *in vitro* culture by freezing tiny shoot tips (meristems) and pollen in liquid nitrogen. Plant meristems must first be pretreated with a cryoprotectant (antifreeze) and frozen in a very controlled manner before being plunged into liquid nitrogen. In liquid nitrogen (-196 degrees Celsius) plant tissue can be stored indefinitely.

IN VITRO CULTURE

In vitro ("test tube") or tissue culture of plants at NCGR serves several important functions. This method efficiently preserves a large number of clones in a small space. At refrigerator temperatures these plants require little maintenance. These miniature plants do not need water, fertilizer, or spray against pests. Plants in this sterile environment free of insects and most diseases can be shipped to scientists throughout the world. Research is underway to optimize the growing and environmental conditions.



GERMPLASM IDENTIFICATION

Molecular markers are well suited for fingerprinting of plant germplasm. Microsatellite markers are DNA or nucleic acid sequences that contain various numbers of short repeats and have become the preferred method of analyzing plant diversity. Research is underway to develop such molecular tools in hazelnuts, strawberries, pears, blueberries and other crops maintained at the Corvallis repository.

The development of these molecular markers is a collaborative effort with national and international scientists. Molecular evaluation of our major crop collections will enable the analysis of plant diversity, the detection of duplicates, and the development of public fingerprint databases for our economically important plants.



7 July 2004

National Clonal Germplasm Repository - Corvallis
phone: 541-750-8712 webpage: www.ars-grin.gov/cor
Curator: Kim Hummer email: hummerk@bcc.orst.edu



Collection Summaries

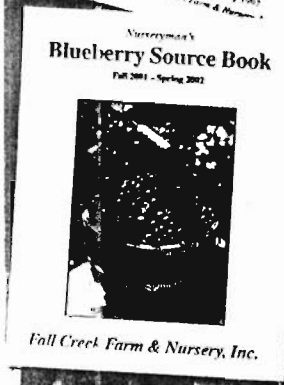
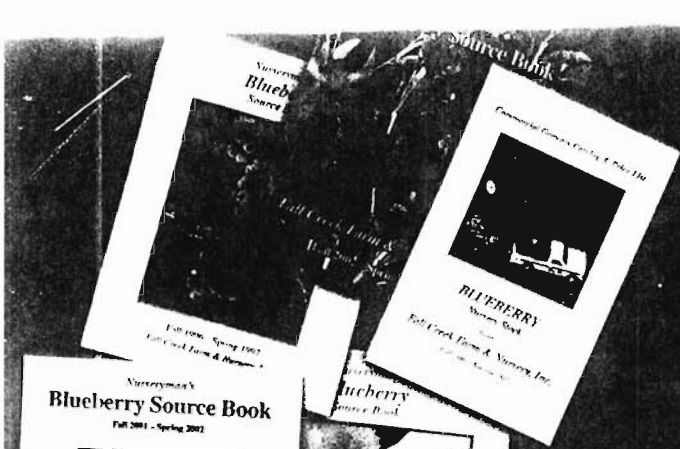
Available Accessions					Inventory on Site*			Unique Accessions	
Code	Genus	Commonname	Plants	Seed	Plants	Seed	Invitro	(in total)	(available)
** MAJOR GENERA **									
ACT	Actinidia	Hardy Kiwi	96	19	121	12	0	138	111
COR	Corylus	Hazelnut (Filbert)	576	0	756	20	34	585	481
FRA	Fragaria	Strawberry	1258	264	1287	323	132	1466	1364
HUM	Humulus	Hops	266	216	674	252	92	551	264
MEN	Mentha	Mint	448	45	479	35	146	482	458
PYR	Pyrus	Pears	1513	139	1862	292	212	1777	1364
RIB	Ribes	Currant/Gooseberry	751	327	814	387	99	927	765
RUB	Rubus	Blackberry/Raspberry	725	906	804	947	123	1652	1463
VAC	Vaccinium	Blueberry/Cranberry	541	645	606	533	101	1197	1079
** Subtotal **			6174	2561	7403	2801	939	8775	7349
** MINOR GENERA **									
AME	Amelanchier	Shadbush	0	24	0	44	0	49	23
ARB	Arbutus	Madrone	2	4	5	4	0	9	5
ASI	Asimina	Pawpaw	94	3	97	6	0	61	53
CEA	Ceanothus	Buckbrush	0	17	0	33	0	35	17
CYD	Cydonia	Quince	78	9	99	11	0	76	56
ERI	Eriobotrya	Loquat	0	0	0	0	0	0	0
ESC	Escallonia	Redclaws	1	0	1	0	0	1	1
GAU	Gaultheria	Salal	9	19	9	13	0	31	27
GAY	Gaylussacia	Black Huckleberry	5	3	5	8	0	14	8
HOL	Holodiscus	Ocean Spray	0	2	1	2	0	3	2
JUG	Juglans	Butternut	35	0	35	3	0	24	24
LON	Lonicera	Honeysuckle	3	20	16	20	0	31	17
MES	Mespilus	Medlar	21	2	24	4	0	26	20
PER	Peraphyllum	Wild Crabapple	2	4	2	3	0	6	5
PYC	Pycnanthemum	Mountain Mint	32	39	32	49	23	89	66
SAM	Sambucus	Elderberry	33	88	34	67	0	127	106
SOR	Sorbus	Mountain Ash	120	64	129	153	0	225	127
** Subtotal **			435	298	489	420	23	807	557
*** Totals ***			6609	2859	7892	3221	962	9582	7906

* Note - Does Not include Dead, Closed, Misidentified or Material Transferred to Another Repository.

Blueberry Nursery Stock

Commercial Growers Catalog & Price List

Fall Creek Farm & Nursery, Inc.
Fall 2003 – Spring 2004



Licensed Varieties

Investing for the Future

Commercial blueberry growers know first-hand how quickly agriculture is changing and must confront new challenges with innovative approaches to stay competitive. New and improved varieties offer opportunities and solutions for the grower. Developing new varieties is an expensive, time consuming process. Much of this work is done by Universities and government organizations whose programs face extreme financial challenges. Increasingly, they must look to the blueberry industry to help support their efforts. By patenting the varieties they release and licensing these varieties to nurseries who collect royalties from plant sales, much needed funds are returned to the breeding programs. We believe that these breeding programs, and the dedicated scientists who develop the varieties for the future, are vital to our industry. We support their efforts and commend them for their dedication. We would like to dedicate our 25th anniversary Commercial Growers Catalog to them.

**UNIVERSITY OF
FLORIDA**
Emerald
U.S. Plant Patent #12165



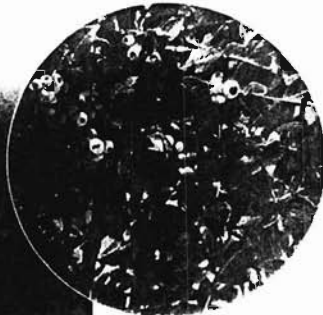
**MICHIGAN STATE
UNIVERSITY**
Liberty
U.S. Patent Pending



**HORT RESEARCH
NEW ZEALAND**
Reka
U.S. Plant Patent #6700



**UNIVERSITY OF
ARKANSAS**
Ozarkblue
U.S. Plant Patent #10035



Dave Brazelton (left)
and Adam Wagner,
Fall Creek's research
technician, evaluate
Aurora,
a new release from
**MICHIGAN
STATE
UNIVERSITY**

Dear Friends,

Back in 1978 we weren't much older than Amelie in the photo on the back cover when we plunged into debt and bought an old farm along the banks of Fall Creek. Many people cautioned us that there wasn't a future in blueberries and that they were probably over-planted. But blueberries have a way of getting in your blood and we were determined to make it our future.

What a future it has been! We have watched the U.S. highbush industry grow from 60 millions pounds twenty-five years ago to over 230 million pounds today. Blueberries have gone from a specialty crop known only in a few select regions to a favorite around the world for those who seek great tasting healthy foods.

It certainly wasn't our vision to become the world's largest blueberry nursery. We never had a "master plan" that dictated when we would add farms, build greenhouses or plant new trial fields. We have always believed that in order to be successful growers needed the very finest quality stock, the newest and best varieties and the most current information available to them. We have been dedicated to those objectives for twenty-five years.

That formula continues today with the introduction of three new northern varieties from the Michigan State University - **Aurora**, **Liberty**, and **Draper**. Not since the release of Duke have we been so excited about new opportunities for northern growers. Please note: All three releases are not available this year. However, given their potential significance to growers, we believe it is important for you to know about them in advance. Look for details on pages 6-9 and 11.

It has been a wonderful and rewarding quarter-century. The best part has been making so many new friends along the way. We look forward to the future, and hope to continue to bring you the best of blueberries for many years to come. We thank you for your business and wish you many successful future seasons.

Sincerely,

David and Barbara Brazelton

Gregg and Becky Vollstedt

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Your Plants and Your Program

The number one goal at our nursery is to provide the finest disease-free blueberry plants available anywhere in the industry. Along with this goal, we have worked closely with our growers to provide them with a cohesive and successful growing plan that has become a trademark of our organization. Whether you are starting in the blueberry business or are an established grower adding acreage, we will be glad to work with you on all facets of blueberry production such as pre-plant preparation, variety selection, field design and layout, cost accounting and cultural care.

Membership

We actively support the following organizations:

*US Highbush Blueberry Council
North American Blueberry Council
Oregon Blueberry Growers Association
Oregon Blueberry Commission
Oregon Association of Nurserymen
American Nursery & Landscape Association*

Contact Us

*For Orders Please Call (800) 538-3001
Phone (541) 937-2973 • FAX (541) 937-3373*

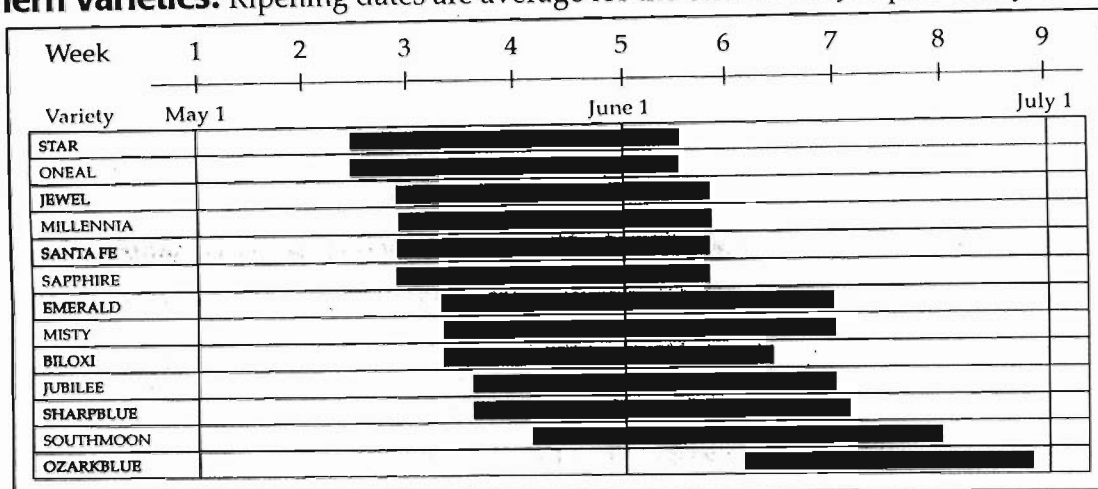
*Ask for Dick Mombell, Rich Schmidt
or
Dave Brazelton*

*Email: berries@fallcreeknursery.com
Website: www.fallcreeknursery.com*

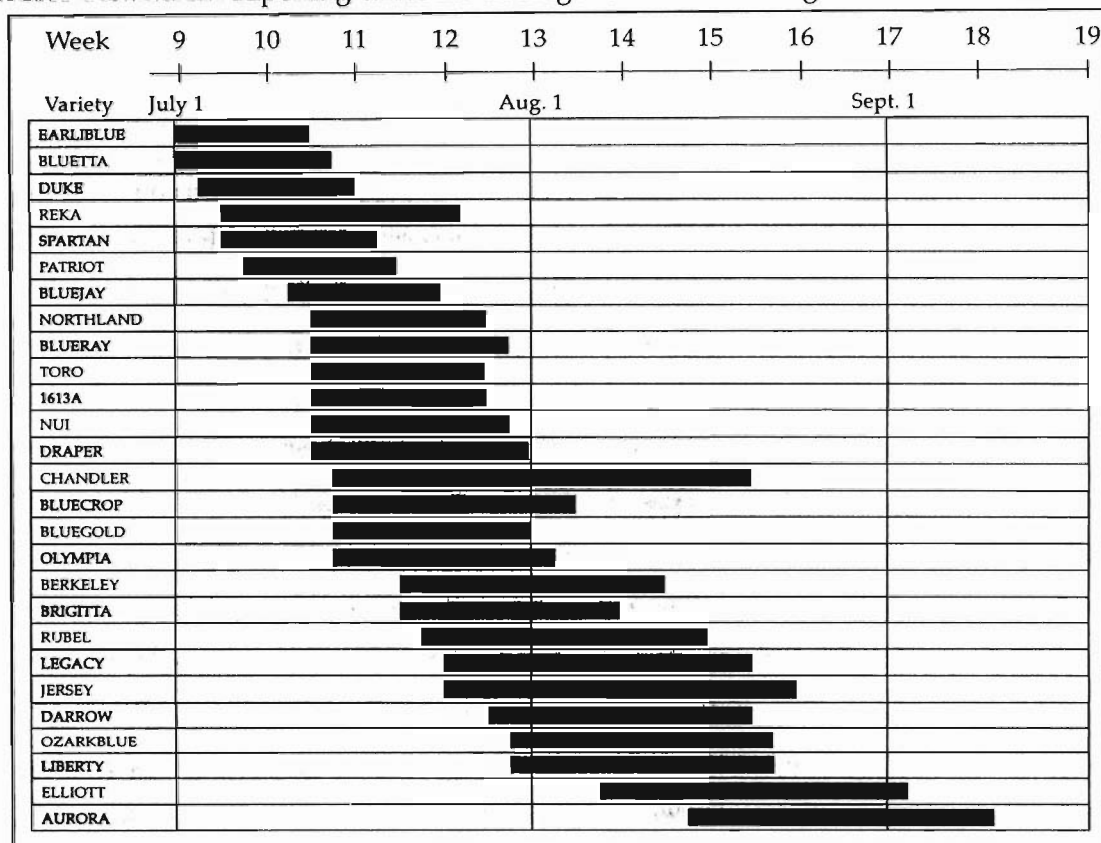
Fruiting Season Charts

Detailed below are the approximate ripening periods for Southern, Northern and Rabbiteye blueberry varieties. Specific harvest dates will vary with location and climatic conditions.

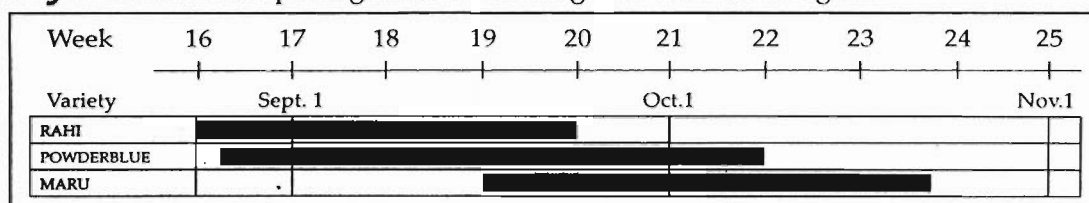
Southern Varieties: Ripening dates are average for the central San Joaquin Valley, California.



Northern Varieties: Ripening dates are average for Western Oregon.



Rabbiteye Varieties: Ripening dates are average for Western Oregon.



Northern Varieties

Northern highbush (*Vaccinium corymbosum*) are the most widely planted blueberries in the world. They grow best in temperate climates where total winter chilling is 1,000 hours or more. Except where listed, most highbush varieties are relatively self-pollinizing. Varieties are listed in order of ripening. The physical characteristics of the variety are listed first, followed by the subjective evaluation of its performance in areas where the variety is best suited. These evaluations are compiled with the most recent information from growers throughout the world.



Denotes varieties exclusive to
Fall Creek Farm & Nursery (FCFN)

Earliblue

Earliest season. Upright bush, moderately vigorous and easy to grow. Fruit is medium large, light blue, good quality and flavor.

Earliblue continues to be popular for a fresh market and U-pick variety as it produces the first quality berries on the market. Not as heavy a producer as the mid-season varieties but the gross dollar return per acre can be excellent since the early season price is usually higher. Avoid frost pockets and poorly drained soil. Closer spacings are popular with this and most other early varieties to increase production. Mechanical harvesting is quite successful with Earliblue when targeted for the process market.

Bluetta

Very early. Short compact bush, medium vigor. Fruit is medium sized, medium blue, fair quality and flavor.

Bluetta is a short statured, bushy variety that ripens with Earliblue. It is more frost and winter hardy than Earliblue but the berry is slightly darker with more variation in size. Very heavy producer, even at a young age. Performs quite well in hot climates. Mechanical harvesting after the primary hand picking is very successful.

Duke

Early. Bush is open, stocky, multicaned and upright. Vigorous, very productive. Fruit is large sized, light blue, firm, mild flavor.

Duke is having a remarkable impact on the blueberry industry. Not since the release of Bluecrop in 1954 has a variety demonstrated as much potential for high, early yields and quality fruit. The berries are remarkably even sized throughout harvest. They are medium blue, quite firm, with a notable crisp flesh. Flavor is mild, improving with cold storage. The bush is strong and one of the most productive varieties grown. Heavy pruning is advised to retain the large berry size. Mechanical harvesting has been very successful the last few years with growers producing fresh market quality fruit. We feel Duke is the best highbush variety offered at this time for fresh market and dessert quality frozen product.



Reka (U.S. Patent #6700)

Early. Ripens between Earliblue and Bluecrop, upright, very vigorous bush, extremely productive. Fruit is dark blue, medium sized, small scar, and firm.

