MANAGING SMALL FRUIT CROPS FOR THE RETAIL MARKET

Marvin P. Pritts, Department of Horticulture, Cornell University's COLLEGE OF Agriculture and Life Sciences, Ithaca, NY

The market for the small fruit grower is changing. Pick-your-own (PYO) sales are either stable or declining, while demand for pre-picked fruit is growing. The increase in per capita consumption of small fruits and changing family priorities are fueling this demand. Furthermore, consumers expect fresh berries to be available throughout the year, not just in early summer. Many growers find that they can no longer support themselves through PYO sales alone, and must adapt to this changing market situation.

Growers should begin to think in terms of producing a portion of the crop for the retail or wholesale market, and extending the season as much as possible. Supermarket produce buyers are more interested in purchasing fruit when it is available for an extended period of time. Only 15% of the strawberries consumed in New York State are produced there, primarily because supermarkets may not deal directly with small, local growers with limited product availability. Furthermore, smaller growers often do not treat their fruit properly for extended shelf life, so supermarket produce buyers have been reluctant to purchase local fruit.

A tremendous opportunity exists for those willing to take the extra steps that are required for meeting new market demands. With some supervised harvesting, a facility to remove field heat and to keep berries cool, a refrigerated truck, and a few phone calls, your berries could be on supermarket shelves anywhere in North America.

Marketing pre-picked berries requires better planning and management than growing for pick-your-own because your job does not end when the berries get ripe. Not only must berries be harvested under your supervision, but they must be maintained in excellent condition for delivery to the customer who may be miles away. Berries that are harvested in the field and transported to the customer without special treatment, will often arrive in an unacceptable condition. Although small fruits are very perishable commodities, there are measures that can be taken to ensure a long shelf life, some of which begin when the site is initially selected and prepared for planting.

Preharvest Considerations

Cultivar selection has an important influence on the quality of product in the market. 'Sparkle', 'Catskill' and 'Delite' strawberries can no longer compete with the firmer fruit of 'Allstar', 'Holiday' or 'Honeoye'. 'Newburgh' is one of the firmer raspberries, and would be superior to 'Reveille' or 'Boyne' for shipping or retail sales. Blueberry cultivars chosen for shipping should have a dry scar. This means that the point of attachment to the pedicel (fruit stem) should be brown after detachment, and no white flesh should be observed. Cultivars with good scars include 'Collins', 'Patriot', 'Blueray', 'Bluecrop' and 'Coville'. The skin of 'Bluetta', 'Herbert' and 'Lateblue' tends to tear when picked, and this exposes the sugary interior of the berry to molds.

Selection of a site with good air drainage, and planting in a row orientation parallel to the prevailing summer winds will improve the quality of harvested fruit. Proper plant densities will also reduce disease pressure on fruit. Trellising brambles and pruning blueberries will allow air and light movement in the canopy so a less favorable environment is created for decay organisms. Rain and dew increase the susceptibility of infection, but this moisture will evaporate quickly in a sparse canopy with good air circulation. For brambles and blueberries, trickle irrigation is better than overhead irrigation since the fruit is not wetted during water application.

Proper fertilization is also an important component of good shelf life. Fruit from plants that are nutritionally stressed will have a shorter shelf life than fruit from healthy plants. It is essential that adequate potassium and calcium are available to the plant, and that nitrogen is not too high. For example, a strong relationship exists between nitrogen availability and fruit softness in strawberry. A leaf analysis aids in fine-tuning the fertilizer program.

Fungicides applied at petal fall will significantly reduce the number of moldy berries in strawberries and bramble fruit. Gray mold (Botrytis cinerea) readily infects senescing petals, and grows from them into developing fruit before it ripens. Such berries may have no visible signs of infection until harvest. Thus, timely petal fall sprays are essential, especially during cool, humid weather.

Some insects cause minor physical damage when feeding on the fruit, but even small wounds are sites for fungal infection. Certain insects may spread bacteria and fungi from fruit to fruit. If insecticides are used to control these pests, be sure to consider the days-to-harvest restrictions.

