

Fire Blight in the Geneva Apple Collection¹

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Abstract

Ratings of the severity of fire blight (caused by *Erwinia amylovora*) were made on trees in the apple collection at the Geneva Experiment Station after severe epiphytotics in 1972 and 1974. The most severe rating for each cultivar, sport or numbered selection is reported on a total of 1224 clones on many of which fire blight has not been reported previously.

Based on natural infections, several authors (3, 4, 5, 6) have reported ratings of the susceptibility of many apple cultivars to *Erwinia amylovora* (Burrill) Winslow et al., the incitant of fire blight. Often the data were from 1-3 trees in one location (3, 4, 5). Aldwinckle (2) derived ratings based on a transcontinental survey of research and extension workers using many man-years of observations. However, only cultivars in substantial commercial production in the United States and Canada were listed (1). Shaw (5) reported the susceptibility of vegetative shoots of 25 apple cultivars to artificial inoculation in the greenhouse. These studies did not include cultivars and sports which were locally unavailable or were only recently produced.

This report summarizes observations of infections on 1224 cultivars, sports, numbered selections and *Malus* species. It does not, however, purport to unequivocally rate fire blight susceptibility. Fire blight has not pre-

viously been reported on some of the clones observed. Many of the apples listed are presently unimportant commercially; some are unknown in North America but are important in other apple-growing regions.

Materials and Methods

One to 126 trees of each cultivar, sport, numbered selection or *Malus* species were observed and rated. Age of trees ranged from 1 to 30 yrs. Trees were mostly on seedling rootstocks at 20 x 20 feet spacing. They were pruned, fertilized and sprayed for control of insects and fungal diseases according to normal commercial practice in New York State. No sprays were applied for control of fire blight. The rating system of van der Zwet et al (7), originally developed for rating the severity of fire blight on pear, was used. In this system, trees are assigned a rating of 1 (100% blighted) to 10 (no blight) on the basis of the number of twigs infected, age of wood penetrated and % of the tree blighted. Ratings were made in September in 1972 and 1974 following severe fire blight epiphytotics.

Results and Discussion

The most severe infection (lowest rating score) on any tree of a given cultivar or sport in either 1972 or 1974 is reported (Table 1). The maximum number of trees rated in either year is also reported. Since a rating of 10

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may indicate escape and not immunity, it should be regarded with caution particularly if derived from a small number of trees. Ratings of 8 or 9 are more indicative of resistance because they indicate that some infection occurred but lesions did not progress extensively. Cultivars with single trees are less likely to have a high rating since they had less chance of being more susceptible because of age, nutrient status or location in an area of the orchards with highest inoculum pressure.

Recording of only the most severe infection could be an unfair indictment of those few clones represented by scions recently top-grafted on older trees. Such grafts grow extremely vigorously and are very susceptible to fire blight. For example, 'Jonamac', which was represented by such grafts, had a most severe rating of 3. 'McIntosh', represented by 138 trees, including all of its sports, had a most severe rating of 7. Observations of mature trees of these cultivars growing next to each other in the field and artificial inoculation of single shoot whips in the greenhouse and the field indicate that 'McIntosh' is more susceptible than 'Jonamac' (H. S. Aldwinckle and J. L. Preczewski, *unpublished*).

Ratings of infection on several *Malus* species are shown but must be regarded as applying only to the particular trees at Geneva. There is evidence in *Pyrus* of great intraspecific variation in resistance to fire blight and in most cases only one example of each species was observed (8).

The ratings reported are strictly applicable to Geneva conditions. Climatic conditions greatly affect blight and would account in part for differences in blight on cultivars at different locations. Nevertheless the observations reported here supplement reports of susceptibility of many well-known cultivars. They also provide unique evidence of susceptibility of lesser known material, which is of interest to breeders and nurserymen, and of susceptibility of cultivars popular in countries where fire blight is not yet epiphytotic. The data should not be used to select resistant material as immune ratings may be due to disease escape. Differences of 1 or 2 units in rating are probably not significant and should not be used to choose between cultivars or, for example, 'Delicious' sports, for fire blight resistance.

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Table 1. Ratings of fire blight severity of cultivars, sports, numbered selections and *Malus* species in the Geneva apple collection after epiphytotics in 1972 and 1974.

