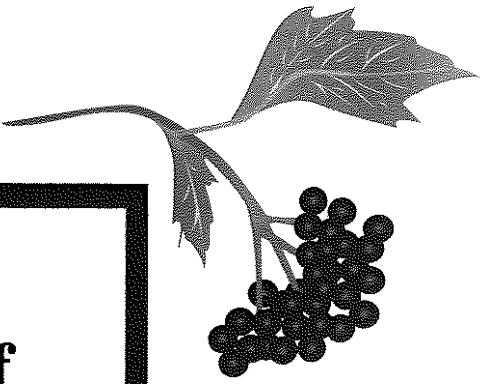
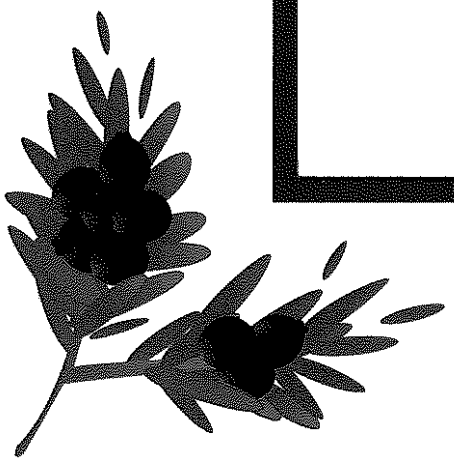
NATIVE FRUIT DEVELOPMENT PROGRAM



Biology & Culture Of

The Buffaloberry



DEPARTMENT OF HORTICULTURE SCIENCE
UNIVERSITY OF SASKATCHEWAN
SASKATOON, SASKATCHEWAN
CANADA

Biology & Culture Of

The Buffaloberry

Beatrice Remlinger, B.S.A.
&
Richard G. St. Pierre, Ph.D.
Research Scientist and Director
Native Fruit Development Program

Department of Horticulture Science
University of Saskatchewan
Saskatoon, Saskatchewan
Canada

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Dr. Branka Barl, Department of Horticulture Science, University of Saskatchewan, Saskatoon, SK.
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Introduction

The buffaloberry, a common prairie native fruit species, is intimately linked to the history of North America's Western Plains. The native fruit of any region represents a source of living history as well as a promise for the future. To date, the economic potential of native fruits of the Prairies remains largely untapped. However, the drive towards agricultural diversification has prompted a growing interest in the development of a native fruit industry. Although buffaloberry fruit have yet to find full-scale acceptance in commercial markets, growing interest in locally grown food products, and the increasing popularity of specialty foods hold significant promise. Widespread acceptance of buffaloberry products presents a challenge to marketing experts, researchers and growers alike, but the fruit spark the imagination of those acquainted with their many attributes, and with a coordinated approach there is reason to be optimistic of the fruit's commercial future. Unfortunately, very little information about most of our native fruit species is in a readily accessible form. In an attempt to remedy this situation, this comprehensive review of the buffaloberry has been compiled.

Please Note: 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 to all 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 the buffaloberry. General recommendations for growing fruit on the prairies are often useful, but some adjustments may have to be made, and some grower experimentation will be required. Complete and accurate record keeping by the grower will be very beneficial.

Part I:

Cultural And Natural History Of The Buffaloberry

A Note About Names

The buffaloberry, *Shepherdia argentea*, is a member of the Oleaster Family (Elaeagnaceae). The generic name, *Shepherdia*, commemorates the English botanist, John Shepherd, while the species name, *argentea*, means silver, in reference to the leaves. All surfaces of the leaves and young shoots are covered with silvery scales. Previous latin designations of *Shepherdia argentea* included *Hippophae argentea, Lepargyraea argentea*, and *Elaeagnus utilis*. The buffaloberry is closely related to *Shepherdia canadensis* (Canada or Russet Buffaloberry) and *Elaeagnus commutata* (Silverberry or Wolf Willow), with which it could be confused. The buffaloberry is also related to the non-native Russian olive (*Elaeagnus angustifolia*), which is often used as an ornamental, and sea buckthorn (*Hippophae rhamnoides*), a Eurasian shrub increasingly found in prairie shelterbelts.

The buffaloberry was used by Native Americans and pioneers as an accompaniment to bison meat. As well, bison used them as a source of food and shelter. This dual identification of bison with the plant accounts for the most often used common name of buffaloberry. The buffaloberry is also very commonly referred to as the silver or thorny buffaloberry in order to distinguish it from the Canada buffaloberry (*S. canadensis*).