A patented release from New Zealand, Reka is one of the fastest growing, most adaptable varieties we have ever evaluated. It is growing well in light sandy soils, peat and heavier clay loams. Reka seems to be more tolerant of wetter ground than many other varieties. Growers are especially enthused over Reka's production. The yield curve is quite steep, out-producing most others in the early years and surpassing most others at maturity. While Reka is successful in the fresh market, process growers like Reka for its superior machine harvest characteristics and high yields. Fall Creek is the exclusive licensed nursery for Reka in North America.

Spartan

Early. Upright bush moderately vigorous and moderately productive. Fruit is very large, superb fresh quality, outstanding flavor.

We introduced Spartan on the West Coast in 1981 and it has been popular ever since. Spartan blooms late but ripens early, and is frost resistant. The berries are very attractive and one of the largest, often covering a quarter. Flavor is one of the best of all highbush. Spartan can be site specific, preferring light, well drained soil. Once this variety is established in a favorable site it can be hard to beat.

Patriot

Early. Vigorous, slightly spreading, short statured bush. Highly productive, bearing very large, medium blue, slightly flat fruit. Excellent flavor, small dry scar, firm if the weather is not too hot.

This super hardy variety is also one of the heaviest producers. The berries hang in large clusters like grapes on the outer periphery of the bush. The bush is of low to medium stature with pliable branches that will yield to heavy snow loads in winter. Plants are easy to establish, tolerating less than ideal conditions such as wet or heavy soils. Berries are very large with fair fresh quality. Well suited for U-pick or farm sales in areas with colder winters or shorter growing seasons.

Polaris

Early. Bush is upright to 4 ft. high and wide. Moderately productive, medium sized fruit, small scar, exceptional flavor similar to Spartan. Highly aromatic.

Polaris is a cold hardy 1996 release from Minnesota. Ten-year production records show Polaris performs as well as Northblue in colder zones. The berries are of moderate size, very firm, light blue, with an outstanding aromatic flavor. Polaris is not self-pollinizing so it should be planted with other blueberry varieties.

Nui (U.S. Patent #6699)

Early mid-season. Spreading bush of medium to low vigor, average productivity. Fruit is extremely large, light blue, firm, outstanding flavor, and superior keeping quality.

Nui offers the very best quality berry in terms of size, flavor and appearance that we have ever seen. The primary drawbacks are the spreading bush and moderate to slow growth. Production has been medium to light in the northern zones but Nui seems to be performing much better in southern areas, tolerating moderate chilling and high summer heat quite well. We recommend Nui where production of a clearly superior berry is of primary concern. Fall Creek is the exclusive licensed nursery for Nui in North America.

Northland

Early mid-season. Bush is vigorous, spreading, medium height, extremely productive. Fruit is medium blue, medium sized, very sweet.

Northland performs quite well in cold climates or where extremes of winter-summer temperatures may preclude other varieties. One of the heaviest producing varieties grown, Northland is doing well in Canada as well as the inland areas of the West, and other climates with cold winters. Northland is recommended for processing, local farm sales or marginal blueberry growing areas with very cold winter temperatures.

Chippewa

Mid-season. Compact, upright bush to 4 ft. high. Fruit is medium large, very light blue, firm and very sweet.

Chippewa is a 1996 release from Minnesota. Parentage incorporates some of the most cold hardy selections known. Production and fruit size has been similar to Northblue. Fruit of Chippewa is larger than Polaris, lighter blue, with milder flavor. Recommended in all areas where a super cold hardy variety is desired.

(Continued on page 6)

Bluejay

Mid-season. Bush is extremely vigorous, medium spreading. Medium to high productivity. Fruit is light blue, medium sized, small dry scar, very firm.

Bluejay is recommended for growers requiring a variety adapted for mechanical harvesting. The bush grows rapidly and is easy to establish. Berries are borne on loose clusters that will hang for long periods of time on the bush so that most of the fruit can be harvested in one picking. The medium sized berry is acceptable for fresh but is best suited for the process market. Overall production has been excellent if Bluejay is protected from frost during bloom.

Northblue

Mid-season. Semi-dwarf bush, growing to a height of 3-4 ft. Fruit is large, dark blue, with a "wild" blueberry flavor.

Northblue was released by the University of Minnesota as a commercial variety where productivity of normal highbush cultivars is poor due to cold winter temperatures or inadequate winter protection. Northblue is quite productive for its size, producing between 3 and 7 pounds per bush in Minnesota tests. Initial observation here in Oregon indicates a high yield potential in milder climates. For commercial plantings, 2 or 3 by 8 foot spacing is recommended. Very little pruning is needed for Northblue the first few years, then regular thinning of old wood is recommended. Northblue is suggested for colder winter climates for commercial, U-pick and local farm sales.

Blueray

Mid-season. Bush is upright, multicaned, productive, vigorous. Large, very light blue fruit, firm, medium to large scar, excellent flavor.

Blueray particularly excels in marginal blueberry growing areas where winters are more severe. It is particularly suited for direct market farms where large size and superior flavor are important. Does best in intensive plantings with severe pruning. Tight clusters discourage machine harvesting the first picking.

Chandler

Mid-late season. Slightly spreading bush, moderate vigor. Largest fruit, medium firm, medium scar, medium color, excellent flavor, long ripening season.

Chandler is a 1994 USDA release noted for its exceptionally large, high quality fruit. Berries of Chandler usually cover a quarter in size, with some larger. A key to this large size is the long ripening season. Chandler can be picked regularly over 4-6 weeks. It is perfect for U-pick and direct market sales where a hand picked standout berry is needed. Yields have been good to excellent. It is recommended for production in areas with milder winters where high-chill varieties do well. Chandler is named in recognition of James Chandler, Agricultural Research Technician, now retired, in honor of his many years of testing blueberry selections in Oregon.

Toro

Mid-season. Strong, spreading, moderate growth. Fruit is consistently large, outstanding firm quality, medium scar, exceptional color, mild flavor, concentrates ripening.

Toro may possess the best overall fresh market quality fruit of any variety. The easy to pick berries are borne on large clusters that hang like grapes from the spreading stocky bush. In some areas it is replacing Bluecrop as the preferred mid-season variety. Production has been consistent and quite high in Oregon. Highly recommended for fresh market and local sales. The large, tight clusters discourage machine harvesting first picking.

1613-A (Hardyblue)

Mid-season. Bush erect, open, strong canes. Vigorous, very productive. Berries medium sized, light blue, very sweet. Open cluster, concentrates ripening extremely well.

1613-A is a time proven variety with significant acreage planted throughout the Northwest. It is a consistent, heavy producer of excellent quality medium size process berries. The bush shape, open cluster and twice pick characteristics make it one of the best for mechanical harvesting. Excellent for on farm sales but not suitable for long distance fresh shipping. Highly recommended where a heavy producing process berry is desired. Seems more adaptable to heavier soils than most varieties.

Bluegold

Mid-season. Compact, spreading bush to 4 ft. Extremely productive. Fruit is very round, sky blue, exceptionally firm, with a small recessed scar. Cold hardy.

When first released in 1990, Bluegold was thought to be late ripening. We were disappointed to learn that this variety was actually mid-season, ripening most all of its fruit within the first two pickings of Bluecrop. A pleasant surprise was the very high production of truly superior fruit. The berries are very firm, flavorful and evenly sized. Shelf life in normal storage as well as controlled atmosphere has been outstanding. A particularly exciting feature is the concentrated ripening, making Bluegold one of the easiest varieties for hand harvest and a good candidate for mechanical harvesting. We recommend Bluegold for growers desiring a superior quality mid-season berry that can be profitably hand picked.

Draper (patent pending)

New!

Mid-season, a few days before Bluecrop. Robust, upright bush, highly productive. Fruit is light blue, consistently large, exceptionally firm with crisp flesh. Small scar, strong skin and excellent low-acid flavor. Fruit ripening is noticeably concentrated to one primary harvest.

Draper is a highly productive, early mid-season cultivar with outstanding fresh market quality berries and excellent machine harvest characteristics. Notable features include exceptional firmness, concentrated ripening, easy release of ripe fruit, loose clusters that bear fruit on the periphery of a strong bush, and excellent post-harvest color retention. Draper berries appear to have a long shelf life. At this writing, five week-old Draper berries, stored in regular cold storage, are still crisp with no sign of decay. Draper was selected from a Duke cross made in 1990 by Dr. Jim Hancock and tested at multiple sites in Michigan and Oregon. We believe that Draper may be the first cultivar that can be consistently harvested mechanically and shipped fresh. We recommend Draper for trial by fresh and process market growers desiring an improved machine harvested mid-season variety. Fall Creek is the exclusive licensed nursery for states west of the Mississippi River and is currently licensed to sell in this territory only.

Bluecrop

Mid-season. Upright, vigorous bush, very productive. Fruit is light blue, very large, small scar, very firm, flavorful when ripe, won't crack or drop.

Bluecrop is still the industry's standard of excellence and by far the most widely planted of any cultivar. An easy bush to grow, Bluecrop has very few problems. Withstands spring frosts quite well with high consistent yields. The fruit can be tart and show a large percentage of "red backs" if picked too early. Bluecrop machine harvests fair after hand harvesting the first or second picking. In warmer areas it can be machine harvested successfully for all pickings. Bluecrop is recommended for all facets of blueberry production.

Olympia

Mid-season. Spreading, vigorous bush, strong canes. Medium producer. Fruit is medium blue, medium sized, small scar, thin skin, won't drop or crack. Best flavor.

Olympia is popular with direct market growers because of its superior flavor and aroma. Our fresh fruit customers consistently rate Olympia as best tasting. An easy bush to grow, Olympia adapts well to most types of soils. Avoid frost prone sites and prune severely to force upright growth. Olympia is well suited for process frozen packs because of its high brix count and uniform size. Good for machine harvesting or "stick pick" methods if the bush is pruned properly.

Brigitta

Late mid-season, ripening just after second pick Bluecrop. Vigorous, slightly spreading bush to 6 ft. Berries medium large, light blue, slightly tart, small dry scar, firm.

Brigitta has a reputation in Australia as a high producer of late ripening, very high quality fruit. Of particular interest is Brigitta's exceptional shelf life and suitability for CA storage. Early observations here in the Northwest indicate that Brigitta does not need as much fertilizer as other varieties and should be managed differently than other varieties to encourage the bush to go dormant in time for winter cold. Pollination trials conducted at our trial farm in 2001 indicate that Brigitta may not be

(Continued on page 8)

(Continued from page 7)

completely self-fertile. We recommend alternating rows with other varieties such as Bluecrop, Legacy or Ozarkblue to improve yields and increase berry size. Brigitta is recommended for those looking for a late mid-season variety of exceptional berry quality with extended shelf life.

Legacy

Late mid-season, after second pick Bluecrop. Upright, open, vigorous to 6-7 ft. Berries medium sized, light blue, very firm, superior scar and flavor.

Legacy is a 1993 USDA release from New Jersey. We have been carefully watching this variety's performance at our farm and numerous test sites around the country. Through this decade, Legacy has steadily improved its standing to become one of the highest producing varieties tested. In 1998, Legacy out-yielded all but one variety in the NWREC Oregon trial plot, producing an equivalent of 12 tons per acre. Equally intriguing is the top ranking Legacy has received for fruit quality and flavor. Mechanical harvest suitability should be good as the ripe berries detach easily and green berries seem to hold well. Legacy is a northern-southern cross, including $\frac{1}{4}$ *V. darrowi*. It will keep its leaves through most of the winter. We recommend Legacy for planting in mild climates and for trial in colder areas for both fresh market and process sales.

Rubel

Late season. Upright bush of medium vigor. Very consistent producer of quite small fruit with intense flavor and color.

After almost 90 years of intensive breeding to make blueberries larger, lighter blue and thicker skinned, we re-introduced Rubel, one of the first blueberry selections to be named. Despite the hundreds of new varieties released since 1912, this wild selection continues to be grown in many areas. Rubel offers consistent yields of small fruit borne on loose clusters, perfect for machine harvest. Rubel is well liked by processors because of its clean harvest, uniformly dark color and low stem count. Food manufacturers covet the small fruit as one of the best for muffins, yogurts and dried products. Our newly released Rubel was carefully selected from a high producing, vigorous bush, thoroughly tested for

viruses and phytoplasmas and then tissue cultured for uniformity and vigor. We are very pleased with the results.

Of additional interest to growers is Rubel's extremely high content of antioxidants, compounds that have been identified as playing a major part in improving eyesight, lowering cholesterol levels and preventing cancer. This recent research has opened new markets for blueberries in general and Rubel in particular. We recommend Rubel for growers looking to mechanically harvest yet diversify their product base in the process market.

Jersey

Late season. Extremely vigorous, large, upright bush. Consistent producer of medium to small sized, medium blue, firm fruit, borne in loose clusters.

Jersey is one of the oldest varieties and one of the most dependable. Grows well in most types of soil, producing consistently high yields of very sweet fruit. Well suited for mechanical harvesting. Jersey is best suited for the process market where a small to medium sized berry is desirable.

Darrow

Late season. Vigorous, upright bush, consistently productive in mild climates. Very large fruit, light blue, firm, with a large scar, excellent tart flavor.

In milder blueberry growing areas such as Oregon, Darrow is a fast growing, consistent producer of good quality late season fruit. Darrow is picked 4-6 times through the season, with the first pick yielding fruit that will easily cover a quarter. The slightly tart flavor is outstanding for cooking or eating fresh. Recommended for U-pick and farm sales. Not suitable for machine harvesting.

Ozarkblue (U.S. Patent #10035)

Late season. Upright, vigorous growth. Fruit is very high quality, firm, large, light blue, with a small dry scar. Consistent high yields.

Ozarkblue has been listed for a number of years in our Southern section, but its outstanding performance here in Oregon warrant consideration by growers in cooler climates. It was released from the University of Arkansas as a variety adapted to the upper southern U.S. Here in the West, Ozarkblue

...distinguishing itself as a late blooming, late
 ...ening cultivar with excellent fresh fruit quality.
 Production figures have been very impressive here
 in Oregon, out-yielding Bluecrop by over 50%.
 Pollination trials conducted at our trial farm in 2001
 indicate that Ozarkblue may only be partially self-
 fertile. For highest yields rows should be alternated
 with another variety such as Bluecrop or Legacy.
 Ultimate cold hardiness of Ozarkblue is not known.
 It is recommended for commercial planting in mild
 areas of moderate winters with 800 hours chilling,
 and for trial in colder zones. Fall Creek is licensed
 to sell Ozarkblue throughout the United States and
 is the exclusive licensed nursery for Ozarkblue in
 Washington, Oregon and California.

Liberty (patent pending)

New!

Late season. Vigorous, upright to slightly spreading, with long drooping fruiting laterals. Fruit is medium to large sized, sky blue, very firm, small scar, with a very pleasant, medium-acid flavor.

Liberty is a selection from a Brigitta x Elliott cross, and seems to have inherited the best characteristics of both. First harvest is about five days before Elliott, ripening over two to three pickings and finishing before Elliott. The berries are slightly flat with an attractive light color and good firmness. Initial observations show possibilities for mechanical harvest as the cluster is loose and ripe berries detach easily from the bush. The flavor is reminiscent of Brigitta but the production is notably better. Consistent high yields in Michigan indicate that the buds and wood of Liberty are tolerant to fluctuating late fall and spring temperatures and cold winters to -20°F. We recommend Liberty for grower trials of late season fresh and process markets. Fall Creek is the exclusive licensed nursery for states west of the Mississippi River and is currently licensed to sell in this territory only.

Elliott

Very late. Upright, vigorous, excellent bush shape. Heaviest producer of medium sized, powder blue, very firm, slightly tart berries. Small, dry scar.

For the last decade, Elliott has been the leading late-season blueberry for the fresh market. It is used extensively in CA storage programs to extend shelf life for up to 12 weeks. The berries are medium sized, light blue with high acid and slightly tart flavor that ripen over a long period of four to five weeks depending on location. It is consistently rated as one of the highest producers in most highbush trial sites around the world. Elliott has moderate vigor and must be adequately pruned to retain bush growth and berry size.

Aurora (patent pending)

New!

Very late, 7-10 days after Elliott. Slightly spreading, vigorous, strong bush. Very high, consistent producer of large, medium dark blue, firm, slightly tart berries with very small, dry scar.

Aurora is the latest ripening new release from MSU, offering northern growers an opportunity to extend the fresh fruit season beyond Elliott. Our observations here in Oregon find Aurora to be more vigorous than Elliott with an extremely high yield capacity. The berries ripen over three to four pickings and average in size about 20% larger than Elliott. The post harvest problems that can plague Elliott do not seem to be apparent with Aurora. Aurora berries can be tart and must be harvested when fully ripe, but flavor is considered superior to Elliott. In CA storage studies, Aurora stored slightly longer than Elliott. We recommend Aurora for grower trials where a cold hardy, hand harvest berry is desired to extend the fresh market harvest season. Fall Creek is the exclusive licensed nursery for states west of the Mississippi River and is currently licensed to sell in this territory only.

Rabbiteye Varieties

Rabbiteye blueberries, *Vaccinium ashei*, are native to the southeastern United States. They have been commercially cultivated for over 100 years. The berries are firmer than highbush, with thicker skin. The seeds tend to be slightly more pronounced than highbush. In the south, growers machine harvest rabbiteyes for both the fresh and process markets. Here in Oregon, rabbiteyes actually ripen quite late, with some varieties starting at the end of August and continuing through October. Their post-harvest shelf life is outstanding, and generally better than highbush.

Although we have not seen significant winter damage on rabbiteyes here in Oregon, it is important to note that winter injury is possible during the sudden cold spells that occasionally occur in western Oregon. As a general rule, rabbiteyes are not self-pollinizing. Plant at least two varieties in alternating rows for best production and largest fruit. Due to the lack of heat units in the summer and colder winters, we do not recommend rabbiteye blueberries north of Puget Sound.



Denotes varieties exclusive to
Fall Creek Farm & Nursery (FCFN)

Rahi

Very late. Vigorous, spreading, moderately productive. Berries are large, firm, light blue, with a small scar, outstanding flavor and dessert quality.

