Exotic Rootstocks for Cherries

James N. Cummins[1]

Commercial plantings of both sweet cherries (*Prunus avium* L.) and red tart cherries (*P. cerasus* L.) are usually grown on rootstocks of either "mazzard" (*P. avium*) or St. Lucie (*P. mahaleb* L.). A limited number of orchards are on Stockton Morello or other *P. cerasus* roots. Representatives of numerous other species have been tried as rootstocks in years past, and testing of such exotic species is currently underway at several stations. The trials at East Malling, UK; Grand-Manil, Belgium; Giessen, German Federated Republic; and Dresden-Pillnitz, German Democratic Republic are particularly noteworthy because of the spectra of taxons which they encompass.

In reviewing the literature, it was sought to identify those species of which at least some representatives have been tried as cherry rootstocks and to identify others which may have some merit for trial; *P. avium, P. cerasus* and *P. mahaleb* have been omitted. The taxonomic scheme of Rehder (55) has generally been followed; however, Latin epithets have been given for only a few varieties. Synonyms are given in those few instances in which confusion would otherwise be assured. A few of the epithets employed will be considered by some to be without standing. It is regrettable that the identities of specific clones used either in sexual reproduction or as vegetatively propagated stocks were but seldom available.

Prior to about 1955, little or no attention was given to virus content of the plant materials under test nor to the possibilities that differences in virus content and in virus sensitivities might introduce serious errors in interpretation of data. Recent work at Geneva (14) and by Plock (52) has involved only virus-free material. It seems prudent to consider that "incompatibility" reported in some cases may be related to interaction with viruses, rather than to genetic incompatibility.

Species Tried and/or Under Trial

P. apetala (Sieb. & Zucc.) Franch. & Sav. is native to the lower elevations of central Hondo, there making a large bush (73. The species appears closely related to *P. incisa* (55). It is under trial at Gembloux as rootstock #1-14-Aa (63).

P. besseyi Bailey seedlings are apparently incompatible under cherries (22, 25, 26). Brase (6) reported that Windsor buds united with *P. besseyi* seedling stocks, but that the buds did not grow in the spring; neither Montmorency nor Black Tartarian buds united initially. In a test of 10 clonal selections, only 1.6% of the Schattenmorello buds united with the stocks (45). A report (47) of occasional use of *P. besseyi* as a stock of tart cherries in cold and dry regions may reflect confusion with a similar species, *P. pumila.*

P. canescens Bois. is native to central and western China. The clone held by East Malling propagates adequately with softwood cuttings under mist (26). Although there is overgrowth of the scion variety, the compatibility and dwarfing make the species continue to appear promising (25, 69). Schmidt found *P. canescens* relatively compatible with sweet cherries (76). At Grand-Manil, a clone designated #3-8-K appears after 9 years to be a suitable dwarfing stock for the tart

[1]New York State Agricultural Experiment Station, Geneva, New York 14456.

cherry Dubbel Gorsem Kricke, reducing tree size by about half (63). It appears satisfactory under several sweet cultivars (48).

P. cerasoides D. Don is an evergreen shrub of the Himalayan foothills. Seedlings have been used successfully under Emperor Francis sweet cherry, but there has been some indication of problems with growth activity beginning too early in the spring (58).

P. concinna Koehne is among the most precocious of all cherries (H. Schmidt, personal communication). Flowers appear before the leaves (55). At Grand-Manil, clone #3-8-W is being tested as a stock (63).

P. cornuta (Wall.) Steud. (syn. *P. padus* sensu Brandis non Linn.) is a native of higher elevations in northern India. At least in the nursery, seedlings were compatible under Emperor Francis (58).

P. dawyckensis Sealy is thought likely to be a hybrid of *P. canescens* x *P. dielsiana* (55). Leafy cuttings rooted best under mist at about 19°C, less well at higher temperatures (48). At Grand-Manil, clone #4-1-K has been compatible and dwarfing under Hedelfingen and Early Rivers (60). The variety *fastigiata*, #4-2-K, has reduced vigor of most scion cultivars, but compatibility has been variable (3).

P. demissa, the western chokecherry, was apparently used somewhat in pioneer days as a cherry stock (18). Seedlings remained free of nematodes during a 2-year trial (64).

P. fruticosa Pall. (syn. *P. chamaecerasus* Jacq.) is a shrubby plant indigenous to the steppes and higher elevations across much of Europe. Tolerant of very low winter temperatures (5), *P. fruiticosa* matures very early in the fall and becomes active in the spring slightly after sweet and tart cherries. Suckering is profuse. Trees on *P. fruticosa* are severely dwarfed, very precocious; they require support for best performance. Seedlings often require 2 seasons to reach buddable diameter. Selections which are fairly easily propagated and are compatible under both sweet and tart cherries have been introduced (14, 52, 53). Root cuttage may be the best method for propagating (13). At Grand-Manil, clone #6-1-P appears promising in preliminary testing (63).

