Propagation Of Saskatoons

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Introduction

Saskatoons may be propagated through the use of seed, suckers (rhizome sprouts), root cuttings, softwood cuttings, grafting, hardwood cuttings, cuttings from etiolated shoots, crown division, and through micropropagation. However, some methods are not economical because of the difficulty in obtaining adequate amounts of material to start with, and because of significant problems associated with an insufficient development of root mass and subsequent poor survivability.

The easiest, most successful methods of propagating saskatoons include the germination of seed, the use of etiolated shoots for cuttings, transplanting suckers, and micropropagation. Ease of propagation is important because it is associated with the production of higher quality planting stock.

Vegetative propagation is asexual propagation. Vegetatively propagated plants come from plant parts other than seed; these parts may include cuttings from shoots or roots, suckers, pieces of leaves, or buds. Plants derived from these parts have a single parent only and therefore are genetically identical to the parent plant. In such plants, fruit production occurs at an earlier age than in those plants propagated by germinating seed. Vegetative propagation is the method of choice for most fruit species.

Micropropagated plants are not necessarily superior or inferior to plants originating from other methods of propagation. Micropropagation is possibly the best method currently available for mass propagating large quantities of saskatoons, but the technique has only been in use since 1987. To date, micropropagated saskatoons have established and grown well.

Propagation by germinating seed is sexual propagation. Seeds usually contain a mixture of genetic material from two parents, consequently, seedlings are not identical to their parents. Desirable characteristics may be lost, and plants grown from seed may take longer to produce fruit. Fruit plants propagated by germinating seed are used primarily for growing rootstocks onto which selected cultivars will be grafted.

However, the saskatoon is a relatively unique fruit crop in that it is self-fruitful, that is, two, genetically distinct parents and cross-pollination are not required for the production of fruit and seed. The consequence of this is that saskatoon seedlings are very similar to, and perhaps indistinguishable from the parent plant. For this reason, there is no substantial disadvantage to propagating saskatoons by seed, provided that only seed produced by the parental clone is used (first generation, or F1, seed).

Regardless of the method of propagation, it should be noted that the quality and vigour of planting stock can vary substantially, depending upon the source. When purchasing new saskatoon plants, a potential grower first must consider the quality of the planting stock, the quantity required, the quantity available from the propagator, and the price. The method of propagation is of secondary concern. Saskatoon plants produced by any method of propagation appear to perform equally well, more or less, in an orchard setting. A certain small amount of genetic variability will be present within orchards established using seedlings.

The following table provides a summary of the advantages and disadvantages of the various methods of propagating the saskatoon.

A Comparison Of Methods Of Propagating The Saskatoon

Source of Material	Advantages/Disadvantages
Seed	- only first generation seed produced by parental clone should be used; seedlings very similar to, or perhaps indistinguishable from the parent plant; some roguing of dissimilar plants may be necessary once maturity is reached
Suckers	- simple technique; available material may be limited; suckers have poor root mass & may be susceptible to transplant shock
Typical shoot cuttings	- difficult to root; uneconomical
Etiolated shoot cuttings from crown of plant	- inexpensive; genetically uniform plants produced; excellent root mass; simple, successful technique
Micropropagation	- genetically uniform plants produced; quick production of large numbers of plants; complex technique; initial high capital cost for propagator
Grafting (budding)	- technique requires skill; rootstock suckers require consistent pruning; effects of rootstock uncertain; the technique is useful for topworking new cultivars

Propagating Saskatoons By Seed

The saskatoon is a relatively unique fruit crop in that it is self-fruitful, that is, two, genetically distinct parents and cross-pollination are not required for the production of fruit and seed. The consequence of this is that saskatoon seedlings are very similar to, or perhaps indistinguishable from the parent plant. For this reason, there is no substantial disadvantage to propagating saskatoons by seed, provided that only seed produced by the original parent clone is used (first generation, or F1, seed).

Reports differ with respect to the amount of dissimilarity in seedlings compared to the parental material. Propagators report a range of 70 to 99% similarity to the parental stock, with the seedling plants being of equal quality, more or less, to the parental stock. Because a certain amount of cross-pollination is possible, it is important to only use F1, or first generation, seed. Seed of subsequent generations will be more dissimilar to the parental stock.

For the potential grower of saskatoons, the purchase of seedlings may be a cost-effective way to establish an orchard.
However, a certain small amount of genetic variability will be present within the orchard.

It must be noted that plant variability associated with seedlings may be useful in the search for new cultivars, especially where resistance to insect pests or diseases is expressed. Other advantages of using seed include lower initial cost and the production of disease-free material.

However, for those predisposed to the do-it-yourself approach and who wish to germinate seed, a number of factors must be considered. Seed may germinate erratically, depending on where it was collected and how it was stored. Germinated seedlings may go dormant very quickly, and inducing them to grow to a size where they can be transplanted successfully will require appropriate cultural techniques in a greenhouse and then a nursery environment. Seedlings will require an additional year of growth before the production of a fruit crop is possible, and some roguing of mature plants that are significantly different may be necessary. Under these circumstances, it is suggested that such an approach only be used where a minimal start-up cost is essential, and where potential genetic variability is not considered detrimental (in shelterbelts, for example).

