Ribes is the group of commercial berries that is most adaptable to long-term storage. Certain cultivars of gooseberries and red currants have been held for as long as three months at 0°C and the storage period can be increased with controlled atmosphere storage (CA). At present, the ribes industry is developing again in the US, and demand is growing. In spite of the growth, producers often experience a backlog of fruit during the peak production season in the Northeast, and lower prices due to excess inventory. Controlled atmosphere storage (CA) is a tool that can help to level out supply and prices and make currants and gooseberries available over an extended season.

Successful CA storage of currants and gooseberries is dependent on optimal cultural practices and acceptable weather during the growing season. Healthy berries (defined as full green strips of disease-free red ripe berries) going into CA will have a longer storage life with higher quality than berries that have been stressed or subject to pathogens before storage. This article will first focus on cultural practices and storage techniques as the key parameters that can be controlled by growers. The impact of weather during the growing season is considered, and then recommendations are made for storage practices that match the weather conditions encountered during the year.

Cultural Practices

Training and Pruning - Cordon training is recommended for getting into production quickly, and for growing the best quality fruit. One way to keep cordon development is to grow the plants for one year as a bush to develop the root system. The cordon branches are selected in the following year, and forced up the stake by taking advantage of the developed roots and providing plenty of water and nutrients. The goal is to keep the plants very vegetative so that roots will be nourished during the growing season in anticipation of pushing the next year’s growth. These plants also have plenty of leaves to nourish developing fruit.

Most pruning is done during the summer. Spent branches that have produced fruit during the fruiting season are removed after harvest as well as any strong, upright branches coming from the base of the plant. Long branches are tipped in the greenhouse and the tip of any excess branches, leaving only two to three medium-sized branches per cordon. Summer and winter pruning regulate the size of the fruit crop and encourage vigorous vegetative growth to nourish the crop and roots. Light penetration is improved through proper pruning which improves fruit quality and keeps inner parts of the plant from dying out.

Finally, younger healthier plants produce fruit that can be stored longer. For example, in general terms, three-year-old plants might produce fruit of a quality that can be stored until April, while five-year-old plants produce fruit that can be stored until November. The more uniformly healthy a planting is kept, the higher the potential for longer CA storage of fruit from that block. Pruning practices help to keep plants young and uniform. Growers should be aware of the condition of each cordon, and should replace them if they stagnate. Blocks should be replanted as needed depending on their health and vigor.

Soil Quality - Choosing well-drained, friable soil is critical to having optimal root development. Freedom from excess water, and the presence of sufficient oxygen are necessary along with the availability of abundant nutrients, especially NPK.

Water - Preventing water stress on plants is critical for obtaining a quality crop. Remember that water is needed for...
Empress – The fruit is large, oval to pointed, and oblong, with dark blue skin. It is free to partially freestone and non-shattering. The neck shrinks in dry seasons and can break down prematurely. In most seasons it is the best fresh market packing plum in Geneva’s trials. The tree is vigorous, somewhat upright and regularly productive if pollinized well. It blooms mid-late and is self-incompatible. It can be pollinized by Stanley, Victory, Moyer, French Prune and Damson. According to the first year’s results in an Empress pollination trial, Damson is the most effective pollinizer. Undoubtedly many other blue plum varieties will pollinize it. In Geneva it ripens in late September. The fruit is firm and well-suited for packing and shipping.

Italian Prune – This very well-established variety is also known as Fellenberg. It is an important variety with diverse uses – fresh, canning, and drying. It is a favorite of many growers in New York for its hardiness and disease resistance. Its fruit is firm and well-suited for packing and shipping. Autumn Sweet seems much better. Its fruit is firm and well-suited for packing and shipping.

Valor – This is a medium size, blue skinned variety with amber flesh of good eating quality. It ripens in the third week of September in Geneva. The tree crops regularly, is somewhat thorny, and has moderate vigor with spreading habit. It is self-incompatible and is pollinized effectively by Stanley, Italian Prune and Longjohn. This fruit is firm and well-suited for packing and shipping.