P. glandluosa Thunb. is a very hardy native to eastern Manchuria, Korea and far eastern USSR (3, 17). Garner (26) propagated *alba-plena* by softwood cuttings; sweet cherries budded on these produced maiden trees, but none survived 2 years in the orchard (25).

P. ilicifolia (Nutt.) Walp. the hollyleaf cherry of southern California, is evergreen, highly resistant to *Armillaria* root rot, but incompatible with sweet cherries (18).

P. incisa Thunb. was being used in Japan as a dwarfing stock 60 years ago (32). Open-pollinated seedlings of both the species and of the variety *compacta* were initially compatible with cherries (22), but have since proved quite unsatisfactory (H. J. van Oosten, personal communication). It roots easily under intermittent mist and makes good unions with some cultivars of both *P. avium* and *P. cerasus* (74). At Grand-Manil, 2 dwarfing clones, #9-7-K and #9-10-K, have been identified that are compatible with Big Burlat (61) and under the tart cultivar Dubbel Gorsem Kricke (63). At East Malling, Merton Glory trees were dwarfed but healthy after 7 years (69).

P. instititia L., although in subgenus PRUNOPHORA is being tested at Grand-Manil under cherries (63).

P. japonica Thunb. is a very hardy native of central China, Manchuria, and northern Korea (3, 19, 76). In Manitoba, 11 varieties of tart cherries were severely dwarfed on the species, with weak unions, scion swelling above the unions, much suckering, and excessively heavy fruiting (1). Rooting of greenwood cuttings depends on IBA or similar auxin-type chemicals (46). This species propagates readily under intermittent mist, but the few cherry trees produced on this stock in the nursery did not survive 2 seasons in the orchard (26). Seedlings are susceptible to rootknot nematode (8). At least the variety *nakii* is a diploid (2n = 16) (43).

P. laurocerasus L. is a relatively winter-tender shrubby tree of Asia Minor (55). The variety *caucasica* proved highly incompatible with sweet cherries (25, 26). However, there appear to be numerous forms of the species not yet tested (55). Seedlings are susceptible to *Coryneum* blight (71).

P. macradenia Koehne is a hardy tree of western China similar to *P. maximowiczii* (55). Clone #13-6-K tested at Grand-Manil was adjudged to have too limited compatibility to have potential as a rootstock (63).

P. maddenia hypoleuca rooted well under intermittent mist, but no sweet cherries budded onto the liners survived the nursery year (26).

P. maritima Marsh., the beach plum of northeastern North America, has been used for Montmorency cherry stocks; trees were 30-40% smaller than standard and fruited well (L. R. Sjulin, personal communication). Seedlings tested at Geneva were good nursery subjects; in the orchard both Montmorency and Emperor Francis trees were severely dwarfed.

P. mollis has shown promise as a dwarfing stock for Merton Glory at East Malling (69).

P. mugus Hand.-Mass. is a prostrate shrub of China, highly similar to *P. incisa* (55). At East Malling cuttings have rooted well under intermittent mist, but the rooted cuttings have proved difficult to establish in the nursery (40, 69). Bud take and growth of young trees in the nursery have been excellent (26). In the orchard, sweet cherries on *P. mugus* have been dwarfed with wide crotch angles (69).

P. nipponica Matsum., native to Sakhalin and the northern islands of Japan, is very winter hardy (76). The Grand-Manil selection No. 14-2-BA is compatible and dwarfing for Hedelfingen. Open-pollinated seedlings (with *P. incisa* the likely pollen donor) demonstrated good nursery compatibility with Early Rivers; many fruit buds were produced on sweet cherries during their second year in the orchard (22), but subsequent performance was unsatisfactory (H. van Oosten, personal communication). The Grand-Manil selection #11-3-R of the variety *kurilensis* has been compatible and dwarfing under Hedelfingen and Schneiders (62).

P. padus L. is a common wild cherry of the woods in Japan (73) and across Eurasia (55). It is very similar to *P. virginiana* (2). It can be propagated by layers, but buds on liners took poorly and no budded trees survived a second season (25, 26). It is susceptible to *Coryneum* blight (71). The variety *watereri*, tested as clone #16-16-K was incompatible with most cherry cultivars and considered not promising (63).

P. pensylvanica L. is the pin cherry of North America. Used as a stock for tart cherries, unions are strong, the trees are dwarfed, and suckering is severe (7, 20, 27, 29). Pin

cherry can be budded on *P. mahaleb* (49). Roots are less hardy than those of *P. besseyi* or *P. mahaleb* (49). It is a natural host for cherry leaf miner (15). *P. pensylvanica* is easily propagated by softwood cuttings under intermittent mist (76).

