Plums on the Prairies

by Rick Sawatzky

Information from Literature

Much has been published about pollination, pollinators, pollinizers, fertilization and fruit set in text books and periodicals. The definitions are not difficult. **Pollination** is the movement of pollen among compatible flowering plants (**cross-pollination**) or from anthers to stigmas on the same plant or different plants of the same clone (**self-pollination**).

Many plants will self-pollinate but set very few fruit; some authors consider them self-pollinating but they are definitely not self-fruitful. **Self-fruitful** plants (and clones) set a crop of fruit after self-pollination; some of these plants bear fruit with no seeds (**parthenocarpy**); others develop seeds with embryos that are genetically identical to the parent plant (**apomixis**); and others produce haploid seeds that develop from an unfertilized egg cell. (When haploid seeds germinate they are very weak seedlings with only half the chromosomes of normal seedlings.) Regarding temperate zone tree fruits, self-pollination and fruit set does not mean self-fertility and the development of normal seeds.

Many temperate zone small fruit species (e.g. strawberries and raspberries) are **self-fertile** and develop maximum yields of fruit with normal seeds as the result of self-pollination by insects.

Pollinators, usually insects, are vectors of pollen movement. **Pollinizers** are plants which provide the appropriate pollen for other plants. **Fertilization** is the process in which gametes from the pollen unite with egg cells in the ovary of the flower. Normal seeds are usually the result of this process.

Also, the principles are easily understood. Poor fertilization in plums and other *Prunus* species results in a poor fruit set. Poor fertilization in apples and pears results in fewer fruit with fewer seeds and smaller, misshapen fruit.

Most writers have overlooked or significantly understated the pollination requirements for growing good plum crops. The exception is George F. Chipman who edited the Prairie Gardener for many years and who wrote about plum pollination in 1934. He summarized a study done by Prof. W. H. Alderman at the University of Minnesota by saying, "...very few hybrid plums would accept pollen freely from other hybrids, but they would all accept pollen from native plums".

Our Recent Experience

Plums are especially demanding with regard to their pollination requirements. They flower earlier in spring than most other fruit species. At this time of year the air temperatures

tend to be low resulting in reduced pollinator activity. Add to this the fact that plums have strong preferences for certain pollinizers and the results are the very poor plum crops familiar to most of us. The situation with apricots is similar.

Strange but true, the fact is that hybrid plums and their seedlings (which may be 75% wild) are very poor pollinizers with one another. However, hybrid plum pollen on wild plum flowers will result in a wild plum fruit crop. Some nurseries are selling the seedlings of wild plums as pollinizers. These are not good pollinizers if the wild parent tree had been pollinated by a hybrid plum. The plum cultivars, Dandy and Bounty, which are claimed to be good pollinizers have never been shown to be good. It was assumed that they were effective pollinizers since they flowered so prolifically. Their characteristics suggest that there is *Prunus salicina* in their genetic background. Their fruit is larger and more oval and their bloom is earlier than wild plums. Pure wild plums, *Prunus nigra* and *Prunus americana*, are by far the best pollinizers for hybrid plums. Pure wild plum plants are becoming less common in the nursery trade. To the best of our knowledge, there are no completely-wild plum cultivars and few pure wild plum seedlings being offered for sale by nurseries and garden centres in the prairie provinces. The best sources of wild plum are seeds from wild groves.

Work at the University of Saskatchewan

The Plant Sciences Department at the University of Saskatchewan has been collecting wild plum genotypes that are proven pollinizers and has been growing wild plums from seed collected from natural stands and testing their suitability as pollinizers. These will be available to nurseries for propagation by soft-wood cuttings or tissue culture.

In addition to being valuable as pollinizers, wild plums can be a fruit crop in their own right. Two or more wild plum clones planted properly in an orchard are capable or yielding heavy crops of fruit. There has been renewed interest in wild plum fruit because of the intense flavour that results in unique and delightful processed products such as wild plum jam. Pioneers grew wild plums because they had very little choice in hardy fruits. Now we know that wild plum fruit is very high in tannin and possibly in other polyphenolics and flavinoids, which are among the phytochemicals valued by health-conscious consumers.

Wild plum pollinizers will not necessarily bloom at the same time as all hybrid plums. It's a good idea to train some of the wild plum branches to grow near the soil or near a heated or sunny wall. This will force early flowering on those branches causing the bloom time to overlap with that of the *Prunus salicina* cultivars (e.g. Ptitsin #5, Fofonoff and Ivanovka) and some *salicina* hybrids. Wild plum branches, not quite as close to the soil, will flower slightly later matching the bloom time of most *salicina* hybrids. The bloom time of high branches should match those of the latest flowering hybrids. To maximize pollinator activity the pollinizer should

be as close as possible to the hybrid plum while considering maintenance requirements and aesthetics.