Several other common names have been ascribed to the buffaloberry. These include: As-say (Mandan name), Baie de buffle (French name), Beef-suet tree, Bull-berry, Crucifixion Berry, Grain de boeuf, Graise de boeuf, Graise de buffle, Haz-shutz (Winnibago name for red-fruit), Ingahawmp (Crow name), Karitsits (Pawnee name), Mas'tinca-pute'-can (Lakota name for rabbit lip tree), Mat'si-ta-si-'mins (Cheyenne name for red hearted), Me-e-nixen (Blackfoot name), Miksinitsim (Blackfoot name for bull berry), Nar-nis (Arkara/Rees name), Nebraska Currant, Rabbit berry, Silverberry, Silverleaf, Tasque-sha-shah (Assiniboin name), Wild oleaster, and Zhon-hoje-waxhide (Omaha/Ponca name for gray something).

Cultural History

The buffaloberry is a fruit native to much of North America and has a long history of use throughout a wide

geographic region. Traditionally, the fruit have been eaten raw or dried, particularly after they have received some exposure to frost. A paste or pudding of buffaloberry fruit was made along with the flour of prairie turnip (*Psoralea esculenta*) and served with buffalo meat. The fruit have also been used in pemmican, soup, and juice. Later, the fruit were used in pies, preserves, and wines. Buffaloberry fruit are said to make one of the best jellies known to epicures. Preservation methods include drying, freezing, and canning.

The utility of buffaloberry plants extends beyond food. The fruit have been used for dyes, and thongs and laces have been made from shredded bark. Ceremonially, the fruit have been used during feasts to honour a girl's attainment of puberty, most likely because the colour would symbolize menstruation. The thorniness and impenetrability of a buffaloberry thicket makes it an ideal stock hedge. The plants and fruit are an important source of shelter and food for wildlife.

The striking contrast of the silver foliage with the red fruit, as well as the winter persistence of the fruit, grant the species a high ornamental value.

The earliest recorded date of cultivation is 1818. The buffaloberry was first introduced into commercial trade by G.J. and L.E.R. Lambrigger of Big Horn City, Wyoming, in the fall of 1890.

Natural History

Range and Habitat

The buffaloberry is native to the Western and Central North American Great Plains. The species is reported as far west as British Columbia and the Sierra Nevada Mountains of California, as far east as Iowa and Manitoba, and as far south as New Mexico. The northern boundary for the species in Saskatchewan is the northern grasslands around Saskatoon (lat. 52° 07' N, long. 106° 40' W). The exact expanse of this species' range is somewhat controversial. Confusion is thought to be due to misidentification of *S. argentea* with *S. canadensis* and *Elaeagnus commutata*.

The buffaloberry is most often found bordering natural waterways, but may also be found in valleys, around sloughs, and in plains or low meadows. It is considered winter hardy, saline tolerant, and drought resistant once established. Ranchers consider the species undesirable, but the resultant loss in capacity to produce forage for cattle is so minimal that eradication is not justified.

Ecology

Natural stands of buffaloberry are typically thick groupings of tree-like shrubs. Thickets often take on a dome shape as smaller, shorter plants emerge toward the outside of the group, and older central plants increase in height. New stems (suckers) arise from root buds on spreading roots. Seedlings begin to produce suckers after as little as five years

of growth with suckers then establishing their own root systems.

The shelter and nitrogen provided by the buffaloberry provides a favourable microclimate for the establishment of other plants and makes the buffaloberry a good pioneering species.

Vegetative reproduction is thought to be the primary method of natural propagation, as seedlings are rare. Seedling growth is slow, increasing the likelihood of seedlings being grazed by wildlife. Seed is dispersed mainly by animals, but because the seed coat is soft, almost all viability is lost prior to seed deposition. These factors may contribute to low natural seedling populations. Once established, mature stands advance steadily into grasslands as new shoots are produced annually at 30 to 40 cm intervals.

Fire can seriously damage older stands of buffaloberry in which there is much dead wood. However, stands re-establish within a few years of fire damage. Rapid re-establishment is possible because individual plants of 20 years or older survive with much of the top and root system intact.

Rabbits, hares and deer can inflict damage by browsing on shoots less than two years in age. Shoots become armed with thorns after that time, making them largely resistant to browsing animals.