Collection Of Naturally-germinated Seedlings

In some years, it is possible to find numerous naturally-germinated seedlings under mature plants in an orchard. Such seedlings appear to be more common where the soil surface is bare. These seedlings may be transplanted to a suitable nursery environment.

Seed Collection And Storage

Fruit should be collected when fully ripe so that the seed can easily be extracted

from the flesh of the fruit; this facilitates cleaning and allows for higher germination rates.

Wild seed is best collected from parental stock material that has vigorous growth and good form, high yield, freedom from insect pests and disease (especially viruses and bacterial infections), and good quality fruit.

Seed are best extracted from fresh, ripe fruit; alternatively, fruit can be frozen. Extract seed from mature fruit, wash thoroughly, sterilize, and surface dry. Seed may be sterilized in hot water (40 to 50°C) for 5 to 30 minutes. Subsequently, immediately cool the seed in water. Seeds also may be sterilized using 1 part household bleach to 9 parts water, or treated with a fungicide such as captan.

Seed should be stored in sealed containers at temperatures of 1 to 7°C. Extracted and cleaned seed should not be stored in the open, or in a warm, dry atmosphere, otherwise the seed will go into a deeper dormancy, with resulting decreased rates of germination.

If seed is purchased, it is important to ask about the seed generation and age, where it was collected, and how it was stored.

Prior to planting or stratification, dry seeds should be soaked in water for several hours to enhance germination.

Basic Concepts Of Seed Germination

Proper sanitation is essential to maximize germination success; all tools, pots and media must be sterile. Media may be sterilized by placing in an oven at 80°C for 2 hours.

Plant seeds remain dormant because of the presence of chemical inhibitors and/or physical mechanisms which prevent germination in the fall. Otherwise, germination in the fall would make seedlings susceptible to cold temperatures; mechanisms for dormancy also allow time for dispersal. In nature, germination inhibitors are naturally overcome by soil microorganisms, rain, cool temperatures, digestive enzymes of animals that may have consumed the seed, or various combinations of these factors.

Consequently, in order to successfully germinate seed, such factors need to be mimicked through the use of ‘preconditioning treatments’ that overcome the mechanisms that inhibit germination. For example, soaking seed in water may help remove chemical inhibitors by mimicking the action of rainfall, although the use of aeration and running water is best.

Saskatoon seeds have embryo dormancy and a relatively impermeable seed coat. This combination of mechanisms requires that cold stratification be used to overcome dormancy. Germination rates for saskatoon seed vary from 7 to 67%, are apparently genetically controlled, and vary with the location the seed is collected from.

Stratifying And Germinating Seed

Recipes for germinating saskatoon seed vary. Studies done at the University of Saskatchewan indicate that, contrary to what is often stated, scarification using a concentrated acid such as sulfuric is not necessary for saskatoon seed to absorb water.

The simplest germination procedure is to sow seed in slightly moist, sandy nursery beds in late-fall. A 1 m by 2.5 m bed can easily hold 1,000 seedlings. The seeds should be broadcast in flats or pots of sterile medium and covered to a depth 2 to 3 times the seed diameter. Germination will occur the following spring. Protection from birds and mice is necessary, so the bed must be covered with a wire screen. Once the seedlings start crowding each other, individual seedlings may be transplanted to a suitable container. Growing seedlings require frequent watering; the soil should be kept moist but not saturated. Overwatering leads to soil saturation, forcing oxygen out of the soil. This stresses roots, encourages damping off fungi, and can kill the seedling. Seedlings must be protected from hot, dry winds and strong winds so as to reduce water consumption and stress. However, some airflow is important to reduce humidity and to increase plant sturdiness.

The storage of seed under moist, cool conditions is called stratification. Stratification is a common treatment used to help seeds overcome dormancy.

The simplest method of stratification is to mix seed with sterile, moist coarse sand, or vermiculite, (3 to 5 parts medium:1 part seed) and then to place this mixture in a plastic bag or container. The container must be kept in the refrigerator at a temperature of 1 to 7ºC for several weeks to 3 or 4 months. The medium should not dry out, but also should not be wet. The emergence of a root from the seed indicates that dormancy has been satisfied and that seeds are ready to plant. However, the root of the newly germinated must not be allowed to get too long, otherwise the germinated seeds will be more difficult to remove and successfully transplant.

The following stratification and germination procedure should provide consistent results:

1) The seed is extracted from the fruit using a blender with dull blades at low speed; the seed will not be damaged, but will have to be sieved from the pulp; the seed must not be allowed to dry out. Fungal problems can be minimized if the seed is surface-sterilized in a solution of household bleach (1 part bleach to 9 parts water) for 5 minutes.

2) The seed is then soaked in water for 24 hours to ensure the maximum absorption of water by the seed. Aerated (using an aquarium pump) or running water is best.

3) Next, the seed is placed in clean, coarse sand (size 20; #3 chicken grit may also be used) that is moist, not wet; the mixture should consist of about 4 parts of sand to 1 part of seed; the seed and sand are then placed into a perforated plastic bag which is then sealed (perforated vegetable storage bags are available in supermarkets).

