

systems and increase opportunities for production. These studies, in addition to cultivar developments, have the potential to facilitate the expansion of blackberry production.

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Raspberry Cultivars in Eastern Canada

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Introduction

Raspberries are a minor crop grown throughout eastern Canada. Similar cultivars are grown from Alberta in the West to Nova Scotia in the East, and as far South as Southwestern Ontario. Most of the red raspberries grown are summer-bearing, although there are a few hectares of fall-bearing cultivars in the warmer areas. There are essentially no commercial plantings of black raspberries.

In this paper, I will discuss: 1) plant production and markets, 2) regional variation in cultivars between 1980 and the present and 3) possible cultivar trends for the next ten years.

Plant Production and Markets for Fruit

Most of the plants are supplied through the Nova Scotia, Quebec and Ontario Plant Propagation Programs. However, a substantial number of plants come from nurseries in the Northeastern U.S. and an undetermined number from fruiting plantations.

Because of the large number of sources of plants, statistical data from

various propagation and certification programs do not give an accurate picture of the cultivar trends. However, information from the Ontario Superior Stock Program shows clearly that raspberry cultivars have changed over the last ten years (Table 1).

The main outlet for fruit is the pick-your own market. However, in recent years an increasing amount of fruit has been shipped fresh into the various retail markets. This trend is expected to continue. Essentially, all processing of raspberries in Canada is done in British Columbia; very little fruit from Eastern Canada goes for processing.

Regional Cultivar Variation *The Maritimes*

The hectarage of raspberries in the Maritime provinces almost doubled from 37.6 ha in 1980 to 72 ha in 1990. In 1980, Nova Scotia had the greatest plantings of red raspberries with 16.8 ha, followed by New Brunswick with 11.2, Prince Edward Island with 9.2 and Newfoundland with .04. By 1990, New Brunswick was the leading producer in the region with 42 ha; Nova

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Table 1. Cultivar percentages of elite red raspberry plants produced in the Ontario Superior Plant Propagation Program.

Cultivars	Year										
	80	81	82	83	84	85	86	87	88	89	90
Viking	3	2									
Trent	3	2									
Muskoka	1	1									
Newburgh	3	3	4	2	3	1	4	4	2	3	1
Latham (U.S.)	3	1	3	4	3	6	11	5	4	2	1
Comet	29	31	32	22	29	23	21	17	16	18	5
Madawaska	5	7	6	5	4	1	2	1	2	2	1
Boyne	15	13	13	42	29	32	27	23	30	28	24
Willamette		3	4	3	3	4	6	7	6	4	
Gatineau	3	4	6	1							
Bonanza	11	6	1								
Festival	7	7	6	5	3	4	2	4	5	7	11
Killarney	1	1	2	5	1	2	2	4	6	2	8
Algonquin								1	3	2	7
Heritage	12	10	12	6	11	14	17	21	13	10	9
Comox										4	5
Chilliwack								1	2	2	
Marcy	3	6	6	2	2	2	2	1	2	3	2
Skeena				1	5	1	1	2			
Chilcotin					1			2		1	2
Nootka					5						
Haida					1	9	5	7	6	6	12
Nova										1	1
Amity										1	1
Royalty										1	
OAC Regal											2
OAC Regency											3

Scotia and Prince Edward Island had remained the same with 20 and 8% respectively, and Newfoundland had increased to 2 ha.

In Nova Scotia 70% of the plantings were 'Carnival' and 30% 'Festival' in 1980. This cultivar mix changed so that in 1990 40% were 'Nova,' 40% 'Festival' and 20% 'Carnival.' In New Brunswick, the cultivars had changed from 95% 'Festival' in 1981 to 50% 'Festival,' 25% 'Nova,' 25% 'Boyne' in 1990.

Quebec

In Quebec, there are no reliable hectarage figures for 1980. However, production of raspberries had more than tripled from 439 tonnes in 1979 to

1308 tonnes in 1989. In 1988 there were 1128 ha of raspberries in the province.

The cultivars grown in Quebec have changed considerably over the last ten years. 'Newburgh' was the most widely planted cultivar in the late 1970's, but is no longer planted. Figures from the Quebec Plant Propagation Program show that in 1978 the only recognized nursery sold 69% 'Newburgh,' 12% 'Carnival,' 7% 'Muskoka,' 6% 'Latham' and 5% 'Boyne.' In 1988, the three nurseries in the program sold 30% 'Festival,' 22% 'Killarney,' 11% 'Boyne,' 9% 'Madawaska,' plus some 'Anelma,' 'Bonanza,' 'Comet,' 'Gatineau,' 'Heritage,' 'Marcy,' 'Muskoka' and 'Nova.'

Ontario

The area of raspberries grown in Ontario has increased steadily from 242 ha in 1980 to 384 ha in 1989.

In 1980, 29% of the plantings were 'Comet,' 14% were 'Boyne,' 14% 'Newburgh,' 14% 'Latham,' 12% 'Bonanza' and the remaining 17% consisted of 'Festival,' 'Avon,' 'Viking' and 'Heritage.' By 1990, about half of the hectarage was 'Boyne,' 10% 'Festival,' 10% 'Royalty,' 5% 'Nova,' and 5% 'Heritage.' The remaining 20% of the plantings was made up of 'Killarney,' 'Madawaska,' 'Willamette,' 'Chilcotin,' 'Comet,' 'Titan,' 'Marcy,' 'Gatineau' and 'Latham.'

The area of 'Comet' grown declined because growers were concerned about its virus and crown gall susceptibility and its tendency to produce fruit on the first year cane.