Cultivar ^a	Trees ^b	Rating ^c	Cultivar ^a	Trees ^b	Rating ^c
Abbondanza	2	8	Ballyfatten	1	8
Acme	1	8	Bancroft	1	9
Akane ^d	2	7	Barbara Ann	2	8
Akero	1	8	Barry	7	4
Akin	1	10	Baxter	1	2
Alamanka	1	7	Beacon	8	5
Alexander	2	8	Beacon #1	1	8
Alice	1	8	Beauty	1	10
Alfa 68A	1	9	Bedan	3	7
Alfa 68B	1	10	Bedford Red	1	8
Alfriston ^d	1	2	Belle de Boskoop	3	10
Allington Pippin	2	9	Bogo de Boskoop	1	10
Almata	1	10	Rouge de Boskoop	2	10
Almey	3	10	Bellefleur Rebord	2	8
Alnarp 2	1	8	Belle Sans Pepin	1	7
Alnarp T 16/36	2	9	Ben Davis	1	8
Alnarp 37/48	2	9	Black Ben Davis	1	7
Alnarp TB 38/60	2	8	Gano	1	8
Alpine	2	3	Tack Ben Davis	1	9
Alton	1	8	Bender No. 1	1	9
Amer Forestier	1	7	Benitts Roter Finkenwerde	1	8
Amere de Berthecourt	2	9	Benoni	2	9
American Summer Pearmain	2	10	Beverly Hills	2	8
Ananas Berzenicki	1	4	Bietigheimer	2	6
Anderson No. 1	1	9	Bingo ^d	1	2
Anna	2	8	Black Crofton	1	6
Annie Elizabeth	1	7	Black Gilliflower	2	6
Antonovka Michurin	1	10	Cornish Gilliflower	1	8
Antonovka kamenichka	1	10	Black Oxford	1	8
Antonovka polutorafuntovaya	1	7	Blair	4	9
Argile grise	1	7	Blanche Ames	2	7
Arkad zimnyi	1	8	Blaze	2	8
Arkansas Starkspur	2	9	Blenheim Orange	1	9
Arkansas Black	2	9	Blue Pearmain	8	6
Arrow	1	8	Blushing Golden	5	8
Ashmead's Kernel	3	9	BM 31021	1	8
Atlas	1	9	Bob White	3	8
Red Atlas	1	6	Boiken	1	8
Aunt Lucy	1	7	Borchert No. 1	1	9
Autumn Arctic	1	9	Bottle Greening	5	6
Babine	1	6	Boutville de Liseux	1	7
Balder	3	3	Bramley's Seedling	6	7
Baldwin	10	8	Bramtot	1	9
Colby Baldwin	1	9	Britemac	6	9
Galbraith Baldwin	1	8	Brock	5	8
Loop Red Baldwin	1	9	Brown No. 1	1	8
Loop Russet Baldwin	2	9	Buckley Giant	1	4
Ballarat	1	10	Burgundy	4	7

^aSports are listed with their original cultivars.

^bMaximum number of trees surveyed in 1972 or 1974.

^cMost severe fire blight rating on system of van de Zwet et al (7) on any tree in 1972 or 1974; 10 = no blight; 9 = 1-3%; 8 = 4-6%; 7 = 7-12%; 6 = 13-25%; 5 = 26-50%; 4 = 51-75%; 3 = 76-88%; and 2 = 89-99% of tree blighted; 1 = tree dead from blight.

^dTrees of clone include scions recently top-grafted on older trees.

Cultivar ^a	Trees ^b	Rating ^c	Cultivar ^a	Trees ^b	Rating ^c
Budagovsky No. 9	1	10	Crofton	1	8
Budagovsky No. 118	1	10	Crow Egg	1	7
Burke Sweet	1	9	Currie	1	7
California Sweet	1	10	Dabinett	1	7
Calville Blanc	2	7	Daintop	1	7
Cap of Liberty	1	10	Dakota	1	7
Caravel	2	9	Davey ^d	1	9
Cardinal	6	7	Deacon Jones	2	7
Carla	1	7	Debbie	2	9
Carlton	1	8	De Flanders	2	5
Carroll	6	8	De Jaune	2	7
Castle Major	1	9	Delawine	2	9
Champlain	2	7	Delcon	2	9
Charlamoff	1	6	Delicious ^d	5	8
Charlottae	1	9	Anson Delicious	6	9
Charlotte	1	10	Boswell Starking	1	9
Chautauqua	1	5	Boyce Delicious	1	10
Cheal's Golden Gem	1	8	Bridgham Delicious	6	10
Cheddar	1	8	Britespur Delicious	1	8
Chehalis	2	9	Cherri-red Delicious	1	9
Chenango	1	5	Clarkrich Delicious	2	9
Chesapeake ^d	1	6	Cooper Spur Delicious	1	10
Chestnut	3	8	Delicious X 300	1	8
Chief	5	6	Delicious X 500	1	9
Chieftan	4	8	Delicious X 700	1	9
Cho You	3	9	Delicious X 800	1	8
Cimitiere	1	8	Delicious X 900	1	8
Clear Heart	1	6	Dermen Delicious 4X	1	9
Cleopatra	1	8	Earlibrite Delicious	1	5
Close	1	8	Earlired Delicious	3	9
Coapman No. 1	1	6	Earlistripe Delicious	1	9
Cockle	1	10	Earlistripe Spur Delicious	1	10
Conard	1	9	Excels Delicious	3	9
Cook No. 1	1	7	Flanagan Spur Starking	1	2
Cornell Spur	1	6	Frank Starking	1	10
Cortland	8	7	Fruitland Delicious	1	10
Red Cortland	1	8	Gardner Delicious	1	10
Coulon	1	8	Glovier Delicious	1	9
Cowhichan	1	10	Green Delicious	1	9
Cox Orange	2	7	Groth Delicious	1	10
Blangsted Cox	1	9	Hardeman Delicious	4	8
Cherry Cox	1	9	Hardispor No. 1 Delicious	1	10
Oreby Cox	1	7	Hargrave Spur Delicious	1	10
Potter Cox	1	6	Harold Delicious	2	10
Queen Cox	1	8	Hastings Delicious	1	10
C. P. Close	1	9	Hi Early Delicious	2	10
Cranberry	1	10	Hi-Red Delicious	3	10
Crandall	2	7	Idaho Delicious 4X	1	6
Crawley Beauty ^d	1	2	Idaho Spur Delicious	1	9
Crimson Beauty	1	9	Imperial Delicious	2	10
Red Crimson Beauty	4	8	Lalla Delicious	2	10
Crimson Brilliant	1	9	Leimgruber Spur Delicious	1	8
Crimson Gold	1	10	Miller Delicious	4	10
Crimson Peasgood ^d	1	1	Myrtle Delicious	2	10
Crimson Superb	1	4	Okanoma Delicious	9	9
Crittenden	4	8	Oregon Spur Delicious	2	8