As buffaloberry occurs naturally along waterways, they commonly experience flood situations. However, the species appears to be flood-tolerant.

The buffaloberry is also considered drought-tolerant once established. Signs of stress, such as wilting of leaves, develop on some of the younger shoots at the periphery of a stand when the water table drops below 1.2 m.

The buffaloberry is naturally found on non-saline to slightly saline soils with electrical conductivities ranging from 0.41 to 6.80 mmhos/cm, and is considered salt tolerant by both the P.F.R.A. and the United States Department of Agriculture, Soil Conservation Service. The pH range of the soils on which the buffaloberry is naturally found varies from 6.29 to 7.71. The cultivar 'Sakakawea' is considered tolerant of high soil pH levels by the U.S.D.A. Soil Conservation Service. Upper limits of tolerance for both salinity and soil pH have not been determined.

Growth Characteristics

The buffaloberry has a small treelike growth habit, ranging in height from 1 to 6 m. The buffaloberry is considered a slow-growing plant, averaging from 17 to 54 cm of new growth per year. The cultivar 'Sakakawea' reaches mature height in 15 to 20 years, with a crown width of 5 to 6 m. Specimens may attain 50 to 60 years in age.

Floral bud break occurs in late April, with vegetative bud break beginning 7 to 14 days later. Male plants seem to bear leaves sooner than female plants. Shoot elongation continues until mid-August to early September. The initiation of buds for the following year occurs from early July to mid-August.

The bark is smooth, whitish to grey-brown, and becomes rough and dark with age. It may shred in long strips. Branches are often weakened by white heart-rot (*Fomes ellisianus*) and are susceptible to wind damage. Many older twigs terminate in stout thorns 4 to 5 cm in length.

Leaves are opposite, simple, smooth-edged, and wedge-shaped. Individual leaves range from 2 to 5 cm in length with both sides appearing clearly silver due to a covering of silver waxy scales. Only the central vein is prominent. Absence of a rust-coloured undersurface clearly separates this species from *S. canadensis*. Leaves emerge one to two weeks after flowering begins, and by late May or early June, the leaves have reached full size. The species tends to hold its leaves later in fall than many other deciduous prairie shrub species.

The root structure of the buffaloberry is complex. It may have a taproot which thickens at the top to form a root crown, from which individual stems arise, or it may have irregularly spaced taproots, or branching roots which thicken into the root crown. Suckers form along the older roots to produce aboveground stems. The bark of the root is greyish-brown with few root hairs and rootlets.

The buffaloberry is a nitrogen-fixer. A symbiotic relationship between soil bacteria and the root permits these plants to assimilate atmospheric nitrogen.

Characteristics of Flowers and Fruit

Buffaloberry flowers are visually inconspicuous, and thought to be better able than other prairie species to withstand spring frosts. The flowers are small, 2 mm in diameter, lack petals, and have four brownish-yellow sepals. Flowers are produced singly or in clusters in the axils of two-year-old branches. Flowers emerge about a week before leaves, unevenly throughout early spring, around the second or third week of April. Clustered flowers open in sequence. Consequently, declining and unopened flowers can be found on the same branch, giving the plant a wide window for pollination, and a long period of fruit ripening. Flower buds are initiated in the fall prior to leaf drop.

All members of the genus *Shepherdia* are dioecious (male and female flowers occur on different plants). Because male (staminate) and female (pistillate) flowers are separated on different plants, cross-pollination is necessary for fruit set. In horticultural settings, one male to five or six female plants is recommended. Few nurseries label the buffaloberry as male or female. Being able to distinguish the sex of individual plants is therefore important if fruit production is a consideration. Male plants have larger, stouter winter buds than female plants. Once opened, male blossoms are about twice the size of female blossoms. Both male and female flowers ripen at about the same time, facilitating pollination. The male flowers have eight stamens. Male plants average three flowers per cluster whereas female plants average six flowers per cluster.

