grow in bunches; even the one year old shoots are covered with buds. After planting it soon starts yielding and from then on it gives an annual high crop. Its fruit harvested properly can be stored well, over-ripened it soon softens.

Kr. 5. Kr 5 ripens in the middle of September or the second half of it, about one week after 'Jonathan.' Its fruit is medium large or large slightly longish round-shaped with an average diameter of 68-70 mm. The whole surface of the fruit gets evenly red. Overripened it is dark red, but does not drop. Its taste is tart but with good flavor. It ripens evenly and does not drop. The tree is medium size which makes it suitable for intensive cultivation.

It gives a large crop, and our experience proves that it can be stored well for a long time. It is tolerant to powdery mildew.

Kr 7. Kr 7 ripens in the second half of September about 2 weeks after 'Jonathan.' The fruit is medium size or large with a diameter of 65-70 mm. The fruit is a slightly flattened round-shape. It does not get red evenly over the whole surface. It ripens evenly and our experience has proven that it gives a good crop that will store well. Kr 7 is resistant to powdery mildew.

Kr 11. Kr 11 ripens at the end of September about 3 weeks after 'Jonathan.' The fruit is medium size or large with an average diameter of 68-70 mm. It is almost round. When ripe it is generally completely red. It is less tart than the other selections with an aromatic flavor. It ripens evenly and does not tend to drop. The fruit flesh is hard. The tree is medium size and is suitable for intensive cultivation.

It gives a large annual crop. It can be stored well for a long period of time.

This description outlined the variety candidates which ripen one after the other with a week's separation. In practice some slight shifts in the ripening periods can occur. However, the Kr series makes it possible for growers to select varieties with the most suitable ripening period for their orchards.

Wild Vitis Riparia from Northern U. S. and Canada — Breeding Source for Winter Hardiness in Cultivated Grapes — a Background of the Swenson Hybrids

ELMER P. SWENSON

Vitis Riparia is a very adaptable American grape species, as shown by its wide distribution. It is the base of my grape breeding, being the only species native in Wisconsin and Minnesota. Clones within the species are quite similar, but do vary somewhat in cluster and berry size, percentage of sugar and acid in the fruit ,and ripening, though being as a group very early in this respect. I have carefully observed the wild grapes and have used what I consider the best in breeding.

The first clone I used was growing in a large red oak in the eastern boundary fence of our farm, just up the hill from Pine Lake. It was the largest in berry size of any around here and was, of course, pistillate. I bagged and hand pollinated a couple of its clusters with pollen from Grandpa Larson's old cultivated grapes here in the house yard, that I believe to be

Moore Early. From the seed 24 seedlings were planted and fruited, with about half of them having perfect flowers. In fruit size they were similar to Beta, with three or four a bit larger in berry. None were superior to Beta in quality, so they were not asexually propagated.

While Grandpa Larson lived, he maintained two wild grape arbores. They were in size about 8′ x 8′ with wild grape, a male and female at either end. He had evidently selected the best wild ones he could find, at least they were both unusual. The bearing vine had the largest clusters of any Riparia I have seen, and I remember counting more than 200 berries on one. The berry size was not unusual, but the acidity was higher or the sugar less than the average Riparia, as they were very sharp to the taste. They were also very susceptible to downy mildew, so that in some years the fruit was nearly worthless. The male plant was also unusual, in that it had the largest and most compound blossom cluster of any wild grape I have seen. This one I used in breeding, emasculating, then hand pollinating a cluster of Seibel 11803 with it. Two of the resulting seedlings have been propagated and also used in breeding. These are my 642 and 643. The 642 I crossed with Black Monukka, planting about 100 seedlings. These were very susceptible to downy mildew and were not winter hardy, so none were propagated. I also used 642 as pollen parent in a cross with my 17-59 (an open pollinated seedling of Minnesota 78). Two of the resulting seedlings are being propagated for second test. They are 2-11-7, a red, and 2-12-6, a blue. The 643 I have crossed with Cabernet, planting 43 seedlings, one of which looks promising. It is 3-16-21, a blue.