Rahi is a New Zealand release selected for its high berry quality and excellent flavor. The first berries are ripe about August 20 in western Oregon, and will generally harvest over a 3-4 week period. The berries are larger than Powderblue or Centurion. Production has been only moderate and care must be taken to not over-fertilize, as the bush will tend to be more vegetative reducing flower bud formation. If techniques are found to improve production, Rahi could be the leading variety for late season production. Recommended for trial and limited commercial planting. Fall Creek is the exclusive licensed nursery for Rahi in North America. Signed non-propagation agreements are required for sale.

Powderblue

Very late. Vigorous, upright, easy to grow bush. Highly productive. Berries are medium sized, sky blue, very firm, small scar, with a long shelf life.

Powderblue is currently the best variety for late season production. The bush is quite vigorous, out growing most highbush. Powderblue has high yields, rivaling the better highbush. The berries are evenly sized, quick to pick, and resistant to cracking from fall rains. We recommend Powderblue for all rabbiteye plantings where a quality, late season fruit is desired.

Maru

Very late. Slightly spreading, vigorous bush. Highly productive yielding large sized, medium blue, firm, mild flavored fruit.

Maru is the latest ripening rabbiteye cultivar to date. In New Zealand, it has proven to be one of the most profitable varieties ever for growers in areas with sufficient warm weather in the fall to ripen the fruit. Initial yields here in Oregon have been quite

high with the fruit of excellent quality at maturity. We recommend Maru for trial in Oregon and other similar climates for growers wanting to extend the harvest season. Fall Creek is the exclusive licensed nursery for Maru in North America. Signed non-propagation agreements are required for sale.

New Introductions

Not since the release of Duke in 1989 have we been so excited about new varieties for northern growers. Draper, Liberty and Aurora culminate years of research by Dr. Jim Hancock from Michigan State University. They have been trialed in multiple sites in both Michigan and Oregon, including our own test plots. We believe that these three varieties have the potential to dramatically change the mid and late season markets. However, it should be noted that they have yet to be proven commercially. We recommend Aurora, Liberty and Draper for trial plantings in your fields to determine if they are right for you. *Due to the high level of interest in these new varieties we are accepting requests in advance of plant availability. Please call for details.*

Fall Creek is proud to be the exclusive licensee for Aurora, Liberty and Draper in states west of the Mississippi and is currently licensed to sell in this territory only.

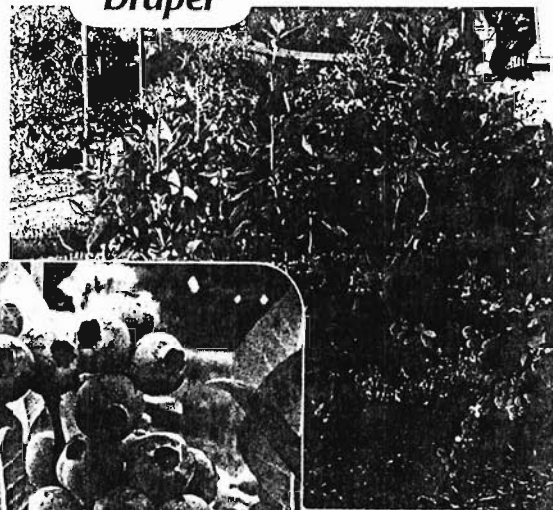
Aurora



Extends the fresh harvest season for northern highbush. Available in trial quantities Spring '04 and commercial quantities Fall '05.



Draper



May be the first major fresh market machine harvest variety. First availability estimated Spring '06.

Liberty



Improved berry quality for late season. First availability estimated Spring '05.

Northern Highbush Varieties

(Top Left) Dutera is one of the world's leading blueberry canners.

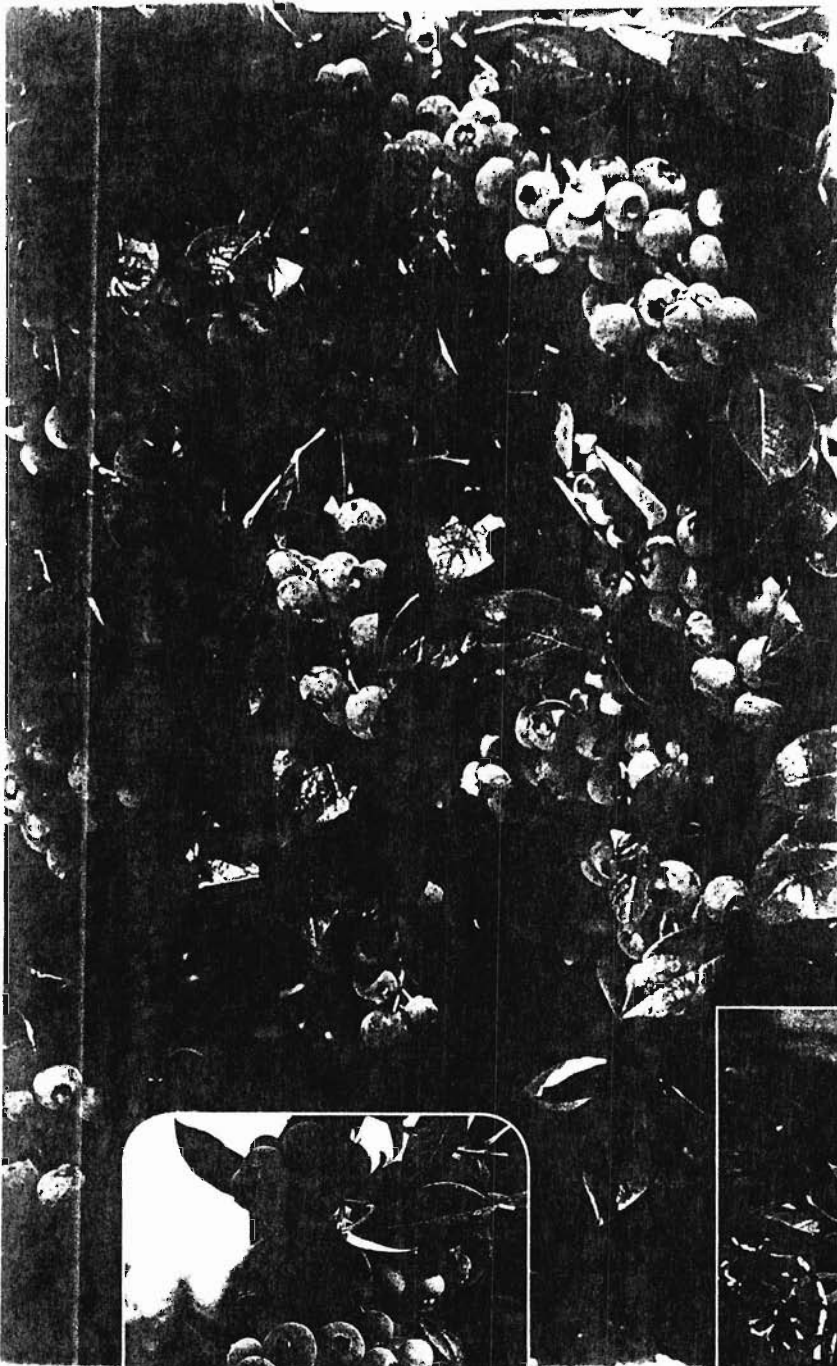
(Top Center) Late season Oval blue has superb quality fresh market fruit.

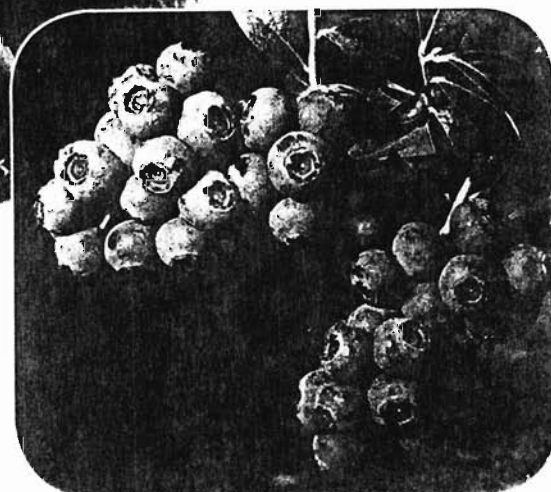
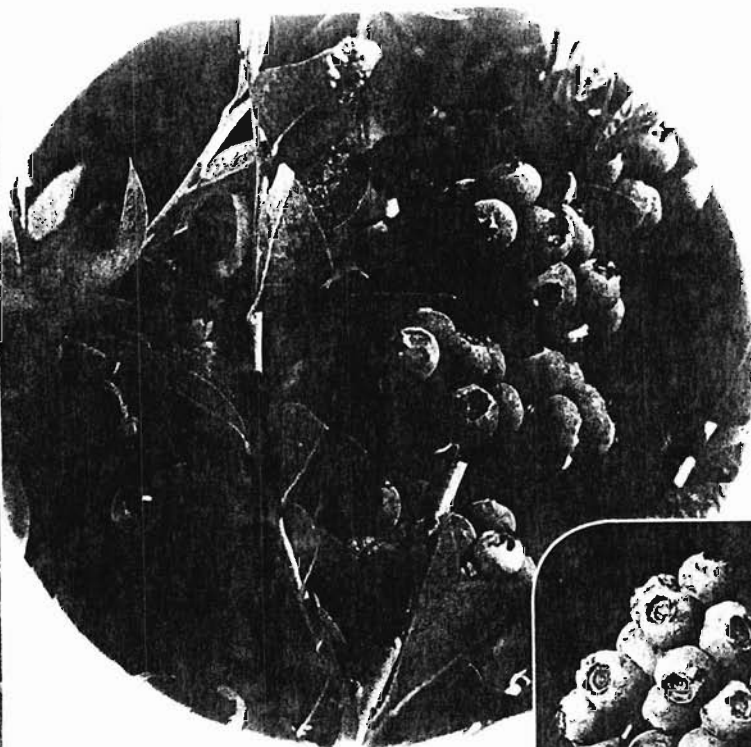
(Top Right) Many shippers consider Bluegold one of the best berries they sell.

(Top Far Right) Look to Pella for fast growth, high production and machine harvesting.

(Bottom Center) Legend is gaining interest for its high production and firm, flavorful berries.

(Bottom Left) Bluecrop has been a proven performer over the last forty years.



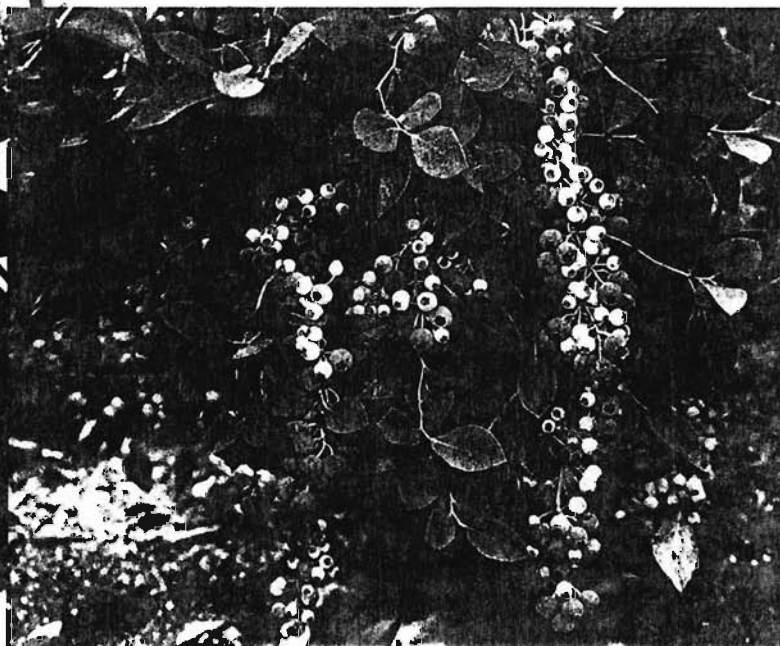
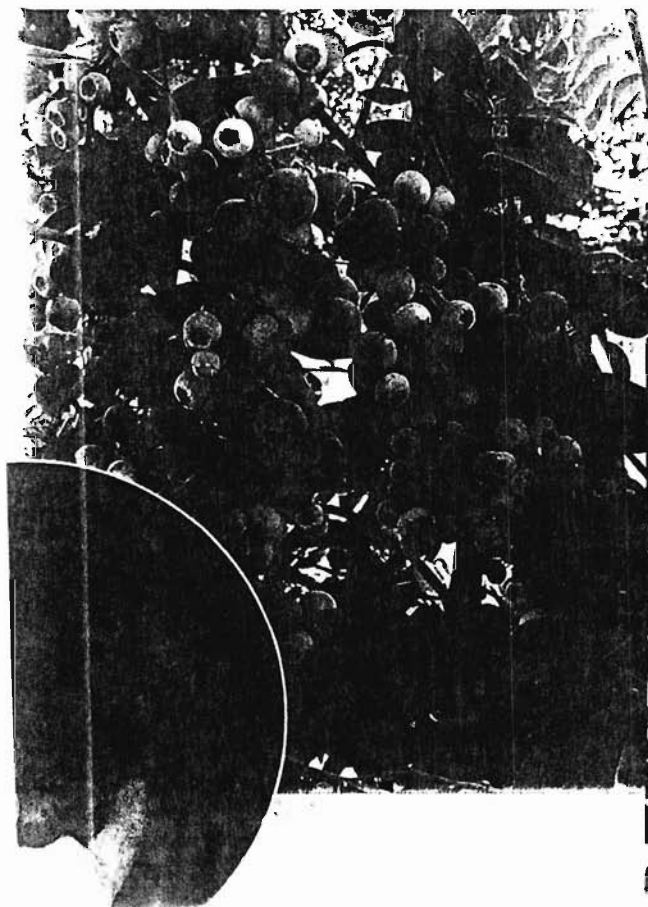


Rabbiteye Varieties

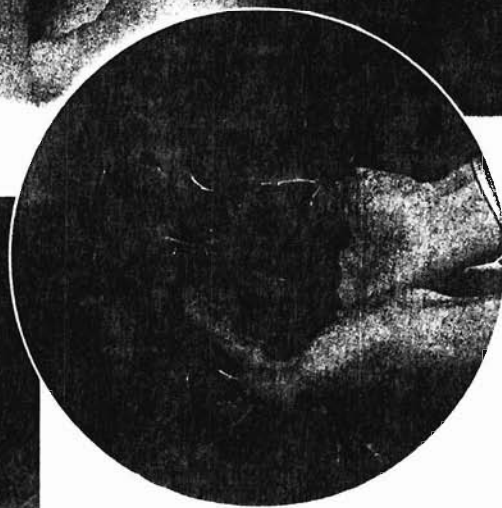
(Left) Maru is the latest ripening rabbiteye to date.

(Bottom Right) Powderblue offers firm, fresh fruit through October

(Bottom Left) Rahi is one of the best quality rabbiteyes.



Southern Highbush Varieties



(Top Left) Florida's new Jewel.

(Top Right) The "Star" of the south.

(Bottom Right) Oneal – early and flavorful.

(Bottom Left) Emerald is the largest southern berry.

Southern Varieties

Included in this listing are varieties considered best suited for southern climates where summers are hotter and chilling hours fall below 1,000 per year. The varieties are listed in order of ripening when fruited in our test blocks in Oregon. Ripening time will vary depending on the climate in which they are grown. Estimated minimum chilling requirement (number of hours under 45°F in winter) is listed for each variety. Subjective evaluation is compiled with the most recent information from growers throughout the world. Most southern highbush varieties are not self-fertile. For highest production and largest berry size, care should be taken to alternate rows of varieties that will cross-pollinize.



Denotes varieties exclusive to
Fall Creek Farm & Nursery (FCFN)

Star (U.S. Patent #10675)

Very early. Bush slightly spreading, moderately vigorous. Fruit is large to very large, sweet, medium blue, small recessed scar, outstanding quality.

This University of Florida release is garnering tremendous interest due to its high berry quality, ease of hand harvest, early ripening and vigorous growth. Star blooms a little later than Oneal and Misty, but ripens with Oneal and before Misty. Berry ripening is highly concentrated, primarily in the first two pickings. Chilling requirement is approximately 300 hours. We have been extremely impressed with this variety and feel it may be one of the best southern varieties to date. We recommend Star for planting and evaluation wherever southern highbush can be grown. Fall Creek is licensed to sell Star throughout the United States and is the exclusive licensed nursery for the western U.S.

Oneal

Very early. Bush erect, slightly spreading. Fruit is medium sized, medium blue, firm, very sweet, excellent scar.

Oneal is the leading fresh variety in California, Chile and Argentina, as well as a key early variety in its home state of North Carolina. Oneal can be a little slower to establish but is notably easier to manage as it reaches maturity. Most growers and sellers would agree that Oneal is one of the very best flavored berries, with exceptionally reliable quality throughout the harvest. In most climates, it is the

first variety to ripen. Yields have kept pace with most other southern highbush. Cumulative cold requirement is listed at 400 hours. Grows best where the pH is kept at 5.0 or lower.

Biloxi

Early. Upright bush, vigorous, productive. Fruit is medium sized, light blue, very firm, excellent flavor.

Biloxi is a 1998 USDA release from Mississippi. It is notable for its early ripening and high fruit quality. Initial observations indicate that Biloxi should ripen just after Oneal and Star. Plants look to have good vigor here in Oregon. Biloxi blooms quite early so it could be a risk in areas with late spring freezes. Biloxi is recommended for trial and commercial plantings in all regions with 400 or more chill hours.

Jewel (U.S. Patent #11807)

Early. Slightly spreading, highly vigorous bush. Highly productive. Fruit is large, light blue, small scar with a slightly tart flavor.

Jewel was released by the University of Florida as a very low chill, early ripening variety with high quality fruit. In Florida it ripens a few days after Star, before Sharpblue. Jewel's plant vigor and strong leafing is similar to Sharpblue. Bushes in Florida have been quite productive, yielding large fruit that is sky blue, firm, with a small scar and rather tart flavor. Flowering period is early, averaging a week before Star, coinciding with Biloxi and Oneal. Chilling requirement is estimated at 200 hours. Jewel is recommended for trial and limited commercial production in areas of low to medium

(Continued on page 16)

(Continued from page 15)

chill where early, high quality fruit is desired. Fall Creek is licensed to sell Jewel throughout the United States and is the exclusive licensed nursery in the western U.S.

