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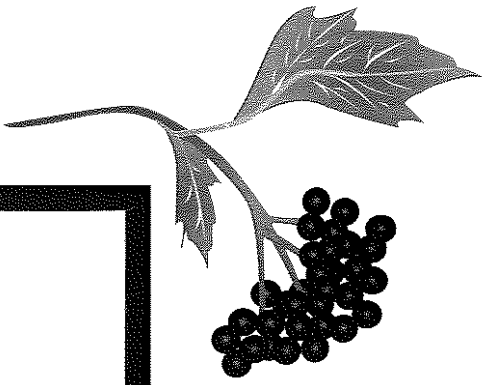
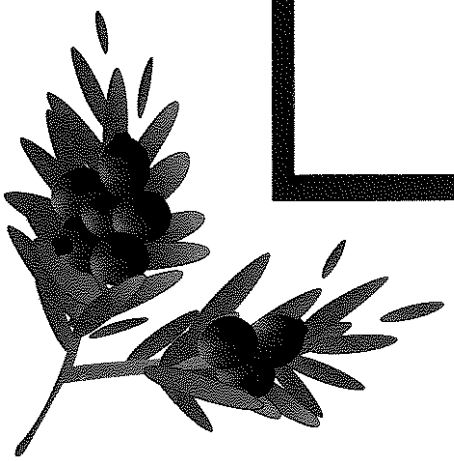
NATIVE FRUIT DEVELOPMENT PROGRAM



The Pincherry

A Guide For Growers



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The Pincherry

A Guide For Growers

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Introduction

The pincherry produces small, delightfully tart fruit which are valued for the production of excellent quality jelly, juice, syrup, sauces and wine.

At present there are no commercial pincherry orchards. Currently, all the pincherries supplied to fruit processors are collected from pincherry growing in the wild. A recent market survey indicated that the amount of pincherries supplied to processors did not meet their requirements. Thus, it appears that a potential market exists for commercial pincherry fruit production.

Pest concerns in pincherry production are relatively minor. Insect pests will very rarely reach economically damaging levels. Diseases, although more of a concern, will only cause economic loss on rare occasions.

There are a limited number of named cultivars available for commercial fruit production. Further selections and breeding programs would be beneficial to orchard growers.

This guide has been compiled to provide a comprehensive source of information for individuals who are interested in growing the pincherry for commercial fruit production, other types of orchards, or in the garden.

This guide was designed to be an educational resource. Every effort has been made to present comprehensive, accurate, up-to-date information. However, the information provided may not be applicable toall locations every year. Additionally, available knowledge changes over time. The suggestions for cultural practices contained in this guide are often minimal. This is because little scientific research has been done on many aspects of the culture and management of pincherries. Growers of pincherries are pioneers. General recommendations for growing fruit on the prairie are often useful, but some adjustments have to be made, and some grower experimentation will be required. Complete and accurate record keeping by the grower will be very beneficial.

Acknowledgements

The authors would like to thank Catherine Greuel for her invaluable assistance in the final stages of preparation of this manual.

Part I:

History, Use and Biology of The Pincherry

History and Use

The bark of pincherry and related species was used by various Indian groups of British Columbia to decorate mats and baskets, as twine to wrap implements, and to cover wound dressings. Folk remedies suggest making tea from pincherry bark for use in curing coughs and stomach ailments. This remedy is not recommended as the hydrocyanic acid in the bark can cause death if consumed in excessive quanitities.

The pincherry has been cultivated in North America since 1773. Little is known about its cultural history as it has not been cultivated to any large degree. Fruit from the wild pincherry has been collected for many years for use in home made jelly, juice, syrup, sauces and wine. The fruit can also be used in pies and ice cream, but the labour intensiveness of pitting often discourages any direct use of the fruit.

The pincherry has figured in a number of rootstock breeding programs in the past. The pincherry has been crossed with *Prunus cerasus* (sour cherry) and the resulting hybrid crossed with *P. maackii*, resulting in *P. x Dropmoreana*, which has potential as rootstock for hardy varieties of sour cherry. Few, if any ongoing breeding programs involving pincherry exist at the present time.

Biology

General Botany

The pincherry, *Prunus pensylvanica*, is a member of the rose family (*Rosaceae*). It is closely related to the native choke cherry, *Prunus virginiana*. It is also closely related to domesticated cherries, plums, peaches and apricots.

The pincherry has a variety of common names. These include fire cherry, bird cherry, pigeon cherry, wild red cherry, and in French, cerises d'été and petit merisier.

The pincherry is commonly found as a small tree 4-8 m (13-26 ft) high. It can occasionally reach a height of 16 m (52 ft) with a trunk diameter of 68 cm (26 in) or more.

The 3 to 11 cm (1-4 in) long simple and alternatively arranged leaves of the pincherry are bright shiny green and shaped like a lance with the edges finely serrated.

If consumed, wilted leaves, pits, and the bark of the pincherry can release hydrocyanic acid into the stomach, which can poison both livestock and humans.

The flesh of the fruit is not harmful

and the small, tart fruit make excellent jelly, juice, syrup, sauces and wine. Cooking destroys the cyanide in the pit, therefore pitting is not necessary if fruit are to be used for making jelly, syrup, sauce or wine. The pitted fruit can be used in baked goods, pies and ice cream. The small fruit size and the need for pit removal are a major disadvantage to using pincherries in baked goods such as pies.

Range and Habitat

The natural habitat of the pincherry extends from Newfoundland to the interior of British Columbia, north to the Mackenzie District and south into Virginia. A number of different geographic strains are known to exist.

In forest areas, pincherry seed can lie dormant in the forest floor for up to fifty years and will germinate only after a forest disturbance, such as fire. In many North American forests, the pincherry is the dominant regenerative species for re-establishment of logged or burned-over areas, where it acts as a nurse crop for other species. The natural productive life of the pincherry is rarely more than 35 years. This is due to re-establishment of other forest species which eventually shade and kill out the pincherry. The pincherry cultivar Mary Liss, grown under orchard conditions, at the Alberta Crop Diversification Centre South (formally known as Brooks Horticulture Research Station), reached at least 29 years of age and gave no indication of decline. In the Appalachian Mountains of Virginia, there are reports of very large, 50 to 60 year old plants.