4) The bag is placed in a fridge or other location that is kept at 4°C, but no higher; the temperature must not increase at any time; every week, the sand and seed mixture should be stirred for aeration and examined to make certain that the sand is still moist and that fungal problems are not occurring.

5) The bag must be left under these conditions, usually for 4 or 5 months. The seeds often begin germinating under these conditions after about 3 months.

6) The germinated seeds are carefully removed from the bag and planted in a sand:peat moss mixture (50:50), or vermiculite:peat moss mixture (40:60), in a tray, or Spencer-Lamaire Rootrainers. Upon completion of stratification, the seeds may be placed in controlled environment of 16 hours daylight at 25°C and 8 hours of darkness at 10°C to complete germination.

7) Further growth and development will be favoured by a warm, well-lit environment; a dilute (concentration is dependent on brand of fertilizer), soluble 10-52-10 or 20-20-20 fertilizer may be applied continuously with every watering. Maximum growth may be obtained using bright full- spectrum fluorescent light (a mixture of cool and warm white) where bright, but indirect sunlight is not available, a constant 25 to 27°C temperature, 70 to 90% relative humidity, and two 30 minute periods of darkness every 24 hours; a moderate amount of air movement is necessary to provide adequate ventilation and to produce stronger stems. The use of carbon dioxide supplementation in greenhouses so equipped may be advantageous in promoting vigorous growth.

8) Before transplanting outdoors, acclimatization is necessary; this involves restricting water, switching to natural lighting and reducing the temperature.

Propagating Saskatoons By Shoot Cuttings

Cuttings are pieces of stems, branches, or roots that are capable of growing new roots (adventitious roots). Shoots that are producing flowers or fruit should not be used for cuttings. Cuttings from younger plants are usually easier to root. Cuttings should not be taken during times of stress (drought, very hot temperatures, cold temperatures). All cuttings should have at least 3 nodes. The best cuttings are basal (from around the trunk or stem), or lateral (horizontal or close to). Rapidly growing vertical shoots with long internodes (watersprouts) do not make good cuttings (these produce plants with fewer branches). Cuttings should be taken just below a leaf node or bud. All cuttings should be planted (stuck) so that at least two leaf nodes are below the surface of the soil. Cuttings need to be protected from hot sun and wind by using shade, mulch and windbreaks.

Softwood Cuttings

Softwood cuttings are derived from the green, new growth of the current season. Cuttings of new growth, 10 to 15 cm in length are taken, usually in early to mid-June. The terminal portions are not used

unless some maturation has occurred. The leaves from the lower third of the cutting are removed, and the cutting is dipped into rooting hormone of appropriate strength. The cuttings are then stuck (inserted) into a rooting medium (1:1 perlite, or vermiculite:peat or sand). The rooting medium should be well-drained and sterile. The use of intermittent mist will minimize water loss from the cuttings until rooting occurs. The frequency of misting must be adjusted to prevent the leaves from drying out following rooting. The cuttings may be hardened-off by reducing the frequency of misting, or by placing them in pots in a shady location for several weeks.

Propagation Using Etiolated Shoots

Etiolated shoots are shoots that have grown in very weak or no light. They have yellow or white foliage and appear rather sickly. Cuttings of etiolated shoots have the ability to root easily. The following procedure (an application of the propagation method termed mound layering) is relatively simple and will lead to rooting percentages and transplant survival in excess of 90%.

During the early spring, before budbreak, a shrub (a minimum of 3 years old) is cut back to ground level to form a stool bed (Figure 2.1). The stool bed is then covered with a black polyethylene (6 mil) tunnel or tent supported by wire hoops (Figure 2.2). Lengths of black plastic pipe (5 cm diameter) may be used to ventilate the tunnels.

When forced shoots are long enough for cuttings (12 to 18 cm), usually in 4 to 6 weeks, they are regreened by slitting the tunnel on the north side so as to avoid direct sunlight which will scorch the etiolated shoots (Figures 2.3 & 2.4).

After 6 days of regreening, 12 to 18 cm cuttings are taken and their bases dipped in a 3,000 to 10,000 ppm (parts per million) solution of rooting hormone (IBA). Liquid Stim-Root 10,000 (Westgro Horticultural Supplies) works well.

The cuttings are then stuck in #4 Sunshine Mix (Fisons), Premier Promix 'HP', or a 50:25:25, by volume, peat:vermiculite:perlite mixture, in RootTrainers (Spencer-LeMaire Industries; these direct root growth downwards). The rooting containers are put outdoors in a mist bed under a clear polyethylene tunnel (or mesh shading cloth), located on 7 to 10 cm of coarse gravel (Figure 2.5 & the color graphic - Basic Components Of A Mist Bed).

Humidity levels under the mist bed's tunnel should be kept high by using automatic misting units (L10 or L12 brass mist nozzles controlled by a timer and solenoid valves; microsprinklers may also be used). Mist frequency and duration for the first 4 weeks is 20 seconds every 5 minutes, day and night. The following 3 weeks, this is reduced to 20 seconds every 7.5 minutes; subsequently, this is further reduced to every 10 minutes during the daytime only. It will take approximately 4 to 6 weeks for the cuttings to root (Figure 2.6).