Millennia (USP # 12816P2)

New!

Early. Spreading vigorous, highly productive bush. Fruit is large to very large, quite firm, medium blue with a very small scar and mild, low acid flavor.

Millennia has become quite popular in Florida for its high production of consistently large, firm fruit that tolerates the heat well. The berries first ripen a few days after Star and yield over a three week season. Flower bud production is very high and Millennia must be heavily pruned to prevent over-fruiting and to enhance early leafing. Cumulative cold requirement is approximately 300 hours. We recommend Millennia for trial in the West and commercial planting in the Southeast. Fall Creek is licensed to sell Millennia throughout the United States and is the exclusive licensed nursery in the western U.S.

Emerald (U.S. Patent #12165)

Early. Bush is vigorous and spreading. Fruit is very large, firm, medium blue, with excellent flavor and a small scar.

Emerald may turn out to be one of the best southern varieties yet released. The vigorous, highly productive bush seems to leaf well despite supporting large crops. Emerald has been known to flower some in the fall but this has not appeared to reduce the spring crop. The berry is firm and well textured with medium blue color. Berry size is currently the largest of any of the southern highbush offered. Chilling requirement is quite low, estimated at about 250 hours. We highly recommend Emerald for commercial plantings in all climates where it is suited. Fall Creek is licensed to sell Emerald throughout the United States and is the exclusive licensed nursery in the western U.S.

Santa Fe (U.S. Patent #10788)

Early. Bush is quite vigorous and upright. Fruit is large to very large, light blue, medium firm, very small scar, with a pleasing sweet flavor.

Santa Fe showed promise as being one of the very best varieties to come out of the Florida program. The drawback was that it turned out to be almost impossible to propagate. We have now broken that barrier with our tissue culture program and are quite excited to offer this exceptional variety to our southern customers. Santa Fe bushes show excellent vigor, with strong leafing and an ability to support heavy crop loads. The berries are uniformly large throughout harvest, easy to pick and of exceptional fresh quality. In Florida trials, Santa Fe has shown an interesting ability to thrive in low organic matter soils while being irrigated with water high in dissolved bicarbonates. Most other clones died or became unproductive. In spring 2002 our test blocks were subjected to multiple hard freezes with temperatures to 25°F. All of the southern varieties experienced injury except Santa Fe, which had a bumper crop. Chilling hours are listed at a minimum 400, but it probably performs better closer to 600. We recommend Santa Fe for trial in California and other southern regions. Fall Creek is licensed to sell Santa Fe throughout the United States and is the exclusive licensed nursery in the western U.S.

Sapphire (U.S. Patent #11829)

Early. Bush has medium vigor, semi-spreading. Fruit is medium sized, light blue, very firm, small scar, with a pleasant aroma and excellent balance of sweet and tart flavors.

Sapphire was developed by the University of Florida to fill the need for lower chill varieties that could accompany or replace Sharpblue. While not as vigorous as Sharpblue, Sapphire has a firm berry of equal or better flavor. Sapphire sets a high ratio of berry buds so pruning will be important for optimum berry size and plant growth. We recommend Sapphire for trial in low chill areas where winter frosts are uncommon. Chilling hours are estimated at 200. Fall Creek is licensed to sell Sapphire throughout the United States and is the exclusive licensed nursery in the western U.S.

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Early. Bush slightly spreading, extremely vigorous. Medium to large fruit, very firm, small scar, mild sweet flavor.

Misty has become the most popular variety in California where it is liked for its fast growth, high yields and consistent quality. Here in the West we find Misty to be quite vigorous, growing very well both on the coast and in the inland heat. Misty has a long harvest season. It is normally picked 3-5 times during harvest. Best results are obtained when Misty is pruned heavily to avoid over-cropping. We recommend Misty for commercial production in areas with chilling as low as 150 hours and all areas with mild winters and hot summers.

Sharpblue

Early. Bush is exceptionally vigorous, slightly spreading. Fruit is very large, medium scar, medium blue, excellent flavor.

Sharpblue is the leading early variety in low chill areas throughout the world. It is the most adaptable of all the low chill types performing well from the heavy soils of coastal Australia to the sandy soils of Florida. Sharpblue continues to be planted because of its bush vigor, earliness, very large fruit and excellent flavor. Care must be taken to harvest frequently to keep the quality high in hot weather. In very mild climates Sharpblue will flower and fruit throughout the year, with a commercial crop favored in spring and a smaller crop in fall. Sharpblue is recommended in areas with winter chilling under 500 hours but will grow in climates where there are practically no chilling hours.

Southmoon (U.S. Patent #PP 9834)

Mid-season. Bush is moderately vigorous and upright. Fruit is very large, sky blue, firm, small dry scar, with outstanding flavor, highly productive.

Southmoon is one of the earlier Florida releases that offers exceptional fruit quality, large berries that are easy to pick, and good production. In Florida's exacting climate, mortality has been a problem, but this has not been an issue in California when planted in suitable soils. Southmoon's berries are some of the prettiest blueberries we have ever seen, and the eating quality supports their

appearance. The berries ripen about 10-14 days after Oneal, with peak harvest around Memorial Day in California. We recommend Southmoon for commercial plantings, particularly in lighter sandy soil. Chilling requirement is listed at 500 hours. Fall Creek is licensed to sell Southmoon throughout the United States and is the exclusive licensed nursery in the western U.S.

Jubilee

Mid-season. Upright, vigorous, consistently productive bush. Fruit is medium sized, very light blue, extremely firm, small scar, with good flavor.

Jubilee is a recent release from the USDA breeding program in Mississippi. It is a hybrid of northern and southern varieties such as Earliblue, Bluecrop and Sharpblue. Jubilee was selected in 1986 as a superior seedling and evaluated in less than optimum blueberry sites where it has excelled as a tough, consistent producer of very high quality fruit. Here in Oregon, we find the fruit exceptionally firm with excellent color and a long shelf life. Jubilee bushes are upright and quite compact, with the fruit borne on the outer periphery of the bush. Ripening period is condensed, usually resulting in two pickings. Chilling requirement is estimated at 500-700 hours.

Ozarkblue (U.S. Patent #10035)

Late season. Upright, vigorous growth. Fruit is very high quality, firm, large, light blue, with a small dry scar. Consistent high yields.

Ozarkblue is a hybrid consisting of both northern and southern parentage. It is a late ripening cultivar, performing very well in California, where it ripens about June 10 - July 10. The berries are large, light blue and of excellent quality. The berries hold up well in the heat. The bush is vigorous and open in habit, like Bluecrop. The bush is quite adaptable, performing well where other varieties have struggled. Ozarkblue should be planted with other varieties for best pollination. Chilling hours are estimated at 800. Fall Creek is licensed to sell Ozarkblue throughout the United States and is the exclusive licensed nursery in Washington, Oregon and California.

Planning Your Commercial Field

A properly planted blueberry field can last 30 years or more and be a great asset to the property upon which it is planted. By having a good marketing plan, selecting the right varieties, planting disease-free stock and proper preparation of the field, a grower can realize the full potential of the crop.

Site Selection

One of the first steps in successfully growing blueberries is to select an appropriate site. The field should offer easy access for equipment and workers. There should be good air drainage with freedom from late spring frosts. Complete soil and water analyses should be done to determine the suitability for blueberries prior to planting. The best blueberry soil is acidic, well drained, loose and friable. If these conditions are not present, soil modification will be necessary. Ample, clean water is essential for growing blueberries. In some areas, irrigation water must be treated for best plant performance.

Variety Selection

It is important to have a basic marketing plan prior to selecting varieties. Some types are better for fresh berry sales, while others are planted specifically for the process market (frozen, juice or dried). What will be their end use? Will the berries be sold wholesale or retail? Will the berries be hand harvested or machine harvested? Is your best target market early, mid, late or all season?

Climate is also important to variety selection. Blueberries have been developed for almost all climates, from warm semi-tropical areas to the coldest zones of the U.S. Your local extension can be a good source to determine what varieties do best in your area.

There are specific varieties that tolerate difficult

conditions such as heavy snow loads, high summer heat, spring frosts, etc. Take time to identify the limiting conditions in your area and choose varieties that best address them.

Once you have identified the key requirements for the varieties you want to grow, use our catalog to find those that best match your needs and marketing plans. We are happy to assist in this essential step. It is important to choose varieties as soon as possible, as plants sell out quickly each year. Many growers place their orders a year or more in advance to ensure obtaining desired varieties.

Field Design and Pre-plant Preparation

We offer numerous information sheets to help you with the basics of preparing your field. Look for our list of "Blueberry Basics" on page 22. The following are some helpful charts to assist you in laying out your field.

Planting and Cultural Care

Fall Creek provides a detailed **Grower's Guide** with all commercial orders at no charge. This guide covers important details from receiving your plants through first year cultural care. We recommend that you read the guide carefully before unpacking your plants. Feel free to call us anytime if we can be of help in planning your project.

Plant spacing – plants per acre	Organic matter volume requirements	Common irrigation statistics
2.5 ft. by 10 ft. = 1,742 3.0 ft. by 10 ft. = 1,452 3.5 ft. by 10 ft. = 1,245 4.0 ft. by 10 ft. = 1,089 2.5 ft. by 11 ft. = 1,583 3.0 ft. by 11 ft. = 1,319 3.5 ft. by 11 ft. = 1,187 2.5 ft. by 12 ft. = 1,450 3.0 ft. by 12 ft. = 1,176	• 1 cubic yard = 27 cubic ft. • 7.5 cubic yards = 1 unit A strip 3 inches deep by 24 inches wide on ten foot rows uses about 11 units per acre of sawdust or ground bark. A semi-trailer typically holds from 10 to 14 units of sawdust depending on moisture levels.	Overhead irrigation: A 40 x 40 ft. riser spacing totals 27 sprinklers in one acre. Typical sprinkler orifice size for blueberries is 1/8", which delivers approximately 3 gpm per sprinkler or 80 gpm per acre. Drip irrigation: A typical drip system uses a line on either side of the plant row with .5 gph emitters spaced 24" apart. The gpm per acre would be approximately 37 on ten foot rows.

Wholesale Price List

Fall 2003 – Spring 2004

Northern Varieties

Group 1

Berkeley, Bluecrop, Bluejay, Bluecray, Bluetta, Duke, Elliott, Jersey, Northland, Olympia, Patriot, Reka¹, 1613-A.

	Less than 500 each	500-1,999 each	2,000+ each
½" Plug (400/Flat)	N/A	N/A	.71
2" Cell	1.95	1.45	1.15
Rooted Cutting	1.95	1.45	1.15
2x5 Field Liner	2.35	1.65	1.45
3½" Pot	2.65	2.40	1.85
Liter Pot	3.35	2.60	2.40
Bed Grown 12-18"	3.20	2.55	2.35
Bed Grown 18-30"	3.60	2.95	2.70
Grow Bag Gallon	3.60	2.95	2.70

Group 2

Aurora⁵, Bluegold, Brigitta, Chandler, Chippewa², Darrow, Earliblue, Legacy, Northblue, Nui¹, Polaris², Rubel, Spartan, Toro.

	Less than 500 each	500-1,999 each	2,000+ each
½" Plug (400/Flat)	N/A	N/A	.71
2" Cell	2.05	1.55	1.25
Rooted Cutting	2.05	1.55	1.25
2x5 Field Liner	2.45	1.75	1.55
3½" Pot	2.80	2.45	1.95
Liter Pot	3.45	2.70	2.50
Bed Grown 12-18"	3.30	2.65	2.45
Bed Grown 18-30"	3.90	3.10	2.90
Quick Start Gallon	3.70	3.00	2.80
Grow Bag Gallon	3.90	3.10	2.90

- All varieties may be mixed for quantity discounts.
- ½" plugs are available by custom order. It is best to order by January for late spring shipments.
- Additional discounts may be available for larger quantities or custom orders. Please inquire.
- Sizes may be slightly smaller for some varieties due to bush habit.

Southern Varieties

Biloxi, Emerald¹, Jewel¹, Jubilee, Millennia³, Misty, Oneal, Ozarkblue¹, Santa Fe³, Sapphire³, Sharpblue, Southmoon¹, Star¹.

	Less than 500 each	500-1,999 each	2,000+ each
½" Plug (400/Flat)	N/A	N/A	.71
2" Cell	2.10	1.70	1.40
Rooted Cutting	2.10	1.70	1.40
2x5 Field Liner	2.50	1.80	1.60
3½" Pot	2.85	2.50	2.00
Liter Pot	3.60	2.95	2.75
Bed Grown No. 1	3.95	3.25	3.00
Quick Start Gallon	3.70	3.00	2.80
Grow Bag Gallon	3.95	3.25	3.00

Rabbiteye Varieties

Maru¹, Powderblue, Rahi¹.

	Less than 500 each	500-1,999 each	2,000+ each
Rooted Cutting	2.10	1.70	1.40
Grow Bag Gallon	3.95	3.25	3.00

¹ Add 15% royalty fee

² Add 15¢ per plant royalty fee

³ Add 20¢ per plant royalty fee

⁴ Add 25¢ per plant royalty fee

⁵ Add 30¢ per plant royalty fee.

For Orders

Visit our new website at :
www.fallcreeknursery.com

Ordering Information

Terms and Conditions

The terms and conditions for transactions with our nursery accompany each acknowledgement and invoice. For detailed information prior to placing an order, please contact us.

Orders and Deposits

This is a wholesale list for commercial growers only. Minimum order \$500.00 for domestic accounts, \$1,000.00 for international. Please inquire for international orders. A 10% deposit is required for all orders. We reserve the right to cancel any order if the deposit is not received within 30 days of issuance of confirmation. All prices U.S. dollars.

Cancellations

Regular orders may be canceled with a full refund of the deposit up to 6 months (180 days) preceding estimated shipping date as listed on the confirmation. Cancellation after this date is not subject to a deposit refund.

International Orders

We welcome international orders and can ship anywhere in the world. Customers are requested to obtain an import permit when necessary and forward it to us a minimum 30 days prior to shipment. Plant preparation, phytosanitary certificates and special documentation to address import permit requirements are charged at our cost. All international orders must be prepaid. All funds U.S. dollars unless otherwise noted. Minimum dollar volume applies.

Payments

All sales will be prepaid before delivery. Accounts may be settled by U.S. check, Visa, MasterCard, interbank transfer or cashier's check drawn on U.S. dollars.

Prices

All prices in U.S. dollars. Prices are subject to change without notice.

Conditions

All orders are subject to crop conditions or errors in count, with the understanding that orders shall be void should injury befall stock from causes beyond our control. Since final grades are ultimately determined by the season's growing conditions, we will substitute if necessary with the closest grade or similar variety, upon your approval. We exercise every precaution in keeping our varieties true to name and warrant to the extent of our invoice price.

Packing and Shipping

Freight, packaging materials and refrigerated storage are charged at cost. All prices FOB our nursery, located just outside Lowell, Oregon, unless otherwise agreed. For freight and shipping information, please inquire. We can help to arrange shipment of your order via UPS, common carrier, LTL, air or ocean freight. We will be glad to load your vehicle at our nursery with advance notice. See hours page 24. Plants become property of the purchaser when they are picked up by the carrier. We are not responsible for loss, damage, or delay in transit.

Bookstore

In today's agricultural environment, information and knowledge are as critical to success as the right variety and proper farming practices. Our nursery has always specialized in providing the information to help our growers enjoy a competitive edge in the industry. As a continuation of this service, we have compiled the best blueberry publications from throughout the country and can now provide them for your convenience.

Shipping and handling charges within the US included in prices.

Fall Creek Farm and Nursery Publications:

Blueberry Growers Guide

A nuts and bolts guide to planting and first year cultural care.

Cost.....Free with receipt of order deposit

Blueberry Basics

- Preplant Preparation
- Interplanting & Replanting Existing Fields
- Creating the Optimum Environment
- Designing Fields for Machine Harvesting
- Plant Spacing for Different Uses
- Options for Mechanical Harvesting
- Plant Sizes and Their Applications
- Mechanical Harvesting for Small Farms
- Integrated Bird Management
- Bareroot vs. Container
- Useful Blueberry Related Websites
- Preplant Preparation for Southern Highbush Blueberries

CostFree

Extension and Private Publications:

FG 78 Fertilizer Guide to Commercial Blueberries

Bernadine Strik and John Hart, OSU, editors.

The first soil interpretive guide for blueberries in the Northwest. Discusses all the major and minor nutrients.

Cost.....Free

Blueberry Economics

The Cost of Establishing and Producing Blueberries in the Willamette Valley

By Bob Lisec, Tim Cross, and Bernadine Strik

A little dated, but the workflow descriptions and computing charts are excellent.

Cost.....\$4.00

PNW 215 Highbush Blueberry Production Guide, 1993

Contributions by 25 authors, Bernadine Strik, OSU, regional editor.

This edition is the latest word on blueberry culture in the Northwest. Includes chapters

on propagation, production, plantation establishment, fertilization, nutrition and pest management. Highly recommended for new and established growers alike.

Cost.....\$16.50

The Highbush Blueberry and Its Management

Robert E. Gough, PhD

A comprehensive guide to growing blueberries including chapters on all pertinent subjects, both before and after planting. Now in paperback.

Cost.....\$30.00

A National Blueberry Production Guide, 1992

Northeast Regional Agricultural Extension Service.

Contains an in-depth complete review of modern blueberry production throughout North America with a number of helpful color plates. Excellent problem identification key.

Cost.....\$50.00

Pruning Video

From Oregon State University

Proper pruning makes a difference in yield and quality. *A Grower's Guide to Pruning Highbush Blueberries* will help you realize the reward of proper pruning — consistent production of quality fruit. Our own Dave Brazelton will lead you through a simple four step procedure including:

- the basics of plant growth—identifying fruit and leaf buds, wood of different ages and unproductive wood
- basic equipment
- how to prune plants of different ages
- ways to increase pruning speed
- pruning for machine harvest. Available in English and Spanish.