Observations and Case Studies

Our recommendation regarding the necessity of wild plum pollinizers has been reinforced by our observations over time and in several locations.

Many years ago our attention was drawn to a Pembina plum tree growing at the residence of Mr. and Mrs. Eric O. Bert. The fruit yields on this specimen were outstanding compared to other specimens of the same cultivar growing in the city. We assumed that there was something special about this tree and it was propagated. The young Pembina trees and trees of many other plum cultivars were planted in the university orchard but their fruit yields were poor. Dandy and Bounty had been planted as pollinizers in this orchard.

In another location a 'multi-graft' plum tree consisting of four hybrid plum cultivars and one *Prunus salicina* cultivar grafted together had been producing poor to fair crops at the residence of one of the authors. Assuming that these cultivars were cross pollinating, the seeds from this tree were saved and grown into mature trees. The objective was to find a superior selection among the seedlings. When these seedlings began to bear fruit, it was obvious that the pollen parent to at least 95% of them was a wild plum and, therefore, a superior selection was not found. Also, it was significant that this large group of seedlings bore few fruit even though most of them were 75% wild. There was no completely wild plum near them.

Later it was discovered that a wild plum was growing in a neighbour's yard approximately 100 meters away from the original 'multi-graft' plum tree. This was the pollen parent.

As a test of the of the pollinizing efficiency of wild plum, a young specimen of *Prunus nigra*, wild plum, was planted near the 'multi-graft' tree. The year that this young wild plum tree began to flower marked the beginning of outstanding fruit yields on the 'multi-graft' tree.

Having made the above observations, the Bert residence was revisited to inspect the Pembina tree and to look for a wild plum that we suspected was growing nearby. There was a wild plum growing in the same yard. It had not been noticed on the first visit years ago.

Plum Pollinizer Recommendations

Dr. Cecil Stushnoff, former head of the Horticulture Science Department, University of Saskatchewan, mentioned to one of the authors that hybrid plums “are poorly compatible as a group”. In our experience the situation is worse than that. Hybrid plums are almost completely ineffective in pollinizing other hybrids. However, they are pollinizers for completely wild plums.

Cultivars of *Prunus salicina*, which is commonly called Japanese or Asian plum, bloom early and are good pollinizers with one another since they are not hybrids.

Cherryplum cultivars are hybrids between sandcherries and plums. Some cherryplums act as good pollinizers to the others in that some cherryplums set good crops within an exclusive collection of cherryplums. The details have not been investigated. Sandcherries are good pollinizers for cherryplums although the sandcherry bloom needs to be forced slightly by pinning some branches near the soil. Sandcherries, since they bloom too late, are poor pollinizers for hybrid plums. Also, cherryplums generally bloom later than hybrid plums and their usefulness as pollinizers for the latter is questionable.

Wild plums, trained so that some branches can be forced, are excellent pollinizers for hybrid plums.

Pollination by Other *Prunus* Species

Contrary to recent published information, sour cherries (*Prunus cerasis, Prunus eminens, Prunus fruticosa*) will **not** cause fruit set on hybrid plums at all.

Many sour cherry cultivars (e.g. Evans), *P. cerasus*, are self-fruitful (i.e. fruitful as a result of self-pollination). However, the dwarf sour cherry, *P. eminens*, the Mongolian cherry, *P. fruticosa*, the Pincherry, *P. pensylvanica*, our hardy apricots, *P. armeniaca*, and the Western Sandcherry, *P. besseyi*, are **not** self-fruitful. Some commercial apricot cultivars are self-fruitful.

Types of plums

Prunus tomentosa, Nanking cherry, is widely grown in the prairie provinces. Nanking cherry as well as eastern and western sandcherries are listed with the plums because they are more closely related botanically to the plums than to true cherries. Nanking cherry plants have serrated leaves which are more fuzzy than other species in this group and light pink flowers. They have ornamental value when planted as specimens or when planted closely and trimmed to form a hedge. The fruit is round, bright red, between 15 and 20 mm in diameter, low in acid, mild flavoured and good eaten fresh. The fruit is held tightly on short stems and is hidden under leaves where there is a light to medium size crop. Since *Prunus tomentosa* is not self-fruitful, two or more genotypes are needed for cross-pollination and good fruit set.

Nanking cherries are propagated by seed. Since there were at least two collections made from their native range in China some Nanking cherry seedlings are much hardier than others. Seedling derived from those collected at the northern limit of the species (i.e. the Northern Limit strain) are the hardiest.