The pincherry is shade-intolerant and commonly found in bluffs, ravines, hillsides, dry woods or thickets, and along fence rows. Pincherry grows on soils ranging in type from infertile sand to rich loam. The pincherry can even be found on areas composed of tailings from surface-mined coal. It is tolerant to both heavy and moist soils, and can apparently withstand up to 1800 mm (71 in) of rainfall per year in the Great Smokey Mountains. Optimum soil pH is reported to be between 5.0 and 6.0, but the pincherry is found in nearly all forest types in the northern regions, on soils having a wide range of pH. Pincherry can be found growing at elevations from 675-1215 m (1200-4000 ft).

Although the proliferation of pincherry seedlings in burned-over and harvested forest areas reduces erosion and protects commercially valuable seedlings, some silviculturists view the pincherry as a competitive, weedy species. Researchers have examined both disease and herbicides as a means to control or eliminate pincherry competition during re-establishment of commercial forest species.

Flower and Fruit Production

In the wild, the pincherry begins to flower from two to four years of age. Flower buds of the pincherry are formed in August or September of the preceding year. The flowers are bisexual (have both female and male parts in the same flower), white, and about 1.25 cm (0.5 in) in diameter. Flowers appear soon after the leaves emerge and are borne in umbels or corymbs containing clusters of 5 to 7 flowers. The flowering date of the pincherry depends on its geographic

location and is therefore variable throughout Canada. Flowering generally occurs in late-May or early-June on the prairies, and during the last week of May in Eastern Canada. The earliest recorded flowering occurred in Saskatoon on May 3, 1933, while the latest flowering occurred on July 2, 1959 in the Mackenzie District, N.W.T.

The pincherry produces a berry-like drupe containing a single hard seed. These small round fruits range from 5 to 8.5 mm (¼-⅓ in) in diameter and have light red, sour, but edible flesh.

Pollination and Fruit Set

The pincherry blooms relatively early, before plants such as the chokecherry or apple, so there is usually less competition for pollinating insects. Observations in New Brunswick indicate that bees and wasps of the genera *Andrena, Dialictus, Halictus,* and *Evylaeus*, were common pollinators of the pincherry. Studies conducted at Kentville, N.S. indicate an average of 3.8 flowers per cluster and a 95% fruit set under natural conditions. Self-pollination appears to reduce fruit set to between zero and 5%. The cultivar Jumping Pound is known to be self-sterile. Cross-pollination is therefore necessary to ensure good fruit set.

As with flowering, the time of fruit maturity will depend on geographic location. Generally on the prairies, fruit will ripen during July and August. In wild stands, peak production occurs in plants from 15 to 25 years of age.

Wild stands appear to produce heavily every second or third year, with reduced yields during intervening years.

Potential Yield

There is very little yield data available for pincherry. The Alberta Crop Diversification Centre North (formally known as the Alberta Tree Nursery and Horticulture Centre) reports yields of 14 to 23 kg (31-51 lbs) per plant. Native plants in West Virginia yielded an average of 1.3 kg (2.9 lbs) per plant but with considerable year to year variation. These wide ranges of potential yield reflect the large amount of variability in the yielding potential of native plants. It will be important to select high yielding individuals for cultivar selection and subsequent propagation. The year to year variation in yield seems to be common to all cultivars currently selected.

Wildlife Use

Pincherry fruits are eaten by at least 25 species of non-game birds, a few upland game birds, and a number of mammals. Buds are eaten by ruffed and sharptailed grouse, and deer and rabbits will browse the foliage and twigs. Small thickets or hedgerows provide nesting areas and cover for birds.

Herbicide Susceptibility

Pincherry is susceptible to dichloroprop, ammonium sulfate and 2,4,5-T and has intermediate susceptibility to 2,4-D, hexazinone and glyphosate.

Herbicide Residues on Wild Fruit

A study in Ontario indicated that high levels of 2,4-D residues were found on fruit 1 month after herbicide application. Wild fruit should not be picked from areas where it is suspected that 2,4-D has been used for weed control. These areas may include roadsides, right of ways and replanted forestry areas.

Part II:

Culture

Cultivars

Because the pincherry has not been domesticated, the only cultivars available are those which have been selected from native populations. There are relatively few selected and named cultivars. These cultivars are available from various nurseries but quantities may be limited. Additionally, import restrictions on *Prunus* species make cross-border purchases impossible.

Jumping Pound - large fruit; mature height of 3.5 m (11.4 ft), weeping habit; profuse flowering; self-sterile; suckering; susceptible to cherry leaf spot disease (*Coccomyces hiemalis*); suitable for both fruit and ornamental use; selected in 1936 by the Alberta Crop Diversification Centre South (formally known as Brooks Horticulture Research Station).

Mary Liss -large fruit; pleasant flavour, tender and thin-skinned; upright with sturdy trunk, non-suckering; suitable for fruit production; selected by John Liss from the wild near Sangudo, Alberta, and sent in 1937 for propagation and distribution to the Alberta Crop Diversification Centre South (formally known as Brooks Horticulture Research Station).

Lee #4 - large fruit; long fruit racemes; fruit borne on the outside of the plant; 150-180 cm (5-6 ft) tall at maturity; suitable for fruit production; recently selected by Mr. Lloyd Lee, Barrhead, Alberta.

Stockton double - Double flowers; dark shining leaves which turn a brilliant red in the fall; suitable for ornamental use; selected by Mrs. M. N. Bradham, Stockton, Manitoba and introduced by the Morden Experimental Station, Manitoba in 1929.

Propagation

It is possible to propagate pincherry by seed, or vegetatively using semi-hardwood cuttings, root-cuttings, suckers and micropropagation. Seed propagation and micropropagation are currently the only practical methods of propagation. Semi-hardwood cuttings have been relatively unsuccessful. All methods of vegetative propagation produce plants identical to the parent plant. Clonal material is desirable for uniform fruit production in an orchard. Plants propagated from seed are extremely variable and dissimilar from the parent plant.