The largest share of my grape breeding has been with the Minnesota 78. It is a seedling of Beta, which in turn is a seedling of a wild Riparia from bottom land along the Minnesota River near the village of Carver. T. V. Munson in "Foundations of American Grape Culture" states that it was a white pure Riparia and that he had a plant of it received from Louis Suelter, who found the wild plant and crossed it with Concord to produce the following named seedlings Beta, Dakota, Monitor, and Suelter.

During the period between 1912 and 1920, M. J. Dorsey at the University of Minnesota, did quite a bit of grape breeding, using Beta as the hardy adapted parent, crossing it with some of Rogers' hybrids and other eastern United States cultivated grapes. From this work, four were named in 1944. They were: Moonbeam, Red Amber, Bluebell, and Bluejay. With the exception of Moonbeam, I used them as soon as possible in breeding, and for me the #78 proved an outstanding seed parent, contributing hardiness, vigor, early maturity of fruit and wood to the seedlings. I have used it more than any other plant in breeding, and it forms the largest part in the foundation of the Swenson hybrids. First crosses were with varieties from the Geneva, New York, station and the Seibel 1,000. In 1949 Emmet Schroeder was importing as many of the French hybrids as he could get, and I purchased from him about 15 of what he considered the best selections. I have used several of them in breeding, and following is a list of selections from crosses on the Minnesota 78 that I have kept until now, or whose lines I am continuing. 78 X Dunkirk = my numbers 34 and 35. 78 X Ontario = 37 and 40. (Edelweiss). 78 X Cardinal = 56 (this Cardinal came from Bradly Bros. Nursery, Carbondale, Illinois. It is a hybrid with vine and fruit character similar to Delaware.) 78 X Kendaia = 80. 78 X Seibel 1000 = 113 and 114, 78 X Seneca = 193, 78 X Golden Muscat = 217. 78 X Seibel 11803 = 445, 442 and 439 (Swenson Red). 78 X open pollination

(seed taken from plant next to Nels Hansen's Onaka = 15-52, 16-12, 17-59 and 18-27. 78 X Buffalo = 4-50. 78 X Humbert 3 = 3-15-35. 78 X Canadice = 3-20-36. I also have two plants of the cross 78 X Venus from seed given me by Pat Pierquet and eleven plants of Suelter X Venus.

At the University of Minnesota, Dr. A. N. Wilcox continued the grape breeding work begun by Dr. Dorsey. After coming to the Horticultural Research Center to work as a gardener in 1969, I went through the records on this work and found that about 5,000 seedlings had been planted. From those, 20 selections had been propagated and planted for second test, which was all that remained of Wilcox' work when I came there. I rooted cuttings of them all and planted them here at my vineyard. I have since used three of them in breeding: the 314, 315, and 319. I used 314 pollen on my 34, pollen from my 4-50 on the 315, and 442 pollen on the 319. Wilcox had mostly used Bluejay as seed parent, and several of his selections were such seedlings with other Minnesota numbers as pollen parent. As a group, they were foxy in flavor, with several much too strongly so for my taste. After observing them here for more than ten years, I rate the 246, 315, 319, and 321 as the best of them.

I have a number of plants from a cross of wild Riparia near South Haven, Minnesota: X Reisling and Himrod. These crosses were made by David Macgregor, and I merely planted the seeds left by him in stratification in a Horticultural Research Center cooler. The wild Riparia from South Haven has a smaller and much more compact cluster than the wild grapes around the Minnesota River Valley, and near the Horticultural Research Center. These first generation plants are strongly Riparia in character with highly acid fruit. I have used two of them in breeding with two crosses on the 23-33 (South Haven wild Riparia X Reisling), using pollen of Swenson Red and C-299-35, and using pollen of 24-52 (South Haven wild Riparia X Himrod) on my 414 (56 X Seibel 11803). The 24-52 has large, loose clusters, berries medium and nearly seedless, the few seeds being very tiny, soft, and sterile.