Cultivar ^a	Trees ^b	Rating ^c	Cultivar ^a	Trees ^b	Rating ^c
Paynter Delicious	4	9	Dufflin	1	8
Red Beauty Delicious	1	9	Duke of Clarence	4	5
Red Bouquet Delicious	1	10	Duke of Devonshire	2	9
Red Chief Delicious	5	10	Dunning ^d	2	4
Red King Delicious	5	10	Dunn's Favorite	1	10
Red Prince Delicious	2	10	Earlijon	1	7
Red Queen Delicious	2	9	Early Banta	1	7
Redspur Delicious	12	8	Early Harvest	2	7
Red Wenatchee Delicious	5	9	Early Joe	1	9
Regal Spur Delicious	2	8	Early McIntosh	3	9
Richared Delicious	3	9	East Malling Crab C	1	10
Rose Red Delicious	1	10	Eastman Sweet	1	8
Royal Red Delicious	3	9	Ebenezer Lambkin ^d	2	1
Ryan Delicious	1	10	Echo	1	10
Sergeant Delicious	5	8	Edgar	1	8
Shotwell Delicious	2	10	Egnor No. 1	1	8
Simpson Starking	2	9	Egremont Russet	1	8
Skyline Delicious	2	10	Ein Shemer	1	6
Skyspur Delicious ^d	1	6	Elita 20 Marculesti	1	10
Stark EarliBrite Delicious	1	10	Elmer	1	9
Starking Delicious	12	8	Emilia	1	5
Starkrimson Delicious	5	10	Empire	79	8
Starkspur Prime Red Delicious	1	10	English Redstreak	1	9
Stripeless Delicious	1	9	Epicurean	1	8
Tonasket Delicious	1	10	Ernst Bosch	1	6
Topred Delicious	2	10	Erwin Baur	1	7
Vance Delicious	14	8	Esopus Spitzenburg	3	4
Vermont Spur Delicious ^d	2	7	Red Spitzenburg	1	7
Wayne Spur Delicious ^d	1	9	Etter's Gold	1	10
Wellspur Delicious	6	9	Eustace No. 1	1	8
X-ellent	2	9	Fairwood	1	8
Delicious x Pyrus species	1	9	Fallawater	1	8
Delistein	2	8	Fall Pippin	1	7
Democrat	2	8	Fall Russet	1	8
Dennis No. 1	1	10	Fameuse	2	9
deRoche St. Lawrence	2	8	Middleton Fameuse	1	9
De Santo No. 1	1	6	Faurot	1	8
Desertnoe Petrova	1	6	Feuillard	1	4
Diana	1	8	Fireside	2	9
Dilatush No. 1	1	5	Connell Red	2	8
Discovery	2	6	Flower of Kent ^d	3	9
Dochidany ^d	1	2	Foxwhelp	1	8
Dolgo	2	10	Franklin	2	9
Donald	1	8	Freeman No. 1	1	8
Donald Wyman	1	10	Freiherr von Berlepsch	1	7
Donato No. 1	1	8	Frettingham Victoria ^d	2	10
Dooley No. 1	1	10	Freyberg	7	4
Dorothea	1	10	Fringe Petal Crab	3	10
Downing No. 2	1	8	Frostproof	1	5
Downing No. 3	1	7	Fuji	2	8
Duchess of Oldenburg	1	8	Fuji (ornamental)	1	10
Daniels Duchess	2	8	Fukunishiki	2	9
Van Buren Duchess	1	9	Fukutami ^d	1	8
Dudley	1	8	Fyan	1	8

Cultivar ^a	Trees ^b	Rating ^c	Cultivar ^a	Trees ^b	Rating ^c
Gala	4	6	Greendale	1	7
Gallen	1	8	Grimes Golden	1	10
Galton	1	8	McClintock Grimes	1	10
Garage	1	6	Gros Bois	2	4
Garland	4	9	Grove	4	7
Garrison	1	8	Haight Favorite	1	3
GDWFI	2	9	Hall Keeper	1	9
Geeveston Fanny	1	8	Haralson	2	8
Geneva	1	6	Hardanger Rosenstrips	1	9
George Carpenter	1	3	Hartman 64	1	6
Gideon	1	9	Hartman 164	1	6
Glenton	2	4	Hartman N1-172	1	6
Glovier No. 1	1	9	Hartman 502	1	8
Golden Delicious	20	7	Hartman 901	1	9
Badami Golden Delicious	6	8	Hartman 999	1	9
Doud Golden Delicious	2	9	Harvey (England)	1	7
Empress Spur Golden	1	10	Harvey (Maine)	1	5
Golden Delicious 4E-23-10 ^d	1	3	Haugmann	1	9
Golden Delicious 4E-24-14 ^d	2	4	Hawaii	1	9
Golden Delicious 4E-25-2	1	10	Hawley	1	10
Goldspur	1	10	Helderman's Favorite	4	9
Perrine Golden Delicious	4	9	Henrietta Crosby	2	10
Razor Golden Delicious ^d	1	7	Hereford Redstreak	1	9
Smoothie Golden	1	7	Hersey No. 1	1	8
Starkspur Golden Delicious	24	8	H. F. DuPont	2	10
Sundale Sturdeespur	1	9	Hillieri	1	10
Yellospur	2	9	Holdfast	1	7
Zeeland Spur Golden Delicious	1	10	Holiday	3	8
Golden Hornet	1	10	Holland	1	5
Golden Melon	1	8	Hollow Log	1	8
Golden Noble	2	7	Holly	5	7
Golden Nugget	1	8	Holstein	1	8
Golden Russet	2	5	Honey Ball	1	8
Golden Winesap	1	9	Honeygold	3	7
Goldjon	1	6	Honora	1	10
Goldo	1	9	Hoover	3	7
Goolsbey	1	10	Hopa	2	10
Governor Carr	1	9	Horei	1	7
Graham	1	10	Howgate Wonder	1	1
Granny Smith	2	8	Hubbardston	1	9
Red Granny Smith ^d	1	3	Hucker No. 1	1	10
Graue Renette von Zabergäu	1	7	Hudson Golden Gem	1	10
Gravenstein	1	10	Huey No. 1	1	8
Australian Gravenstein	3	8	Hume	2	9
Banks Gravenstein	2	9	Hunter Ottawa 244	1	9
Blood Red Gravenstein	2	8	Huntsman	2	8
Knuthenborg Gravenstein	2	8	Huvitus	2	9
Mead Gravenstein ^d	1	4	Hyslop	2	9
Oratia Beauty	2	7	Idagold	2	8
Shaw Gravenstein	2	9	Idared	28	1
Washington Gravenstein	2	5	Ikorocavka Alaja	1	9
Yellow Gravenstein	5	7	Ildrod Pigeon	1	8
Graves No. 1	1	7	Ingrid Marie	3	6
Graves No. 2	1	4	Red Ingrid Marie	1	6
Greasy Pippin	1	9	Irish Peach	1	8
			Isayev's Desertrnyi	1	6