The fruit are highly variable in

colour, size, harvestability, and quality. Usually the colour is a bright reddish orange, but yellow-fruited plants are known. The cultivar 'Sakakawea' produces from 12 to 20% yellow fruit. Botanically, the fruit have been variously described as a drupe or as a fleshy perianth surrounding an achene. Numerous other botanical descriptions of the fruit indicate that a great deal of confusion surrounds knowledge of the structure of the fruit. In any case, the fruit is single-seeded, each seed being dark and smooth. On average, a single fruit weighs one twentieth of a gram. Fruits range in diameter from 3 to 5 mm. Fruit begin to ripen about 107 days from first flowering, in the order that they were pollinated. They are considered ripe when fully yellow or red. This may occur from July to September and the fruit remain on the bush until frost or later, and after the leaves fall. Female plants begin to bear fruit at four to six years of age, then produce abundantly for many years.

The taste of buffaloberry fruit collected before a frost is rather astringent or sour, although some consider it sprightly. Personal taste, differing trees, and growing conditions affect flavour. A general bitterness is attributed to the presence of saponins, which are used commercially as foam producers. After exposure to a frost, the taste improves as the sugar content rises. Yellow-fruited varieties appear to be sweeter. The fruit are pectin-rich, with pectin content decreasing as the fruit age. Harvested fruit soon develop a strong, rather unpleasant odour and become sticky. The seed is easily chewed and consumed with the fruit.

While the exact concentration of saponin in buffaloberry fruit has not been determined, it is high enough to grant them a high foaming ability. Saponins, although not easily absorbed by the body, can cause severe gastrointestinal upset upon heavy consumption. They are found in such common foods as beets and alfalfa sprouts. Consequently, raw buffaloberry fruit should only be consumed in moderation. Considering their long history of use by native peoples, they cannot be considered harmful in limited quantities.

Vitamin C (ascorbic acid) is high in the buffaloberry, with levels recorded as high as 150 mg/100 g fruit. For comparison, the average vitamin C content of an orange is 54 mg/100 g fruit.

S. canadensis is known to concentrate mercury, creating a possible health hazard in polluted areas; the buffaloberry may possess the same ability.

The following compositional analysis of buffaloberry fruit was obtained from the Alberta Department of Agriculture, Food and Rural Development, Food Quality Branch.

Component	Fruit collected before frost (August 26, 1993)	Fruit collected after frost (October 10, 1993)
pH	2.74	2.82
cobalt (ppm)	<1	<1
manganese (ppm)	1	1
iron (ppm)	6	7
magnesium (%)	0.009	0.009
phosphorus (%)	0.026	0.031
calcium (%)	0.015	0.014
sodium (%)	0.016	0.018
potassium (%)	0.24	0.28
fat (%)	0.67	0.70
protein (%)	1.4	1.8
moisture (%)	75.1	77.8
ash (%)	0.51	0.62
carbohydrate by difference (%)	22.3	19.1
dietary fibre (%)	4	5
fructose (%)	3.7	6.2
glucose (%)	6.4	7.9
sucrose (%)	<0.2	<0.2
maltose (%)	<0.2	<0.2

Part II:

Buffaloberry Culture

Cultivars

Two named cultivars of buffaloberry currently exist: 'Gold-eye', a yellow-fruited variety, developed in Morden, Manitoba, and 'Sakakawea', a variety which was developed by the Soil Conservation Service of the U.S.D.A. for revegetation of disturbed areas. The cultivar 'Xanthocarpa,' another yellow-fruited selection, belongs to the species *S. canadensis*. Larger, yellow-fruited selections are considered sweeter than the others of the same species.

The Soil Conservation Service of the U.S.D.A. is currently evaluating selections of buffaloberry for conservation use in the Northern Plains. It hopes the program will result in the eventual release of seed-propagated cultivars. Eligible Saskatchewan and Manitoba residents may obtain buffaloberry for shelterbelt planting through the P.F.R.A. in Indian Head, SK or through certain local nurseries.

Propagation

Propagation by Seed

Mature fruit can be collected in late September, processed by wet maceration, and recovered through flotation. Viable seed will settle to the bottom. Extraction is not necessary for short-term storage. Extracted seed should be kept clean, dry, and cool. Storage in a sealed container has been accomplished at 7 to 16°C and 30% relative humidity. Seed of the buffaloberry, at a moisture content of 13.1%, showed 97% germination after 42 months storage at 5 °C. The P.F.R.A. tree nursery in Indian Head, SK, recommends sealing stratified seed in containers maintained at 15°C. There are 110,000 - 870,000 dry seeds per kilogram.

Seeds may be incubated in petri plates at 20 to 30°C to estimate viability. Fifty percent germination has typically been reported, but 80 to 90% germination has been obtained with fresh seed.