Pat Pierquet marked and observed many wild vines in and near the Research Center, testing the fruit for sugar and acid. On a northwest bank of the Minnesota River near Jordan, he found a very productive plant of good cluster size and having the highest sugar reading of any that were tested. This juice from this plant (given number 89) had a reading of 25° balling. Flowers of 89 were pollenized with a North Carolina number selection and 15 vigorous plants from this cross were planted but all but four were males. The bearing vines were all pistillate, and while larger in berry than the wild, were very acid and sharp to the taste, so none were saved. Seedlings of 89 X Perlette, Seigerebe, and Zinfandel are currently under test. In 1982, I crossed Minnesota wild Riparia 89 with Muscat Hamburg.

Pat marked and numbered what he considered the best of the bearing wild Riparia vines, later getting cuttings of them. These Morden grapes had been grown from seed collected in the Riding Mountains, thought to be the northernmost limit of the species. The #37 was considered to be the best of them—good health and vigor, with quite large clusters, the leaves having a distinctive glossiness. It also was the earliest to ripen, the fruit coloring in late July. In 1979, I rated the 1-16-126 (Rip. 37 X S.V. 18-283) as one of the finest F1 hybrids I have seen.

About ten years ago, I found two superior clones of wild Riparia (Riparia #1 and Riparia #2) about two miles southwest of our farm, one on a line fence, the other on the edge of

a pothole on the neighboring farm. This last one has the same distinct glossiness of leaf as the Manitoba 37 and, like it, is very disease resistant, ripening with the earliest. These selections are being used in crosses.

Nels Hansen, while at South Dakota State University at Brookings, did some grape breeding, using Beta, a wild grape from Fort Pierre, South Dakota, and a wild grape collected at Bismark, North Dakota as hardy adaptive parents, crossing them with named varieties from the eastern United States. He named 32 of the seedlings from his crosses,[1] and I have used two of them in breeding. First used was Mandan (Wilder X N.D. wild) X Red Amber. Bearing vines of the seedlings from this cross were all so small in cluster size that none were propagated. In 1981, I crossed my Kay Gray with Eona (Lady Washington X Beta). These young seedlings have not as yet fruited. Kay Gray was grown from open-pollinated seed of my 217 with the plant from which the seed was taken, growing next to Hansen's Onaka, most likely its pollen parent.

Byron Johnson, a private breeder from Cincinnati, Ohio, has also used one of Hansen's grapes in breeding. It is Osbu (Beta X Agawam). He crossed it with Baco Noir and has named one of the seedlings Kee-Wah-Din. This past season I also used Kee-Wah-Din on my 2-4-7.

Dr. Ron Peterson has continued the grape breeding at South Dakota State University. However, his work is based on still different wild Riparia clones. These he found in eastern Montana, where temperatures, especially in winter, tend to fluctuate more widely than here, and there being generally not much snow. This is also the case at Brookings. He has to date named one plant from his work. It is Valiant (wild Riparia X Fredonia), and it is rated even more winter hardy than Beta. These Montana Riparia are perhaps superior to Wisconsin and eastern Minnesota kinds in their adaption to open winters with great variance in temperature.

Here we have, then, a very wide base for continued grape breeding to achieve winter-hardy, adaptive varieties of high fruit quality for both table and wine. I believe that by intercrossing these hybrid lines from several superior wild Riparia clones, the future of grape growing in areas of very cold winter climate is, indeed, very bright.

Literature Cited

1. Nels Hansen, *South Dakota Bulletin*, 224.

BOOK REVIEW

Persimmon Culture in New Zealand. Hirotoshi Kitagawa and Paul G. Glucina. Science Information Publishing Centre, P. O. Box 9741, Wellington, New Zealand. DSIR Information Series No. 159, 1984, 74 pages. Price NZ $11.95 plus $.80 surface postage.

This excellent paperback book contains color photographs of the important cultivars of Japan, New Zealand and other countries. Rootstocks, propagation methods, shoot growth, flowering, pollination and fruit development are clearly described. A significant portion of the book describes orchard management of persimmons including site selection, soils, spacing, training, pruning, potential yields, nutrition and important insect and disease pests. Harvesting, storage and processing methods are covered including the effects of temperature on storage and shelf life. The causes and techniques used to remove astringency are covered in some detail. The use of 69 beautiful color photographs throughout this book enhance the clearly written text and lead to a good understanding of persimmon culture.

—D. C. Ferree