Pozegaca – This is an old and famous variety from Eastern Europe with high quality and many uses. One of the more common synonyms is Hauszwetsche. In Eastern Europe it has many clones, which have been developed over centuries. Most of the types we have seen in Geneva have small to medium sized fruit with a blue skin and a waxy bloom. The flesh is firm, greenish or amber with high sugar and a good acid balance. Most types have a pleasant level of astringency, similar to Italian. The pit separates easily. It is self-fruitful with an upright tree form. In most seasons the fruit hangs quite well on the tree for several weeks after maturity. This variety is very susceptible to the plum-pox virus. In Eastern Europe it is used for many processing purposes including preserves and brandy. We made a nice preserve from it in 2003.

President – This is a medium large oblong plum with skin color like Valor, reddish blue, and dark yellow firm flesh. It is both crisp and sweet with good acid balance and a slight bit of astringency. It ripens in late September and is not as large as Empress. It pollinizes Empress very well and vice versa.

Greengage Plum Types
These are also known as Reine-Claude types and date back to their introduction from Armenia into France at about 1500 A.D. Usually they have small, round, generally green, yellow or blushed fruit with special flavors/aromas that are highly prized by connoisseurs. Usually they have softer flesh texture than most

Weed Control – Weed control is important to help prevent water and nutrient stress in plants. In addition, good weed control helps improve air ventilation, and reduces disease potential.

Disease Control – Botrytis is the main disease that can cause fruit spoilage. A spray program should be considered if Botrytis has been or becomes a problem. The berries are most susceptible during flowering and become more resistant after flowering. The stem and flower end of the berry are most susceptible to infection. In Holland, it is assumed that 50% of the spray protection is lost after about 25 mm of rain, and another application of fungicide is made. When plastic roofs or greenhouses are used, much less spray is used.

Climate Control – The use of greenhouses is a way to control free water, humidity, light, temperature, and to some extent disease. The value of the crop must justify its use, and this is probably only possible in some cases for an early season crop. Plastic roof structures are a less expensive alternative that can have many of the same benefits as a greenhouse except for humidity and temperature control.

Cultivar Choice – Certain cultivars such as Rovada have the genetic predisposition to long strigs of large-sized berries. Choosing a cultivar that has the genetic capability of producing the quality of fruit one wants is the first step to achieving quality. Cultural practices will help to optimize the potential available to the plant due to a genetic make-up. Other considerations such as chill requirements, pest resistance, and winter cold resistance are also factors to weigh in cultivar selection.

Impact of Weather
Chill Periods - The proper cultivar must be chosen for the time of year production is desired, and for either greenhouse or outdoor production. This is because each cultivar has somewhat different chill requirements (from about

Figure 1. Trellised red currant in the greenhouse.
Figure 2. Harvested red currants
Figure 3. Packing red currants
Figure 4. Packaged red currants
Figure 5. Boxes of red currants in CA storage. Bag is sealed at base of pallet with sensing and gas-feed lines attached.
Figure 6. Botrytis causes some loss during storage.

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California Blue – This is a round, medium-large, unevenly shaped plum that is firm enough to pack and ship for three days after Shiro. Flavor is good and firm enough to pack and ship to wholesale markets.

Jostaberries – This variety was released by Cornell in 1972. It has a maroon/purple color and is self-incompatible. The plum is firm enough to pack and ship to wholesale markets.

Ruby Queen – This variety produces the largest fruit of the varieties tested. It has red/purple skin, yellow flesh and ripens around Labor Day in Geneva. The tree is vigorous and the fruit is self-incompatible, bright and similar to Osahi in hardness. It should not be tried in regions that do not have success with growing other peach varieties. It is self-incompatible and pollinated well by Burbank.

Ersinger – This variety has good flavor if not too heavily cropped. It ripens two weeks before Burbank and has good potential for many other varieties.

Valerie – This is a Vineland, Ontario selection. It ripens in early August in Geneva this blue plum with a nice flavor can overset and be small. This variety does not drop. It needs a pollinator and Stanley and Valor both work. Valene pollinates Valerie but Valene will not pollinate Valerie.

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European Blue Plum Types

This group of blue and purple/ blue plums forms a type group spanning an eight-week ripening period from early August to late September. Many shapes, flavors and textures are represented. Good eating quality, regular cropping and good tree longevity were the primary traits used as a basis for their recommendation.

Ensinger - This ‘German Prune’ style of fruit (meaning that it is oboilegged and has blue skin) has very good flavor. It ripens in early July or early August in Geneva, amongst the earliest blue plums. It crops heavily and retains its flavor very well but it is not firm enough to ship.