Adequate ventilation is required. Temperatures under the tunnel should not exceed 40^{o}C.

A dilute (the concentration depends on the brand available) 10-52-10 or 20-20-20 fertilizer solution may be used for misting. Weekly applications of a sanitizer (45 ml Rocal or Skyclean) also should be made.

The cuttings can be left to harden-off, then mulched with peat moss and wood chips in mid- to late-October. Enclosure with a wire mesh is necessary to prevent rodent damage.

The cuttings also may be transplanted to the field in late-August when the roots show through the bottom of the container. Transplants should be kept moderately well-irrigated until late-summer; weeds should be controlled, but deep cultivation close to the plants must be avoided.

Propagating Saskatoons By Suckers

Offshoots or suckers are shoots that arise from rhizomes (which are underground stems). Propagation using suckers is a form of dividing the plant. Suckers older than 1 year of age must be carefully inspected for the presence of *Cytospora* canker. If *Cytospora* canker is present elsewhere in the orchard, suckers should not be used for propagation because of the possibility of spreading this disease. Suckers are usually removed with the aid of a pruning knife and/or shovel and can be used as rootstocks for grafting, or as new plants to be grown on their own roots. When removing suckers, 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. Suckers are best removed in early-spring or late-fall when the plants are dormant. Succulent suckers should be allowed to air dry for several days before planting to reduce problems associated with rotting.

Propagating Saskatoons By Root Cuttings

Root cuttings, 1 to 1.5 cm diameter, and 5 to 10 cm long, should be taken in the fall or early-spring. If root pieces are cut in the fall, they should be stored for two months at 4^{o}C. The root cuttings are then placed in polyethylene bags filled with moist peat moss and stored in the dark for 3 weeks at 21^{o}C. This treatment promotes shoot growth in 2 to 4 weeks. The root cuttings can then be planted in nursery rows, stem end up, and 0.5 cm below the soil surface. Frequent, light irrigation, and shading, will encourage shoot growth.

Micropropagation Of The Saskatoon

Micropropagation is a term that has the same meaning as the terms tissue culture and *in vitro* culture. Micropropagation requires some specialized equipment, precise environmental control, and scrupulous technique, but in the long run, should not produce more expensive plants. The technique uses small plant parts, including pieces of leaves and stems, or entire buds, which are cultured under sterile conditions on artificial growing media, ultimately producing thousands of new

Plate 2. Propagation Using Etiolated Shoots

Figure 2.1: Stool bed created from a mature bush.

Figure 2.2: Black polyethylene tunnels over stool beds (Photo by R. Sawatzky).

Figure 2.3: Regreening etiolated shoots (Photo by R. Sawatzky).

Figure 2.4: Etiolated shoots prior to cutting (Photo by R. Sawatzky).

Figure 2.5: A typical covered mist bed.

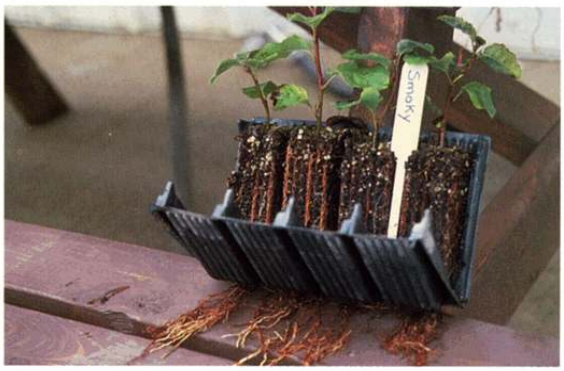
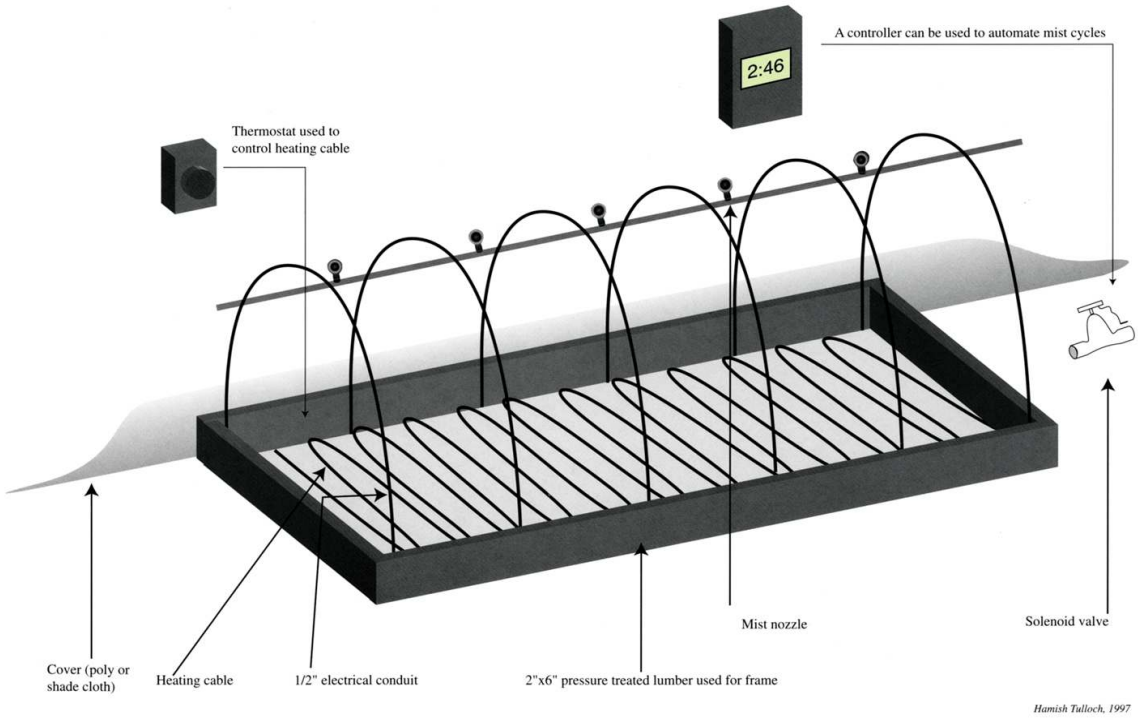