VHS Format

Cost.....\$25.00

Product Descriptions

We grow Vacciniums in every size and form to meet your needs. Following is a description of the plant products offered and uses for each. Shipping and order information is also listed. All stock is virus tested throughout the growing cycle. **See pictures of our product line on our website – click on "Products."*

Liners

½" plug

Rooted microcutting in a ⅝" wide by 1" deep cell. Greenhouse grown, not hardened off. Best for transplanting to a larger pot or protected bed. Most economical product for long distance air freight. Our custom box holds 4,000 plants and weighs just 50 lbs. (22.5 kg). Sold in flats, 400 per variety. *Available by custom order. Ships May–June.*

2" cell

Rooted microcutting in a 50 count flat. Plant height averages 4-8". Greenhouse started, finished and hardened off outside. Suitable for transplanting to 1 gallon pot, nursery bed or directly to the field under optimum conditions. Sold in multiples of 50 per variety. Available fall through spring.

Rooted cutting

Cuttings from hardwood or softwood, grown for one full season in community flat or a plug tray. Separated and graded. Plant height averages 3-8". Suitable for transplanting to a 1 gallon pot or nursery bed. Sold in multiples of 50 per variety. Available December–April.

Finished Stock

2x5 field liner

A one-year plant designed for direct planting into the field. The 2x5 is a deep rooted, grooved cell designed for mechanical transplanting and long distance shipping by UPS, truck or air freight. Plant height averages 6-10". Average weight is 26 lbs. (12 kg) per 100 plants. *Usually available by custom order only. Please order before March 1 for September–April deliveries.*

3½" pot

Ten to fifteen month plant that makes an economical field-ready liner. We use a tall perennial pot that provides a generous solid root system. Most highbush blueberries average 10-12" height and are sold as No. 1s. Shipped UPS or bulk boxed for truck shipments. Order in multiples of 50 per variety. Available September–May.

Liter pot

Field-ready plant grown in a 4½" x 4½" x 5½" pot. A vigorous, strong plant that transplants well. Most highbush varieties average 12-18" height. Can be shipped by UPS in multiples of 25 per variety, or by truck, packed 500-750 per pallet bin box. Available September–May.

Quickstart 1 gallon

Field-ready plant grown in a blow molded one gallon container. Our extended growing program provides abundant roots and vigorous tops for rapid field establishment. Plants are well branched, slightly smaller than those in grow bags, averaging 16-20" in height. Shipped by truck, 300 per pallet bin box.

Grow bag 1 gallon

Our premium field-ready plant. Most northern varieties finish as 18-30" size while southern varieties are slightly shorter. Transplanted with little shock to the root system. Oftentimes ready for fruiting the second season. Shipped by truck, bulk loaded or packed 300–340 per pallet bin box. Minimum order multiple, 10 plants per variety. Available September–June.

Bed grown, bareroot

We offer a full selection of most varieties grown in our unique system of fumigated soilless raised beds. These plants produce an extremely fibrous root system and are harvested so that an optimum amount of media remains attached to the roots, assuring successful transplanting. All bundles have the roots wrapped with stretch film for protection during storage and shipping. Can be shipped by UPS, bulk loaded or palletized for truck shipments. Sold in multiples of 10 per variety. Available January–April.

Shipping Weights

Product Type	
½" plug	400 plants = 5 lbs.
2" cell	50 plants = 10 lbs.
No. 1 rooted cutting	50 plants = 10 lbs.
2 x 5 field liner	50 plants = 15 lbs.
3½" pot	18 plants = 18 lbs.
Liter pot	25 plants = 50 lbs.
12-18" bed grown	10 plants = 8 lbs.
18-30" bed grown	10 plants = 14-16 lbs.
1 gal. grow bag	10 plants = 45 lbs.

Office Hours

We welcome visitors at the nursery. Please call ahead so we can arrange our schedule. Our business hours are Monday–Friday 8:00–4:30. Loading and receiving hours are 8:00–3:00.

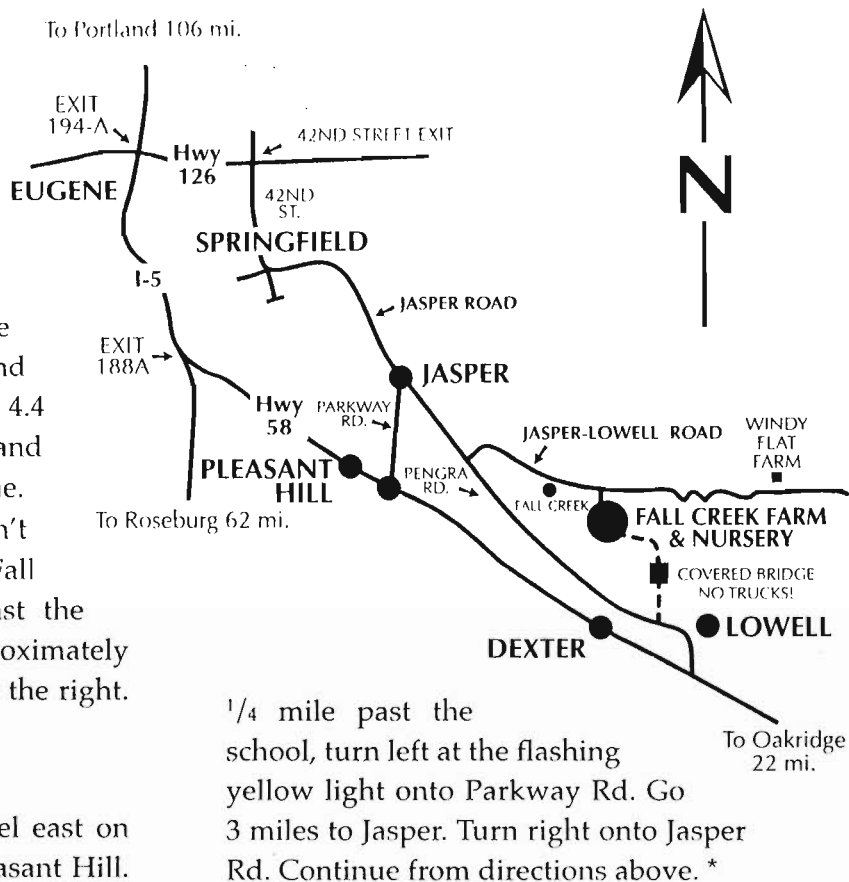
How to Find Us

From the North:

Travel south on I-5 approximately 2 hours from Portland to the Springfield Exit 194A. Go east on Hwy 126 toward Springfield. Take the 42nd St. exit and turn right. Continue 1.8 miles to the intersection of 42nd & Jasper Rd. Turn left and continue 4.4 miles to Jasper. *Pass the Jasper Store and continue 3.8 miles to the left turn lane. Turn left onto Jasper-Lowell Rd (don't miss this turn!) and go 2 miles to Fall Creek. Approximately 300 yards past the Fall Creek Market, turn right. Go approximately 1/2 mile. Entrance to the nursery is on the right. Please slow to 5 mph.

From the South on I-5:

Take the Oakridge exit 188A. Travel east on Hwy 58 approximately 6 miles to Pleasant Hill.

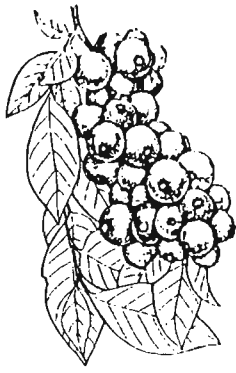


1/4 mile past the school, turn left at the flashing yellow light onto Parkway Rd. Go 3 miles to Jasper. Turn right onto Jasper Rd. Continue from directions above. *

Important: When visiting our nursery, please call first.

For Orders Please Call Dick Mombell,

www.fallcreeknursery.com



Fall Creek Farm & Nursery, Inc.

Welcome to Fall Creek Farm and Nursery, Inc! We hope that your visit to the United States will be informative and that we can provide helpful information which will address your interest in Blueberry Nursery Stock.

As the leading Blueberry Nursery, we have close relationships with other nurseries, commercial growers, shippers and packers within the trade. Through our diligent efforts to recognize and address specific import requirements, our customers have successfully received plants from Fall Creek Farm and Nursery into many distant production areas – Chile included.

Fall Creek Plants for Chile

For 25 years, producing blueberry nursery stock that complies with the most stringent import regulations has been our focus here at Fall Creek Farm and Nursery, Inc. We have developed a vertically integrated Tissue Culture Program that exemplifies state of the art selection, quality control, propagation, and shipping techniques. For Chile, the ½” plug is an economical (and perhaps the only) choice for growers that meets and exceeds all current import regulations. Fall Creek Farm and Nursery sells only rooted blueberry plants. In vitro material is not available.

Foundation Mother Stock for the ½” plug crop is maintained in an insect-proof screen house equipped with a locking double door entry and disease prevention footbath. These plants are routinely monitored and tested and kept free of all known blueberry pests, viruses and pathogens. Prior to culture initiation, each plant is tested for trueness to type using random amplified polymorphic DNA (RAPD) marker techniques.

All tissue culture media is steam pasteurized at 65 C for a period of 45-60 minutes in new flats prior to setting the tissue culture plantlets. The growing facility is a 90 x 110 foot (27.45 x 33.55 meter) Gothic arch gutter connect greenhouse equipped with steel benches and concrete walks. The tissue culture crop is grown exclusively in this facility. No other crops are grown in this structure during this time period. The entire house is completely sanitized prior to and just after each crop is finished. Oregon Department of Agriculture personnel (acting also as cooperators of the USDA) conduct final inspections of each order to satisfy all Phytosanitary requirements prior to export. Prior to shipment, all orders are given a complete insecticide and fungicide treatment.

Order Process

Importation of Blueberry Plants into Chile requires attention to very strict import and quarantine regulations. Customers in Chile must obtain an import permit from the Agriculture and Livestock Service, Department of Agricultural Protection. These permits are typically valid for 120 days from the date of issuance and specify all conditions that must be met for preparation of plant materials, prior to, during and after arrival into Chile. Post entry quarantines are common place and approved growing sites are required.

Finished ½” plugs are available for shipping **only** during a brief period of time each year from late May into early June. The plants are grown by custom order and a list of the varieties available for purchase by customers in Chile is included.

Orders for ½” plugs need to be in place 8 months to 1 year in advance of the shipping season. At the time an order is placed, a written acknowledgment will be presented. A 25% non refundable deposit is required within 30 days, to confirm the order. All prices are US Dollars. When patented varieties are included, completion of an International Non-Propagation agreement is also required. Approximately 1 month before the shipping date, a pro-forma invoice will be issued and the balance of the account is due. A copy of the consignees import permit must also be on record at Fall Creek, by this time.

Within a few days of a shipment, representatives from the Oregon Department of Agriculture will make a final inspection of each individual order. Upon completion of this inspection and review of the import permit, a Federal Phytosanitary Certificate will be issued. This certificate will serve as a statement of origin and compliance to import regulations. The original Phytosanitary Certificate and Original Customs Invoice accompany each shipment.

Shipments of the ½” plugs are by Expedited Air Priority Service – Freight Collect. Danzas DHL has been our freight forwarding agent and has offices in Santiago at A. Merino Benitez Airport. Our goal is to have shipments to their destination within 72 hours of the departure time from Fall Creek Nursery.

For more information about our nursery or to place an order, please contact:

Dave Brazelton
President

Dick Mombell
Sales Manager

Rich Schmidt
Sales and Shipping

Blueberry Varieties For Commercial Growers in Chile June 2004

Northern Highbush

Bluecrop
Berkeley
Brigitta
Bluejay
Bluegold
Blueray
Bluetta
Chandler
Darrow
Duke
Earliblue
Elliott
Jersey
Legacy
Northland
Patriot
Rubel
Spartan
Toro

Southern Highbush

Bluecrisp*
Biloxi
Jewel*
Jubilee
Misty
Oneal
Sapphire*
Sharpblue
Southmoon*
Star*

* Patented by the University of Florida
\$0.20 per plant royalty charge
International Non-Propagation Agreement Required

Fertility and soil management in newly established 'Elliott' blueberry

July 8, 2004

Linda White, M.S. graduate student, Horticulture, OSU
Bernadine Strik, Professor, OSU

Cooperators: Wei Yang, Assistant Professor, NWREC, OSU
John Hart, Professor, Crop and Soil Science, OSU
Dave Bryla, ARS-USDA, Corvallis

Objectives:

Determine the impact of pre-plant incorporation of sawdust and surface sawdust mulch on nitrogen fertilizer needs (uptake) of 'Elliott', plant growth, soil moisture status, and the natural colonization of mycorrhizae in a newly established blueberry planting.

Procedures:

Planting at the North Willamette Research and Extension Center (2-year-old; 30" x 10')

Treatments:

Incorporation of organic amendment: with or without incorporation of fir sawdust

Surface mulch: with or without added sawdust mulch

Nitrogen fertilization rate: **no** N fertilizer (0 kg/ha); **low** (22 kg N/ha [$\sim$ 20 lb N/a]);
medium (68 kg N/ha); or **high** (114 kg N/ha) rate of nitrogen fertilizer
(ammonium sulfate) applied as a triple split. All get same rate of P and K.

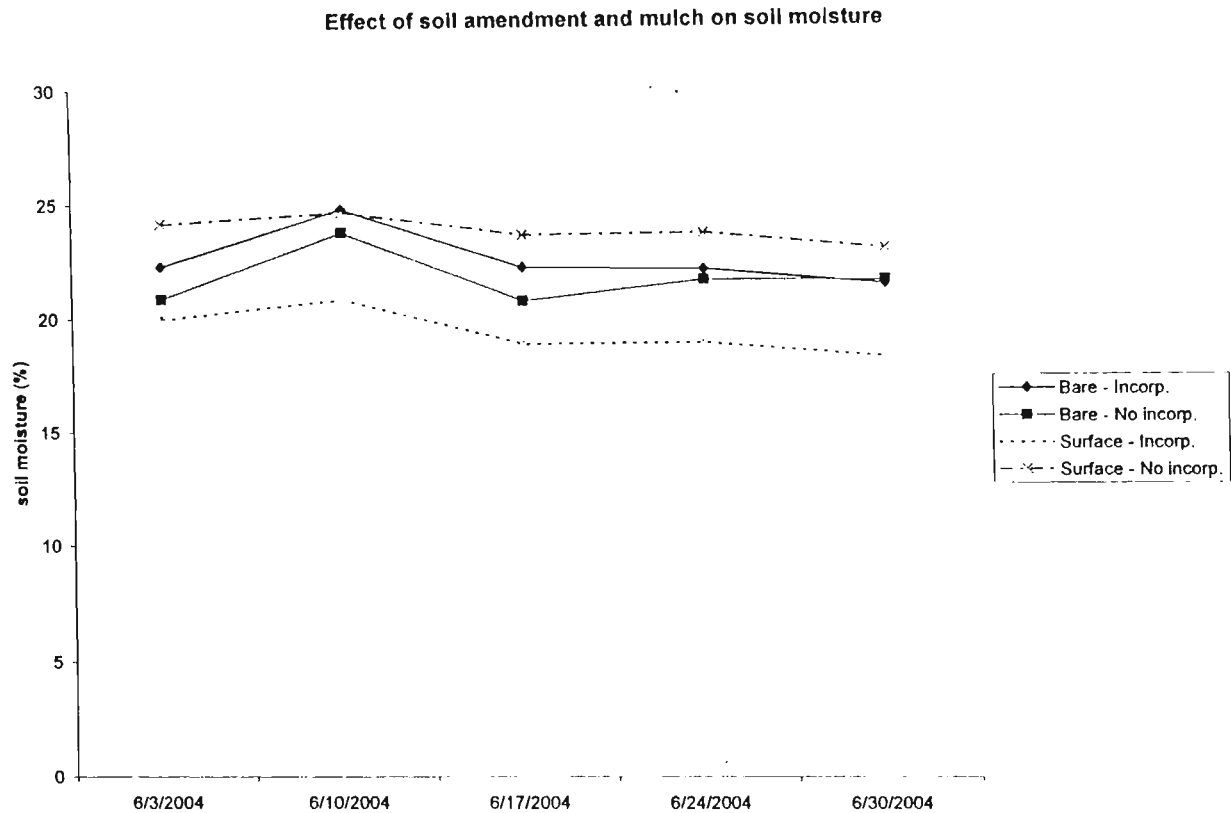
= 12 treatments (4 reps)

Data collected:

C:N ratio of sawdust; pH; nutrient content of potted plant nursery mix; plant dry weight and nutrient content before planting in October, 2003; and mycorrhizal colonization, tissue samples, soil samples, soil moisture readings, and shoot growth throughout study. In fall 2004 and 2005, plants will be evaluated for top and root growth with nutrient concentrations (P, K, N, Mg, C, Ca, S and micronutrients) and the concentration of ^{15}N determined per plant part. These data will be used to calculate percent fertilizer (N) recovery, distribution of fertilizer N, and quantity and distribution of the other nutrients, as we have done in our other experiments in berry crops.

Soil Moisture – TDR Observations

- Plots without amendments, but using mulch, show the highest soil moisture content.
- Plots with amendments and mulches show the lowest soil moisture content.



- Common soil moisture levels in spring are approximately 25%.
- The field is currently irrigated with overhead sprinklers for one hour per day to avoid runoff.
- TDR readings are taken once per week.

Nitrogen Fertilization of Young and Mature Blueberries

July 8, 2004

Bernadine Strik, Professor of Horticulture, NWREC, Oregon State University
Pilar Bañados, Ph.D. candidate, Oregon State University
Tim Righetti, Professor of Horticulture

Objectives:

- Determine whether nitrogen (N) fertilizer rate has an impact on fertilizer-N uptake and growth of young, newly established blueberry plants
- Ascertain the effect of N fertilization rate and in-row spacing on growth and yield of mature blueberry
- Determine the impact of a late application of fertilizer N in mature blueberry plants and the optimal timing of fertilizer applications

The following “bulleted” items are key “take home” messages from our study.

N fertilizer use in young blueberry plants:

- Blueberry plant growth in the planting year was greatest (best) at a rate of 45lb N/a (Fig. 1).