P. pilosiuscula Koehne makes a small tree in its native China. It appears to be hardy as *P. mahaleb* (55). At Grand-Manil, #16-3-M has proved incompatible with cherries; the variety *media*, #16-6-R, has restricted tree vigor in preliminary tests (63).

P. pleiocerasus Koehne is a small tree of China, ranging west of the normal distribution of *P. pilosiuscula*. It appears closely related to *P. maximowiczii* (55). At Grand-Manil, clone #16-11-K was not compatible with the varieties tested and is not considered to have promise (63).

P. pseudocerasus is an epithet that has been applied to at least 3 different taxons, including varieties of *P. sargentii* and *P. serrulata*; there is still considerable confusion in *Prunus* collections. *P. pseudocerasus* Lindl. has been cultivated for its red fruit for centuries in much of China (73) and to a small extent in California for the very earliest fresh market (47). Dai-Sakura was grown in Japan as a dwarfing, precocious rootstock (29). The cultivar Yung-Fo is easily rooted and is a good nursery subject with good bud take, and trees survive at least the early years in the orchard (26, 67). The clone used at East Malling is tetraploid (2n = 32) (43).

P. pumila L. has been used very successfully in cold, dry regions as a stock for sour cherries. It takes the bud well and forms good unions. No dwarfing is evident during the first 5 years in the orchard (7, 29).

P. sargentii Rehd. (syn. *P. sachalinensis* Koidz.; *P. pseudocerasus* Schmidt not Lindl.) is among the very hardiest of cherries (10, 36, 44, 56, 76). It has been said to come true from seed. *P. sargentii* clones can be propagated on *P. avium* or *P. serrulata stocks* (56). In the nursery, seedlings were compatible with both sweet and tart varieties, but very pronounced scion overgrowths developed (42). It is among the species under trial at Grand-Manil (63), as #19-160-K.

P. serrula Franch. is a small tree of western Yunnan, hardy as *P. mahaleb* (55). In preliminary testing at Grand-Manil, it has reduced tree vigor enough to merit continued trial (63).

P. serrulata Lindl. (syn. *P. pseudocerasus* Hort. not Lindl.) is a dominant wild cherry of northern Japan, and from it have come many selections of double-flowered cherries. As a species, it is vigorous, quick-growing, disease-free and hardy. Most of the flowering cherries classed in this species are probably complex interspecific hybrids, e.g., Hata-Sakura appears to be *P. serrulata* x *P. pseudocerasus* (57). Most forms root poorly by cuttage (73). At East Malling, sweet cherries budded onto certain form(s) survived a year in the orchard, but thereafter trees were stunted, rather than dwarfed (26).

There have been understandable difficulties in anglicizing the Japanese names for cultivars; it is probable that some clones are referred to by more than one name (Table 1). Spelling and punctuation usually follow Wilson (73).

P. sieboldii (Carr.)Wittmack is widely cultivated in Japan as a small ornamental tree that is long-lived on its own roots. No wild form is known. Varieties root readily from cuttings (73). The most common cultivar Takasaga, and sometimes the entire species may be assigned by some to *P. serrulata* (55). In the Grand-Manil trials, Takasaga, #19-111-R,

has reduced tree vigor significantly and has been generally satisfactory; however, compatibility is variable under Early Rivers (63).

P. subhirtella Miq. is a wild cherry of central China; the variety *ascendens* is apparently the more primitive stock and typical of the basic species (73). The tree of *P. subhirtella* is long-lived and vigorous (34). Under intermittent mist, some clones require elevated temperatures, ca. 23C, for good rooting; the varieties *ascendens* and *pendula*

Table 1. Varieties and cultivars of *Prunus serrulata* tested and/or under trial as rootstocks for cherries.

Clonal designation	Station	Station no.	Results of testing
albo-plena	Grand-Manil	#19-2-K	Poor compatibility; not promising (63)
affinis	Grand-Manil	#19-4-R	Incompatible; not promising (63)
Amanogawa	Grand-Manil	#19-30-B	A *lannesiana* form (55)
Asano	Grand-Manil	#19-8-D	Preliminary results are promising (63)
atrorubra	Grand-Manil	#19-6-K	Incompatible; not promising (63)
benden	Grand-Manil	#19-101-R	
	Geneva	NA 23890	
Beni-higan			Larger diameter cuttings rooted much better than smaller (51)
Botan-zakura	Grand-Manil	#19-11-K	Unsatisfactory (63)
Dai-koku	Grand-Manil	#19-26-R	Generally good compatibility with sweets, with tree vigor reduced (63)
Fugenzo	Grand-Manil	#19-36-R	
Fuku-rokuju	Grand-Manil	#19-34-K	Generally incompatible with sweets; not promising (63)
Gioiko	Grand-Manil	#19-44-K	Appears promising in preliminary tests (63)
Hata-zakura	Grand-Manil	#19-49-K	Incompatible; not promising (63)
Hokusai	Grand-Manil	#19-45-R	Appears promising in early tests (63)
Horinji	Grand-Manil	#19-46-K	Not satisfactory (63)
Ichyo	Grand-Manil	#19-135-R	
Imose	Grand-Manil	#19-55-R	Incompatible; not promising (63)
Itokukuri	Grand-Manil	#19-58-W	
	Geneva	PI 215556	
Jo-nioi	Grand-Manil	#19-4-R	Probably same as *affinis;* incompatible, not promising (63)
Kiku-sakura	Grand-Manil	#19-62-W	Incompatible with sweets; unsatisfactory (63)
Kiku-shidare-zakura	Grand-Manil	#19-117-K	
Kokonoye	Grand-Manil	#19-61-K	Somewhat incompatible with Early Rivers, but generally satisfactory; tree size somewhat reduced (48, 60, 63)
Kwanzen			Highly sensitive to common viruses such as green ring mottle and sour cherry yellows. Many propagating lines carry little cherry virus as a latent (M. F. Welsh,