Cultivar ^a	Trees ^b	Rating ^c	Cultivar ^a	Trees ^b	Rating ^c
Ivette	2	9	Kidds Orange Red	2	7
Iunast	1	7	Killand	1	9
Jakob Fischer	1	10	King Acre Pippin	1	9
Jamba	1	8	King Cole	3	7
James Grieve	2	6	King David	1	10
Neumann James Grieve	2	3	King Luscious	5	5
Jay Darling	1	10	Kingston Black	2	8
Jefferis	1	7	Kitaika Zoltaio	1	7
Jenkins No. 1	1	10	Koningszuur	1	7
Jensen No. 1	1	5	Korei	1	8
Jensen No. 2	1	5	Kyokko	4	7
Jersey Black	1	10	Lady	2	9
Jerseymac	7	8	Lady Carrington	5	6
Jewett	2	9	Lady Sudeley	1	8
Joan	3	6	Lakeland	1	8
John Standish A ^d	1	2	Lande	1	8
John Standish B	3	7	Langley Pippin	1	8
Jonadel	3	9	Large Yellow Siberian	2	10
Jonagold	126	6	Lasalle	1	8
Jonagram	2	5	Late Strawberry	2	9
Jonalicious	5	8	Late Sweet McIntosh	1	7
Jonamac ^d	14	3	Laxton's Fortune	3	6
Jonathan	3	7	Laxton's Superb	1	9
Adams Jonathan	1	9	Levering Limbertwig	1	10
Anderson Jonathan	2	8	Lewis No. 1	1	8
Blackjon	1	9	Ligotino No. 1	1	5
Conkle Jonathan	6	6	Linda	1	7
Freeborn Jonared	4	5	Linnton ^d	1	7
Jon-a-late	1	8	Lisovich No. 1	1	7
Jonared	4	7	Liveland Raspberry	2	9
Smith Jonathan ^d	2	4	Loachapoka	3	10
Welday Jonathan	2	8	Lobo	1	10
Jones Favorite	1	10	Bates Lobo	3	8
Jongrimes	3	10	Lodi	6	5
Jonnee	1	6	Starkspur Lodi	20	7
Jono	1	7	Lord Kitchner	1	4
Jonwin	2	7	Lord Lambourne	2	8
Jork 55 669	1	10	Lord Seedling	1	9
Joyce	1	8	Lovejoy No. 1	1	8
Jubilee	1	8	Lowry	2	9
Julyred	6	7	Lubec No. 1	1	4
June Wealthy	1	9	Luke	1	7
Kamsomolez	1	10	Lyman Prolific	1	10
Kanorkowa	2	9	Lyons	4	8
Kasha	2	8	Macoun	10	9
Katherine	5	9	Magnolia Gold ^d	1	7
Katja	1	5	Maiden Blush	1	6
Kaupanger	1	8	Maidstone Favorite	1	7
Keegan	2	9	Maigold	1	7
Kelley No. 1	2	7	Major	1	8
Kemp	1	10	Malabols ^d	1	6
Kendall	3	6	Malinda	2	8
Kendall Kitaiki	1	10	Malus AA33340	1	10
Kensib	3	10	Malus baccata	4	10
Kernohan No. 1	1	7	M. baccata columnaris	3	10
Khashabi	1	8	M. baccata mandshurica	1	10

