

Fig. 2. Fruit of 'Harcrest' peach (scale in cm).

Table 2. Cold hardiness of dormant flower buds and shoot xylem of 'Harcrest' compared with 'Redhaven' and 'Loring' in controlled freezing tests in 1979.

Cultivars	T ₅₀ ²	
	Flower buds	Shoot xylem
Loring	-22.5	-26.8
Redhaven	-23.5	-26.4
Harcrest	-23.7	-29.3
s _d ^y	0.456	0.566

²Temperature (°C) required to kill 50% of the flower primordia and 50% of the shoot xylem using a standard test (2).

^ySE of the difference between 2 means.

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'Silvan' Blackberry

G.R. McGregor¹

Potato Research Station, Healesville, Victoria, 3777 Australia

K.H. Kroon²

Knoxfield Horticultural Research Institute, Victoria, 3180 Australia

Additional index words. *Rubus* sp., fruit breeding

'Silvan' is a blackberry cultivar of exceptional quality and yield. In Victoria, the cultivar displays greater tolerance to heavy soils, wind and drought, plus greater productivity, fruit size, and jam processing qualities than other commercial cultivars of trailing blackberries such as 'Boysen', 'Marion', and 'Young'.

Origin

'Silvan' was selected from the progeny of a cross between U.S. Oregon 742 and US-Oregon 928 (Fig. 1). The seed was supplied in 1952 by G.F. Waldo, then a USDA horticulturist at Corvallis, Oregon. US-Oregon

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¹Berry Fruit Research Officer, Dept. of Agriculture, Victoria.

²Berry Fruit Extension Officer, Dept. of Agriculture, Victoria.

928 subsequently was released as 'Marion' (1). The selection was made by officers of the Dept. of Agriculture, Victoria, in 1964. 'Silvan' has been tested for over 10 years by co-operating growers in the Silvan district of Victoria. Prior to the name 'Silvan' being formally applied, the names 'American Bramble' and 'Scoresby Selection' were used.

Description

Primocanes emerge with a green color, but quickly assume a wine-red tinge; they are

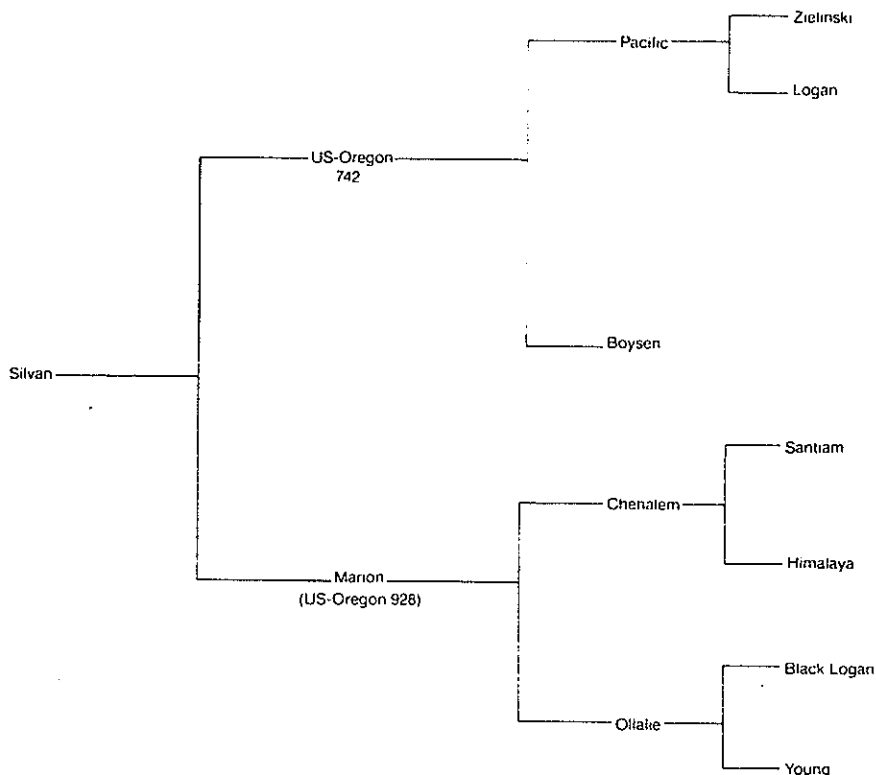


Fig. 1. Pedigree of 'Silvan' blackberry.

densely armed with brittle 3–5 mm thorns. In commercial practice, the 1st primocanes to emerge in spring (usually 2–5) are shortened to 2 nodes 10 days before harvest, and the subsequent flush of 6–10 canes is allowed to grow unchecked. Primocanes are trailing, and may reach 9 m in length and 20–25 mm basal diameter before growth ceases in winter.