Table 1. ***Continued***

Clonal designation	Station	Station no.	Results of testing
			personal communication); thrifty and hardy trees in Washington, D. C. (41).
Mazakura	Geneva	10669	Softwood cuttings under intermittent mist have emergent roots within 10 days; a month after initial setting cuttings have developed very large masses of well-branched roots, and these establish easily in the field. In central New York, Emperor Francis and Montmorency trees have survived 3 winters in the test orchards with no apparent ill effects. In England, Mazakura was discarded as a stock for flowering cherry as being too weak a grower (33). In Japan, Mazakura has been an important rootstock for flowering cherries for at least a century (73).
Mikuruma Gaeschi	Grand-Manil	#19-25-K	
Ojochin	Grand-Manil	#19-115-K	Appears promising in early observations (63)
Okiku	Grand-Manil	#19-85-K	Somewhat variable in compatibilities; tree size reduced (63)
	Geneva	7178	PI 215563
Shimidzu	Grand-Manil	#19-118-K	Incompatible; not promising (63)
Shirofugen	Grand-Manil	#19-1-R	Sensitive to numerous viruses, especially green ring mottle
Shirotae	Grand-Manil	#19-60-K	Incompatible with sweets; unsatisfactory (63). Probably "Sirotae."
Shogetazu superba	Grand-Manil	#19-163-K	
Shuyaku	Grand-Manil	#19-116-K	
Sumizone	Grand-Manil	#19-119-K	Incompatible; not promising (63)
Tai-haku	Grand-Manil	#19-127-K	Incompatible; not promising (63)
	Geneva	7378	PI 41852
Taizanfukun	Grand-Manil	#19-7-B	Early observations promising (63)
Taki-noki	Grand-Manil	#19-16-R	Incompatible; not promising (63)
Taoyama	Grand-Manil	#19-126-R	Incompatible; not promising (63)
Udzu-zakura	Grand-Manil	#19-137-W	Incompatible; not promising (63)
Ukon	Grand-Manil	#19-40-R	Generally incompatible with sweets; unsatisfactory (63)
Wasinowo	Grand-Manil	#19-150-K	Incompatible; not promising (63)
Yae Akebono	Grand-Manil	#19-3-K	
Yae murisaki	Grand-Manil	#13-2-R, 19-71-R, 19-153-K	Cuttings root best when apical bud has hardened (51)
Yedo-sakura	Grand-Manil	#19-80-K	Compatibility varies with cultivar; tree size is reduced (63)

root well over a range of basal temperatures (48). At Grand-Manil, Fukubana, #19-201-K, was easy to propagate and has been compatible with and dwarfing for Hedelfingen (61). Under Montmorency, *ascendens,* #19-212-K, has been compatible and has reduced tree vigor significantly. Also under test at Grand-Manil are *autumnalis,* #19-203-R, and *plena rosea,* #19-206-R (63). Seedlings of *P. subhirtella* are highly variable and relatively hardy; selections can be budded on mazzard, but do not take well on *P. serrulata* (56).

P. tenella Batsch. (syn. *P. nana* Stokes), the Siberian almond, has been generally difficult to root at Geneva; trees sucker freely, but the suckers seldom root. A few selections can be propagated readily as greenwood cuttings under intermittent mist. The possibility of root cuttage has not yet been explored. Siberian almond is unusually susceptible to peach tree borer. One selection is compatible with Redhaven peach. On another *P. tenella* clone, one badly stunted tree of Emperor Francis has survived for 7 years in the orchard.

P. tomentosa Thunb. is distributed across northwestern China, the Himalayas, and Turkestan. It is very winter hardy and tolerant of "wet feet" (76). Seedlings have proved incompatible with both sweet and tart cherries (21, 76). Greenwood cuttings root fairly well under intermittent mist; high basal temperatures improve rooting considerably. Layering has proved a preferable system. At Geneva, there has been consistent difficulty establishing rooted cuttings, even with liberal use of benomyl drenches.