Harvest Considerations

Blueberries are not as perishable as other small fruit crops, and local berries have been sold in supermarkets for several years. A blueberry can remain on the bush for more than a week after ripening without spoiling. This has allowed the grower to guarantee price, quantity and delivery date to produce buyers up to one week in advance, something which has been difficult to do with raspberries and strawberries.

Raspberries and strawberries ripen quickly, so harvesting the same planting frequently (once every two days) is critical. Fruit harvested before it is fully ripe will have a much longer shelf life than fully ripe or overripe fruit. The optimum stage of maturity for the raspberry occurs when the berry first becomes completely red, but before any darker hues develop. Strawberries with a white tip will retain their firmness much longer than those harvested fully ripe, and will lose less water during storage. Some training may be required to teach pickers the proper stage and appearance for harvesting.

Fruit quality for fresh market raspberries usually declines as the season progresses. Be sure the marketing channels are open before the first berries ripen as these will likely have the highest quality and largest size for the season.

Avoid touching a berry before it is ready for harvest. Place only undamaged berries with good appearance in the pack. Studies have found that the magnitude of injury caused by human pickers can be so great as to mask any other causes of deterioration.

Overripe berries are susceptible to mold. Once the mold growing on overripe berries sporulates, large amounts of inoculum will be present to infect other ripening fruit. Overripe berries also attract ants, wasps and other pests. Do not dispose of rotten berries near the field, and pick them off the bushes. It may be more economical in the long run to pay pickers for harvesting rotten as well as marketable fruit. One could pay an hourly wage to a worker for harvesting only rotten berries so the other pickers will not contaminate their marketable berries with fungal spores.

Harvest directly into small containers. Use half-pints for raspberries and blackberries, and pints for the other small fruit crops. Wide, shallow containers are better than deep containers. Check with the buyer to determine what type of container is preferable; each type has advantages and disadvantages. The pulp containers are inexpensive, but stain easily. Wooden containers also stain and are expensive. Solid clear plastic (polystyrene) containers will not stain, they significantly reduce moisture loss when used with a cap, customers can see all the berries they purchase, and they are inexpensive; however, juice can accumulate at the bottom. It is difficult to cool berries in either of these types, and mold tends to develop on the lower berries. The slitted plastic containers allow for rapid cooling, do not stain, and do not accumulate juice; however, if the slits are too wide, berries can be damaged. A narrowly slitted plastic half pint container with a plastic wrap is often used by large wholesalers.

Postharvest Considerations

Much time and effort can be expended to produce and harvest a good crop of berries, only to have the crop deteriorate before it is sold. This deterioration is caused by respiration of the fruit. Respiration occurs in all living organisms and is the process by which food reserves are converted into energy. In a complex series of reactions, starches and sugars are converted first to organic acids, then to more simple carbon compounds. Oxygen from the surrounding air is used, and carbon dioxide and heat are released. Respiration of fruits results in shrinkage and reduced sweetness. Raspberries and blackberries have a higher respiration rate than any other fruits, while strawberries follow closely on the list. Note that raspberries respire as much at a freezing temperature as oranges do at room temperature. Conditions which slow the respiration process are low temperatures, high carbon dioxide levels and low oxygen in the storage chamber.

Temperature is the easiest and most effective condition to modify for extended storage of fruits. Some large shippers on the West Coast use a high carbon dioxide atmosphere, and there have been some attempts to use low oxygen storage, much like is done with apples. In small fruits, however, bad-tasting aldehydes and alcohols will accumulate in the fruit when oxygen is limited. Work is currently being conducted on overwraps that accumulate carbon dioxide in the pack, but even this new technology is not very effective without good temperature management.

A 10^{o}F reduction in temperature reduces the respiration rate by approximately 50%. Furthermore, at 77^{o}F and 30% relative humidity, fruit will lose water 35 times faster than it would at 32^{o}F and 90% relative humidity. Prompt cooling, and maintenance of proper temperatures and humidity, are essential.