Seed Propagation

The variability in plants produced from seeds have both advantages and disadvantages. Plant variability is useful in the search for new cultivars having increased

yield, enhanced fruit quality and disease or insect resistance. Other advantages of seed propagation include lower initial cost and the production of disease free material.

If plants are being propagated for fruit production then seed propagation is less than desirable. Non-uniformity of growth, flowering and harvest dates, fruit quality, eveness of ripening and an extra year to fruiting, in comparison to vegetatively propagated material, are a number of dis-advantages.

Fruit collection for seed can be done in late August by hand picking or knocking fruit onto a canvas. About 50 kg (110 lbs) of fruit yields 8 kg (17 lbs) of cleaned seed, with an average of 28,000 seeds/kg (13,000 seeds/lb).

Seed is cleaned by screening, macerating in water, floating off the pulp, and drying the seeds. Seed should be surface dried only, as excessive drying reduces seed viability. Seed can retain viability for 10 years if stored at -11 to -13°C (9-12°F) in a sealed container.

Stratification is necessary for seeds to germinate. Three stratification methods are described below:

1. Field sow the seed outdoors after harvest to allow for natural stratification. Field sowing and natural stratification often results in non-uniform seed germination. If seed cannot be sown immediateley after harvest, then the it can be stored at -18°C (-0.4°F) and sown the following July.

2. Stratify the seeds in moist sand for 60 days at 20°C (68°F) followed by 120 days at 5°C (41°F) to break dormancy.

3. Consistent and uniform germination of over 75% can be obtained by using a 24-hour soak in 0.5M hydroxylammonium chloride, followed by 30 days stratification alternating 5 days at 5°C (41°F) with 5 days at 30°C (86°F). A second stratification period of 60 to 90 days at 5°C (41°F) is followed by a 10-day germination period of 12-hours at 5°C (41°F) alternated with 12-hours at 30°C (86°F).

After stratification by the above methods, the seed can be field sown in the spring or used immediately for greenhouse seedling production.

Seedling production is best on soils of medium texture with a pH of 7.0 to 8.0. Sow seeds at the rate of 100 seeds per meter (39 in) and a depth of 2 cm (1 in). Soil crusting can delay emergence, so seedbeds may need to be mulched with silica sand. Generally, fertilization is not required. There are no major disease problems, but fumigation of seedbeds with Basamid, 30 days before sowing, issuggested to prevent damping-off. Two year-old seedlings can be lifted once they have reached vegetative maturity and their leaves have fallen.

Semi-hardwood Cuttings

Semi-hardwood cuttings taken in June have been rooted under mist, but the success rate is low. The highest proportion rooted for semi-hardwood cuttings (12.5%) occurred without IBA treatment, whereas only 7.8% rooted using 0.8% (8000 ppm) IBA treatment. The number of rooted cuttings decreased for cuttings taken in July

and August.

Root Cuttings

Somewhat higher rates of rooting (33%) have been reported for propagation by root cuttings. Root cuttings 10cm (4 in) in length and 1-2cm (0.5-1 in) in diameter are taken in the spring, incubated in soil under greenhouse conditions (18/16°C (64/61°) day/night temperatures, 12 hour day length) with no hormone application.

Suckers

Suckers are shoots that arise from rhizomes (underground stems). Suckers can be dug up in early-spring or late-fall when the plant is dormant. It is essential to obtain as large a root mass as possible, and the root mass should not be allowed to dry out prior to transplanting. Only suckers that are well-rooted should be transplanted.

Micropropagation

Micropropagation is a method of propagation analogous to any other form of vegetative propagation, such as the use of cuttings or suckers. The technique differs in that small plant parts, including pieces of leaves and stems, or entire buds, are cultured under sterile conditions on artificial growing media, ultimately producing thousands of new plants. Micropropagation is a term that has the same meaning as the terms tissue culture and *in vitro* culture.

Micropropagation requires some specialized equipment and scrupulous technique, but in the long run, should not produce more expensive plants. Micropropagated plants are not necessarily superior to plants originating from other methods of vegetative propagation. It should be noted that the quality and vigour of micropropagated plantlets can vary substantially, depending upon the source.

Pincherry has been successfully micropropagated from dormant buds. Micropropagated pincherry of the cultivars Jumping Pound and Mary Liss are commercially available.

Orchard Establishment

Site Selection

To select a site suitable for establishing a pincherry orchard, it is important to consider such factors as soil type, drainage, slope of the orchard site, availability of a source of good quality water, and protection from the wind.

If possible, orchard sites should have a slight slope (1-2%) so as to provide for the drainage of water and cold air; this is especially important during frosts. There should be a break in any shelterbelt at the low end of the orchard to allow for proper air flow. Preferably, the slope should not face south so that the soil will warm up more slowly in the spring, thus delaying flowering. A north or east facing slope will also prevent sunscald.

Prior to transplanting, soil preparation should include tillage and perhaps the use of a non-residual herbicide such as glyphosate, which will eliminate

perennial weed infestations.

Preferably, a green manure crop should be grown for 2 years prior to orchard establishment. It is important to eliminate all perennial weeds.

The pincherry will grow in all types of soil and is tolerant of heavy, moist soils. A sunny location is preferable as the pincherry is shade intolerant.

Soil pH is not overly critical. The pincherry seems to tolerate a very wide pH range; the optimum pH is reported to be 5-6.

For irrigation, surface water is generally of better quality than well water, which can have a high salt content (the measure of salinity, or EC, should be less than 1 mS/cm). Ideally, the water supply should be situated near the orchard and the supply should be sufficient to meet annual irrigation requirements.

Windbreaks

For orchards, protection from the prevailing winds is important. Strong or persistent winds can cause severe dessication, especially in the winter, and damage from abrasion and tearing. The consequences may include the loss of shoots, buds, flowers and fruit. Such damage acts as a natural form of pruning and results in reduced bush size and an atypical form. Additionally, leafing-out and flowering can be negatively affected on the windward side of bushes; both can be delayed and the amount of bloom can be reduced. Fruit size may also be reduced.

Windbreaks provide protection from drying winds, help maintain snow cover, and decrease moisture loss and soil erosion. Windbreaks also allow for better pollination.