P. virginiana L., the chokecherry of eastern North America, is similar to *P. padus,* the chokecherry of Asia (2). Tukey and Brase (66) reported Montmorency incompatible on chokecherry. When used as a stock under *P. padus,* chokecherry suckers badly, but there are no suckers from the *P. virginiana/P. padus* combination (28). Chokecherry is susceptible to *Coryneum* blight (71). It is a common host for X-disease mycoplasm. Cherry leaf miner larvae are not able to survive on chokecherry (15, 30).

Species Not Tried as Cherry Rootstocks

No record has been found that the following taxons have been used under either sweet or tart cherries, although interspecific hybrids involving some of these species have been tried.

P. campanulata Maxim. is a small tree thought to be native to Taiwan; it is somewhat cold-sensitive. It thrives in central California. On Taiwan, it appears to be in rhythm with the monsoons, rather than with photoperiod; anthesis occurs there in January. Some forms come true from seed. Seeds germinate in the fall if planted in mid-summer. At least some forms can be budded onto *P. avium* and *P. serrulata* (37, 56, 73).

P. cantabrigiensis Stapf. (syn. *P. pseudocerasus* Koidz. not Lindl.) appears to be an allotetraploid with highly self-fertile flowers (54). It appears slightly less hardy than *P. pseudocerasus* Lindl. (55).

P. cyclamini Koehne, and the close related

P. dielsiana Schneid. make shrubby trees in their native China (55).

P. emarginata (Dougl. ex Hook.) Walp., the western bitter cherry, is compatible on both mahaleb and mazzard stocks. The variety *mollis* is more vigorous than the species type; it has been used successfully as an intermediate stem for sweet cherries (18).

P. glandulosa Thunb. is a native of the sunny slopes and rockeries of

eastern Manchuria and Korea (3). It is commonly cultivated in Japan (73) and in the USA as "flowering almond" (55).

P. gravesii Small. is similar to *P. maritima*; it is native to Long Island (55).

P. griffithii (Bois.) Schneid. is native to Afghanistan north to Turkestan and Mongolia (39).

P. humilis Bunge is native to the Korean peninsula and Manchuria, found there on dry, sandy slopes. Its strong root system produces many suckers. Seedlings are very precocious (3).

P. incana (Pall.) Batsch. the Underwood cherry, is a native shrub of southeastern Europe and Asia Minor. It is drought-tolerant and not demanding as to soil, but is not hardy in western USSR (76).

P. involucrata Koehne is very similar to *P. cyclamini* and *P. dielsiana* (55).

P. jacquemontii Hook. is similar to *P. tomentosa* (50).

P. maackii Rupr., the Amur chokecherry, is native to Korea, Manchuria, and far eastern USSR. Buds are compatible on *P. mahaleb* (49). It is easily propagated under intermittent mist. Seeds require 80 to 100 days for after-ripening (77). Seedlings are compatible rootstocks for *P. virginiana* (12). Open-pollinated seedlings are not hypersensitive to inoculation with raspberry ringspot and cherry leaf roll viruses (11). *P. maackii* is very winter hardy (55).

P. prostrata Labill. is a shrubby dwarf of the Mediterranean region usually above 1500 m. It is closely related to *P. incana* (55).

P. serotina Ehrh. is a late-blooming, winter-hardy tetraploid. It propagates satisfactorily under intermittent mist (76). In Ecuador, the variety *capuli* is cultivated for its fruit; some individual trees are enormously productive (16). Selections of the species make fairly good growth as scions on mazzard stocks (19). Larvae of cherry leaf miner cannot survive on this species (15, 30).

Summary and Discussion

Clones and/or seedlings of 35 species, besides *P. avium, P. cerasus* and *P. mahaleb* have been reported from cherry rootstock trials. Of these, *Prunus besseyi, P. glandulosa, P. illicifolia, P. padus, P. tenella, P. tomentosa,* and *P. virginiana* seem to have little merit for further trial. Sensitivity to low winter temperatures renders the following species of doubtful value for cherry stocks: *P. cerasoides, P. laurocerasus* and *P. serrulata.*

The results from Grand-Manil (48, 61, 62, 63) emphasize the importance of examining both a diversity of forms within a species and a spectrum of scion varieties. Specific clones of *P. dawcykensis, P. incisa, P. nipponica kurilensis, P. serrulata, P. subhirtella* and *P. yedoensis* appear to be very suitable for a narrow range of fruiting varieties. The results at East Malling with clones of *P. canescens, P. incisa, P. mollis, P. mugus* and *P. pseudocerasus* continue to be encouraging for specific combinations. Observations of *P. fruticosa* clones at Geneva, N.Y., and in Germany confirm the earlier promise of this species. It now appears that intensive investigation is most likely to yield clones of value as understocks for cherry from among the following taxons, some of which have not been tried at all in this context: *P. canescens, P. cantabrigiensis, P. dawcykensis, P. fruticosa, P. incisa, P. mugus, P. nipponica, P. pseudocerasus, P. sargentii, P. serrula, P. serrulata, P. sieboldii, P. subhirtella,* and *P. yedoensis.* Particularly among the flowering cherries there are numerous clones in existence which have good horticultural qualities that could be

useful in stocks. In further investigation, vigilance to avoid virus contamination should be much increased.