Prunus besseyi, western sandcherry, is a sprawly shrub that spreads by rhyzomes. The fruit is purple/black with green flesh, on medium length (10 to 15 mm) fruit stems and between 15 and 20 mm in diameter with improved clones bearing fruit up to 25 mm in diameter. The fruit is usually very astringent with improved clones somewhat less so. This species

blooms profusely at a young age and can bear very heavy crops. Since *Prunus besseyi* is not self-fruitful, two or more seedlings are needed for cross-pollination and good fruit set.

Prunus pumila, eastern sandcherry, is not widely grown in western Canada perhaps because it has not been improved by selection of superior genotypes as much as the western sandcherry. *P. pumila* is similar to *P. besseyi* except that the bush is somewhat larger and the fruit is approximately 50% smaller. Two or more seedlings are needed for cross-pollination and good fruit set.

Sandkings are hybrids between nanking cherry and western sandcherry. Some nurseries list them as black nanking cherries. These hybrids are best grown with both western sandcherries and nanking cherries since their pollination requirements have not been investigated well.

Cherryplums (or sandcherry x plums) are hybrids between western sandcherry, *P. besseyi* and Asian plum, *P. salicina*. Two or three years after being planted they produce heavy crops of plums that are approximately 3 cms in diameter. Cherryplum cultivars, **Dura, Manor, New Oka and Zeta** are considered by the authors to be among the best cherryplums for fruit production in zone 2b. The first three are quite similar in appearance. The skin colours are a dark bluish-black with variable amounts of dark green and flesh colours are varying shades of wine-red giving processed products an attractive colour. The colours vary with the amount of light that the fruit receives during its development. The fruit of Dura, Manor and New Oka ripens during the third week of August. The fruit is highly flavoured and when eaten fresh is appreciated by many. Their top branches will probably winter kill during the most severe winters. However, lower branches will likely remain fruitful.

Zeta ripens near the end of August and remains edible on the plant for several weeks. The skin colour is striped and blotched dark wine red over dark green and the flesh and juice are dark wine red. The flesh is firm and astringent and the skin is sour. The stone is semi-free.

Opata was developed by Dr. N. E. Hansen in South Dakota and is a cross between *P. besseyi* and *P. salicina* Gold. It has dark wine-red skin with a waxy bloom, green flesh and the fruit is approximately 3 cms in diameter. Opata is a vigorous grower with attractive glossy leaves. 'Opata' is a Sioux Indian word meaning 'bouquet'.

Upright cherryplums, *Prunus* (*besseyi* X *salicina*) X ? *nigra* or *americana*, bear fruit that is more elongated and less astringent than the wild plums. They are probably open pollinated crosses between cherryplum and wild plum. At least their fruit characteristics and blossom times suggest this. Cultivars in this group are Wessex and Convoy. Compass *is P. besseyi x P. hortulana mineri*.

Hybrid plums are genetic combinations of wild plums with *Prunus salicina.* The University of Saskatchewan released fifteen cultivars in 1960. Old University of Saskatchewan records simply refer to their parentage as "Native x *P. salicina*. Mixed open pollinations." Plum cultivars in this group are the following.

Pembina is a dark red plum with a bluish waxy bloom on the skin. The fruit is approximately 5 cms in diameter, has very sweet flavourful flesh, a semi-free stone, moderately sour skin

and ripens in early September. The tree is vigorous and upright/spreading into a vase shape. Pembina resulted from crosses between Assiniboine plum and a large California plum, *P. salicina* Red June, developed by Luther Burbank. Dr. N.E. Hansen made these crosses at the 'South Dakota State, College of Horticulture experiment grounds' in Brookings and introduced Pembina and other cultivars in 1917. Earlier, Hansen had selected Assiniboine from a group of open pollinated seedlings that were grown from a batch of wild seed collected in 1895 from the Stonewall district thirty miles north of Winnipeg, Manitoba. George F. Chipman suggested in 1934 that Assiniboine is probably *P. nigra* rather than *P. americana*.

Prairie, Acme and Elite were introduced in 1960 by the U of Saskatchewan. Since our records do not indicated that these cultivars resulted from specific controlled crosses and since these cultivars resemble Pembina in every detail, we suspect that they are apomictic seedlings of Pembina. This means that they are genetically identical to Pembina. Other cases of apomixis have been reported in plums.

Patterson Pride, which was introduced by the U of S in 1960, has a unique weeping growth habit. The fruit is 4 to 5 cms in diameter, deep red with a slight waxy bloom. The flesh is firm, sweet and aromatic and the skin is thin and not sour. This cultivar ripens latest of all in mid September.