Figure 2.6: Rooted saskatoon cuttings ready for transplanting (Photo by R. Sawatzky).

Basic Components Of A Mistbed



plants. The technique allows for the tremendous multiplication of what may be very limited parental material. Micropropagated plants are not necessarily superior to plants originating from other methods of propagation, but it should be noted that the quality and vigour of micropropagated plantlets can vary substantially, depending upon the source.

Micropropagation is possibly the best method currently available for mass propagating large quantities of saskatoons, but the technique has only been in use since 1987. To date, micropropagated saskatoons have established and grown well.

For those interested in learning more about the micropropagation of saskatoons, the following references should be consulted:

Chu, C. and K.W. Mudge. 1996. Using a rockwool plug system *in vitro* on *Amelanchier, Cercis, Kalmia,* cherry and apple. HortScience 31(4):566 (Abstract 009).

Pruski, K., M. Mohyuddin and G. Grainger. 1991. Saskatoon (*Amelanchier alnifolia* Nutt.). pp. 164-179 in Y.P.S. Bajaj (ed.). Biotechnology In Agriculture And Forestry. Vol. 16. Trees III. Springer-Verlag, Berlin.

Pruski, K., J. Nowak and G. Grainger. 1990. Micropropagation of four cultivars of

saskatoon berry (*Amelanchier alnifolia* Nutt.). Plant Cell, Tissue and Organ Culture 21:103-109.

Propagating Saskatoons By Budding

Budding, a type of grafting, involves the process of joining parts of two plants in a manner such that they will unite and grow as a single unit. Budded plants consist of two parts, the scion and the rootstock, or understock. The scion is the part that develops into new branches, leaves and fruit; the rootstock is the part into which the scion is inserted and which comprises the root system and lower stem. Budding involves the use of a scion with only a single bud attached to a piece of bark.

In general, rootstocks for fruit plants may be derived from seed, rooted cuttings, suckers, or layers. They are selected for control of size, cold hardiness, disease resistance, nematode resistance and so on. Seedling rootstocks are used primarily. The main disadvantage of using seedlings is the lack of genetic uniformity, but the use of seedlings is easier and less expensive than the use of clonal rootstocks.

In the past, budding was the easiest and most economical method of propagating saskatoons. Budding would still be a useful method of propagation on a small scale because the rootstock will confer resistance to the woolly elm aphid, and topworking a number of different cultivars on a single stem may be of interest to some.

The best rootstock to use for saskatoons is *Cotoneaster acutifolia*. This rootstock is hardy, readily available, entirely compatible, and transplants easily. Rootstocks of mountain ash, apple, hawthorn have also been used, but not very successfully because of a certain degree of incompatibility.

Budding may be accomplished anytime that stocks and scionwood are available; in deciduous shrubs, this is usually about a month or so before a new period of growth.

Basic Guidelines For Budding

1) Both rootstock and scion should be alive, vigorous, and healthy.

2) The best scionwood/budwood has healthy vegetative buds, and no flower buds (vegetative buds are narrower and more pointed). The buds should be dormant (bud break and leafing out immediately following grafting will require too much water and the scion will die). Budwood is selected from the previous season's growth or the base of current season's growth after it has matured.

3) The best rootstock is young; vigorous seedlings are better than rooted cuttings or layered plants.

4) Cleanliness is important; debris and dirt must be removed before making cuts.

5) Quick and efficient work is best. Scions or budwood must be kept cool and in the shade. Once the buds are collected, they may be placed in plastic bags with moist paper towels if necessary, and stored in a

refrigerator at 5 to 7°C.

6) Cutting tools must be sharp and clean to allow for controlled, clean cuts, and to prevent the crushing of plant tissues and infection. Tools must be disinfected with bleach, alcohol, vinegar or soap.

7) The correct orientation and position of the scion pieces must be maintained. Buds must always point upwards, otherwise the graft will fail. Buds are usually inserted 10 to 15 cm above the soil on the north side of the rootstock for protection against exposure to the sun.