The cooling process should occur in two stages. Simply setting harvested berries in a cold room is not adequate because the field heat is not removed fast enough. Rapid movement of cold, humid air through the berries is essential during the first few hours after harvest. Brokers contend that for every hour delay in cooling, shelf life is reduced by one day. Growers can take advantage of night cooling by harvesting fruit as early in the morning as possible.

Large growers may have a separate pre-cooling facility specifically designed for removing the field heat, but inexpensive, effective improvisations can be adapted for any cold storage. If a grower only has a walk-in cooler, recently picked flats of berries can be set into a cardboard box which is opened at both ends. A household fan is then placed at one end of the box to draw air through the flats. Once the berries are cool, flats are removed from the cardboard and wrapped in plastic. The plastic will reduce water loss during storage, and prevent condensation on the berries when flats are removed from the cooler. The plastic should not be removed until the temperature of the berries warms to near the temperature of the display. Condensation will then form only on the outside of the plastic, while the berries inside will remain dry.

The storage room itself can be maintained as low as 30°F. Berries will not freeze at or above this temperature because the sugars in the fruit depress the freezing point. One may want to maintain the storage at a slightly warmer temperature (32°F) to allow some room for error. Major shippers, however, report that storage at 40°F reduces shelf life by 50% compared to 30°F.
The selection of a cooling unit is very important when designing a cooler. If the temperature difference between the air and the cooling unit is large, then the condensers will accumulate ice from moisture in the air. This drying of the air would not cause a problem for dry goods, by will severely dehydrate fruit. The atmosphere around the fruit should be humid to prevent shrinkage, so a cooler should be selected which can maintain a relative humidity of 90-95% at 32°F. These types of coolers are more expensive and less common than those for dry goods. Consult your agricultural engineering specialist for help with selecting a cooling unit and building a storage facility.

Transporting Berries to Market

The loss of soft fruits such as raspberries and strawberries from harvest to the consumer's table is estimated at more than 40%. A 14% loss occurs from farmer to wholesaler, a 6% loss occurs from wholesaler to retailer, and 22% is lost between the retailer and consumer. Much of these losses are due to poor handling of berries after harvest.

There are many steps in the distribution chain which can negatively affect fruit quality. A typical handling scheme might be transporting berries from the field to the pre-cooler, wrapping flats after pre-cooling, loading into a refrigerated truck, transporting to a distribution center, unloading into the warehouse, loading into a truck, transporting to retail store, unloading, handling in the backroom, and setting up the display. Mishandling at any point along this route can result in unacceptable berries.

You should work to minimize the number of handling steps from field to display. Berries should remain cold and wrapped during each phase of transportation. Never allow the berries to sit on unrefrigerated loading docks. When loading a truck, stack flats on a palette and away from the walls. Ensure that cold air is free to circulate around the sides of the palette and across the top and bottom. When flats of fruit are allowed to touch the floor or side walls, temperatures in the flats can rise as much as 20°F. Do not stack flats directly over the rear wheels, and use strapping or stretch film to stabilize the load. Refrigerated trucks should be equipped with air-suspension systems rather than spring systems to reduce transit vibrations.

Most mechanical refrigeration equipment in current use is designed to maintain temperature, but lacks the air flow and refrigeration capacity for rapid cooling. Temperature regulating equipment in trucks does not have the accuracy to achieve temperatures below 40°F without danger of freezing. Furthermore, high density loads are used to minimize transportation costs, but this inhibits cooling during transit. Thorough product cooling before loading is very important.
Allow berries to warm only when they are ready for display to consumers, and before removing the plastic wrap over the flats. Any condensation will then form on the plastic wrap rather than on the berries inside.

Often the transportation of berries is beyond the control of the grower. To develop new and distant markets, receivers must be educated in proper handling procedures. Personal contact with the receiver before the first delivery is often useful. In other cases, handling instructions may be attached to the flats.

By using proper harvesting and storage techniques, it is possible to maintain quality raspberries for 7 days after harvest, and strawberries for 2 weeks. Blueberries can be maintained for 3 weeks after harvest. This is certainly enough time for growers to take advantage of distant markets throughout North America.

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