Literature Cited

1. Anon. 1963. Research report of the Experimental Farm, Morden, Manitoba, 1960-1962. Canada Dept. Agr., p. 24.
2. Bailey, L. H. 1898. Sketch of the evolution of our native fruits. Macmillan, New York, 472 pp.
3. Baranov, A. I. 1960. The Manchurian dwarf cherry. *Philippine J. Sci.* 89: 275-282.
4. Bartels, A. 1976. *Prunus serrula. Deut. Baumsch.* 28:84.
5. Bolotskji, J. S. 1957. (Trials with *Prunus fruitcosa* in Burjat-Mongolio.) *Agrobiologija* 6:138-140 (Russian).
6. Brase, K. D. 1953. Western sand cherry—A dwarfing stock for prunes, plums, and peaches. *Fruit Var. Hort. Dig.* 8:23-24.
7. Budd, J. L. 1890. Stocks for the cherry, plum, prune and apricot. Iowa Agr. Exp. Sta. Bul. 10:421-430.
8. Buhrer, E. M., C. Cooper and G. A. Steiner. 1933. A list of plants attacked by the root knot nematode. *Pl. Dis. Rptr.* 17:64-96.
9. Carrick, D. B. 1920. Resistance of the roots of some fruit species to low temperature. Mem. Cornell Univ. Agr. Exp. Sta. 36:613-661.
10. Cernysov, M. V. 1961. (Selected Sahalin sour cherries.) *Sadovostvo* 6:43. Abstr. in *Pl. Brdg. Abstr.* 32:2380.
11. Cropley, R. 1968. Testing cherry rootstocks for resistance to infection by raspberry ringspot and cherry leaf roll viruses. Annu. Rpt. E. Malling Res. Sta. for 1967. pp. 141-143.
12. Cullinan, F. P. 1937. Improvement of stone fruits. *In* Yearb. Agr., USDA, pp. 665-748.
13. Cumming, W. A. 1958. Propagation of *Prunus* species and varieties. Proc. Int. Plant. Prop. Soc. 8:85-91.
14. Cummins, J. N. 1972. Vegetatively propagated selections of *Prunus fruticosa* as dwarfing stocks for cherry. *Fruit Var. Hort. Dig.* 26:76-79.
15. Cushman, R. A. and D. Isely. 1916. The cherry leaf beetle, a periodically important enemy of cherries. USDA Bul. 352. 28 pp.
16. Darrow, G. M. 1954. The Capulin cherry of Ecuador. *Fruit Var. Hort. Dig.* 9:23-24.
17. Darrow, G. M. and G. E. Yerkes. 1937. Some unusual opportunities in plant breeding. *In* Yearb. Agr. USDA, pp. 545-558.
18. Day, L. H. 1951. Cherry rootstocks in California. Cal. Agr. Exp. Sta. Bul. 725.
19. Denney, A. 1964. Biochemical and field compatibility studies of selected Prunus species. Abstr. in *Hort. Abstr.* 35:7120.
20. Downing, A. J. 1847. The fruits and fruit trees of America. Wiley and Putnam, New York. 590 pp.
21. Duquesne, J. 1974. Les travaux de recherches actuellement en cours dans le monde pour l'obtention de cerisiers de petite taille par l'itilisation de nouveaux port-greffes. *La Pomologie Francaise* 16 (6):115-122.
22. Floor, J. 1957. Report on the selection of a dwarfing rootstock for cherries. *Euphytica* 6:49-53.
23. Fogle, H. W., E. L. Proessting, Jr., E. C. Blodgett, and M. Aichele. 1962. First-year production records from a cherry rootstock study Proc. Wash. State Hort. Assn. 71-75.
24. _____, J. C. Snyder, H. Baker, H. R. Cameron, L. C. Cochran, H. A. Schomer and H. Y. Yang. 1973. Sweet cherries: Production, Marketing, and processing. USDA Agr. Handbk. 442. 94 pp.
25. Garner, R. J. 1968. Some problems in the production of smaller trees for sweet cherries. Proc. Symp. for cherries and cherry growing, Int. Soc. Hort. Sci., Bonn: 22-24.
26. _____ and C. P. Nicoll. 1957. Observations on *Prunus cerasus, P. mahaleb* and other species as rootstocks for sweet cherries. Annu. Rpt. E. Malling Res. Sta. for 1956. pp. 63-72.
27. Hansen, N. E. 1927. Plant introductions (1925-1927). S. Dak. Agr. Exp. Sta. Bul. 224. 66 pp.
28. _____. 1930. Fruit stocks where the mercury freezes. Proc. 9th Int. Hort. Congr., London. 307-311 pp.
29. Hedrick, U. P. 1951. The cherries of New York. Rpt. New York State Agr. Exp. Sta. for 1914, part 2. 371 pp.
30. Herrick, G. W., and R. Matheson. 1916. Observations on the life-history of the cherry leaf beetle. *J. Agr. Res.* 5:943-950.
31. Hutchinson, A. and W. H. Upshall. 1964. Short-term trials of root and body stocks for dwarfing cherry. Ont. Hort. Exp. Sta. Rpt. for 1963. pp. 8-16.
32. Ikeda, T. (ca. 1907). Fruit culture in Japan. Tokyo: Siebido. 110 pp.
33. Ingram, C. 1925. Notes on Japanese cherries. *J. Royal Hort. Soc.* 50:73-99.
34. _____. 1929. Notes on Japanese cherries. II. *J. Royal Hort. Soc.* 54: 159-180.