Fruit are borne on thorny peduncles arising from leaf axils along the entire length of the cane and extend beyond the foliage. As berries enlarge and ripen, the color changes from green to wine red and to shiny purple black when fully ripe. The fruit picks easily at firm ripe and fully ripe stages. Fully ripe fruit tend to soften and lose their gloss soon after harvest. In southern Victoria, 'Silvan' is harvested from the 1st week of December to the 1st week of January, at the same time as 'Young', 1 week earlier than 'Boysen' and 2 weeks earlier than 'Marion'.

Characteristics

The most outstanding features of 'Silvan' are its high yield, good fruit quality, and disease tolerance. Under comparable commercial management, 'Silvan' yields (11 t/ha) are about 25% more than 'Boysen' (9 t/ha), hitherto the most productive blackberry cultivar in Victoria, 35% more than 'Young' (8 t/ha), and more than double the yield of 'Marion' (5 t/ha). Growers normally achieve

fruit sizes of 20–25 mm diameter, 40 mm long, with a mean weight of 6–8 g.

'Silvan' has gained favor among consumers and processors because of its excellent flavor, which, when fully ripe, is sweeter and less acid than 'Boysen', 'Marion', or 'Young', and is reminiscent of the flavor of *Rubus procerus* P.J. Muell., the introduced blackberry species which occurs extensively as a weed in Southeastern Australia, and whose flavor is preferred by processors. The texture of 'Silvan' jam resembles 'Boysen' jam in seediness, fruit coherence, and plug (torus) softness. 'Silvan' is particularly well suited to the jam processing market because of its flavor and processing quality; it is also well suited to the pick-your-own market because of its flavor, size, and appearance both on the plant and harvested. While it is well accepted on local fresh fruit markets, its short shelf life precludes shipping long distances.

Under commercial management, 'Silvan' seems to be more tolerant of anthracnose (*Elsinoe veneta* [Burkh.] Jenkins) than other blackberry cultivars, and maintains vigor despite infection by crown gall (*Agrobacterium tumefaciens* [Smith & Townsend] Conn). Only unthrifty plants seem subject to a dry berry condition, similar to *Peronospora rubi* Rabenh. infection of other blackberry cultivars. Viruses were not found in 'Silvan' in a survey of *Rubus* species in Victoria (3); however, tobacco streak virus was isolated from Victorian plants of 'Silvan' sent to New Zealand (4).

Compared to other *Rubus* cultivars, 'Silvan' seems to be more tolerant of wind, drought and heavy soils and in this sense is stress tolerant. Winter hardiness to very cold temperatures has not been evaluated, since the lowest monthly average of daily minimum temperature in the 'Silvan' district is over 2°C (2).

Propagation and Availability

'Silvan' propagates readily by tip rooting primocanes. Cuttings may be struck under mist, but with difficulty. Limited supplies of plants are available from R. Stace-Smith, Agriculture Canada, Vancouver, B.C., and from Knoxfield Horticultural Research Institute, P.O. Box 174, Ferntree Gully, Victoria 3156, Australia.

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BC 72-1-7 Red Raspberry

Hugh A. Daubeny

Research Station, Agriculture Canada, 6660 NW Marine Drive, Vancouver, B.C. V6T 1X2

Thomas M. Sjulín

Washington Research and Extension Center, Puyallup, WA 98371

Additional index words. *Rubus idaeus*, disease resistance, *Amphorophora agathonica*

BC 72-1-7, a selection from the British Columbia red raspberry (*Rubus idaeus* L.) breeding program, is being released as germplasm. It has a unique combination of desirable horticultural characteristics and resistance to several pests which will make it a useful parent. The selection is homozygous for gene Ag₁ which confers resistance to *Amphorophora agathonica* Hottes, the aphid vector of raspberry mosaic virus. It is the 1st genotype described which is homozygous for the characteristic. The use of BC 72-1-7 as a parent makes it unnecessary to screen for

aphid reaction, since all its seedlings will be resistant. Other useful characteristics of this selection are varying levels of resistance to several diseases including root rot, most likely caused by *Phytophthora erythroseptica* Pethb., postharvest fruit rot caused by *Rhizopus* spp., and probable resistance to pollen transmission of raspberry bushy dwarf virus (RBDV). Useful horticultural characteristics are high yield and bright red, nondarkening fruit color.