Cultivar ^a	Trees ^b	Rating ^c	Cultivar ^a	Trees ^b	Rating ^c
<i>Malus brevipes</i>	1	10	Imperial McIntosh	8	9
<i>Malus florentina</i> Sdlg	1	10	Improved All-Red McIntosh	2	8
<i>Malus fusca</i>	1	10	Johnson McIntosh	2	10
<i>Malus halliana</i> ^d	1	10	Kimball McIntosh 2-4-4-4	3	9
<i>Malus hupehensis</i>	3	9	Kress McIntosh	2	10
<i>Malus platycarpa</i>	1	9	Macspur	3	7
<i>Malus purpurea aldenhamensis</i>	4	7	McIntosh 652	3	9
<i>Malus sikkimensis</i>	1	10	McIntosh 775	5	8
<i>Malus zumi calocarpa</i>	1	10	McIntosh 8F-1-12	3	10
Mandan ^d	2	9	McIntosh 8F-2-27	4	10
Mandan 32-5	2	7	McIntosh 8F-3-3	2	10
Mandan 41-27 ^d	2	7	McIntosh 8F-5-11	3	10
Mandan 44-22	1	8	Nured McIntosh	3	8
Mandan 44-25	1	7	Paladino Spur McIntosh	2	7
Mandan 48-53 ^d	2	3	Rogers McIntosh	2	9
Mandan 48-54 ^d	2	6	Sergeant McIntosh	1	10
Mandan 53-18	1	6	Speckled McIntosh	1	10
Mandan 56-4	1	8	Spur McIntosh	1	8
Mandan 58-17 ^d	1	7	Summerland McIntosh	6	7
Mandan 58-21	1	10	Wrzesinski McIntosh	1	6
Mandan 60-35	1	8	McLemore	2	4
Manitoba Spy ^d	1	5	McLicious	1	4
Mann	1	9	McClusky No. 1	2	1
Mantet	2	8	Medaille d'Or	1	9
March No. 1	2	7	Medina	2	7
Marechal	1	7	Megumi	1	8
Margaret Anderson No. 1	1	7	Melba		
Margil	1	7	Hunter Melba	6	9
Maribor	2	6	Red Melba	2	9
Mariborka ^d	1	2	Melrose	4	8
Marin Oufroy	1	8	Merton Ace ^d	1	2
Martha	1	9	Merton Beauty	1	10
Martinmas	1	10	Merton Charm	2	5
Mary Potter	1	10	Merton Delight	1	9
Mary 1	1	10	Merton Joy	1	9
Mary 3	1	9	Merton Pippin	1	7
Mary 4	1	6	Merton Prolific	2	10
Mary 5	1	9	Merton Russet	1	6
Mary 6	1	9	Merton Worcester	1	8
Mary 67-1	2	7	Michael Henry Pippin	1	9
Mary 67-2	1	8	Michurin's Seedless	1	7
Maunzenapfel	1	6	Midland	1	8
McCauliff No. 1	1	6	Midttun	1	8
McCoy Red Winter	1	6	Milton ^d	2	4
McCoy No. 1	1	8	Milwaukee	2	8
McIntosh	9	9	Mingan	1	8
Ashworth Old McIntosh	1	7	Minjon	2	9
Black Mickey	1	10	Minnehaha	1	10
Boller McIntosh	48	7	Minn. 1478	2	9
Cornell McIntosh	8	7	Minn. 1505	5	8
Cornwall McIntosh	2	9	Minn. 1527	2	8
Early Maturing McIntosh	1	8	Minn. 1590	1	5
Farley McIntosh	2	10	Minn. 1593	6	9
Geneva McIntosh	7	8	Minn. 1627	2	8
Green Peak McIntosh	2	10	Minn. 1660	4	7

Cultivar ^a	Trees ^b	Rating ^c	Cultivar ^a	Trees ^b	Rating ^c
Minn. 1691	1	6	N.J. 41	5	8
Mio	1	8	N.J. 44	6	8
Mitchell Special Red	1	2	N.J. 45	1	4
Mitchell No. 7	1	8	N.J. 46	2	6
MK-14	2	8	N.J. 49	1	6
Mo. 2071	2	9	N.J. 50	1	10
Mo. 2890	2	9	N.J. 51	1	7
Mo. 3467	3	9	N.J. 52	1	7
Mollie's Delicious	6	7	N.J. 136055	5	7
Monarch	2	7	N.J. 293056	4	9
Monmouth Beauty	1	9	669 N.J. 2	3	8
Monroe	20	8	N.Z. 21	5	8
Montgomery	3	6	N.Z. 41	6	6
Morden 357	2	9	Newell	1	9
Morden 358	1	10	Newfane	1	5
Morden 359	1	10	Newhouse No. 1	1	9
Morden 360	1	10	Newton Wonder	1	9
Morden 361	1	9	Newtosh	1	9
Morden 363	3	9	Niagara ^d	2	3
Morgan No. 2	1	9	Niobe	1	8
Morgenthau No. 1 ^d	1	3	Nipissing	2	10
Morse Beauty	1	10	No Blo	1	8
Morse Late	1	8	Norris No. 2	1	10
Morse No. 2	1	10	Norris No. 3	1	10
Mosa 64	1	9	Northern Spy	15	7
Mother	1	8	Bender Spy	1	9
Murasaki	3	8	Crimson Spy	2	10
Muscadet de Berney	1	9	Farmer Spy	1	9
Muscadet de Lens	1	8	Field Spy	2	9
Mutsu	29	6	Greene Spy	3	8
Nagel 59	1	5	Green Peak Spy No. 1	2	8
N.D. 49-4	2	10	Green Peak Spy No. 2	2	8
N.D. S-44-25	1	8	Hunter Kinkead Spy	2	9
Nehou	1	9	Kibbee Spy	1	8
N.H. 8	6	7	Kuppens Spy	1	9
N.H. 9	1	8	Loop Red Spy	1	9
N.H. 62-5	1	5	Loop Spy #654	4	9
N.J. 4	1	6	Loop Spy 2-2-4-4	4	9
N.J. 5	1	8	Oberle Spy	1	9
N.J. 9	1	8	Redwin Spy ^d	2	9
N.J. 10	2	8	Schoharie Spy	6	7
N.J. 12	1	10	Weatherley Early Spy	1	10
N.J. 13	1	10	Northwestern Greening	1	7
N.J. 24	4	7	Nova Easygro	1	9
N.J. 27	7	9	N.S. C13-30-88	1	10
N.J. 29	3	7	N.S. K28-15-30	1	5
N.J. 31	5	7	N.S. K32-99-2	2	10
N.J. 32	2	10	N.S. K32-100-3	1	9
N.J. 33	4	6	N.S. K32-176-41	1	9
N.J. 35	5	6	N.S. K33-99-1	2	9
N.J. 36	4	8	N.S. K33-112-3	2	10
N.J. 37	6	7	Nubeena ^d	1	3
N.J. 39	2	8	Nugget ^d	1	7
N.J. 40	5	6	NY 88	4	7