Erlaiblite – Similar to Ensinger in size and shape, it has darker blue color and slightly blander flavor. It is not firm enough to ship.

3,500 - 2,000 hours) which are critical for flower bud development. According to the Utah method, chill requirements are as follows: Juniper (the common greenhouse cultivar) 1500 hours, Rovada 1800 hours, and Jenkon van Tets, more than 1850 hours. If greenhouse grown, the temperature should be kept between 2.7°C (51°F) until the chill period has been satisfied. In outdoor production in the Northeast, these chill periods are normally satisfied naturally without problems.

Temperature - The flowering period would ideally have maximum temperatures of 22°C. A minimum of 17-20°C will help to insure better movement of bees. Wind also helps with the pollination process. Excessive heat can burn tender tissue and scar berries, and can also stress the plant. Shading or water sprayed overhead can prevent damage.

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Rain - Top irrigation or rain normally help the development of better quality fruit than drip irrigation. If it were economically feasible, placing plastic roofs only for the flowering and ripening phases of production would be ideal. The roofs would be off during the rest of the season.

General CA Recommendations

Harvest and Handling - Unripe berries have a shorter CA storage life than ripe ones. A test can be done to determine the best point at which to harvest. Testing begins five weeks before harvest and is done every few days depending on how warm the temperature is. Twenty-five bushes are chosen to sample, and a cluster from the top, middle, and side of the bushes are picked. Clusters from all plants chosen in the same general location are grouped together (i.e. all tops, sides, middles). The first and last berries on the strigs are pulled and mixed together to get a range of measurements. The following readings are graphed, and when the brix reading from the last berry of a self-incompatible bunch equals the reading of the first berries, and the readings from the inside of the bush stabilize, fruit should be harvested. No wet berries should be picked, and care should be taken not to bruise or crush berries. Berries are often picked into one quart, cardboard pulp baskets for CA storage.

Placing Into CA Storage - Fruit should be cooled to 0°C with no condensation to begin. They are then placed into a large plastic bag which fits over a pallet that seals the bag on the bottom. Oxygen content is lowered to 2-3% by replacing the air with nitrogen. The carbon dioxide level is raised to 20-25%, and temperature maintained at 0.5 - 0.9°C. More carbon dioxide is used in years as pests or diseases were stressed and berries are a bit yellow. The cardboard baskets and boxes used help to absorb free water that might result from unwanted condensation. Avoiding rapid temperature changes will help prevent condensation. An RH of 93% is ideal. If plants have been stressed during the growing season, or the fruit is coming from an older or non-uniform block, storage life will be reduced.

Possible Problems

Pale Berries- Berries can lose their bright red color and become pale and appear water-soaked if oxygen levels are too low in CA storage. Picking too early causes the same appearance.

Yellow Strips - The yellow color results when plants were stressed during their first phase of growth (May and June).

Botrytis- Infections normally take place during flowering, even though the fungus doesn't develop until berries ripen.

Short Strips - Last half of strip with no flowers! Short strips are caused by a lack of chill period.

Berries Are Weak and Burst- Plants probably lacked water in the first growth phase (May-June), and had excess water in the last phase to ripening.

Last Berries Don’t Ripen - If the last berries on the strip don’t ripen, this is usually because the plant did not have enough leaf area. Pruning and water/ fertilization can help improve this situation.

Gooseberries

The CA storage techniques for gooseberries are not as well tested and developed as for red currants. Some cultivars can be stored at 0°C for at least three months without CA if harvested at a green, mature stage. The berries will ripen off the plant at room temperature, and also over a more extended time period in cold storage. They are sensitive to ethylene, and ethylene will speed the ripening process. Two approaches could be taken with gooseberries. One would be to harvest at a green mature stage and place in CA conditions similar to red currants. Ethylene scrubbers could likely extend storage life. A second approach not yet tested might be to harvest at a 3/4 ripe stage and treat with MCP. Dutch researchers are planning to do further research with the second option.

Resources

A more complete guide to CA storage of Ribes will be available this spring from Cornell Cooperative Extension of Columbia County, 518-828-3346. A good blue book on Ribes production is also available. Currents, Gooseberries, and Jostaberries: A Guide For Growers, Marketers, Processors and retailers In North America by Danny I. Barney, and Kim Hummer.