Stratification is not needed for fall-planted seed. Fruit may simply be spread thinly after collection and allowed to dry. Heating of the fruit must be avoided. For spring planted seed, stratification in a slightly moist medium for 3 months is recommended. Acid

scarification is not required. Seeds should be sown at a rate of 30 to 50 viable seeds per 30 cm of row, to a depth of 6 mm, and mulched with about 1.3 to 2.5 cm straw. Germination occurs within 24 days of spring planting. Germination does not require light.

Vegetative Propagation

Suckers are easily separated from parent plants. Male plants are said to produce more suckers than female plants.

Cuttings of the yellow-fruited genotypes, taken in late-July, have been rooted quite successfully using 0.8% IBA-talc and thiram, a 1:1 sand:perlite mixture, and mist.

Plantation Establishment

Site Requirements

The buffaloberry prefers medium-textured, well-drained, moist soils but will survive under less favourable conditions. It will tolerate saline, droughty and temporarily flooded soils. Full sun is essential as the buffaloberry will not tolerate shade.

Site preparation should begin one to two years before planting. A green manure crop, grown for two years prior to establishment, is suggested to help minimize weed problems, and to add organic matter to the soil. The site should be cultivated and kept weed free for at least one year prior to planting. The application of a non-residual herbicide such as glyphosate may be useful. The primary purpose of site preparation is to eliminate perennial weeds which compete with young transplants.

Plant Spacing

The choice of plant and row spacing is a function of cultivation and harvesting methods used. Spacing must be wide enough to allow passage of equipment, permit entry of adequate light, and promote good air flow. Within-row spacings of 1 m are suggested for shelterbelts, while 5 m should be allowed between adjacent rows. When deciding where to plant buffaloberry, it is important to remember that seedlings grow into mature trees of about 4.5 m in height, and 3.5 m in width. If a fruit crop is desired, male and female plants must be planted near enough for pollination to occur so that fruit will be produced. One male to six females is typically recommended. Trees should be labelled male or female when flower buds or fruit are visible so that the appropriate plants will be selected.

Transplanting

Transplanting of seedlings should be done when they are two years old, or when they have a stem diameter of 0.8 to 1.3 cm. Only vigorous plants with a well developed root system should be used. Spring transplanting is preferred to fall. All plant material must be adequately hardened-off. Container-grown plants tend to perform better than bare-rooted seedlings. Plants should be set a little deeper into the soil than they were in the

container. Then the soil, and possibly well-rotted manure, should be firmed around the roots, and the plants well watered. Overwatering may cause root rot. It may be necessary to cut back the tops of bare rooted seedlings if conditions at transplanting are very dry. This involves the removal of one-half to two-thirds of the top growth to minimize transplant shock. Established buffaloberry plants may be successfully transplanted, providing that proper equipment is used; sufficient root mass must be extracted along with the mature plant, and the root mass must not be allowed to dry out.

Plantation Management

Irrigation

Once established, the buffaloberry is considered drought-resistant. Only young shoots on the periphery of stands show signs of drought stress when the water table drops below 1.2 m. Normal moisture conditions in Saskatchewan are adequate for many deciduous trees and shrubs, as long as weed competition is minimized. As a native plant, local growing conditions should nearly always satisfy the shrub's need for moisture.

Nutrient Requirements

Specific fertilizer requirements for the buffaloberry have not been determined. However, the buffaloberry is considered a good choice for poor soils as it has the capacity to fix atmospheric nitrogen.

Pruning

Pruning is perhaps the single best method of maintaining tree health. As a general rule, old, dead, damaged, or diseased wood should be removed. Crossed branches represent a source of potential injury, and should either be removed or firmly braced to avoid abrasion. Pruning should be done in the spring or late winter so that susceptibility to winter damage is not increased and so that growth following pruning will encourage quick healing of damaged tissues. In a fruit plantation, it is important to remember that an open growth habit is desirable to promote good air flow and to permit the entry of adequate light. In a landscape setting, pruning will determine if a buffaloberry is grown as a small tree or a large shrub. If pruned to a single trunk, it is considered a small tree that can add accent or landscape effect.

Pollination

Pollination is necessary to ensure fruit set since the species is dioecious. The most common pollinating insects observed have been wild relatives of the honeybee and leafcutter bee. Bumblebees apparently visit the flowers less often. Various unidentified small flies also have been observed on male and female flowers.