Windbreaks should be situated so as to reduce the effects of the prevailing winds in both summer and winter. Windbreaks should extend 10-15 m (32-48 ft) beyond the area to be protected. The porosity and height of the windbreak determine the protective effect. A 3 m (10 ft) high windbreak will reduce wind velocity for up to 90 m (100 yds) downwind. Synthetic windbreaks should have a porosity of about 50%. Planted shelterbelts provide the best wind protection. A 9 m (30 ft) high shelterbelt reduces wind speed for 90 m (100yds) upwind and 275 m (300 yds) downwind.

Plant Spacing

Plant spacing is dependent upon the type of equipment available for tillage and harvesting, the method of harvest, and whether pincherries are to be grown in an orchard or as part of a shelterbelt. In general, rows should be at least 1-2 m (3-6 ft) wider than the equipment available.

It is suggested that spacing between plants be 1.5 m (5 ft) with rows 4.5-6 m (15 -20 ft) apart. A between-plant spacing of 1.5 m (5 ft) and a between-row spacing of 4.5 m (15 ft) requires about 1450 plants/hectare (2,600 plants/acre); the exact number of plants will vary with the dimensions of the area planted.

Wider between-row and within-row spacings provide for better orchard ventilation and therefore help reduce the risk

of disease problems. Smaller within-row spacings increase early yields and returns.

Transplanting

Vigorous plants 15-60 cm (6-24 in) tall should be used for transplanting. A well developed root mass is essential. The roots must not be allowed to dry out.

Generally speaking, transplanting of field-grown stock is best done in early spring after the soil thaws (greenhouse grown stock requires hardening off). Transplanting can also be done in the late-fall, before the soil freezes, provided that the material has been hardened off. However, a dry fall, followed by a cold, dry winter may result in a large percentage of loss. It is possible to transplant rooted cuttings and micropropagated plants in mid-August. This allows some time for further root growth, but also provides sufficient time for natural winter hardening to occur. Significant shoot growth will likely not occur until the growing season after transplanting.

Fall planted suckers should not be pruned until the following spring. Spring planted suckers should be pruned to a height of 20 cm (8 in). Rhizome cuttings are best transplanted in early spring, as is bare-rooted stock.

When transplanting, plants should be set a little deeper, approximately 2-5 cm, (1-2 in)) than they were in the propagation container. The soil can then be firmed around the roots. Subsequently, the plants need to be watered well, and consistently, but not overwatered. Pruning the shoots back should not be necessary, except as noted for suckers. Well-composted manure can be mixed in with the soil around the transplant. One hundred to 200 grams (4-8 oz) of a phosphate fertilizer (0-20-0, 11-48-0) could also be mixed in, using less if phosphorus levels are adequate, or if manure has been used. This will help promote root growth.

Growers should normally count on a minimum 10% loss of transplanted material, which will therefore need to be replaced.

Grassing Down

This involves the planting of a permanent grass cover between the rows of pincherry plants. A grass cover is important for the control of erosion and enables mechanical harvesting even in wet conditions; it also may help retain soil moisture and control some weeds. A grass cover will also increase the absorption of rainfall and at the same time minimize runoff.

Suitable grasses must not be weedy (like quack grass), must produce only one seed crop per year, must be hardy and resistant to snow mold, and should form a resilient turf capable of withstanding the use of a mechanical harvester during wet weather. Some tests in the Peace River country of northern Alberta indicate that Chewings Fescue (cv. Oasis) and Creeping Red Fescue (cv. Boreal) have performed well in saskatoon orchards. These grasses may be useful in pincherry orchards. Observations made at the University of Saskatchewan suggest that Crested Wheat Grass (cv. Fairway) may also work well. This grass is an easily established bunch grass that can withstand dry weather, greens quickly in the spring, and is dwarf in stature.

Some species of grass native to the prairie may offer excellent potential for an understory soil cover.

Orchard Management

Irrigation

Most native fruit species, like the pincherry, will survive under normal moisture conditions without supplemental irrigation, provided that weeds are adequately controlled. However, irrigation will improve orchard establishment and rapid growth, and may be required to maximize fruit yield, depending on natural rainfall. Once plants are established, one or two annual irrigations may be sufficient.

Accurate estimates of water requirements for the pincherry are not available; research on the best timing and amount of irrigation required has not been reported. In semi-arid climates, newly established plants and shrubs require about 4 L (1 gal) of water/week (equivalent to 2.5 cm/0.25 m^2 (1 in/10 sq. in) of rainfall around the plant). During the second year, 15-19 L (4-5 gal) every 2 weeks is required. These amounts may be met by rainfall.

A simple test to determine if irrigation is required is to squeeze a handful of soil into a ball. If this soil ball holds its shape when jarred slightly, then there is no need for irrigation; if the soil crumbles, water is required. This method is quick and inexpensive but is somewhat inaccurate.

However, it is possible for the pincherry to be irrigated too much. Excess water can result in root damage from poor soil aeration and may prevent the uptake of mineral nutrients and water; young plants may be especially susceptible to root rot. Excessive water may also contribute to insipid fruit flavour and cracking.

Wide-row spacings and limited supplies of water make trickle or drip irrigation the most cost effective method. The use of sprinkler or surface irrigation requires about twice as much water as does the use of trickle irrigation.

The advantages of trickle irrigation are many. Water is placed where it is needed (no watering between rows, fewer weeds), irrigation equipment is semi-permanent (nothing to lift or move around regularly), low labour and operating costs are normal, foliage is not watered (thereby reducing the incidence of plant disease), wind has no effect on the application of water, other field operations can be carried out simultaneously, and fertilizers can be applied through the system. Operating pressures and flow rates are low, therefore the required pumps and piping are smaller and leaks at connections are not common. Because water requirements are lower, conservation of energy and water is easily possible.

On the negative side, emitters may easily clog with salts, algae or soil, mechanical or rodent damage is possible, and sunlight may cause the plastic pipes to crack.

In contrast to trickle irrigation, overhead irrigation systems can be used to advantage for frost protection during flowering, and even earlier in the spring to delay flowering, if spring temperatures are warmer than normal.

Simpler irrigation techniques include gravity fed irrigation from raised tanks, and hand-watering from a tractor-pulled tank and trailer. These methods may be the most economical for small orchards in particular.