Perfecion/Superb has a confusing background. Both Perfection and Superb were introduced by the University of Saskatchewan in 1960. By 1975 a cultivar named 'Perfection' was being sold by nurseries but the fruit did not fit Perfection's original description. The ripening season and fruit description was similar to Superb, which had disappeared in name by that time and the University's breeders stock had been lost. This is a good quality early plum with very sweet flesh and moderately sour skin ripening in early August. It is slightly elongated, 4 x 4.5 cms, and yellow with an 80% red wash.

Geddes, a 1960 Uof S introduction, is a good quality yellow plum with a slight blush, is 4 cms in diameter and ripens in late August.

Supreme is another Uof S plum, yellow with a red blush, 5 cms in diameter, of excellent quality and ripening in late August.

Brookred was introduced by the Crop Diversification Centre South in Brooks, Alberta. The tree is upright spreading and very hardy. The fruit is similar to that of Pembina only smaller.

Prunus salicina cultivars include Ptitsin #3, #5, #9, #10, and #12, Brookgold, Green Elf, Fofonoff, and Ivanovka.

Wild plums are native to North America in the United States from Massachusetts north west to Manitoba and Saskatchewan, south to Florida (the NW corner of the state), and south west to New Mexico and central Texas and in Canada from New Brunswick trough southern Quebec and Ontario and north to Riding Mountain National Park in Manitoba. Two species are mentioned in the literature, Canada plum, *Prunus nigra* and American plum, *Prunus americana.* They a quite similar in appearance. The native range of *P. nigra* almost completely overlaps the native range of *P. americana* except that *P. nigra* extends slightly further north into Canada and is found in isolated locations near rivers in Saskatchewan and Alberta. The native range of *P. americana* extends much further south.

Old cultivars of wild plums are Assiniboine, Winnipeg, Cheney, Mammoth, Valley River, Olson, and McRobert. There is a small probability that a few of them may still be offered for sale.

Breeding to Improve Cherryplums and Plums

There are immediate opportunities, using new parental genotypes, to improve cherryplums for greater hardiness, more upright growth habit, more attractive fruit and better fruit quality. Hardier populations of *Prunus besseyi* with colourful fruit have been found and are being evaluated to select the best genotypes for breeding. Hardier cultivars of *Prunus salicina* have been introduced after the cross breeding that produced the cherryplums was done. Therefore, from at least two different directions the genetic diversity and improvement of cherryplums can be accomplished.

An exciting opportunity to develop high quality, hardy cultivars of *P. salicina* exists in crossing our hardy cultivars with the colourful, high quality cultivars that are grown in California.

The Plant Sciences Department, University of Saskatchewan is pursuing both of these opportunities to improve plums through breeding work.

New Propagation Methods

In recent years many of the plums and cherryplums have been propagated and tested on their own roots. This propagation method is beneficial to both propagators and growers. The plants are less expensive and much easier to maintain compared to grafted plants. The cost of propagating plums by soft-wood cuttings or by micro-propagation is a fraction of the cost of producing grafted plants.

Also, propagation by these less expensive methods results in plants with root systems and crowns that are genetically identical. Because of this the grower does not have to battle the tendency of the 'wild' rootstock to overgrow the grafted crown.

The old propagation technique involved grafting many of the cherryplums onto sandcherry roots. Controlling the sandcherry's rhyzomes under a low-growing cherryplum was a significant maintenance problem. Sandcherry was even a worse rootstock for plums because, added to the rhizome problem, there was the problem of the sandcherry root system providing inadequate anchorage for the tree. Mature plum trees on sandcherry roots would fall in windy rain storms.

Plum seedlings, which were mostly wild, were used as rootstocks for plums. They were better than sandcherries but they suckered profusely because of partial graft incompatibilities added to the rootstocks' natural tendency to overgrow.

Nanking cherry was used as a rootstock for both plums and cherry plums but most of the resulting plants were short-lived. We were not sure of the exact nature of this 'delayed incompatibility' but if the graft union were buried and the plum managed to establish its own roots, the tree would live for many years.

Commercial Orchards

Given the advantages of new propagation techniques and the rediscovery of good plum pollination, commercial plum orchards serving the local market will likely be established. In the prairie region it is not difficult to grow plums organically and the premium price paid for this

fruit may be an added incentive. Mechanical harvest of the cherryplums and the P. salicina cultivars is possible.

Site Selection

Well recognized considerations of basic site selection and design include the selection of well drained soil on a north or east slope with rows and shelter belts that allowing air drainage.

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Domestic Fruit Program web site: http://www.usask.ca/agriculture/plantsci/dom_fruit/index.html