Cultivar ^a	Trees ^b	Rating ^c	Cultivar ^a	Trees ^b	Rating ^c
NY 162	4	2	Otterson No. 1	1	9
NY 163	4	7	Ozark Gold	6	8
NY 247	4	8	Ozark Ruby	1	8
NY 271	21	6	Pacific Pride	1	9
NY 380	5	7	Paducah	1	10
NY 18491	2	9	Red Paducah	1	9
NY 47513-1	7	8	Palmiter No. 1	1	7
NY 55158-2	4	9	Papierowka Polska	1	10
NY 58553-1	1	9	Paradise Sweet	2	7
Odin	3	8	Paradiso	1	10
Ogden	1	9	Paragon	1	7
Ohio 3	1	9	Parkman	4	9
Ohio 6037	1	7	Patricia	2	8
Ohio 7291	1	8	Paulared	5	5
Ohio 7313	2	5	Payette	3	6
Ohio 7428	1	9	Peace Garden	2	9
Ohio 8285	1	8	Peau de Vache	1	8
Ohio 8417	1	8	Peck Pleasant	2	8
Ohio 8469	1	8	Pepinka litewska	1	10
Ohio 8481	2	5	Piervomaiskoie	1	7
Ohio 8758	1	8	Pink Beauty	1	9
Ohio 9345 ^d	4	5	Pink Pearl	2	9
Ohio 12120	1	8	Pink Wood	1	10
Ohio 12770	1	5	Pioneer Scarlet	1	4
Ohio 13052	2	9	Piotosh	1	9
Ohio 13177	1	8	Pipin Shafrannyi	2	8
Ohio 13359 ^d	2	7	Pocomoke ^d	1	8
Ohio 16025	1	5	Polly Eades	1	9
Ohio 16500	1	9	Pomme Grise	1	10
Ohio 16506	1	10	Pomme Pierre	1	8
Ohio 16617	1	7	Porter	1	9
Ohio 16654	1	9	Porter No. 1	1	9
Ohio 16773	1	4	Potomac ^d	1	3
Ohio 16780	1	5	Potter No. 1	1	8
Ohlson	1	7	Pound Sweet	1	8
Oliver	2	8	Prairie Rose	1	9
Ontario	1	8	Prairie Spy	2	7
Geneva Ontario	2	9	Prima	2	8
Opalescent	2	6	Primate	2	9
Orei	1	9	Prime Gold	1	10
Orenco	2	10	Priol's Delicious	7	7
Oriole	1	9	Priscilla	1	7
Orleans	2	9	Prof. Sprenger ^d	2	9
Orleans Reinette	2	6	Pumpkin Sweet	2	8
Ortley	1	9	Purdue 9A1-71	1	10
Osterling No. 1	1	9	P 1235-2	1	9
Oswego	4	6	Purdue Virus Indicator	1	9
Ottawa 272	1	9	Puritan	3	9
Ottawa 274	2	8	Quaker Beauty	2	7
Ottawa 292	3	8	Quebec Belle ^d	1	7
Ottawa 294	5	6	Quinte	7	9
Ottawa SRO 522	1	8	Quindell	1	9
Ottawa SRO 523	1	10	Radiance	6	8
Ottawa T-391	2	9	Ranger ^d	2	8
			Raritan	7	7