35. _____. 1930. Prunus subhirtella. *Gdnrs. chron.* 87:349.

36. _____. 1940. Sargent's cherry. *Gdnrs. chron.* 108:124.

37. _____. 1944. Apparent manifestation of a paternal habit. *Gdnrs. chron.* 115:178.

38. _____. 1946. A revised classification of the deciduous cherries. *Gdnrs. chron.* 119:196-197.

39. _____. 1946. The rock cherries: Amygdalocerasus. *Gdnrs. chron.* 120: 138-139, 150-151, 162, 174, 186.

40. Jackson, J. E. 1977. Cherry rootstocks. *In* Annu. Rpt. E. Malling Res. Sta. for 1976. pp. 46-49.

41. Jefferson, R. M. and A. E. Funsonie. 1977. The Japanese flowering cherry trees of Washington, D. C. Natl. Arboretum Contrib. No. 4.

42. Joley, L. E. 1942. Overgrowth produced by edible cherry on Sargent cherry (*Prunus sargentii* Rehd.). Proc. Amer. Soc. Hort. Sci. 40:277-278.

43. Keep, E. 1958. Cytological notes. Annu. Rpt. E. Malling Res. Sta. for 1957. pp. 75-78.

44. Krussman, G. 1965. Zur Sichtung der jananischen Ziekirschen. II. *Deut. Baumsch.* 6:166-169.

45. Liebster, G. 1968. Erste Ergebnisse mits Prunus besseyi Bailey als Unterlage für Steinobst. *Mitt. Klosterneuburg* 18:389-400.

46. Longley, L. E. 1939. Growth substances in rooting certain Prunus species. Proc. Amer. Soc. Hort. Sci. 37: 1091-1092.

47. Marshall, R. E. 1954. Cherries and cherry products. Interscience, New York. 283 pp.

48. Monin, A. 1968. La nanification der cerisier. Symp. Kirschen & Kirschanbau, Bonn. pp. 13-16.

49. Mowry, J. B. 1958. Rootstocks for propagating Prunus selections. *Fruit Var. Hort. Dig.* 13:23-25.

50. Mulligan, B. O. 1935. Some March-flowering members of the *Prunus* family at Wisley. *J. Royal Hort. Soc.* 60:196-198.

51. Paterson, D. B. 1958. Flowering cherries from cuttings. Proc. Int. Plant Prop. Soc. 8:92-94.

52. Plock, H. 1971. Die Bedeutung der Steppenkirsche als Zwergunterlage für Süss Und Sauerkirschen. (Local printing). 6 pp.

53. _____. 1973. Die Bedeutung der Prunus fruticosa Pall. als Zwergunterlage für Süss Und Sauerkirschen. *Mitteilungen* 23 (2):137-140.

54. Raptopoulos, T. 1941. Chromosomes and fertility of cherries and their hybrids. *J. Genet.* 42:91-114.

55. Rehder, A. 1949. Manual of cultivated trees and shrubs hardy in North America. Macmillan, New York. 996 pp.

56. Russell, P. 1934. The oriental flowering cherries. USDA Circ. 72 pp.

57. Schenk, E. 1968. Chemotaxonomische Untersuchungen zu Sortenfrage. Symp. Kirchsen & Kirschanbau, Bonn. pp. 166-170.

58. Singh, R. N., S. S. Randhawa and P. N. Gupta. 1971. Rootstock performance of two wild species of cherry *Prunus cerasoides* and *Prunus cornuta* in the nursery. *Indian J. Hort.* 28 (3):196-198.