Fertilization

Proper use of fertilizers is important to reducing costs, to growing healthy plants, and to minimizing the ecological impact of fertilizers on water bodies. An excess of fertilizer can result in problems as serious as a deficiency.

Of all the essential mineral nutrients, nitrogen (N), phosphorus (P), and potassium (K) are the ones used in quantities that may require replacement. Nitrogen is the most common nutrient requirement, but it has been observed that excessive levels of nitrogen occur more frequently in fruit orchards than deficient levels.

Magnesium, manganese and boron are only rarely required. Iron, although present, may not be available to plants on alkaline soils. Members of the rose family such as the pincherry are particularly susceptible to a lack of iron, which is indicated by a yellowing of the foliage (termed iron chlorosis).

Prairie soils generally require that soil nutrient levels of 35 kg (77 lbs) N, 27 kg (60 lbs) P, and 136 kg (300 lbs) K, per acre be maintained.

Soil analysis will indicate the nutrient status of the soil. It is important for growers to monitor new shoot growth, leaf color and luxuriance, and fruit production and size. Short terminal growth and pale green leaves suggest a need for fertilizer.

Nutrient requirements are probably higher during growth, prior to maturity. During periods of active growth, it is generally suggested for bush berry crops that 39 to 45 kg (86-100 lbs) N, 6 kg (13 lbs) P, and 56 kg (123 lbs) K per hectare per year be applied. At maturity, nutrient requirements decrease; the general recommendations for other bush berry crops are 17 kg (37 lbs) N, 3 kg (6.6 lbs) P, and 34 kg (75 lbs) K per hectare, assuming yields of about 5,600 kg (12,500 lbs) per hectare.

Leaf analysis is the most accurate method of determining mineral requirements, provided that optimum nutrient concentrations have been established. Province of Ontario recommendations for sour cherry leaves include 2.2-2.8% N, 0.15-0.2% P, 1.3-2.3% K, 1.2% Ca, and 0.35% Mg.

Fertilizers are best applied late in the fall after the plants are dormant or in early spring before the leaves flush. It is best not to fertilize (or irrigate) after harvest because high levels of soil fertility (and water) delay the development of winter hardiness.

Fertilizer requirements for pincherry have not been determined. It is not known how necessary or suitable the above recommendations are for the pincherry. Soil tests should be made before fertilizers are applied.

Pruning

The suckering tendency of pincherry

will require consistent pruning if a neat appearance is desired. The use of the cultivar Mary Liss, which is reputed to be suckerless, may eliminate this need.

Regular, careful pruning is important to maintain plant health and improve yield, but major pruning does not become necessary until the orchard is about 6-10 years old.

Pruning primarily involves the removal of weak, diseased and damaged shoots. Low, spreading branches should be removed and the centers of shrubs thinned to keep them open and thus allow good air circulation. The removal of older, less productive stems is also suggested. The production of new plant growth should be encouraged because the largest fruit are usually produced on 1-4 year old shoots.

Late-winter and early-spring pruning (prior to budbreak), is suggested. Active shoot growth following pruning at this time will encourage healing and will better prevent diseases from infecting the tissues. Late-fall and early-winter pruning may leave shoots susceptible to winter damage. Summer pruning is not recommended because removal of the leaf surface limits normal growth and development, fresh cuts can enhance the spread of various diseases, and pruning at this time may induce the formation of new shoots that will not have time to harden properly for winter.

However, certain diseases require immediate pruning for the most effective control (including black-knot, canker and fireblight). A number of insect pests such as the tent caterpillars can be effectively controlled by pruning and destroying the "nests". In these circumstances, the benefits of immediate pruning outweigh any disadvantages.

Shrubs should be maintained at about 2-3 m (6-10 ft) in height by pruning the leaders. Such heading back should not be practised until the plants reach this desired height and plants are well established.

Large orchards will require the purchase of pneumatic or hydraulic pruners.

When pruning diseased growth, tools should be disinfected with Lysol (1 part Lysol to 19 parts water), or household bleach (1 part bleach to 9 parts water) after every cut. Lysol is less corrosive to pruning tools. Pruned material should be removed and burned.

Mulching

The use of mulches, will help suppress weeds (especially between plants in the row), will reduce extreme fluctuations between daytime and nighttime soil temperatures, and will aid in the retention of soil moisture. Common materials used for mulching include wood chips, bark, straw, sawdust (spruce or poplar in particular), waste hay and gravel. A maximum of 30 cm of mulch should be applied (greater thicknesses may not be economical) and the mulch should be kept 20-30 cm (8-12 in) from the plant stems to discourage mice. A black plastic mulch can also be used, but is more expensive, requires the irrigation to be laid first, and also requires the use of a fertilizer injector.

Pollination

Pincherry requires cross-pollination in order to have good fruit set. Supplemental pollination using honey bees may be beneficial in achieving good crop yields. It will also be necessary to interplant at least two different cultivars to insure cross-pollination. One plant in every 10 should be of a different cultivar.

Harvesting

Normal harvest dates vary from late-June to late-July, depending on latitude. In Saskatchewan, pincherry is normally ready for harvest around the latter part of July.

The simplest harvesting methods are hand picking, or using a berry rake (a comb with large teeth). A small power vibrator and catching frame, as is used for highbush blueberries, is another method of harvesting.

Mechanical harvesting can be accomplished using a pull-type harvester (as is used for raspberry harvesting), or a self-propelled harvester (as is used for highbush blueberry harvesting). Effective machine harvesting of pincherries requires that row width at ground level be about 50 cm (20 in), and bush height no more than 3 m (10 ft).

During the first 3 to 4 years of production, it may not be economical to use commercial harvesters because yields may be low; therefore U-Pick, or contract hand picking should be considered.

It is essential that freshly harvested fruit be rapidly cooled to remove field heat. Immediate post-harvest cooling (within 2-3 hours of harvest) slows the chemical changes within the fruit that lead to over-ripening and deterioration, reduces the activities of micro-organisms that cause fruit rot, and reduces dessication; shelf life is consequently increased. A refrigerated truck or nearby facility is often considered essential. Completing fruit harvest in the morning (prior to about 11:00 AM) substantially reduces problems resulting from field heat.