8) Contact of cambial tissues between the scion and the rootstock must be ensured. Matching is easy if the rootstock and scion are of similar size. If they are of different sizes, the inner edge of the bark must be matched.

9) Scions may be secured to the rootstock using rubber bands, teflon tape, string, plastic, leather strips, or plant fibers. These must be removed when the graft union has healed, otherwise growth will be restricted.

10) The graft must be protected from hot, dry, or very wet conditions. The best time to graft is in the mornings or evenings, otherwise exposed surfaces will dry out and tissues may be killed. Heated beeswax, melted paraffin wax, plastic, moist cloth, or local tree resins may be used to cover the graft union to prevent desiccation.

11) Budded or grafted material should be inspected 10 to 14 days following the grafting procedure. If the bud is still green, then the graft is likely successful; if the bud is brown and shrivelled, the operation has failed. A successful bud will have begun to grow in 25 to 30 days. At this time, the bud wrap can be untied. Shoots from the rootstock will have to be consistently pruned out during the lifetime of the grafted plant.

Methods Of Budding

Shield Budding

Shield budding (T-bud, or its variation, the inverted T-bud), is the most commonly used method of budding. This method of budding is illustrated in the color graphic - Shield Budding. This method only can be used when the bark is slipping from the wood. A 3 to 4 cm long vertical cut is made through the bark of the rootstock. A 1 to 2 cm horizontal cut is made across the upper (for the T-bud method) or lower (inverted T-bud method) end of the vertical cut; the knife blade must be angled away from the vertical cut so as to open the bark. Both cuts should be just through the bark to the wood. The shield is cut starting 1 cm below the bud and completed 1 cm above the bud; the scion wood should be held with the bud pointing towards you and the cut made parallel to the axis of the scionwood and only just into the wood. The bud shield is then inserted under the bark flaps of the rootstock so that is completely enclosed. The bud is then wrapped in an upward spiral, starting just below the base of the wound on the rootstock, and finishing above the wound.

Chip Budding

Chip budding is used when the bark is not slipping from the wood, or when the bark is too thick. This method of budding is illustrated in the color graphic - Chip Budding. The lower branches and leaves are removed from the rootstock. A horizontal cut is made at a 45° angle at a suitable location on the rootstock. This is followed by a shallow, vertical, downward cut, 2.5 to 4 cm long, starting above the first cut. A shield is cut from the scionwood to match the wound on the rootstock. The bud is removed so that it is near the center of the shield; the cut must be as parallel to the scionwood as possible and just into the wood; the base of the shield is squared with a slanted cut and the bud is set in place on the rootstock with the cambial layers aligned on at least 1 side. The bud is then wrapped in an upward spiral, starting just below the base of the wound on the rootstock, and finishing above the wound.

Care Of Newly-Propagated Saskatoons

Once plant material has been propagated, an environment favourable to vigorous growth and hardening-off is necessary before the new plants can be transplanted to the field.

Containers

Containers should be small enough so that they can be easily moved, but large and deep enough for adequate root growth. Vertical ridges on the inner surfaces of the containers prevent roots from growing in a spiral pattern and prevents plants from becoming rootbound (the condition where root growth becomes excessive for the restricted space, water and nutrients in the container; under such conditions, roots become unhealthy and may even wilt; rootbound plants will not anchor themselves properly upon transplanting). Containers must also have holes for adequate drainage.

Soil Mixtures

Planting mixtures must be able to hold moisture, but also provide for good drainage.