Origin

BC 72-1-7 is a selection from a 1972 cross of 'Haida' x 'Canby'. Both parents are of Pacific Northwest origin and are heterozygous for gene Ag₁. The selection was selected for *A. agathonica* resistance in the field at Agassiz, B. C. in 1973 by a procedure

previously described (3). In 1974 and 1975 it was evaluated for plant and fruit characteristics and subsequently placed in 1977 in a test plot at Abbotsford, B. C. In 1981 the selection was placed in another test plot at Abbotsford and also in plots at the Western Washington Research and Extension Center at Puyallup, Wash.

Description

BC 72-1-7 produces numerous primocanes which are nonpubescent and nonwaxy. They are erect, develop a compact growth habit, and have relatively few spines. Floricanes show basal cracking. Fruiting laterals are upright and medium in length. Internodes are short and laterals thus are closely spaced. Fruit is presented in a cluster habit at the lateral tips. The medium size fruit is a bright nondarkening red color. The fruit does not separate quite as readily from the receptacle as fruit of 'Willamette', 'Meeker', and 'Skeena'; thus, it is probably less suited to machine harvest than these. Fruit firmness is comparable to that of 'Willamette', 'Meeker', 'Skeena', and 'Chilcotin', commercial cultivars in the Pacific Northwest (4, 5).

The 1983 data (Table 1) are typical of those obtained in earlier years at Abbotsford, where BC 72-1-7 consistently produced higher yields but smaller fruit than 'Willamette', 'Meeker', 'Skeena', and 'Chilcotin'. At Puyallup, where comparisons were made with 'Willamette', 'Meeker', and 'Chilcotin', the selection pro-

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THE UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
WASHINGTON, D.C.
and
THE OREGON AGRICULTURAL EXPERIMENT STATION
CORVALLIS, OREGON

NAMING AND RELEASE OF BLACKBERRY CULTIVAR WALDO

The Agricultural Research Service and the Oregon Agricultural Experiment Station announce the naming and release of WALDO, a new thornless blackberry. WALDO was selected in 1976 and was tested as ORUS 2031. WALDO was from a cross of ORUS 1122 (Marion x OSC 878) and ORUS 1367 (ORUS 1083 x NC 37-35-M2). OSC 878 has in its pedigree Jenner-1, a selection of the wild blackberry (Rubus ursinus), and the eastern cultivar Eldorado.

WALDO has moderately vigorous canes, but the canes are not as long as those of the Marion cultivar. It has a growth habit similar to Evergreen, but not as vigorous. The canes are thornless and easy to handle, but may be brittle at times when handled late in the spring. Propagation is generally by cuttings from new canes, but tip layering may be used. The fruiting laterals are short and sturdy and this gives a cluster type fruiting habit. The canes appear to be more resistant to cane and leaf spot than the Marion or Boysen cultivars. The winter hardiness of WALDO is unknown, but it has been equal to standard cultivars in the Willamette Valley.

The berries are large, equal to Marion, and the berry is firmer than Marion with an attractive glossy black appearance. The berry has good shelf life and flavor and frozen and canned samples have been rated as having good quality. The berry has a smaller seed than the Marion cultivar, and a greater number of drupelets. WALDO begins to ripen 4-7 days after Marion and continues 7-10 days later. The fruit is well exposed and easily detached. The yields from test plots have equaled Marion, ranging from 9-12 tons per hectare (3.6 - 4.8 T/A).