Cultivar ^a	Trees ^b	Rating ^c	Cultivar ^a	Trees ^b	Rating ^c
Raymond	1	7	Gallia Beauty	1	9
Red Apple	5	10	German Rome	5	6
Red Astrachan	1	8	Hotle Rome	1	9
Red Baron	3	8	Law Rome	2	8
Red Bellflower	1	4	Loop Rome 2-2-2-4	3	7
Red Canada	1	9	Loop Striped Rome	1	8
Red Codling	2	8	Mills Rome	1	9
Redfield	3	10	Nero Rome	4	8
Redflesh	3	10	Nured Rome	1	7
Redford	1	10	Ohio Rome	1	8
Redgold	2	9	Penrome	1	7
Red Goudreinette	1	9	Ruby Rome	1	8
Redhook	2	7	Spuree Rome	3	8
Red Jacket	1	10	Starkspur Red Rome	1	8
Red Limbertwig	1	9	Taylor Spur Rome	1	9
Red Sauce	3	5	Wright Rome	2	9
Red Scarlet	1	9	Rondo	1	10
Red Seek-No-Further	1	9	Rose Bud	1	9
Red Statesman	2	8	Rosedale	2	10
Red Thorle	4	5	Rosthern 18	1	8
Red Transparent	2	8	Rouse No. 1	1	7
Red Warrior	3	8	Roxbury Russet	2	8
Redwell	1	9	Royal Jubilee	1	7
Red Willow Twig	2	6	Ruby	2	9
Red Wing	1	8	Runkel No. 1 ^d	2	5
Regent	2	8	Rush's Favorite ^d	2	2
Reid No. 1	1	7	Saint Cecilia	1	5
Reid No. 2	1	7	Salome	2	8
Reid Seedling	1	8	Salowitz No. 1 ^d	1	4
Reinar	1	8	Sandow	2	8
Reine des Pommes	1	7	Hunter Sandow	3	8
Reine des Reinettes	1	8	Sangrado	1	9
Reineta Encarnada	1	9	San Jacinto	1	7
Renet Beegamotnyi	1	6	Saratoga	2	6
Rhoda	1	9	Saugahatchee	2	9
Rhode Island Greening	6	7	Scarlet Crofton	1	10
Keukalaar Greening	2	6	Schoharie	2	8
McNicholas Greening	1	7	Schoner aus Miltenberg	1	10
Rieper No. 1	1	10	Schoner aus Nordhausen	2	6
Ringstad	2	10	Scotia	4	8
Rival	2	3	Scotland No. 1	1	9
Roanoke	6	8	Scott Winter	1	9
Robinson No. 1	1	8	Sears No. 1	1	8
Rodney	1	6	Secor	2	8
Roman Stem	2	7	Sekai-ichi	1	9
Rome Beauty ^d	2	3	September	1	10
Australian Rome	1	9	Sharon	2	10
Baillie Rome	1	8	Shaw	1	8
Barkley Rome	3	9	Shaw Ribston	1	9
Carlson Rome	1	6	Shear No. 1	2	8
Clifton Rome	2	8	Shelred	1	8
Conical Rome	1	9	Shenandoah	2	9
Cowin Rome	4	6	Shiwassee	1	8
Cox Rome	3	9	Shin-Indo ^d	1	7
Dalzell Rome	1	9	Shinko	1	8
Frimley Rome	2	8			

Cultivar ^a	Trees ^b	Rating ^c	Cultivar ^a	Trees ^b	Rating ^c
Shinsei	1	10	Imperial Stayman	1	8
Shoesmith	1	4	Penn Stayman	1	7
Shumaker No. 1	2	6	Poe Stayman	1	9
Sigafus No. 1	2	7	Red Stayman	5	7
Sikora	1	10	Scarlet Staymared	1	9
Sinta	2	5	Staymared	1	9
Sir Prize	1	7	Steacy	1	10
Sissipuk	2	9	Stearns	2	8
Skinner Seedling	2	8	Stirling	1	10
Smokehouse ^d	5	6	Stouffer No. 1	1	9
Snowdrift ^d	1	10	Strain No. 1	1	5
Sokeri Miron	2	8	Stull No. 1	2	10
Sonderskov	1	8	Sturmer Pippin	1	5
South Dakota C-4-81	1	7	Sullivan No. 1	1	8
South Dakota C-5-1	1	6	Sumatovka	2	3
South Dakota C-5-7	1	8	Summer Champion	1	10
Souvenir de Fernand Cognet	2	8	Summerglo	1	7
Sparkler Crab	1	10	Summer Scarlet	2	8
Spartan	13	8	Summer Rambo	8	8
Hunter Spartan	3	8	Redsumbo	1	8
Sweden Spartan	1	9	Red Summer Rambo	1	4
Spartan 10C-6-43-1	3	8	Summerland ^d	3	2
Spartan 10C-11-49-1	1	6	Summerland 8C-5-62	4	1
Spartan 10C-17-48-2-2	2	10	Summerland 8C-29-24 ^d	1	5
Spartan 10C-17-48-5	4	10	Summerland 9E-13-47	2	8
Spartan 10C-18-39-5	4	10	Summerland 10C-1-21	1	9
Spasovka Kvasna ^d	1	2	Summerland 10C-6-25	2	7
Späthbluehenden	1	6	Summerland 10C-18-33	6	8
Spencer	3	9	Summerland 10C-19-24	3	7
Spencer Seedless	12	8	Summerland 10C-24-26	1	8
Spicap	1	10	Summerland 10C-31-16	1	8
Spigold	9	7	Summerland 10C-34-3	1	9
Spijon	10	8	Summerred	5	6
Spokane Beauty	2	6	Sungold	12	8
St. Lawrence	1	10	Susvorenskoye	1	10
Stahls Prinz	1	6	Sutton	1	7
Stark	1	7	Swaar	2	9
Miami Stark	1	8	Sweet Bough	1	8
Pollock Stark	3	7	Sweet Delicious	1	10
Stark No. 179	3	7	Sweet Greening ^d	1	4
Stark No. 287	2	8	Sweet McIntosh	1	10
Stark No. 287 (reverted)	1	8	Sweet Winesap	3	8
Stark Blushing Golden	6	2	Szampanska	1	9
Stark Earliblaze	2	6	Tangier ^d	1	5
Starkspur Earliblaze	1	9	Tasman Pride	1	7
Stark Earliest	1	8	Taunton Cross	1	10
Red Stark Earliest	5	6	Tayeshnoe	1	10
Stark Jongrimes	1	10	Thew Gold	2	9
Stark Splendor	11	9	Thorberg	2	9
Stark Summer Delicious	2	8	Timiskaming	1	10
Starr	1	9	Tioga	1	9
Stavish 26	1	10	Tohoku 2	4	7
Stawianka	2	6	Tohoku 4	2	9
Stayman	1	8	Toko	3	8
Blaxstayman	1	9	Tolman Sweet	2	5
I 15 Stayman	1	10			