Harvest

Harvesting represents one of the major drawbacks to the widespread use of buffaloberry fruit. The thorns are sharp and numerous. The fruit ripen unevenly,

are small, and often adhere quite strongly to the branches. Pickers' hands soon become sticky and scratched. Many older trees are too tall for convenient picking, and the dense irregular growth of the plant can make it difficult to reach all of the fruit. Until successful breeding and pruning programs are developed, this fruit is unlikely to become a successful U-pick crop. Heavy gloves have been recommended for pickers, but this makes handling the small fruit awkward. A hand-held comb or toothed scoop, as is used in natural blueberry stands, could be useful, but this would also harvest a large number of leaves and under-ripe fruit. Branches could also be bent into buckets and the fruit beaten off with a stick.

The traditional method is to lay a cloth on the ground under the bush and then to beat the bush with a stick. This method works better on some trees than others, and is best if fruit are older and have experienced a frost. Otherwise the method demands more effort than hand picking and is more harmful to the bush. About -10°C is considered the best time for harvesting as frozen fruit fall off very easily.

Fruit of the buffaloberry may be harvested well into the winter and are typically stored by freezing.

Pests, Diseases & Other Problems

Insect Pests

Researchers at the P.F.R.A. tree nursery in Indian Head, SK and at the U.S.D.A. Soil Conservation Service Plant Materials Centre in Bismark, ND have identified various root, leaf, and fruit pests. Leaf feeders commonly found on the buffaloberry in North and South Dakota include *Datana sp.*, (larval form) and *Erannis tiliaria*, a linden looper. Some plants have been severely defoliated by Japanese Beetles (*Popillia japonica*) in Tennessee. The cecropia moth caterpillar (*Hyalophora cecropia*) is credited with partially defoliating young buffaloberry plantings as well. Two sucking insects, *Paratrioza arborensis* and *Psylla magnicauda*, both psyllids, were also noted. Root-feeders include larvae of the june beetle (*Phyllophage sp.*), and click beetle larvae (Elateridae). Leafhoppers, which fly up when trees are disturbed, are a nuisance, especially if trees are planted near a recreational area. Otherwise, they are not a cause for concern.

The P.F.R.A. Shelterbelt Centre in Indian Head, SK noted premature fruit drop, which appeared to be the result of an insect feeding on buffaloberry fruit. The insect was identified as a *Rhagoletis* species, a fruit fly, and is now known as the buffaloberry maggot. Buffaloberry maggots overwinter as pupae under buffaloberry plants, within about 5 cm of the soil surface. They may overwinter for two years before emerging. Buffaloberry maggot populations may be monitored through the use of plywood traps painted yellow and covered on both sides with a sticky substance. In Indian Head, SK, the peak population of buffaloberry maggot adults was observed between July 25 and August 6, 1983. Four species of parasites were reared from overwintering buffaloberry maggots: *Halticoptera sp.*

(Pteromalidae), and *Opius sp.*, *O. gahani*, and *O. downesi* (Braconidae).

Another insect, known as the buffaloberry fruitworm, has also been observed. It is a moth larvae which is presently identified as *Carposina niponensis ottawana*. The last instar larvae of these insects overwinter in cocoons buried in the soil. Buffaloberry fruitworm populations may be monitored through the use of sex-attractant traps developed for *Carposina niponensis niponensis*. Most buffaloberry fruitworms in Indian Head, SK, were caught between July 16 and 29, 1983. Three species of parasites have been identified along with the buffaloberry fruitworm: *Ascogaster sp.* (Braconidae), and *Trathala sp.* and *Diadegma sp.* (Ichneumonidae).

Diseases

Mature stands of the buffaloberry are rendered weak and susceptible to wind damage once they are infected by white heart rot (*Fomes ellisianus*), which is specific to the buffaloberry and widespread. Infection occurs through damaged branch stubs. Advanced symptoms are manifested by the appearance of a 'conk', a hard, dry, dark-brown fruiting body in the shape of a hoof, growing from branch stubs and on stems. Control involves pruning well below the site of infection.

Younger plants are infected by a fungal canker, *Cucurbitaria sp.* Leaf spots are caused by *Cylindrosporium shepherdiae* and *Septoria shepherdiae*. A powdery mildew is caused by *Sphaerotheca castagnei* and *S. humilis*. Rusts are caused by *Puccinia caricis-shepherdiae* and *P. coronata*. These fungi are not considered significant pathogens.