Problems

Diseases

The pincherry is attacked by various pathogens. The most important diseases appear to be black knot, cytospora canker, cherry leaf spot, and brown rot of fruit. Pincherry is also infested by powdery mildew and fire blight. No fungicides are registered for disease control in pincherry.

Black Knot (*Apiosorina morbosa*)

Black knot, a fungal disease of many *Prunus* species, is known to infect pincherry in Eastern Canada. This disease is present on the prairies, but is normally only seen on chokecherry with very few reports on pincherry. The disease is conspicuous by the black stem and branch galls. The effect of black knot on pin cherry ranges from girdling and loss of twigs and branches to dieback and eventual mortality of the plant.

Black knot has a 2 year lifecycle. Initial infection occurs at the base of developing shoots shortly after bud-break, with galls appearing later in the growing season or the next spring. A thin layer of

olive-coloured fungal tissue forms over the gall. The gall produces spores in the spring of the second year which infect susceptible plants during wet weather.

Within infected areas, many plants are not susceptible or only slightly susceptible, indicating that resistant genotypes exist.

Black knot may be controlled by removing and destroying infected branches soon after signs of the disease are first observed.

Cytospora Canker (*Cytospora leucostoma*)

Reports from Pennsylvania indicate that pincherry is susceptible to cytospora canker. The initial signs of this disease are sunken, reddish-brown cankers which result in circular killing of the bark of limbs and stems. As the disease progresses, the bark will shrivel and split. Gum may exude from the split bark. This exusion of gum is referred to as gummosis. Foliage on infected branches turns bright reddish-brown and remains attached for several weeks.

This fungal disease results in branch mortality and crown dieback. It is believed the disease enters via decaying fruit clusters and wounds in the bark. The disease is considered a wound parasite, therefore sound cultural practices are suggested for its control.

Cherry Leaf Spot (*Coccomyces hiemalis*)

Initial signs of cherry leaf spot are numerous red-purplish-black spots on the upper side of pincherry leaves and slightly raised, waxy pustules on the underside. As the disease progresses, leaves will begin to have a shot-hole appearance. Infected leaves will eventually turn yellow and fall. In severe cases, disease spots may be visible on the leaf petiole, fruit and fruit stalk.

Cherry leaf spot is primarily spread from plant to plant by rain-splash so it may not be of any significance in the prairies due to normally low relative humidity and amount of rainfall.

Good orchard sanitation will reduce the number of fallen leaves remaining on the soil surface, which can serve as a source of infection in the next year.

This disease has traditionally been a concern in chokecherry seedlings. It is interesting to note that although the disease is devastating to seedlings it has little impact on older chokecherry plants. Very few cases of cherry leaf spot disease have been reported on pincherry in the prairies.

Brown Rot of Stone Fruits (*Monilinia fructicola*)

The first symptoms of the disease are brown spots on flower petals, stamens or pistils. The brown spots spread rapidly to include the stem. In humid weather, the infectedpart may appear greyish-brown. Twigs bearing infected flowers develop small, elliptical, sunken, brown cankers at the base of the flower stem. This canker may encircle the stem causing twig blight.

Small circular brown spots appear on the fruit as they approach maturity. As the

disease progresses, the surface of the fruit will be covered with ash-coloured tufts of fungal conidia. The speed at which the disease progresses is dependent on the relative humidity. The infected fruit become completely rotten and dried. The rotten, dried fruit, referred to as mummy berries, may remain on the plant or fall to the ground.

Mummy berries and infected twigs act as sources of flower and twig infection the next spring. Infecting spores can be carried by wind and rain-splash. The infected twigs serve as sources of infection for the maturing fruit. Fruit are susceptible to disease infection as a result of wounding by insects, twig punctures or hail. However some infections may take place without any wounding at all. Susceptibility to the disease increases as the fruit mature.

Initial infections of brown rot can be controlled by the removal of infected twigs and plant-borne mummy berries in the spring. Removal of mummy berries falling to the ground can also decrease initial infections. This can be accomplished with good orchard floor cultivation and management.

Insect Pests

The timing of insect feeding has a great effect on the extent of damage caused. The two most important periods are: a) during flowering and fruit set; and b) during fruit development. Insect damage during flowering and fruit set directly decreases potential crop yield through flower and immature fruit loss; insect damage during fruit development can induce loss of young fruit. At later stages in fruit development, damaged fruit are not lost, but marketable yield is reduced.

The effects of leaf feeding insects are less well-defined. If damage to the total leaf area of a shrub is great enough, some fruit loss could occur because sugar production would be substantially reduced. Additionally, leaf feeding could effect the storage of sugars within the plant and could have long term effects on plant survival and growth, depending on the severity of damage. Control of leaf chewing insects is most critical in young plants or seedlings. Severe defoliation at a young age could cause some long term damage. In older plants, defoliation is less likely to cause long term damage unless it occurs late in the season. Severe, repeated attacks over a number of years could cause long term effect or even plant death in older plants. In the majority of cases, control of defoliators is not critical in older plants unless they reach such high levels that fruit loss begins to occur.

The pincherry is attacked by a variety of insects but very few seem to be consistent problems and cause very little economic damage. No insecticides are registered for use in pin cherries.

A partial list of some known insect pests and associated damage follows.

Moth Caterpillars

Ugly nest caterpillar (*Archips cerasivoranus*)

Eastern Tent Caterpillar (*Malacosoma americanum*)

Northern Tent Caterpillar (*Malacosoma californicum*)

Fourlined leaf Roller (*Argyrotaenia quadrifasciana*)

Fruit tree leaf roller (*Archips argyrospila*)

Gypsy Moth (*Lymantria dispar*)

Speckled Fruitworm (*Orthosia hibisci*)

All the moth caterpillars attacking pincherry cause foliar damage and have only one generation per year. The larvae hatch in the spring and feed on foliage for 6-8 weeks prior to pupating. The tent caterpillars and the ugly nest caterpillar spin a conspicuous webbed nest around their feeding area. Control of these caterpillars is easily obtained by removing and destroying the nest and the associated caterpillars. In contrast, the other caterpillars do not spin a conspicuous web and can be found scattered over the entire plant, making them much harder to control using non-chemical techniques. Adults will emerge from July to early-September, laying their eggs on the branches or trunks of pincherry plants. The visual appearance of the egg masses differ for each species. If egg masses are observed, samples can be sent to the provincial entomologist for identification.