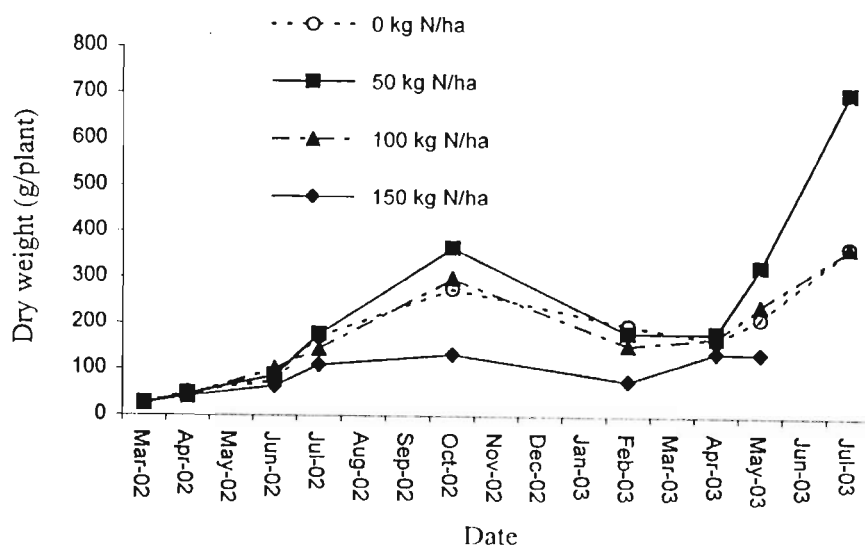


Figure 1. Total dry weight per plant (g) as affected by different levels of nitrogen fertilization in kg N/ha/year in young ‘Bluecrop’ blueberry plants grown under field conditions from March 2002 to July 2003.

- Young plants are much more sensitive to under- and over-fertilization because they do not have a lot of stored N reserves to serve as a “buffer” and the young root system is very sensitive to fertilizer “burn”. Un-fertilized plants did not grow well. Plants fertilized with 90 and 135 lb N/a showed severe signs of fertilizer burn with 17% and 55% of the plants dying by October 2002, respectively.
- Un-fertilized plants recovered more nitrogen (N) from the leaves before they fell in the fall (~ 5 lb N/a). Fertilizer N treatment also affected the concentration of P, K, Ca, Mg, Mn, and C in senescing leaves – this is the first time this has been reported in blueberry. In general the concentration of all of these elements was lower (more recovered by leaf fall) in the unfertilized treatments.
- There was very little uptake of fertilizer N (less than 1%) at the end of April, two weeks after the first application of fertilizer. The highest percentage of fertilizer recovery occurred in plants fertilized with 45 lb N/a – they took up 17% of the fertilizer applied by October 2002. Plants fertilized with 90 lb N/a took up 10% of the fertilizer applied by this same time (Fig. 2).

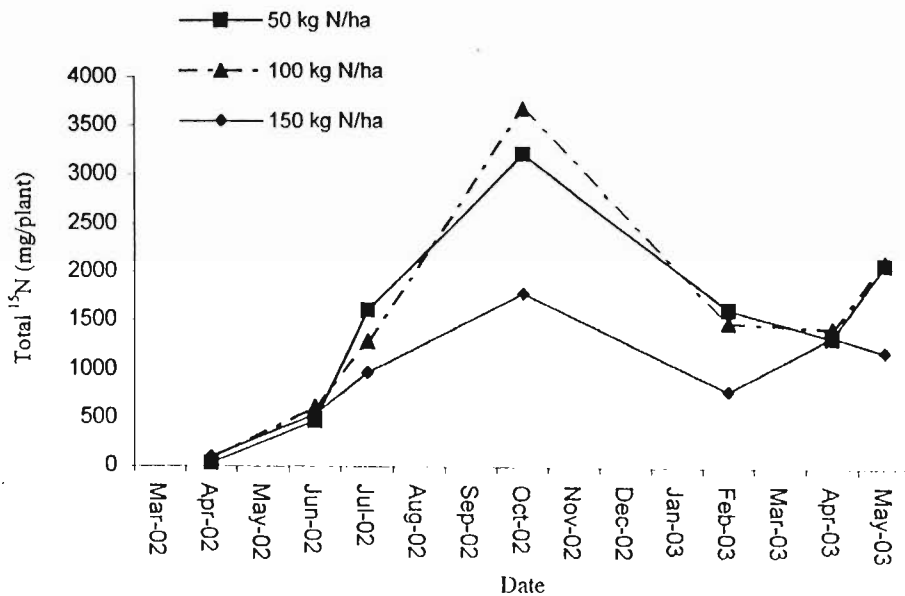


Figure 2. Total nitrogen from fertilizer (^{15}N) per plant (mg) as affected by different levels of nitrogen fertilization in young ‘Bluecrop’ blueberry plants grown under field conditions from March 2002 to May 2003. Arrows indicate each of the triple split application of ^{15}N in 2002.

- Even though plants took up only 8 to 9 lb N/a, this fertilizer N accounted for 60% to 67% of the total N in the plant. Thus young blueberry plants do not require much fertilizer N in the planting year.
- Our preliminary recommendations are to fertilize young plantings by applying N fertilizer to individual plants rather than broadcast for increased efficiency of uptake -- plants cannot take up fertilizer that is applied beyond the rooting area.

- Based on this study we will likely change our N fertilizer recommendations for un-mulched, young plants to: 0.6 oz/plant in the planting year; 0.8 oz/plant in year two; and 1.0 oz/plant in year three.

Impact of N fertilization rate and in-row spacing on N fertilizer uptake and growth of mature plants:

- Total plant dry weight was significantly affected by in-row spacing, but not by N fertilization rate over the 2 years of this study. Thus, the data in figure 3 are averaged over N fertilization rate.
- The percentage of dry weight allocated to roots was 27% and 25% for plants spaced at 1.5' and 4', respectively in September. Proportion of dry mass partitioned to roots in September was not related to rate of N fertilization

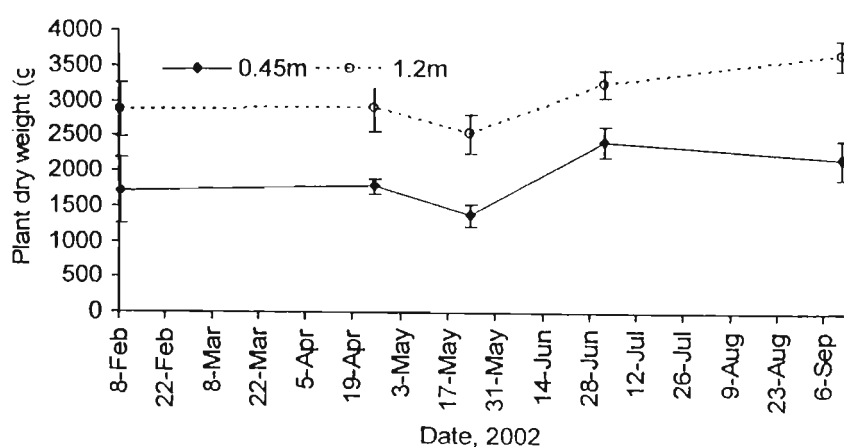


Figure 3. Plant dry weight of mature 'Bluecrop' plants at an in-row spacing of 0.45m (1.5') or 1.2m (4') in 2002, averaged over nitrogen fertilization rate.

- Fertilizer N was not taken up very quickly at either spacing (Figure 4). Two weeks after the first split of fertilizer N was applied, plants had recovered only 1 to 2% of the applied fertilizer. Fertilizer recovery increased to 4 % in May (two of the three splits applied), 12 to 17% in July (two weeks after last split applied), and 22 to 43% in September, at the end of the season.
- Plants spaced at 1.5' and fertilized with 100 or 200 kg·ha⁻¹ of N took up 43% or 31% of the fertilizer including harvested fruit, respectively, by September. At the 4' in-row spacing, plants recovered 23% of the fertilizer N at the 100 or 200 kg·ha⁻¹ of N rate.
- In September, leaves accounted for 34 to 46% of the total fertilizer N in the plant.

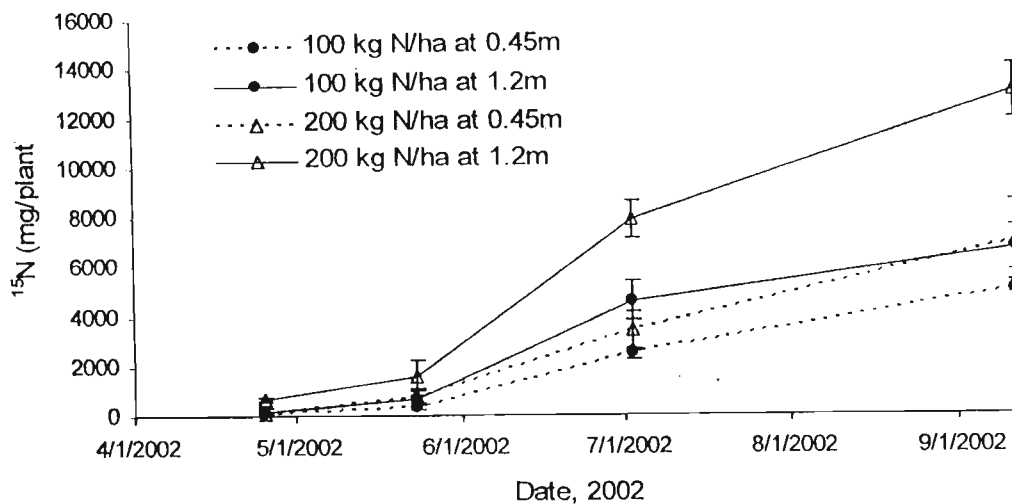


Figure 4. The effect of nitrogen fertilization rate at two in-row spacings on total N content from the fertilizer in mature 'Bluecrop' in 2002. Mean $\pm$ SE

- In-row spacing had no significant effect on N concentration of fruit, but N fertilization rate did: Fruit from unfertilized plants averaged 0.63 %N whereas fruit from fertilized plants averaged 0.84 and 0.92 %N when fertilized with 100 or 200 kg·ha⁻¹ of N, respectively. Thus higher rates of N fertilization can increase N content of fruit, despite relatively little fertilizer being taken up before the fruiting season; it is not known how this would impact fruit quality.
- Yield and berry weight in 200 and 2003, were not affected by N fertilization rate, only by in-row spacing.
- Total N harvested in the fruit averaged 12 and 9 kg·ha⁻¹ for the 1.5' and 4' spacing, respectively. The amount of fertilizer N harvested in the fruit ranged from 2 to 6 kg·ha⁻¹ (depending on N rate and spacing).
- When we calculated net fertilizer recovery (the N fertilizer recovered by plants - the N fertilizer present in harvested fruit and leaves at senescence), plants spaced at 1.5' had a higher net recovery (24% to 33% when fertilized with 200 or 100 kg·ha⁻¹ of N, respectively) than those spaced at 4' (17% regardless of N rate). Thus, plants at a higher density seem more efficient at taking up fertilizer N than those at a wider spacing implying that recommended N fertilizer application rates should not be proportional to planting density as has been done in the past.
- Based on this study, we will likely change our N fertilizer recommendations for un-mulched, mature plantings to 120–140 lb N/a.

Effect of timing of fertilizer N application in mature blueberry plants:

- Plants fertilized with the same rate of fertilizer but at different timings showed us that there is a relatively narrow “window” of application for efficient N fertilizer uptake.
- Percent fertilizer recovery was 42% for the fertilizer N applied in March, 34% for the May application, and only 12% for the July application.
- Based on this study and another concurrent one, we are recommending growers split the total N fertilizer rate required for the planting into thirds with the first split applied in late April, the second in mid-May, and the third in mid-June. Split applications provide the N fertilizer when plants “need” it and allow plants more time to absorb N before it is moved below the root zone.
- N concentration in the harvested fruit was less than 1% and was not affected by timing of application. However, in the March application, 22% of the N in the fruit came from the fertilizer compared to 12% for the May application and less than 1% for the July application. We thus caution growers that high rates of fertilizer N early in the season may increase N concentration of fruit and decrease fruit quality.

Funding:

We appreciate the support of the Oregon Blueberry Commission, the Northwest Center for Small Fruits Research, the Agricultural Research Foundation, the donation of planting stock from Oregon Blueberry Farms, the support of Fall Creek Farm and Nursery, and the loan of a machine harvester from Littau Harvesters Inc.

Table BY 1. Yield and fruit size for blueberry cultivars and selections planted in replicated trials (3, 3-plant reps) in 1994, 1996, 2000, and 2001 at OSU-NWREC. Plants were scored for percent of plant showing blueberry shock virus symptoms at bloom and the final yields were adjusted by that percentage to determine “adjusted shock yield”. The unadjusted figures are also presented.

	Fruit size (g)		Shock adjusted yield				Yields not adjusted for shock			
			Yield(t/a)		Yield (kg/ha)		Yield(t/a)		Yield (kg/ha)	
	2003	Overall	2003	Overall	2003	Overall	2003	Overall	2002	Overall
1994 Planting										
Powderblue	1.2	1.1	10.14	5.55	22723	12441	10.14	5.55	22723	12441
Tifblue	1.3	1.1	7.70	4.88	17244	10932	7.21	4.81	16153	10776
1996 Planting										
Ozarkblue	1.5 b	1.9 bc	7.11	5.05	15936	11336	6.55	4.75	14589	10655
Chandler	2.6 a	2.7 a	7.94	4.40	17791	9862	7.94	4.12	17791	9232
Brigitta	1.7 b	1.9 b	6.74	4.29	15109	9622	6.74	3.84	15109	8607
Bluecrop	1.6 b	1.7 c	4.33	3.88	9697	8690	4.33	3.88	9697	8690
2000 Planting										
Elliott	1.7 a	1.5 a	7.83 a	5.89 a	17551 a	13198 a	6.79 a	5.34 a	15222 a	12033
Bluecrop	1.4 a	1.6 a	5.88 a	4.23 b	13185 a	9475 b	5.88 a	4.23 a	13185 a	9475
MSU 30	1.6 a	1.6 a	3.50 b	2.69 c	7841 b	6031 c	3.36 b	2.56 b	7533 b	5730
Duke	1.6 a	1.7 a	2.27 b	2.74 c	5093 b	6132 c	2.12 bc	2.66 b	4753 bc	5962
MSU 36	1.4 a	1.6 a	2.50 b	2.20 cd	5608 b	4921 cd	2.50 bc	2.20 bc	5608 bc	4921
Little Giant	0.4 b	0.5 c	1.65 b	1.40 d	3691 b	3128 d	1.65 bc	1.40 bc	3691 bc	3128
Rubel	0.7 b	0.8 b	1.33 b	1.38 d	2972 b	3101 d	0.75 c	1.10 c	1688 c	2459
MSU 51	1.6	-	5.39	-	12068	-	5.03	-	11264	-
Aurora	1.5	-	4.95	-	11084	-	4.78	-	10714	-
MSU 52	2.3	-	3.25	-	7280	-	3.25	-	7280	-
Draper	2.0	-	3.04	-	6822	-	3.04	-	6822	-
MSU 46	1.4	1.5	2.36	2.65	5299	5947	2.36	2.16	5299	4848
Jubilee	1.0	-	2.33	-	5220	-	1.55	-	3481	-
MSU 32	1.2	1.3	1.99	1.55	4471	3471	1.33	1.22	2980	2726
MSU 35	1.9	-	1.99	-	4456	-	1.36	-	3046	-
MSU 22	2.2	-	1.62	-	3623	-	1.62	-	3623	-
Pearl River	1.5	1.4	0.07	0.11	164	234	0.07	0.11	164	234

Table BY 1 (cont.). Yield and fruit size

	Fruit size (g)			Shock adjusted yield				Yields not adjusted for shock				
				Yield(t/a)		Yield (kg/ha)		Yield(t/a)		Yield (kg/ha)		
	2003	Overall		2003	Overall	2003	Overall	2003	Overall	2002	Overall	
2001 Planting												
MSU 57	2.5	ab	-	2.34	a	-	5254	a	-	5254	a	-
A9	1.0	d	-	0.93	b	-	2088	b	-	1815	b	-
Bluecrop	1.5	cd	-	0.47	bc	-	1063	bc	-	1063	bc	-
MSU 55	2.3	ab	-	0.44	bc	-	986	bc	-	849	bc	-
AR 342	1.0	d	-	0.30	bc	-	674	bc	-	674	bc	-
AR 179	1.4	cd	-	0.22	bc	-	500	bc	-	400	bc	-
MSU 60	2.3	ab	-	0.15	c	-	337	c	-	289	c	-
MSU 63	2.8	a	-	0.12	c	-	261	c	-	231	c	-
MSU 56	1.3	cd	-	0.06	c	-	134	c	-	134	c	-
MSU 59	1.4	cd	-	0.05	c	-	119	c	-	119	c	-
Liberty	1.9	bc	-	0.04	c	-	91	c	-	90	c	-
MSU 42	1.3	cd	-	0.04	c	-	87	c	-	87	c	-
G 292	2.5		-	4.25		-	9528		-	9528		-
MSU 49	1.5		-	2.78		-	6219		-	6219		-
AR 439	2.1		-	1.01		-	2267		-	2267		-
AR 259	2.0		-	0.48		-	1071		-	1071		-
MSU 53	1.7		-	0.07		-	146		-	146		-
MSU 54	1.6		-	0.04		-	84		-	84		-
AR 299	1.0		-	0.02		-	45		-	39		-

Mean separation within trial and column by Duncan's $p \leq 0.05$.