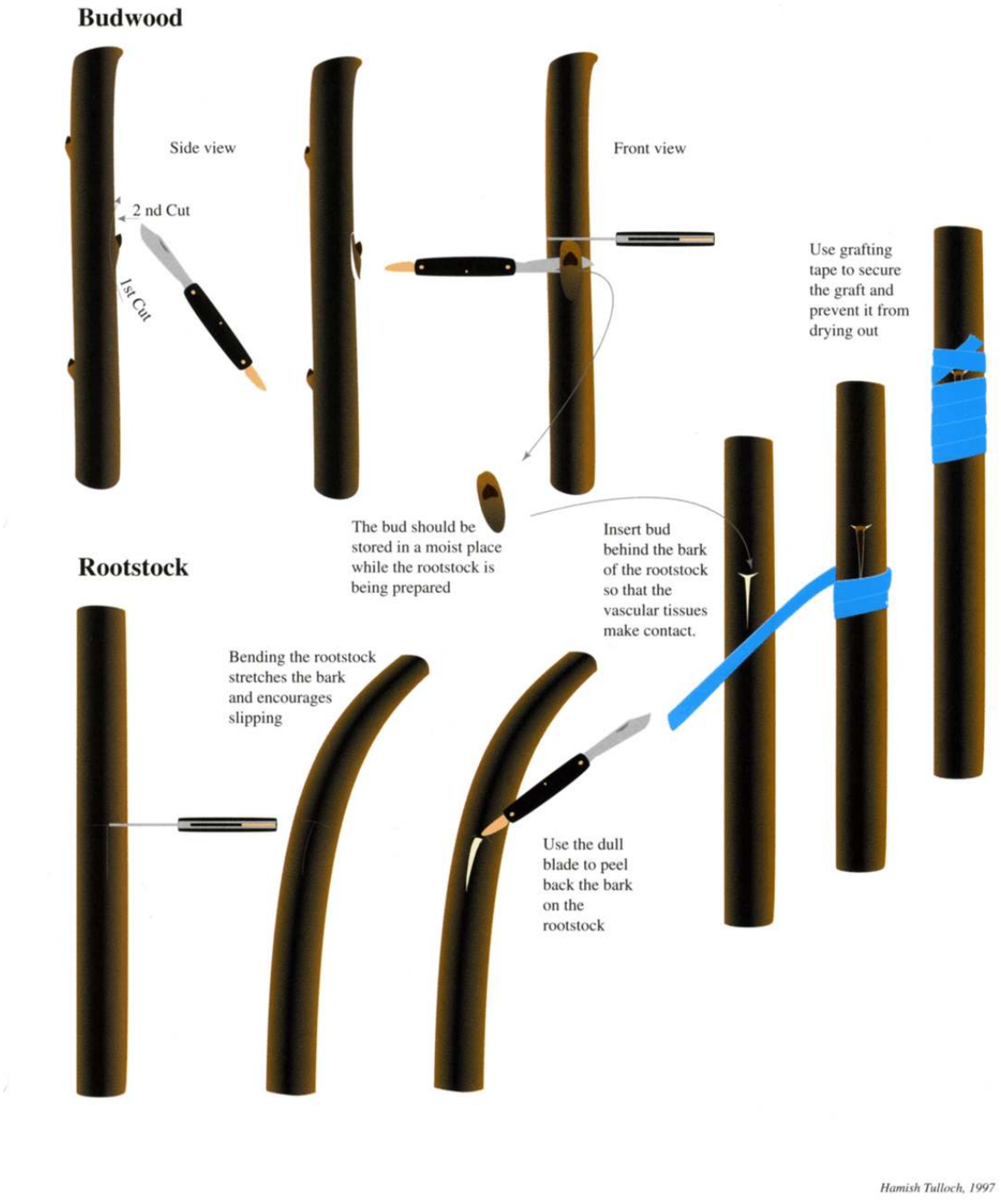
Soil Sterilization

Heating moistened soil to 71°C for about 30 minutes kills most soil-borne disease organisms. However, note that sterilization also kills beneficial soil microorganisms and therefore should only be used where necessary. Sterilization may be accomplished in various ways. A simple method is to place moist soil into a covered metal pot or closed plastic bag and left to heat up in the sun for several days. More sophisticated soil sterilizers also are available.