Cultivar ^a	Trees ^b	Rating ^c	Cultivar ^a	Trees ^b	Rating ^c
Tompkins King	1	7	Wageningen Z.74	2	6
Red Tompkins King	1	9	Walser No. 1	1	7
Whitney Russet King	1	9	Warder	1	8
Torino No. 1	1	10	Washington Strawberry	3	6
Torino 31B	1	8	Watermelon	1	4
Torstein	1	9	Watson No. 1	5	8
Toshkee	1	9	Wayne	9	6
Toyo	1	9	Wealthy	2	8
Transcendent	2	6	Case Wealthy	2	9
Trapp No. 1	6	9	Coombs Wealthy ^d	1	7
Tremlett's Bitter	1	9	Loop Wealthy	3	8
Tumanga	1	6	Rings Wealthy	1	9
Turley	2	7	Stevenson Wealthy	3	7
Twenty Ounce	4	6	Webster	12	8
Anderson Twenty Ounce	1	10	Wedge	1	9
Collamer Twenty Ounce	1	10	Wellington	8	9
Horton Twenty Ounce	3	8	Wellington Bloomless	1	9
Twistbody Jersey	1	9	Westchester	2	8
Tydeman Early	8	4	Westfield	1	10
Tydeman's Late Orange	1	8	Whetstone	4	8
Tydeman Spur No. 3	1	7	White Crofton	1	9
Tydeman Spur No. 6	1	6	White Pippin	1	10
Tyler	2	8	White Winter Pearmain	1	7
Upton No. 1	1	10	Whitney Crab	2	7
USDA No. 1	1	7	Wickson	2	8
Utter	1	9	William Crump	1	6
Vagnon Flocher	1	10	Williams	1	8
Vandevere	1	3	Willis Williams	5	8
Van Eseltine	1	8	Wilson No. 1	1	5
Veitch Scarlet	1	10	Wilson Red June	2	6
Victory	6	5	Winchester	1	9
Viking	5	8	Winesap	5	10
Vilmorin	1	8	Bisbee Winesap	5	8
Vineland 20201	2	8	Dermen Winesap	1	9
Vineland 29202 ^d	4	4	Doud Winesap	1	10
Vineland 35012	2	8	Mance Spur Winesap	1	10
Vineland 35046	2	7	SeeandO Winesap	1	10
Vineland 350413	2	9	Starkspur Winesap	4	10
Vineland 65031	1	8	Winston	1	7
Vineland 65032	1	8	Winter Arkad	1	10
Vineland McIntosh Sdlg. No. 4	1	10	Winter Banana	1	7
Virginia Crab	1	9	Spur Winter Banana	1	7
Virginiagold	3	2	Winter Gold	4	7
Vogelcalville	1	7	Wodarz No. 1	2	9
VPI 1	2	10	Wolf River	3	9
VPI 5	3	7	Woodward NFCA	2	7
VPI 6	7	6	Woolbrook Russet	1	3
VPI 7	6	8	Worcester	2	10
VPI 9	4	9	Worcester Cross	1	10
VPI 10	6	8	Worcester Pearmain	2	7
VPI 11-75	6	7	Wright	1	9
VPI 11-116	4	6	Wright No. 1 ^d	2	3
Wabiskaw	2	8	Yarlington Mill	1	7
Wagener	2	10	Yellow Bellflower	2	8

Cultivar ^a	Trees ^b	Rating ^c	Cultivar ^a	Trees ^b	Rating ^c
Yellow Newton	2	7	Yugoslavia 6427	3	8
Yellow Transparent	1	9	Yugoslavia 6947	3	7
Perrine Yellow Transparent	2	10	Yugoslavia 6970	2	5
Wrixparent	2	9	Yugoslavia 7060	2	6
York Imperial	1	8	Yugoslavia 7064	1	6
Colora York	1	8	Yugoslavia 7141	1	6
Perrine York	2	9	Zalesak No. 1	1	4
York-a-red	1	3	Zalesak No. 2	1	6
Yorking	1	3	Zalesak No. 3	1	8
Young America	1	9	Zimnieje Piervoskhodnoie	2	4
Yugoslavia 3709	1	4	Zorza	3	2
Yugoslavia 6327	2	10	Zusoff	2	8

A Comparison of the Growth Habit of 'Bergman' and 'McFarlin' Cranberry Cultivars on Commercial Bogs in British Columbia¹

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Abstract

Observations were made on the growth habit of 'Bergman' and 'McFarlin' cranberry cultivars, in commercial bogs, during the spring and summer of 1974. The cultivars differed in growth habit in that 'Bergman' produced more uprights on recent runners while 'McFarlin' produced more new uprights on the Growth or on older uprights continued. 'McFarlin' also produced more flowers per upright than 'Bergman'.

The cranberry (*Vaccinium macrocarpon* Ait.) is grown commercially in over 1000 acres (400 ha) of the Fraser Valley of British Columbia. In

this area ninety per cent of the acreage is in the cultivars 'McFarlin' and 'Bergman' (Eaton 1970); 675 acres (273 ha) in 'McFarlin' and 275 (111 ha) in 'Bergman' (Thorpe 1972). Although the acreage is not large compared to those in the New England states the yields per acre in British Columbia are often higher.

Bergman (1950) described the cranberry vine as consisting of long creeping stems forming an intertwining mat over the bog. From the stems, uprights arise which bear the flowers and fruits. In a later report, Bergman (1961) distinguished between old uprights (those at least one year old) and new uprights (those in their first year of growth). Old uprights may

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