Weeds

Weeds pose a problem in any commercial or residential planting for a number of reasons. They compete for water, nutrients, and light. This is especially true for new plantings. Weeds may also harbour pests. If weeds are uncontrolled, the need for supplemental watering will be increased. Cultivation, mowing, pulling, hoeing, and chemicals are the main methods of weed control. For proper shelterbelt establishment, within-row weeding is required about three times per growing season for the first three summers. Cultivation between rows will be required for about five years, until shade and competition from the buffaloberry can inhibit weed growth. This cultivation should create a clean strip at least 1 m wide on each side of the row. Broadleaf and grassy weeds are the primary killers of nearly established trees. Where herbicides are being used, safety of the applicator, other workers and potential customers to an orchard must be considered. All label recommendations and safety guidelines must be observed.

Birds, Rodents & Deer

Rabbits and deer find young, mainly thornless plantings of buffaloberry quite palatable and may cause severe damage. Suckers along the edges of old plantings appear to be able to recover from browsing but nursery plantings should be protected by fences, tree guards, or

chemical repellents. Birds and other wildlife will consume the fruit. Nets, noise-makers, traps, detonators, dummy hawks, and special helium balloons can all be used for control if birds present a problem in an orchard. Fences, mouse bait, rodent repellent, and snow have all been used to protect young plants from feeding animals.

Part III:

Use & Potential Economic Importance

The buffaloberry is useful in a shelterbelt planting because of its high salt and soil pH tolerance, drought-resistance, winter-hardiness, and nitrogen fixing ability. Its disadvantages include limited effectiveness as a wind barrier because of an open form and relatively low height. It is usually planted as the outside row of farm shelterbelts or in field and roadside belts. Wildlife use the buffaloberry as a source of food and shelter. Sharp thorns also make them useful as barrier plantings, where traffic control is desired.

The U.S.D.A. Soil Conservation Service released the cultivar 'Sakakawea' in 1983 for use in site reclamation. Surface-mined lands, flood plains, and other disturbed areas benefit from revegetation with buffaloberry. The buffaloberry is recognized as a pioneering species and plays an important role in plant succession. Research is currently under way to develop cultivars to supplement 'Sakakawea'.

The buffaloberry has only recently begun to be appreciated for its ornamental value. With the growing interest in sustainable landscapes, a drought-tolerant, low-maintenance species such as the buffaloberry is an important plant to consider when landscaping. The silver leaves and red fruit create excellent contrast. The leaves remain attached until late fall and the fruit are held well into winter, which provides a welcome addition to the winter landscape. With or without pruning, the buffaloberry forms an interesting accent to almost any landscape. Suckers tend to be weak and easily controlled, and few native insects pose a serious problem to the plant.

The Saskatchewan fruit industry is currently profiting from the recent increase in demand for specialty or gourmet products. There are two commercial processors of the buffaloberry in the prairie provinces: Silke Verwimp of Sima Garden and Kitchen, Outlook, SK, makes buffaloberry jelly, and Bep Hamer of Gramma Bep's Gourmet Foods, Swift Current, SK, makes both jelly and jam. According to these processors, consumer response to their products is positive. The P.F.R.A. and Alberta Agriculture's Crop Diversification Center have also made jelly and report that taste-testers were favourably impressed. Recent market studies have indicated a strong demand for products with a strong 'place' identity. Combined with other market trends such as increased expenditures on specialty food items and the never-ending demand for something new, there should be excellent market potential for a gourmet buffaloberry product from the Canadian

Prairies.

The high saponin and vitamin C content of the fruit also suggest that the buffaloberry may be an excellent source of both substances for commercial extraction.

Part IV:

Recipes

Buffaloberry fruit can be used in a variety of ways, especially in jelly and beverages. They may also be canned, frozen, or dried for later use. If canning, only a little water needs to be used with the fruit, and sugar isn't necessary. Pectin is generally not required when making jelly, depending on the age of the fruit and the degree of dilution. Upon extraction, the juice appears milky with only a very slight orange tinge. Boiling it with sugar removes the milkiness to leave a clear amber juice which gels upon cooling. Jam is a darker reddish-orange. Fruit collected before or after frost may be used. Fruit which have undergone a frost are sweeter but pectin levels are reduced.

If the fruit are collected after exposure to frost, they also are considered edible without further processing.