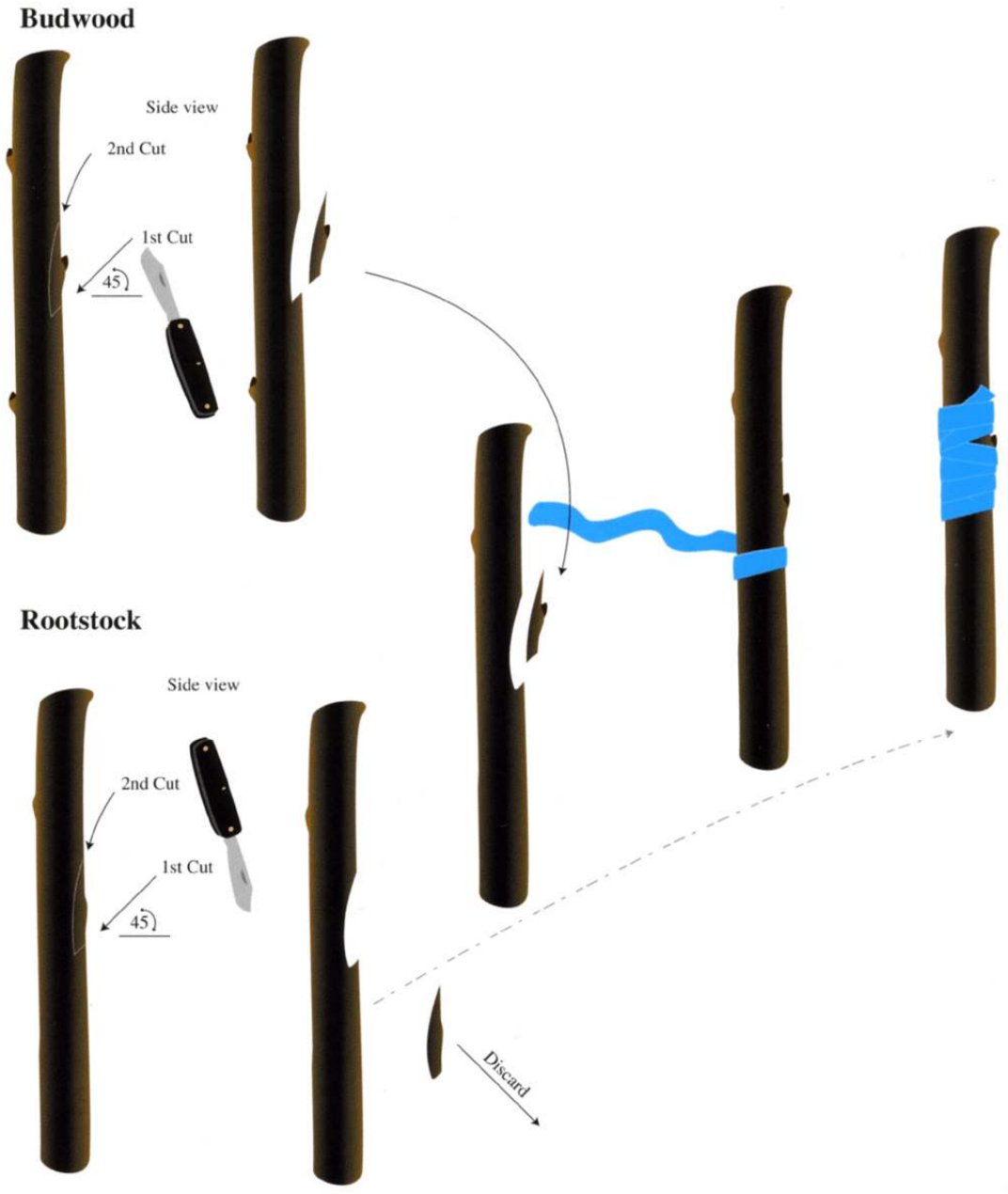
Shading

A lack of shade, or excess shade results in poor plant growth. Shading is required for hardening-off. Very young seedlings require a 50% reduction of incident light for most purposes; a 40%

Shield Budding



Chip Budding



Hamish Tulloch, 1997

reduction is sufficient for hardening purposes. The following regime for hardening-off is useful: 30% reduction at 45 days prior to transplanting, 15% reduction at 20 days prior to transplanting, and 0% reduction at 5 days priorn to transplanting. It is essential to maintain the evenness of shade. Shade materials can be plastic or fabric netting (shade cloth), or wooden slats (lathing).

Maximizing Growth In A Greenhouse

Growth and development will be favoured by a warm, well-lit environment; a dilute (the concentration depends on the brand used), soluble 10-52-10 or 20-20-20 fertilizer may be applied with each watering. Maximum growth may be obtained using bright full-spectrum fluorescent light (a mixture of cool and warm white), where bright, but indirect sunlight is not available, a constant 25 to 27^{o}C temperature, 70 to 90% relative humidity, and two 30 minute periods of darkness every 24 hours. The plant canopy must not be closer than 20 cm to the light. A moderate amount of air movement is necessary to provide adequate ventilation and to produce stronger stems. The use of carbon dioxide supplementation in greenhouses so equipped may be advantageous in promoting vigorous growth.

Hardening-Off

Before transplanting newly propagated material, hardening-off, or acclimatization to field conditions is necessary; this involves restricting water, switching to natural lighting and reducing the temperature.

Transplants must be hardened-off so that they can better withstand the move from the sheltered greenhouse or nursery environment to harsher field conditions, which may be warmer, colder, and drier. Hardening-off is a process of tempering whereby plants are gradually exposed to more sun and heat and/or lower temperatures, to wind, and to moisture stress. Hardening-off is a process of controlled stress which reduces the rate of transpiration and photosynthesis, causes plant tissue to become more dense (therefore containing less water), and encourages food storage in plant tissues because growth is slowed. The initial stages may involve some wilting, but plants should recuperate at night (as long as the central stem and growing tips remain green and firm, the plants are not being harmed). Hardened-off plants are better able to cope with subsequent droughts and are more productive under dry conditions.

Hardening-off should be initiated 2 weeks prior to transplanting. Hardening-off should not be overly excessive, otherwise plant growth will be affected for the rest of the growing season.

Selecting & Propagating New Varieties Of Saskatoons

It’s a simple matter for a grower to select and propagate their own new variety of saskatoon, which may have some superior characteristics, and which may eventually become a new cultivar. Special training is

not required, simply the ability to observe and compare.

When picking fruit from native stands of saskatoons, it's not unusual to notice that one particular shrub appears superior to the others around it. Fruit flavour, size, or shrub yield might be outstanding. A particular shrub may be known to you to bear consistent yields from year to year in contrast to others. The shrub may appear less diseased, or of a different stature. Such observations are the basis of new plant varieties and are invaluable in terms of new crop development. They are a way in which any grower can make a valuable contribution to a developing industry and the conservation of native fruit germplasm.

Some characterisitics to look for when selecting a new saskatoon variety include unusual fruit size, yield, health and vigour of the shrub, hardiness, fruit flavour, and apparent resistance to insect pests or diseases. Only one of these superior characterisitics need be present to make your find a valuable one.

The simplest methods to propagate a potential new variety include seed collection and germination, removal and rooting of suckers, and softwood cuttings. Ensure that the proper procedure for the method of propagation is followed. Such methods ensure the preservation of the parent plant, and the success of propagation. Uprooting and removal of the original plant is not recommended because it is unlikely that the plant will survive.