In southwestern Ontario, which has milder winters, less winter hardy cultivars such as 'Willamette' and 'Chilcotin' can be grown. These cultivars are restricted to that region.

Prairie Provinces

The area of raspberries grown in the Prairie provinces has increased from 20 hectares in 1980 to 130 hectares in 1990. Plantings in all three provinces have increased: Alberta from 12 to 32 hectares, Saskatchewan from 4 to 20 hectares and Manitoba from 4 to 78 hectares. In Alberta, the cultivar mix has remained approximately the same over the last ten years with about 60% 'Boyne,' 10% 'Redbrook,' 10% 'Killarney,' and the remaining 20% composed of 'Madawaska,' 'Trent,' 'Chief,' 'Festival,' and an unknown cultivar. More 'Festival' appears to have been planted in recent years. 'Nova' is not hardy enough in this province. There is interest in fall-bearing cultivars but as yet only trial plantings exist.

In Saskatchewan, 'Boyne' is the only cultivar grown. In Manitoba, 'Boyne' was the only cultivar until the last five years, when some 'Nova' has been planted.

Future Trends

In most regions of eastern Canada, 'Boyne' is predicted to remain the predominant cultivar in the near future. In areas with less severe winters, the acreage of 'Festival' and 'Nova' will increase although 'Festival' may fall from favor because of its susceptibility to late yellow rust (*Pucciniastrum americanum* (Farlow) Arthur). Newer cultivars which may also be grown are 'Algonquin' and 'Haida' from Agriculture Canada, B.C., and 'OAC Regal' and 'OAC Regency' from University of Guelph. These cultivars may make an impact, particularly in Ontario, although 'Haida' may be of interest in Quebec because of its late fruiting season.

Fall-bearing raspberries are still a minor crop and until a cultivar with the fruit quality of 'Heritage' and a two-week earlier fruiting season is released, the acreage will remain small. None of the three new, early fall-bearing cultivars, 'Autumn Bliss' from England, 'Redwing' from Minnesota, and 'Watson' from New York, matches the fruit quality of 'Heritage,' although 'Autumn Bliss' and 'Watson' have larger fruit. In Ontario, 'Autumn Bliss' is very weak-skinned and soft, 'Redwing' is small and soft, and 'Watson' has a poorly-formed neck which often causes the fruit to crumble.

The major requirements for a successful raspberry in Eastern Canada are: 1) winter hardiness; 2) large fruit size and quality, particularly firmness for shipping; and 3) disease resistance and high yields. New cultivars will probably need resistance to at least the large raspberry aphid (*Amphorophora agathonica*), Raspberry Bushy Dwarf Virus and *Phytophthora* root rot. In Quebec, late fruiting cultivars are needed to move the main picking season away from public holidays when pickers are scarce.

The breeding programs in Agriculture Canada at Kentville, NS, Morden, MB and Vancouver, BC, and at the

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University of Guelph, ON, have selections in advanced stages of testing which are likely to be named in the next few years. These will have improved fruit size and disease resistance combined with winter hardiness.

Eastern Canada is fortunate that

despite a small acreage of raspberries, there is a relatively large breeding effort. This will support the industry in the future and as improved cultivars are released, I feel sure that there will be a gradual increase in the acreage of raspberries grown.

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Longitudinal Bark Cracking on Trunks of Young Asian Pear Trees in Response to a Rapid Drop in Winter Temperature¹

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Abstract

Freeze-induced longitudinal trunk bark cracking on young Asian pear (*Pyrus pyrifolia* (Burm.) Nak.) trees was evaluated following a rapid drop in temperature to -21°C in February 1989. Scion cultivars were '20th Century,' 'Chojuro,' 'Hosui,' 'Kikusui,' 'Niitaka,' 'Okusankichi,' 'Seigyou,' 'Shinko,' 'Shinseiki,' and 'Tsu Li' on Old Home x Farmingdale (OHF) 51, OHF 97, OHF 217, OHF 282, and OHF 333 rootstocks. There was no rootstock effect on bark cracking. The scion cultivar effect was highly significant, however. Cracking of 'Okusankichi' trunks (47% of the trees) was significantly greater than 'Kikusui,' 'Shinseiki' or 'Tsu-Li' which had no cracking. Other cultivars were intermediate between these extremes. Cracked trees were significantly larger in trunk circumference than uncracked trees. Cracked trees had significantly lower trunk circumference relative growth rates during 1989 than uncracked trees. Freeze-induced cracks appeared to be related to the size of the tree within a given scion cultivar.

Introduction

Rapid temperature declines during the dormant season can cause widespread damage to woody plants, especially when the temperature decline begins well above freezing (2, 11). Following a sudden temperature drop, the outer layers of bark and the wood cool most rapidly and are subjected to

appreciable tangential tension, which causes marked shrinkage and cracking (11). Damage in the form of longitudinal trunk bark cracks has been reported on several forest species (11), cherries (11), apples (1, 5, 9, 10) and peach (1) and may increase the plant's susceptibility to disease (11).

We noted longitudinal trunk bark cracking in an experimental planting of young Asian pear trees following exposure to rapid, wide temperature changes during February 1989. Since the orchard included trees of several scion cultivar and rootstock combinations, we were interested in differences that might be associated with such variables. Comparative information on cold hardiness of Asian pear cultivars appears to be lacking in the literature.

Materials and Methods

The planting, composed of 10 Asian pear (*Pyrus pyrifolia* (Burm.) Nak.) cultivars on 5 rootstocks, was established in the spring of 1985 at the Washington State University Royal Slope Research Unit near Othello, Washington. Scion cultivars were '20th

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