WALDO is introduced as a thornless blackberry for local home use, fresh shipping, or as a processing berry in the Pacific Northwest that may be machine picked. Virus indexed plants of WALDO are available for nursery propagation. For further information about WALDO, write to F. J. Lawrence, USDA-ARS, National Clonal Germplasm Repository, 33447 Peoria Rd., Corvallis, OR 97333. For a list of nurseries, write to the Department of Horticulture, Oregon State University, Corvallis, OR 97331. Neither the Agricultural Research Service nor the Oregon Agricultural Experiment Station has plants for sale.

M. E. Carter

Administrator, Agricultural Research Service

AUG 08 1989

Date

J R Dutton

Director, Oregon Agricultural Experiment Station

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'Marion' Trailing Blackberry

CHAD FINN¹, BERNADINE STRIK², AND FRANCIS J. LAWRENCE³

'Marion' is the most widely planted blackberry cultivar in the world. In Oregon, which leads the world in production of blackberries, 'Marion,' often called "marionberry" by consumers and marketers, has been the dominant cultivar since the early 1980's when it replaced 'Thornless Evergreen' as the most widely planted cultivar (15). In 1995, 'Marion' was harvested from 1,420 hectares within Oregon. Approximately 200 ha was in the "off-year" of alternate year production (16) in 1995.

About 95% of the Pacific Northwest blackberry crop is processed (16). 'Marion' and 'Thornless Evergreen' account for approximately 70% and 20% of the harvest, respectively (15). 'Marion' is regarded as a berry with a premium quality and is usually sold under the 'Marion' name, whereas 'Thornless Evergreen' and other blackberries are sold under a generic, "blackberry" label.

'Marion' has developed its outstanding reputation for several reasons, primarily related to fruit quality, including fruit flavor, aroma, and perception of fewer pyrenes. Waldo (23), the USDA-ARS small fruit breeder in Corvallis, Oregon, was able to incorporate the outstanding flavor and pleasant aroma of the trailing western blackberry (*Rubus ursinus* Cham. & Schldt.; syn. *R. macropetalus* Dougl.) into 'Marion.' 'Marion' is perceived as being "less seedy" than 'Thornless Evergreen,' eastern U.S. erect, and semi-erect blackberry cultivars. While pyrene measurements have not identified any size differences between 'Marion' and eastern U.S. cultivars (Takeda, pers. comm.), there

¹Special thanks to Dr. Maxine Thompson, Professor Emeritus, Oregon State University for help in trying to sort out 'Marion's' pedigree.

²Research Geneticist, USDA-ARS Horticultural Crops Research Lab, Corvallis, OR 97330.

³Associate Professor, Oregon State University, Department of Horticulture, Corvallis, OR 97330.

⁴Retired Research Horticulturist, Corvallis, OR 97330.

ursinus, the perfect flowering characteristic may have come from 'Logan,' which was commercially grown at the time 'Santiam' was found. The cultivar 'Black Logan' also has an uncertain origin as does 'Phenomenal'; in these two cases, the maternal parent is known but the pollen parent has been hypothesized based on the different *Rubus* species and cultivars growing in the vicinity. While we cannot be positive about the entire ancestry of 'Marion,' the fruit characteristics and plant growth habit are most similar to *R. ursinus*.

Trailing blackberry cultivars tend to be extremely vigorous and 'Marion' is no exception. New, primocanes emerge in the spring, grow upright until cane weight pulls them to the ground where they grow along the soil surface. Primocanes can grow 6-11 m during the growing season (2, 4) with one plant producing as much as 200 m of primocane growth (4). Plants also produce a second flush of primocanes, naturally, during the fruit ripening period (4).

'Marion's' poor winter tolerance is the main factor that has limited its production to the Willamette Valley. Depending on the environmental conditions leading up to and after a winter cold period, state of dormancy, and cultural practices, 'Marion' often will exhibit cane and/or bud injury (LT₅₀) at -5 to -22 C (3, 4). Apparently, 'Marion' has a very low chilling requirement that is often met before winter has even begun, making it particularly susceptible to fluctuating winter temperatures (17). The plants exhibit a remarkable ability to develop secondary buds and will often produce a full crop on secondary buds after the primary buds have been killed (18).

Growers typically bundle and tie the primocanes to a trellis in mid-August to early September; occasionally they are left on the ground until February before being trained. The timing of the trellising reflects the risk a grower is willing to take relative to potential winter injury. August-September trained 'Marion' plantings are more productive the following year (2)

but since they are on the trellis as opposed to the ground during the winter, they are more susceptible to winter injury (1). Primocane suppression date can also affect subsequent cold hardiness and yield (2, 3).