Sawfly (*Hoplocampa sp.*)

Adult sawflies emerge from the litter and feed on nectar and pollen in late-May. The adults are 5-6 mm (¼ in) long and primarily yellow in color. Eggs are laid in the calyx of the flower. Larvae emerge in 5 days, and enter and feed within the developing cherry which dries up and turns black. The larvae then enter a second fruit. Mature larvae are 8-9 mm (½ in) long and white with yellow heads. Mature larvae exit the fruit after 2-3 weeks, fall to the ground, overwinter as larvae in coccons in the soil, and pupate the following spring. Damaged fruit quickly dry up and fall to the ground.

The sawfly is difficult to control. Good orchard sanitation, including removal of fruit drops and regular cultivation, may result in dessication of the overwintering larvae and thus limit the number of adults emerging in the spring, keeping infestation levels to a minimum.

Cherry Fruit Maggot (*Rhagoletis cingulata*)

The adult cherry fruit fly is a small fly with distinctly patterned wings. The larvae are small, yellowish-white, legless maggots.

Eggs are laid by the adult in July when the fruit are beginning to ripen. Eggs hatch in about 5-8 days. The larvae feed on the fruit flesh for approximately 11 days. They then fall to the ground where they enter the pupal stage. Adults emerge from May to the middle of July. Infested fruit are misshapen, undersized and often characterized by one side being partly decayed and shrunken.

A 15 x 20 cm (6-8 in) yellow sticky card can be used to monitor for the presence of the adults. These sticky cards should be placed in the orchard at the end of April, prior to adult emergence.

Good orchard sanitation can reduce

the number of pupae in the soil, thus decreasing the chances of an increasing population the following year.

Weather-Induced Problems

Problems caused by weather may include cold injury, desiccation, wind damage, and sunscald.

Cold injury and desiccation are, in part, associated with the development of winter hardiness and dormancy. The development of winter hardiness (a process called hardening-off) and dormancy allow a woody plant to survive our winters. The requirement for a period of dormancy is often referred to as a chilling requirement. If this chilling requirement is not met, abnormal growth and development, or no growth, may result. Dormancy requires, and follows hardening-off, which is a physiological process initiated by decreasing daily temperatures and shorter days. Inadequate hardening-off predisposes a plant to cold injury.

Cold injury is associated with prolonged extreme cold temperatures, or sudden extreme drops in temperature following a warm spell. Desiccation is caused by relatively warm dry winds that have effects when the ground, and consequently a plant's roots, are still frozen; the aboveground parts of the plant lose water to the warm, dry winds, but this water cannot be replaced because the roots are frozen.

Symptoms of both cold injury and desiccation are similar and often associated. Warm, dry winds can be followed by sudden drops in temperature. Symptoms may include death of an entire plant, or death of more susceptible plant parts such as new wood, leaf buds and flower buds. Winter damage may allow the subsequent entry of dieback and decay fungi such as *Cytospora* canker.

Killing frosts are defined as temperatures of -2.2°C (28°F) or lower; at this point, most actively growing plant tissues are killed. Symptoms of spring frost damage include light browning of flowers and leaves; damaged parts will drop off. Flowers are especially susceptible to frost damage. Such damage may be restricted to the internal parts of the flower and may not be noticeable except under magnification.

Strong winds can cause abrasion, tearing and desiccation. Hard brown edges result from this damage. Leaves and new shoots are susceptible to wind damage. Fruit can also be affected, grey or light brown scabs forming.

The bark of pincherry is susceptable to sunscald injury. Sunscald can occur in both summer and winter. Bark exposed to the hot summer sun can discolor and bubble, subsequently forming cankers. On cold, sunny days during the winter, bark exposed to the sun may become warmer than the air and then cool rapidly after sunset; splitting and subsequent canker development can occur.

Prevention of these problems is associated with proper site selection and management practices. The development of winter hardiness requires low levels of soil moisture and fertility in late-summer and fall. Substantial irrigation, or fertilization after harvest is not suggested. Low lying sites

with a high water table are also conducive to delaying hardening off, and also to frost damage because of poor air drainage. Windbreaks are important for reducing the effects of strong, persistent winds. A slight NE slope to the orchard will help prevent sunscald; a spray of dilute white exterior latex paint can also be used. This may also help delay flowering in the spring.

Weeds

Weeds can substantially reduce shrub survival and growth because they are strong competitors for moisture and nutrients. A vigorous stand of weeds may consume 6-8 mm (¼-⅓) of water per day. Weeds should not be allowed to go to seed.

Weeds are controlled by mechanical means around seedlings. Reports from PFRA suggest that Linuron can be applied to dormant 1-year old seedlings, to control most winter annuals. As pincherry is intermediate in susceptibility to sprays of 2,4-D, hexazinone and glyphosate, there may be potential for their use in weed control in pincherry orchards. **However, none of the above herbicides have been registered for use on pincherry.**

Birds

Many bird species that are normally beneficial (because they feed on destructive insect pests) may cause serious crop losses when fruit are ripe. It is generally illegal to kill birds and ecologically unwise; most birds are protected under the Migratory Bird Act. Consequently, control can be difficult. Control efforts must begin as soon as birds start to damage crops, before they develop an established feeding pattern. A combination of two or more methods of control is likely to be more successful.

The use of netting (plastic impregnated paper, nylon, cotton, or polyethylene) may be the only effective solution, but it is necessary to keep the netting off the bushes using simple frames of poles and wire. Anti-bird netting has been shown to be both effective and economically feasible for blueberries. Once installed, netting requires little maintenance, is non-toxic, and neither causes noise nor injures birds.

Some observations suggest that several strands of monofilament fishing line strung crosswise over the top of a strawberry crop mimic spider webs that many birds prefer to avoid. This idea may be applicable to pincherry.