Buffaloberry Jelly
(Elias and Dykeman 1990)

8 cups fruit
1 cup water

Simmer 10 minutes.

4 cups of resulting juice
6 cups sugar
pectin

Measure the specified volume of juice in a large kettle that will allow the rolling boil required for jelly making. Stir in pectin and lemon juice, if indicated in the recipe. Bring to a full boil with constant stirring. Stir in sugar and bring to a rolling boil. Boil hard one minute, remove from heat, and skim off foam. Immediately pour into hot, sterilized jars. When jelly is set, cover the surface with at least 1/8 inch of hot, melted paraffin. Remove any bubbles and make certain a complete seal is formed with the jar.

Buffaloberry Jelly
(Anonymous 1969)

This white, milky juice produces a pleasing amber jelly to serve on toast or with meat.

10 cups of washed fruit
10 cups water

Place the fruit in a saucepan, add water, bring to the boiling point. Simmer gently until fruit is tender (about 8 - 10 minutes). Crush the fruit with a potato masher. Drain through a moistened jelly bag. The juice is pale milky, thick and has a rather disagreeable odour.

6 cups of resulting buffaloberry juice

6 cups sugar

Place juice in saucepan and boil 3 minutes. Add sugar, boil briskly until 2 or 3 distinct drops flow together from a metal spoon. Remove from heat and skim. Pour into hot, sterilized jars, cool slightly, then seal with paraffin. Store in a dark place as jelly fades if kept in the light. Yields 3 pints.

Buffaloberry Jelly
(Turner and Szczawinski 1981)

1 l (4 cups) buffaloberry fruit, picked before the first frost
50 ml (1/4 cup) water
sugar

Place fruit and water in a pan, bring to a boil, and simmer for about 10 minutes, stirring frequently. Strain through a jelly bag, measure juice, and return to pan with an equal volume of sugar. Bring to a boil and keep boiling, stirring constantly, until jelly sets when tested on a cold plate. Pour into hot, sterilized jars and seal with melted paraffin. Store in a cool place. This is a beautiful light-orange jelly that can be used in place of cranberries on meat or chicken. Yields 4 medium-sized glasses.

Buffaloberry Jelly
(Harrington 1967)

Wash and crush fruit and add 1/2 cup water to every 2 quarts of fruit. Boil slowly for 10 minutes, stirring frequently to prevent scorching. Put into a jelly bag and drain off juice. To each cup of juice add 1 cup of sugar. Bring to a boil until it gels by the standard jelly test. This makes a clear jelly, with the colour of golden honey or pale apricot. It has a pleasant bright or nearly tart taste, something like currant jelly. When the fruit is very ripe after frost, the use of commercial pectin, following the recipe for currant jelly on the package, will ensure that the jelly will set. The juice may have a milky appearance at first, but it soon clears in the cooking process.

Buffaloberry Jelly
(Harrington 1967)

2 cups of buffaloberry juice
1 cup of crabapple juice
2 1/2 cups sugar

The pectin from the apples augments that in the buffaloberry fruit.

Buffaloberry Preserve
(Harrington 1967)

6 cups fruit
6 cups sugar
2 cups water

Buffaloberry-ade
(Turner and Szczawinski 1981)

250 mL ripe buffaloberry
250 mL sugar
750 mL boiling water

Place fruit and sugar in a large jar and add the boiling water. Stir until sugar has dissolved, mashing the fruit at the same time. Let stand until cooled, then

chill in refrigerator. When serving, pour through a strainer. Makes 8 small glasses.

Buffaloberry Juice
(Stewart 1981)

Wash the fruit well, crush them in cold water and allow to stand for 10 minutes, then strain to make a pleasant and tart lemonade drink. If the juice is too bitter, add a little brown sugar. Use about one tablespoon of fruit to a cup of water - more if a stronger taste is preferred.

Buffaloberry Juice
(Harrington 1967)

Grind up the fruit, seeds and all, then shape into patties and dry in the sun. Add a cup of these fruit to a pint of cold water and mash thoroughly. Sugar can be added.

Buffaloberry Beverage
(Harrington 1967)

Put 1/2 pint of fruit in a quart jar, add 1/2 pint of sugar. Fill with boiling water and seal.

Buffaloberry Dessert
(Harrington 1967)

Wash fruit, place in a container and mash thoroughly. Beat the mixture into the consistency of whipped cream.

Part V:

Resources

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