During the fruiting year, the plants break bud in early spring but do not normally flower until after the danger of frost has passed. The crop typically begins to ripen at the end of June with commercial harvest beginning the first week of July and finishing in late July. Over 85% of the crop is harvested with mechanized harvesters (16). Fruit for the IQF (individually quick frozen) market and the very limited fresh market is usually harvested by hand, the lack of fruit firmness is a major limitation for 'Marion.' The drupelet skin will often break under the weight of other fruit in the harvest flat thus hindering 'Marion's' use for fresh market. More importantly, it is difficult in the processing plants to use air blowers to separate leaves and other contaminants from the fruit when the fruit are compacted and have leaked juices from their broken skins.

'Marion' canes have small prickles. These are a nuisance during training but they are a serious problem when these prickles dislodge during mechanical harvesting. The prickles become a contaminant in the harvested fruit.

'Marion' fruit, which average 4.5-5.5 g, typically have about 65-80 drupelets per fruit early in the season and 60-70 later in the season (7, 8, 9, 19). Ripe fruit retain their color well when processed and the fruit averages 13.6% soluble solids and 1.5% titratable acidity, with a pH near 3.2.

Fruit yield of 'Marion' is not particularly high. In replicated trials, 'Marion' plants produced 15,000 kg/ha in their second cropping season (7, 8, 9). In commercial production, the average yield for 1993-1995 was 7500 kg/ha; however some cold injury occurred in these years. In comparison, 'Thornless Evergreen,' a more cold hardy derivative of *R. laciniatus* (1), averaged 9600 kg/ha over this

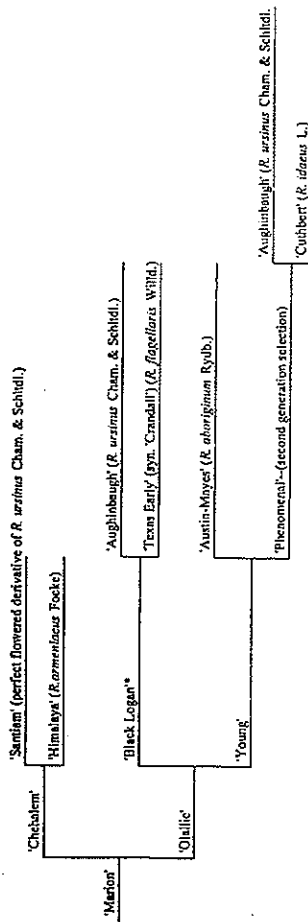


Figure 1. Pedigree of 'Marion' trailing blackberry.

**Black Logan' is either 1) synonymous with 'Mammoth' and it is a 2nd generation selection from 'Aughinbaugh' x 'Texas Early' (12, 13) or 2) it is a selection from open pollinated seed of 'Mammoth' that in turn was a selection from 'Aughinbaugh' x 'Texas Early' (6). Information derived in part from: Darrow, 1918; 1937; Hedrick, 1925; Hall, 1950; Jennings, 1981; 1988; Logan, 1909; Thompson, 1997; Waldo, 1957; Waldo and Darrow, 1948.

same period, and growers report yields of 'Chester Thornless,' a semi-erect blackberry, at 22,500 kg/ha.

While 'Marion' is susceptible to cane and foliar diseases, such as septoria leaf spot (*Septoria rubi* Westend) and purple blotch (*Septoria ruborum* (Lib.) Petr.), and fruit pests, such as botrytis fruit rot, dryberry mite (*Phyllocoptes gracilis* (Nalepa)), and redberry mite (*Acalitus esigi* (Hassan)), these pests can be controlled with good management. As with most blackberries, 'Marion' is tolerant of root diseases. While the trailing blackberries can be infected with tobacco streak virus (TSV), raspberry bushy dwarf virus (RBDV), and blackberry calico virus (BCV), these viruses have not been shown to affect growth or yield in 'Marion'.