	Year	10%	20%	30%	mean
MSU 32	2000	1-Jul	1-Jul	12-Jul	2
Duke	2000	1-Jul	5-Jul	19-Jul	2
MSU 36	2000	1-Jul	5-Jul	21-Jul	2
MSU 46	2000	5-Jul	5-Jul	19-Jul	2
Jubilee	2000	1-Jul	7-Jul	21-Jul	1
MSU 57	2001	1-Jul	7-Jul	21-Jul	1
Draper	2000	7-Jul	7-Jul	21-Jul	1
MSU 30	2000	5-Jul	9-Jul	25-Jul	2
Little Giant	2000	9-Jul	9-Jul	25-Jul	2
Bluecrop	1996	6-Jul	11-Jul	24-Jul	3
MSU 22	2000	12-Jul	12-Jul	22-Jul	2
Rubel	2000	15-Jul	19-Jul	25-Jul	2
MSU 35	2000	15-Jul	19-Jul	1-Aug	2
AR 342	2001	7-Jul	21-Jul	21-Jul	1
AR 179	2001	21-Jul	21-Jul	21-Jul	1
AR 259	2001	21-Jul	21-Jul	21-Jul	1
AR 299	2001	21-Jul	21-Jul	21-Jul	1
AR 439	2001	21-Jul	21-Jul	21-Jul	1
A9	2001	21-Jul	21-Jul	21-Jul	1
Bluecrop	2001	21-Jul	21-Jul	21-Jul	1
Liberty	2001	21-Jul	21-Jul	21-Jul	1
MSU 42	2001	21-Jul	21-Jul	21-Jul	1
MSU 53	2001	21-Jul	21-Jul	21-Jul	1
MSU 54	2001	21-Jul	21-Jul	21-Jul	1
MSU 56	2001	21-Jul	21-Jul	21-Jul	1
MSU 59	2001	21-Jul	21-Jul	21-Jul	1
MSU 63	2001	21-Jul	21-Jul	21-Jul	1
MSU 55	2001	21-Jul	21-Jul	4-Aug	1
MSU 52	2000	21-Jul	21-Jul	21-Aug	1
Brigitta	1996	16-Jul	24-Jul	7-Aug	2
Bluecrop	2000	15-Jul	25-Jul	13-Aug	2
Chandler	1996	25-Jul	27-Jul	20-Aug	2
G 292	2001	21-Jul	4-Aug	21-Aug	1
MSU 51	2000	4-Aug	4-Aug	21-Aug	1
Pearl River	2000	4-Aug	4-Aug	4-Aug	2
Ozarkblue	1996	27-Jul	7-Aug	31-Aug	3
Elliott	2000	5-Aug	8-Aug	2-Sep	2
MSU 60	2001	4-Aug	21-Aug	21-Aug	1
Aurora	2000	4-Aug	21-Aug	15-Sep	1
MSU 49	2001	4-Aug	21-Aug	30-Sep	1
Tifblue	1994	12-Aug	24-Aug	21-Sep	3
Powderblue	1994	12-Aug	30-Aug	26-Sep	3

Should you crop blueberries the first two years after planting?

Bernadine Strik, Professor, Horticulture, OSU, Berry Research Leader, NWREC
Gil Buller, Research Assistant, NWREC

Objectives:

- Determine the impact of cropping plants (no prune) the first two years after planting on yield, plant growth and future productivity
 - Ascertain whether in-row spacing and cultivar affect a plant's ability to support a crop in the early years

Planted: October, 1999; two-year-old "grow bag"

Cultivars: 'Duke'; 'Bluecrop'; 'Elliott'

In-row spacing: 4' and 1.5'

Early cropping: pruned (no crop 2000-2001; crop in 2002 & 2003); no pruning (cropped in 2000-03)

Data collected include yield, picking time, and fruit size, pruning weight, cane number and age distribution, percent fruit bud set, tissue analyses, plant dry weight partitioning (in winter).

Summary:

The effect of early cropping (no blossom removal the first two years) and in-row spacing at 1.5' and 4' were studied in 'Duke', 'Bluecrop', and 'Elliott' grown on raised beds for 4 years. No yield was produced on the control plants in the planting year (year 1) and the year after planting (year 2). Plant growth at the start of year 3 was adversely impacted by early cropping. Early cropping reduced the dry weight of the root system, crown, and one- to three-year-old wood in all cultivars. 'Bluecrop' plants had less total dry weight than those of 'Duke' or 'Elliott'. Roots accounted for 30 to 45% of the total plant dry weight depending on cultivar. Early-cropping reduced root system weight 42% compared to control plants. Early-cropped plants had a lower percentage of fruit buds in 'Bluecrop' and 'Duke' than control plants. Early cropping reduced yield in year 3 by 18% in 'Bluecrop', 26% in 'Duke', and 54% in 'Elliott'. Yield of 'Elliott' in year 4 was still affected by early cropping, but there was no "long term" effect in 'Bluecrop' and 'Duke'. Cumulative yield (years 1 through 4) was not affected by early cropping in 'Bluecrop' or 'Duke', whereas in 'Elliott', cumulative yield was lower in early-cropped plants. Plants spaced at 1.5' produced 62% to 140% more yield than those spaced at 4'. 'Elliott' plants seemed less suited to high density planting due to their large total dry weight and large root system.

Results:

- Yield was reduced in all cultivars in 2003, due to poor weather during the pollination period.

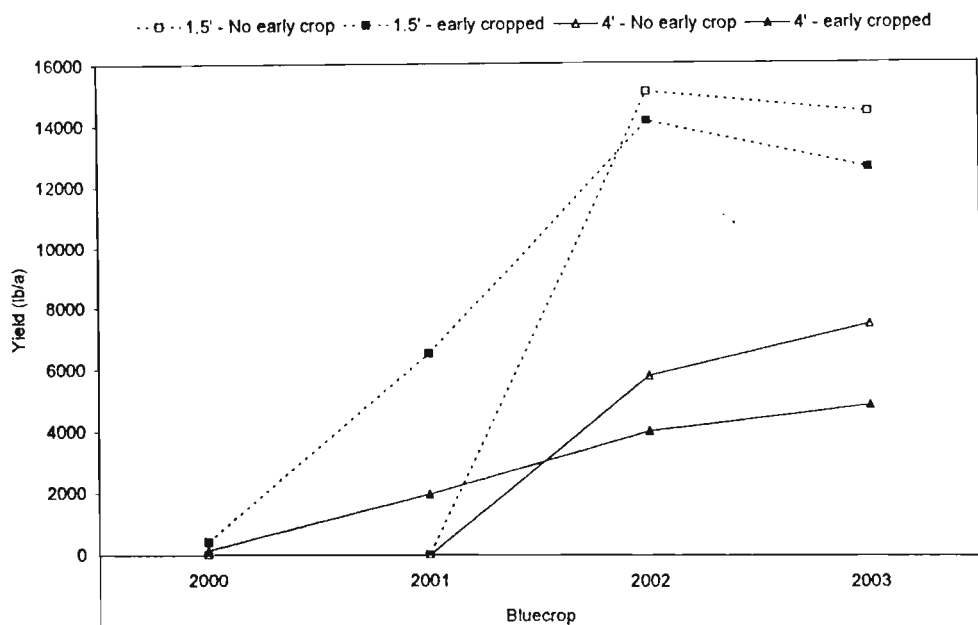


Figure 1. The effect of early cropping on yield of 'Bluecrop' from 2000-2003 at 1.5' and 4' in-row spacing

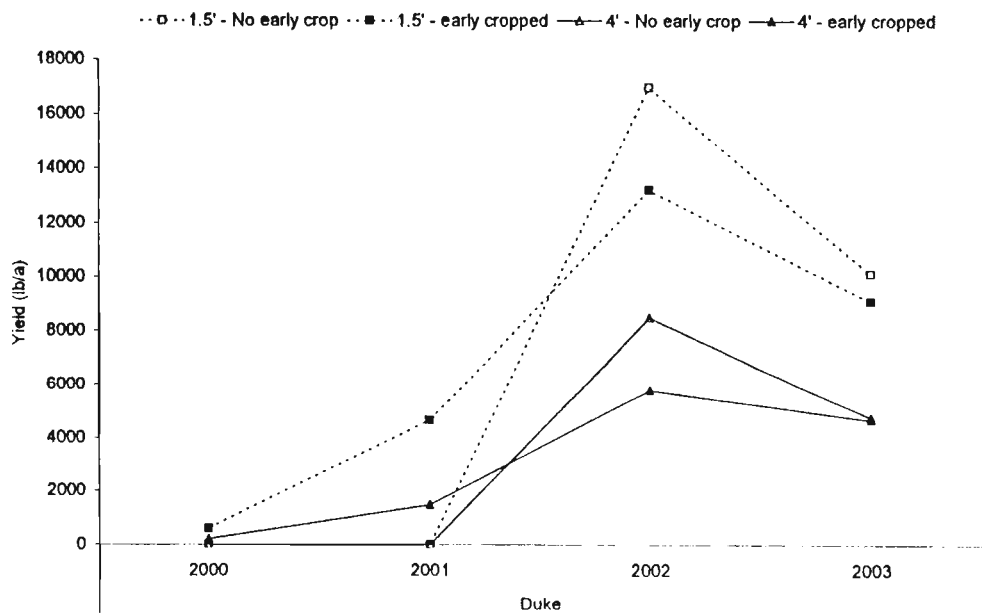


Figure 2. The effect of early cropping on yield of 'Duke' from 2000-2003 at 1.5' and 4' in-row spacing

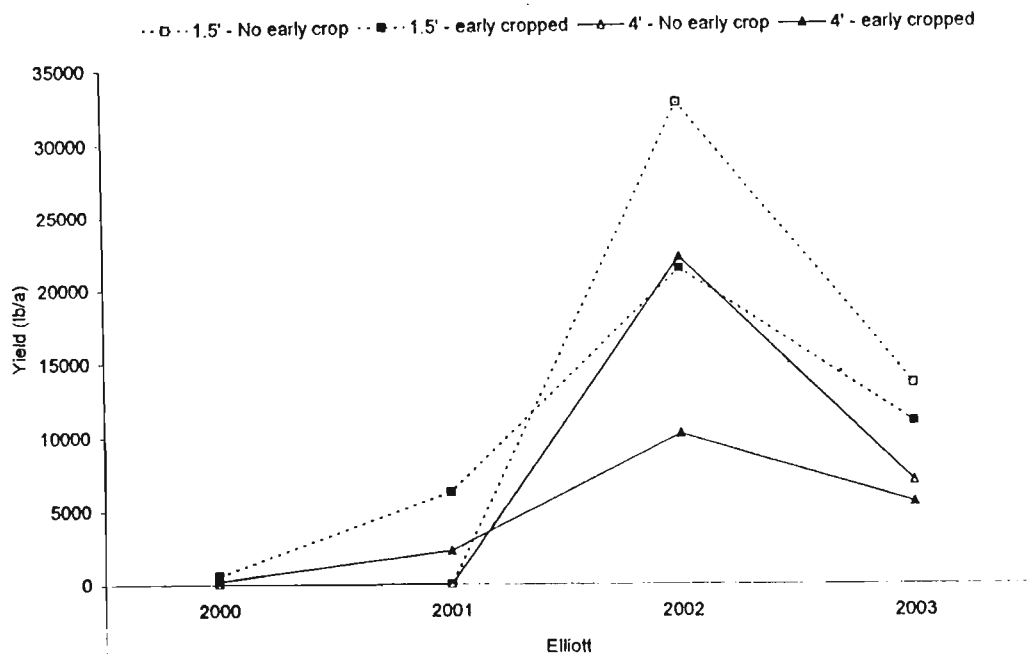


Figure 3. The effect of early cropping on yield of 'Elliott' from 2000-2003 at 1.5' and 4' in-row spacing

- Cropping in 2001, had negative effects on subsequent plant growth and percent fruit bud set. In February 2002, early cropping reduced the percent fruit buds in 'Bluecrop' from 52% to 40%, from 69% to 66% in 'Duke', but there was no effect in 'Elliott' (averaged 62%).
- There was a significant early cropping by cultivar interaction with early cropping reducing yield in 2002 by 18% in 'Bluecrop', 26% in 'Duke', and 54% in 'Elliott'. This seems to support our hypothesis that early cropping is more of a stress on plants that have a high yield late in the growing season.
- In February 2003, there was no effect of early cropping on fruit bud set. Cultivars differed in average percent fruit buds with 'Duke' having the highest (~ 55%) and 'Bluecrop' the lowest (~ 44%). There has been no consistent effect of in-row spacing on percent fruit bud set.
- Cumulative yield was significantly affected by early cropping (Figure 4). However, there was a cultivar by early cropping interaction, because cumulative yield was similar between early cropped and control plants in 'Bluecrop' and 'Duke' whereas early cropping reduced yield 20% to 40% in 'Elliott', depending on in-row spacing.

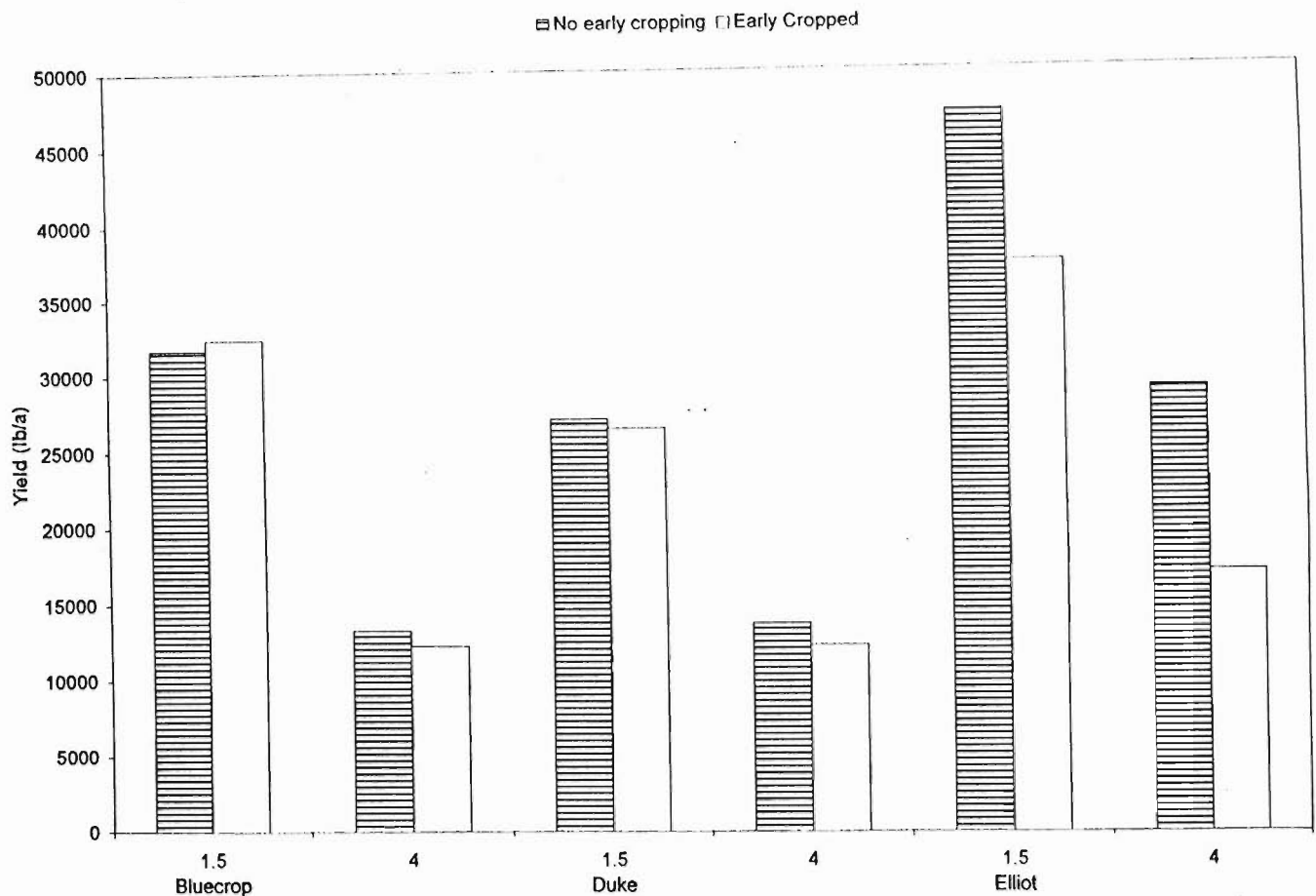


Figure 4. The effect of early cropping, cultivar, and in-row spacing on cumulative yield (2000-03)

- 'Bluecrop' produced a 140% higher cumulative yield at 1.5' than at 4' for plants that were not cropped early. 'Duke' produced a 97% greater yield at 1.5' than at 4', whereas 'Elliott' only produced 62% more yield at 1.5' than at 4'.
- In-row spacing had an inconsistent effect on average berry weight.

Conclusion:

Young plants spaced at high density (1.5') produced from 62% to 140% more cumulative yield in this study, depending on the cultivar. 'Bluecrop' seemed to be the best adapted to higher density plantings and 'Elliott' the least, perhaps due to differences in the top:root ratio and total plant dry weight or size in these cultivars. Early cropping produced economical yields, particularly in year 2 at 1.5'. Early cropping seemed to "stress" plants as evidenced by a reduced total plant dry weight, and fruit bud set after year 2. However, early cropping had less impact on 'Bluecrop' and 'Duke' than on 'Elliott', perhaps due to 'Elliott's' higher yield and late fruiting season. Early cropping is not recommended in these cultivars as there is no increase in cumulative yield (years 1 to 4). However, if income from fruit is needed in years 1 and 2, growers may be able to produce fruit on 'Bluecrop' and 'Duke' – provided yields are not too high.