"Scare-Eye" balloons (Pest Management Supply, Inc., P.O. Box 938, Amherst, MA, 01004, U.S.A.), suspended on flexible poles (bamboo, poplar, willow, fiberglass), and moved every 7-10 days, appear to be effective in apple orchards.

A Reflective Mylar Tape is currently being used in commercial strawberry fields in California for bird control. The tape is 2.5 cm (1 in) wide and is used in 30-60 cm (1-2 ft) lengths tied to fence posts, or whatever is convenient. The tape produces a fluttering sound in light winds and reflects light brightly. It is not known how effective this might be in pincherry orchards. The tape is available from: Sutton Agricultural Enterprises Inc., 538 Brunker Ave., #7, Salinas, CA 93901, USA. The tape costs

$5.00 U.S. per 500 ft roll.

Hanging hawk silhouettes and twisted yellow tape strung above the crop may also be of use. More sophisticated solutions include the use of infra-red motion detectors that trigger a loud alarm.

Rabbits and Mice

Rabbits and mice can also be a cause of damage. Rabbits may eat young shoots and both rabbits and mice can girdle stems (strip away bark completely around the circumference of the stem). Damage from mice is associated with excessive weed growth within the crop and normally occurs in the winter when there is a protective snow cover. Prevention of damage is the most effective means of control.

Controlling weeds and keeping grass strips mown on a regular basis will help discourage mice and rabbits. Brush piles and other trash should be removed from fields, ditches, fence rows, and from around buildings because this material provides protection and breeding sites.

A homemade mixture of 1 part (by weight) thiram (75% wettable powder) with 10 parts water-emulsifiable black asphalt can be used as a taste repellant. This mixture must be sprayed or thoroughly brushed onto plants from soil level to a height of 60 cm (2 ft) and must be applied to dry stems after leaf fall on a warm day. Natural soaps containing ammonium salts of fatty acids (eg. Hinder) have an unpleasant odor and may repel rabbits.

Mulches applied after the ground is frozen in the fall may also help to prevent damage from mice.

Poison baits are very toxic to most mammals and are not suggested for use.

Deer

Deer may feed on twigs and larger branches; they can destroy or alter the shape of shrubs. Browsing may be heavier where alternative sources of food are unavailable and in severe long winters.

Many native plant species are ecologically adapted to annual moderate or heavy browsing. Winter browsing stimulates new vegetative growth in the spring, even on dry rangeland. However, browsing removes flower buds and therefore reduces the potential fruit crop. Some light to moderate browsing may have little overall effect.

The most cost-effective way to protect against deer is to enclose the area to be protected with a woven-wire or electric fence. Woven-wire fences must be 2.3 m (7.5 ft) high as a minimum; gates must be kept closed. Lower fences may reduce but not eliminate browsing. Electric fences should be 1.8 m (6 ft) high and consist of 7 strands of wire 20-30 cm (8-12 in) apart.

Commercial deer repellants are considered to be generally ineffective. Guard dogs may be another possible solution.

Part III:

Economic Considerations and Plant Sources

Economic Considerations

According to the 1994 Specialty Berry Assessment Study, prepared for the Saskatchewan Indian Agriculture Program (SIAP), about 454 kg (1000 lbs) of pincherry were purchased by fruit processors in 1993 at an average price of $2.20/kg ($1.00/lb). The report suggests that the supply fell considerably short of the processors' demand. To date, there are no commercial pincherry orchards and all pincherries supplied to the market were collected from wild pincherry plants.

Suppliers of Plants and Seed

Plants of pincherry cultivars may be derived from several different sources including germinated seeds (seedlings), suckers, rooted cuttings and micropropagated plantlets.

If plants of a named cultivar were grown from seed, first generation (F1) seed should have been used. Similarly, only F1 seed should be purchased if one is starting plants from seed. It is suggested that written certification of F1 status be obtained at the time of purchase of seed or seedlings.

It would be useful to be able to verify that the plant material being purchased is in fact the cultivar that it is labeled as. Unfortunately, there is no easy way to verify the identification of most native fruit cultivars at present.

It is important to note that recommendations for specific cultivars of pincherry are only tentative. Valid scientific cultivar evaluation trials are still in progress.

Because cultivar recommendations are not possible at the present time, 2 or 3 cultivars, if available should be planted when establishing an orchard or orchard. An orchard comprised of several cultivars may have the following long term advantages: a) greater overall resistance to insect pests, diseases and other environmental problems; b) better consistency of overall orchard yield; and c) greater adaptability for future processing possibilities.

Before purchasing plant material, it is important to investigate several sources before making any decisions. Cost and availability of plant material may vary considerably.

Note that this list is incomplete and not meant as an endorsement.

Alberta

D'n A Gardens
Box 544
Elnora, AB
T0M 0Y0
Tel: (403) 773-2489
Fax: (403) 773-3784

Eagle Lake Nurseries
Box 2340
Strathmore, AB
T1P 1K3
Tel: (403) 934-3622

Forster Nurseries
RR #2
Wetaskiwin, AB
T9A 1W9
Tel: (403) 352-6900

Laidlaw Nursery
Box 316
Tofield, AB
T0B 4J0
Tel: (403) 662-2778

The Saskatoon Farm
(P. Hamer)
RR #1
Dewinton, AB
T0L 0X0
Tel: (403) 938-6245

Spruce Lane Farm
Box 278
Irricana, AB
T0M 1B0
Tel: (403) 274-1875

Manitoba

Aubin Nurseries Ltd.
Box 1089
Carman, MB
R0G 0J0
Tel: (204) 745-6703
Fax: (204) 745-6838

Saskatchewan

J. Boughens Wholesale Nursery
Box 1679
Nipawin, SK
S0E 1E0
Tel: (306) 862-5313

John's Nursery and Market Garden Ltd.
Box 24
Henribourg, SK
S0J 1C0
Tel: (306) 764-8139

Lakeshore Garden Centre
RR #3
Saskatoon, SK
S7K 3J6
Tel: (306) 382-2077
Fax: (306) 382-6433

Prairie Plant Systems, Inc.
108-106 Research Drive,
Saskatoon, SK
S7N 3R3
Tel: (306) 975-1207

Part IV:

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