'Marion' represents an amazingly diverse ancestry. The breeders of the past were able to capture several of the most positive characteristics of a species and combine it into one genotype. The outstanding fruit quality, particularly flavor, of 'Marion' has been the reason it has risen to such dominance in the worldwide market. 'Marion' will continue to be the predominant cultivar in the Pacific Northwest until a cultivar is developed that is firmer fruited, more winter cold tolerant, thornless, and, most importantly, retains 'Marion's' fruit quality characteristics.

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Introduction to the Workshop: Small Fruit Breeding for the Southern United States: Progress and Prospects

JOHN R. CLARK AND CURT R. ROM¹

Introduction

The American Pomological Society, co-sponsored a workshop 3 February, 1997, at the Southern Region-American Society for Horticultural Science Annual Meeting in Birmingham, Ala. The workshop was organized to highlight achievements in small fruit and grape breeding in the southern US. Four accomplished fruit breeders who were all retired or nearing retirement gave presentations in the crop areas in which they had made significant improvements during their careers.

Small Fruit Crops

Small fruit and grape production in the southern US is an important component of horticultural crop production. These crops are grown in most states of the region. The fruits are used both as fresh market

and processing commodities, for immediate retail or wholesale distribution.

Blackberry (subgenus *Rubus*) production in the southern states in 1990 was estimated to be 807 ha with the major cultivars Shawnee, Cheyenne and Rosborough (2). Production of blackberries was projected to increase to 1192 ha by the year 2000, with much of this production of newly-released cultivars. Raspberry (subgenus *Idaeobatus*) production data for southern states has not been reported but increased interest in raspberry production has developed in recent years. The speaker on blackberry and raspberry breeding was Dr. James N. Moore of the University of Arkansas. Dr. Moore has been on the faculty at Arkansas since 1964, and has successfully advised 31 graduate students, and released 30 fruit

¹Department of Horticulture, University of Arkansas, Fayetteville, AR 72701

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CORVALLIS, OREGON

NAMING AND RELEASE OF BLACKBERRY CULTIVAR KOTATA

The Agricultural Research Service and the Oregon Agricultural Experiment Station announce the naming and release of a new blackberry cultivar KOTATA. KOTATA was selected in 1950 by George Waldo, USDA plant breeder (retired) at Corvallis, and was tested as OR-US 1050. KOTATA was from a cross of OSC 743 (Pacific x Boysen) and OSC 877 (Jenner-1 x Eldorado). KOTATA was widely tested in Oregon during the late 1950's and has continued on test with various growers since 1963.

KOTATA has vigorous thorny trailing canes and an ample number of canes are produced in each hill. Propagation is generally by tip layers. Leaf bud cuttings can be used but do not root as readily as cultivars such as Chehalem. The fruiting laterals arch out well from the canes and harvesting is not difficult. The canes are as resistant to cane and leaf spot as Marion and reported more winter hardy than Marion or Boysen. Clones of KOTATA free of known viruses have been selected for release.

The berries are large, equal to Marion in size and easily detached. The berry is firmer than Marion or Boysen with a very attractive glossy black appearance. The fresh fruit has good shelf life and good flavor and is rated superior to other Pacific Northwest blackberry cultivars for fresh shipping. Total acids are slightly less than Marion and Boysen but equal in soluble solids. The seed approximates Marion in size. Although KOTATA has a lower seed:pulp ratio, the texture is quite good.

Processed berries of KOTATA, both canned and frozen, have been rated equally or superior to Marion and Boysen in general appearance and overall quality. Yields of KOTATA have equalled Marion in most years of testing and ranged from 9.8 - 12.3 tons per ha (4-5 T/A).

KOTATA is introduced as a fresh market shipping berry or for local use but has very good qualities for commercial processing. Its firmness, glossy bright color, and shelve life are valuable characteristics for addition to the blackberry gene pool.

Further information about KOTATA may be obtained from the Oregon Agricultural Experiment Station, Corvallis, Oregon 97331. Neither the Agricultural Research Service nor the Oregon Experiment Station have plants for sale. A list of nurserymen who have plants for sale can be obtained from the Chemical and Plant Division, Washington State Department of Agriculture, Olympia, Washington 98504.

T. B. Kenney

Administrator, Agricultural Research Service

John A. Davis

Director, Oregon Agricultural Expt. Station

NOV 13 1984

Date

Sept 24, 1984

Date