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FOTO 1

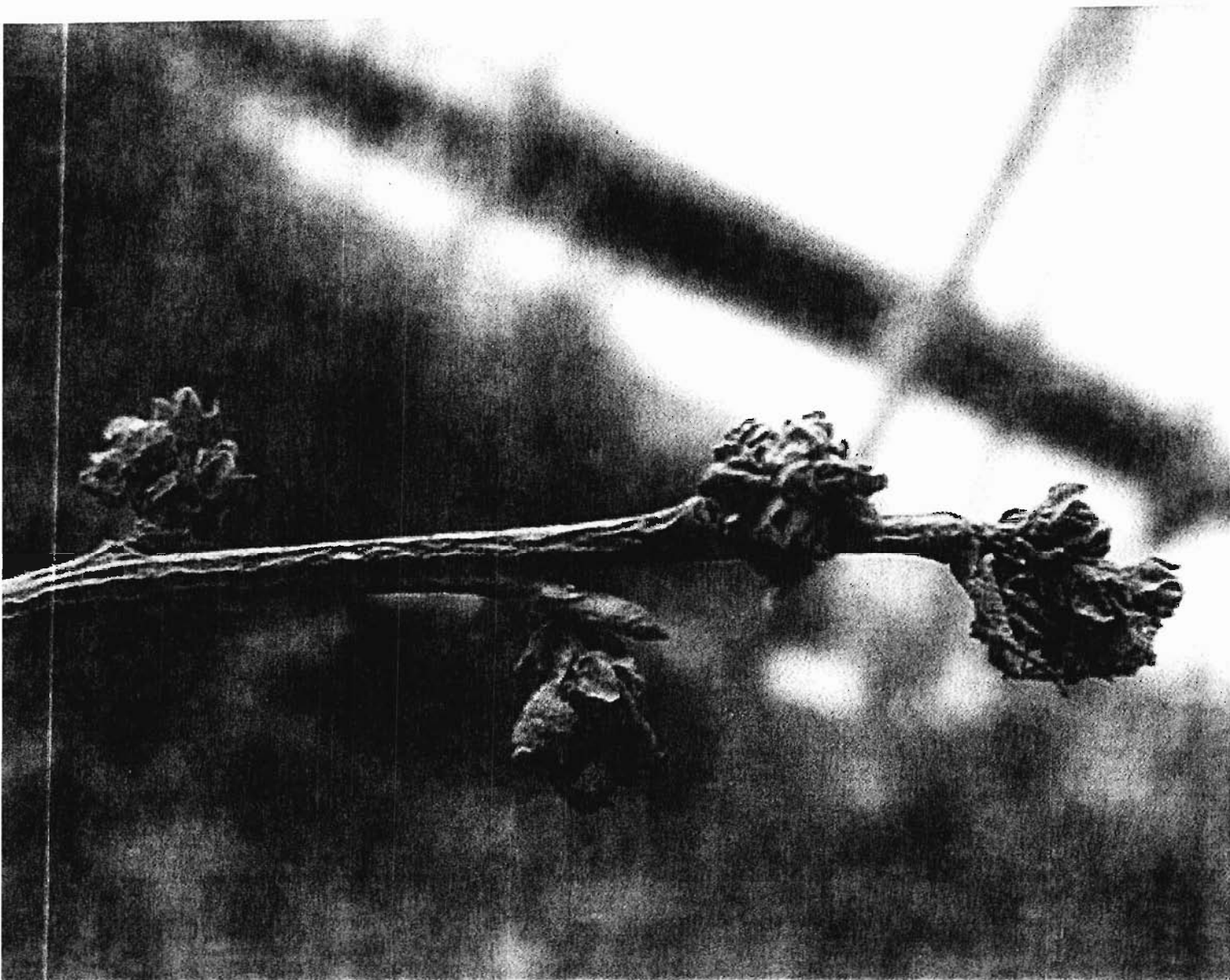


FOTO 2



FOTO 3

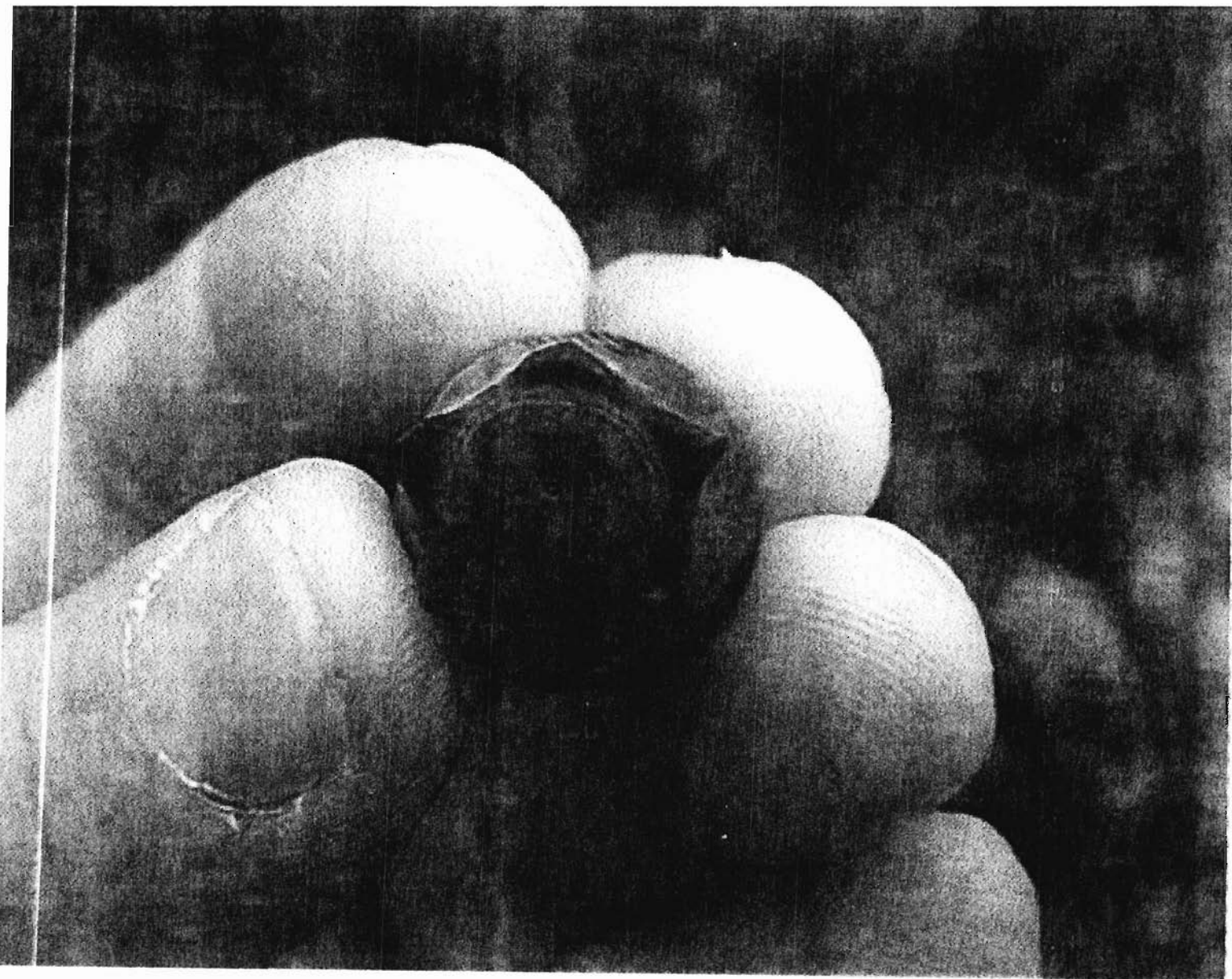


FOTO 4



FOTO 5

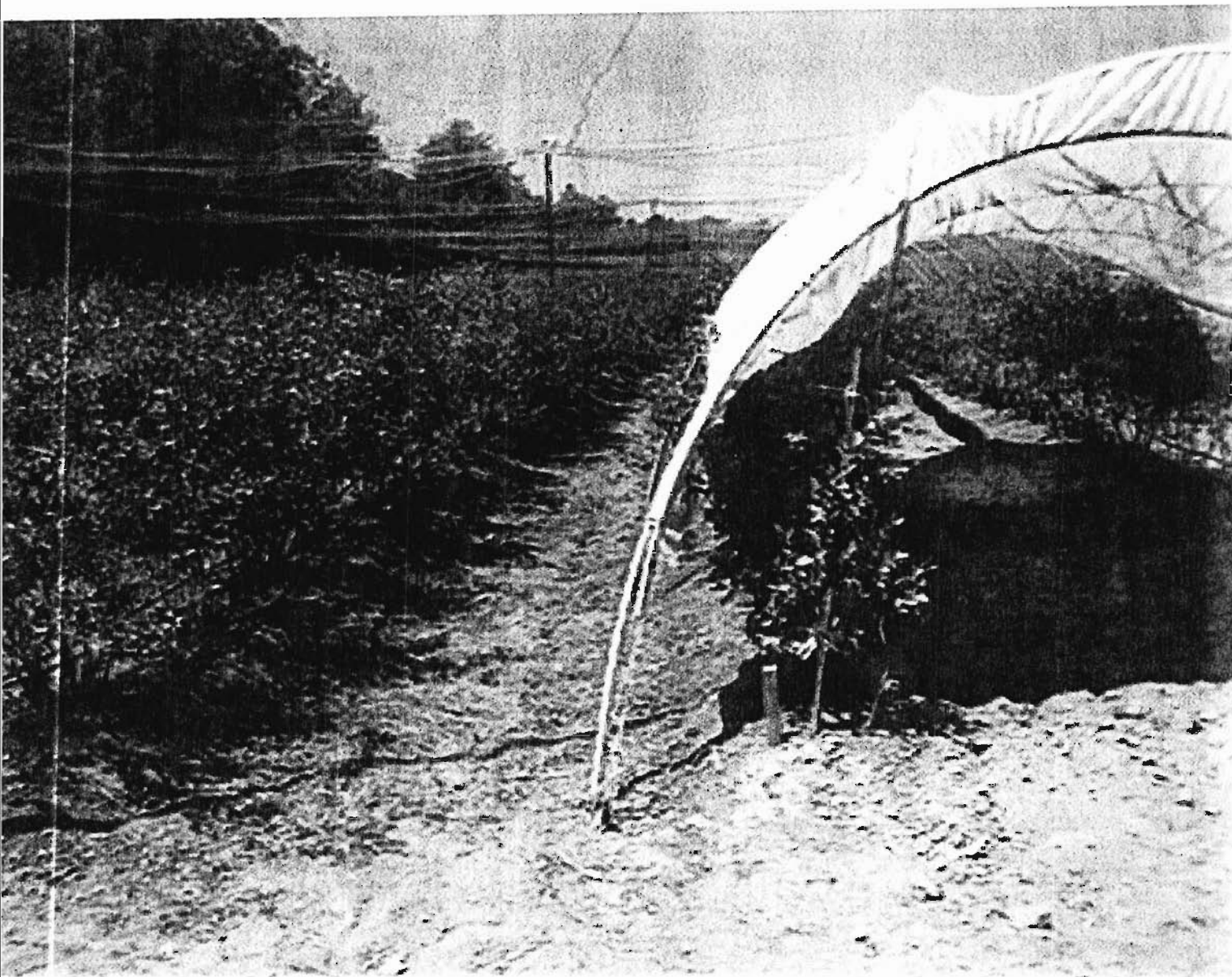


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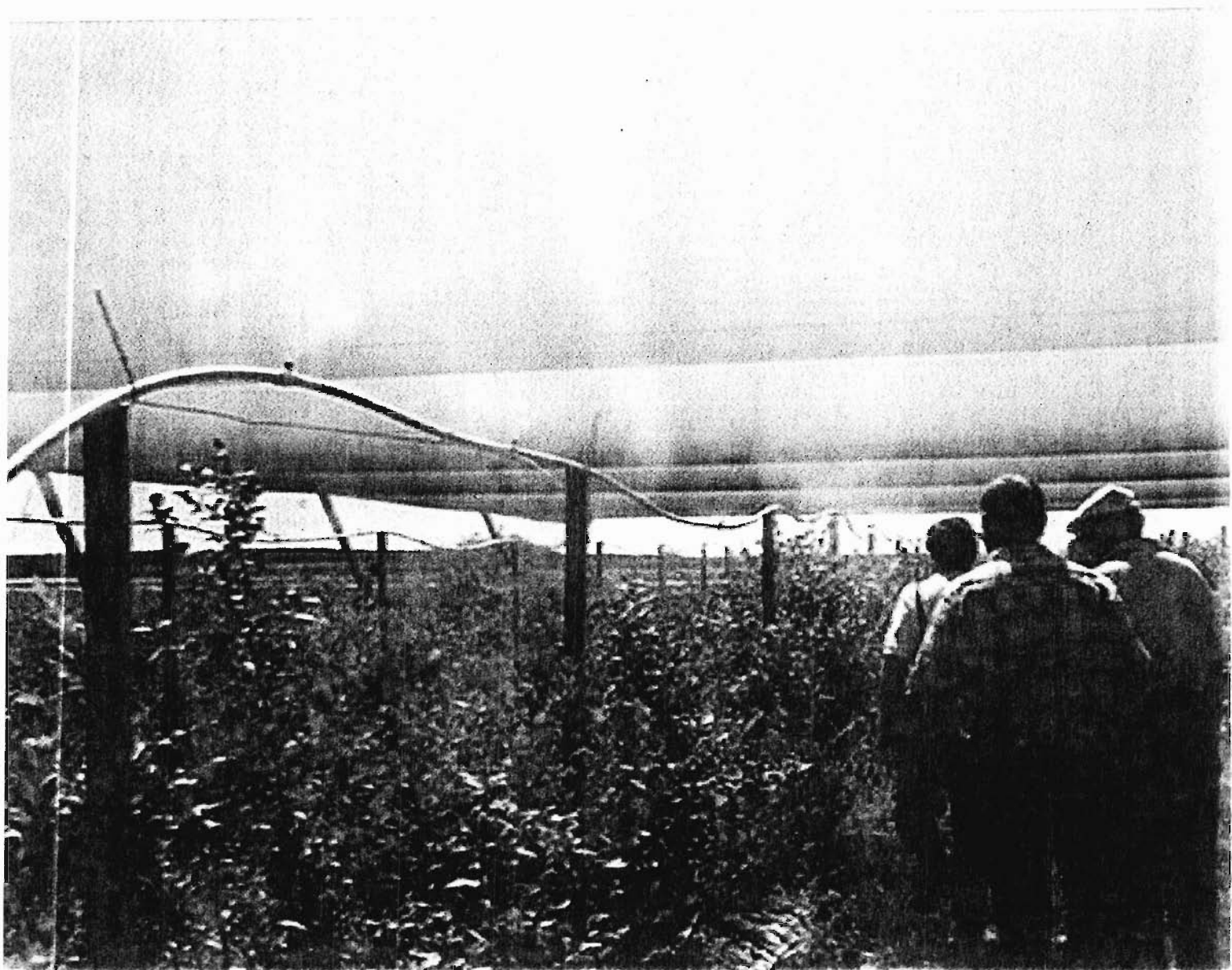


FOTO 7



FOTO 8

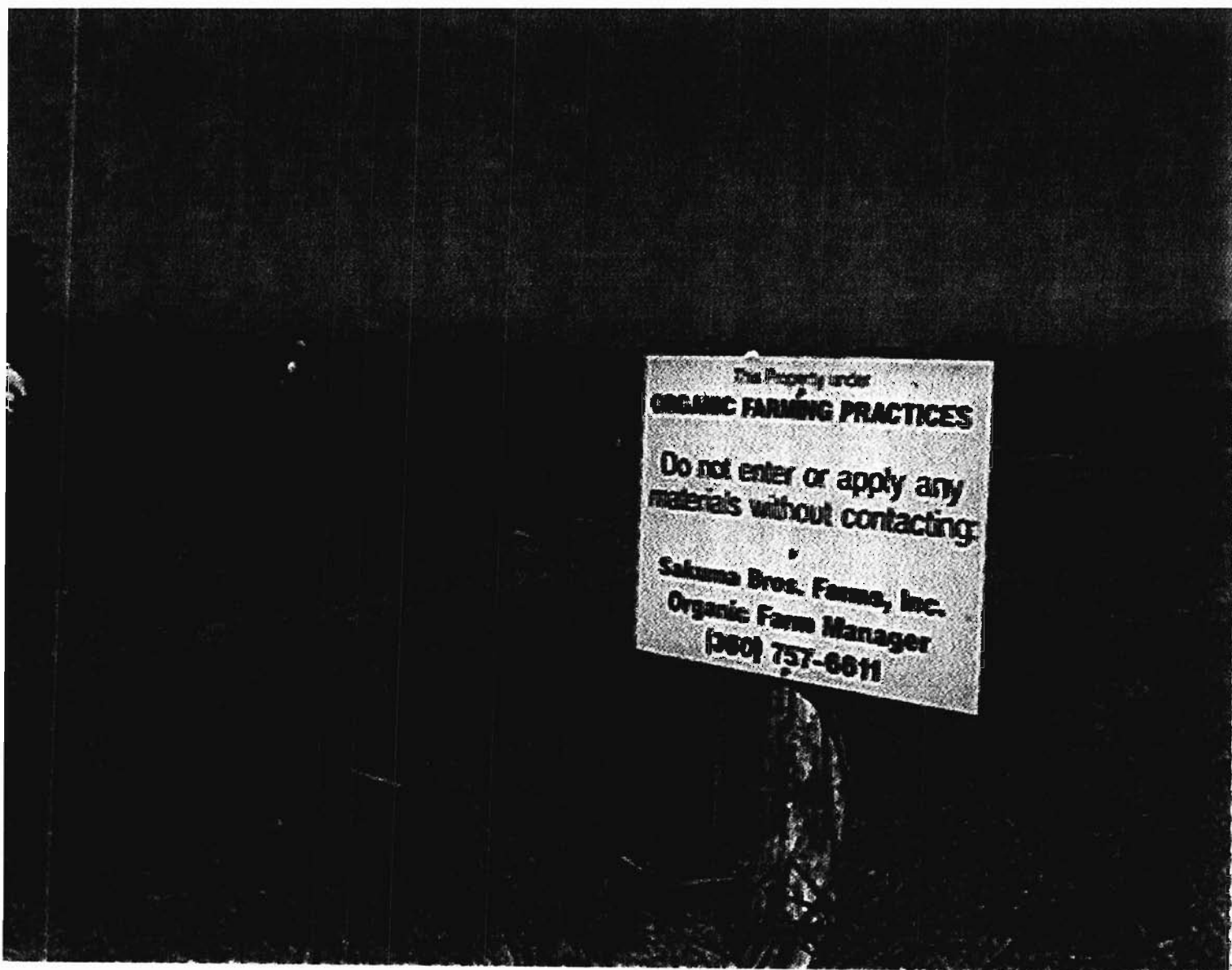


FOTO 9