59. Stebbins, R. L., J. R. Thienes and H. R. Cameron. 1978. Performances of sweet cherry cultivars on several clonally propagated understocks. *Fruit Var. J.* 32:31-37.

60. Trefois, R. 1972. Nanification du cerisier par la voie botanique. *Le Fruit Belge,* 4th trimester. pp. 285-318.

61. _____. 1974. Possibilities nouvelles de production de cultivars de cerisiers sur les sujets porte-greffe produits par bouturage sous broillard. *Le Fruit Belge* 42 (368):262-281.

62. _____ and A. Monin. 1972. Comportments differentiels de combinations de greffage de varieties de cerises sur des Prunus ornamentaux et autres. Sta. Cult. Fruit & Maraich., Gembloux, Belgium, 75-50-CER, 69 pp.

63. _____ and _____. 1978. Personal communications.

64. Tufts, W. P. and L. H. Day. 1934. Nematode resistance of certain deciduous fruit tree seedlings. Proc. Amer. Soc. Hort. Sci. 31:75-82.

65. Tukey, H. B. 1964. Dwarfed fruit trees. Macmillan, New York.

66. _____ and K. Brase. 1930. Factors in the production of cherry trees in the nursery. Proc. Amer. Soc. Hort. Sci. 27:88-92.

67. Tydeman, H. M. and R. J. Garner. 1966. Breeding and testing rootstocks for cherries. Annu. Rpt. E. Malling Res. Sta. for 1965. pp. 130-134.

68. Volkov, S. A. 1953. (Propagation of the Chinese sandcherry). *Sad i ogorod* 8:69-70. (In Russian; original not seen. Quoted by Zylka.)

69. Webster, A. D. and D. G. Chapman. 1975. Cherry rootstocks. Annu. Rpt. E. Malling Res. Sta. for 1974. p. 46.

70. Westwood, M. N. 1978. Mahaleb x mazzard hybrid cherry stocks. *Fruit Var. J.* 32:39.
71. Wilson, E. E. 1953. Coryneum blight of stone fruits. *In* Yearb. Agr., USDA, pp. 705-710.
72. _____. 1953. Bacterial canker of stone fruits. *In* Yearb. Agr., USDA, pp. 722-729.
73. Wilson, E. H. 1916. The cherries of Japan. Arn Arb. Publ. No. 7. Univ. Press, Cambridge. 68 pp.
74. Wolfram, Bridgitte. 1966. Stand und Aussichten der Zuchtung einer schwachwachsenden Kirchunterlage. *Obstbau* 6:86-88.
75. _____. 1966. Erste Ergebnisse bei der Zuchtung einer schwachwachsenden Kirschunterlage. Tagungeber. Deutch Akad. Landwiss., Berlin. pp. 93-97.
76. Zylka, D. 1971. Die Verwendung von wilden Kirscharten in der Sortenzuchtung und als Unterlage. *Gartenbauwissenschaft* 36:261-291, 417-444, 557-572.

Aliceblue and Beckyblue Blueberries

P. M. LYRENE AND W. B. SHERMAN[1]

Aliceblue and Beckyblue are two new rabbiteye blueberry cultivars recently released by the Fruit Crops Department of the University of Florida. The only rabbiteye blueberry cultivar previously introduced by the University of Florida was Bluegem in 1970. Aliceblue and Beckyblue resemble each other in chilling requirement, both requiring less chilling than any other rabbiteye cultivars available. As a consequence, they can be grown farther south, and in most years should fruit well as far south as the line between Daytona Beach and Tampa in Central Florida. On the other hand, low chilling in blueberries is associated with early flowering, and Aliceblue and Beckyblue probably would not be reliable producers north of Florida because of their tendency to flower while the frost hazard in those regions is still high.

Aliceblue and Beckyblue are not self fertile, and should be planted together for cross pollination. In Gainesville, they bloom in late February to early March, about a week before 'Bluegem'. Both show some resistance to powdery mildew, a disease that attacks most rabbiteye blueberries but has not been shown to seriously reduce yields. Annual yields from 5 to 6-year-old irrigated plants have been about 10 kg per plant. The fruit of Aliceblue and Beckyblue ripens before that of other rabbiteye cultivars, in late May or early June in Gainesville. Berries are firm, round, flavorful, and medium blue. The scars left where the berries separate from the stem during picking are small and dry. Berries of Aliceblue, which are about equal in size to those of 'Woodard', are slightly larger than those of Beckyblue, which resemble berries of Bluegem in size. Aliceblue and Beckyblue should be most valuable in the southern part of the rabbiteye blueberry production area. Growers outside of Florida should initially consider only small experimental plantings of the two cultivars. Plants were released to Florida blueberry nurserymen in the Winter 1977-78 and some rooted cuttings will be available to the public next Winter.

[1]Fruit Crops Dept., University of Florida, Gainesville, Florida 32611.