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A Longer Marketing Life for Blackberry and Raspberry Fruit*

Jayesh B. Samtani, Small Fruit Production Specialist, Horticulture, Hampton Roads Agricultural Research and Extension Center
Mosbah M. Kushad, Postharvest Physiologist, Crop Sciences, University of Illinois at Urbana-Champaign

Caneberries, which include blackberries and raspberries, must be picked when the berries are ripe or nearly ripe to ensure quality. Their thin fruit skin, high respiration rate, and high ethylene production make these berries extremely susceptible to postharvest losses. Although both raspberries and blackberries are considered "soft" fruits, raspberries are slightly more perishable in nature. The raspberry fruit is susceptible to greater moisture loss and fungal infection because of its lack of an outer protective covering (cuticle) and the fact that the raspberry fruit is left with a cavity in the center when detached from the plant.

The producer can expect close to 100 percent loss of salability (marketable quality) within 48 hours of picking if berries are mishandled and not cooled. The shelf life of berries can be shortened by numerous factors, including physical damage during harvest and handling, shriveling from moisture loss, fungal rot, and deterioration due to physiological factors.

Avoiding Damage to Berries

Minimizing Physical Damage

To minimize physical damage to berries,

1. Avoid shipping soft-fruited varieties, particularly for long distances. These include raspberry varieties 'Latham,' 'Cascade Dawn,' 'Malahat,' and 'Autumn Bliss' and blackberry varieties 'Shawnee' and 'Choctasaw.'

2. Harvest berries at the earliest acceptable stage of maturity for the intended market in order to maximize variety firmness. Fresh market berries are harvested at a less-ripe stage than berries used for processing but at a more-ripe stage than berries that get shipped long distances. Raspberries for long-distance shipping should be picked at the pink to light red stages, while fresh market berries can be picked at the red to dark red stages.

3. Choose containers that are adequately ventilated and do not have sharp or rough edges that could rupture fruit.

4. Pack fruit no more than three to four berries deep. This will help prevent crushing the fruit at lower levels in the container. Overfilling should be avoided to prevent bruising from the lid of the clamshell (fig. 1).

Figure 1. Berries stacked no more than three to four layers deep in ventilated containers. Take precautions to avoid overfilling containers in order to prevent injury from the lid of the clamshell that may occur when stacking containers. (Photo by J. Samtani, author.)

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5. Properly train each member of the picking crew not to grasp the fruit too tightly during picking. Fruit should be gently picked using a turning motion rather than a pulling motion; the thumb, index finger, and middle finger should be used with the palm facing up. Injuries to fruit can be minimized by picking from the exterior of the plant and working inward.

6. Combine the harvesting and grading processes into a single action. Harvest when fruit surfaces are dry and minimize mold growth by using only clean, nonmoldy fruit.

7. Maintain smooth roads and driveways from the picking site to the storage area.

8. Choose a smooth-riding truck with good tires, ideally with a refrigerated unit, to begin cooling in the field. In the absence of refrigeration, ensuring natural ventilation is the next best alternative (fig. 2).

Figure 2. Adequate windows provide natural ventilation in trucks that lack refrigeration facilities for shipping berries and other fresh produce to local markets. Also noteworthy is the exterior of the truck, designed to draw customer attention. (Photo by J. Samtani, author.)

9. Develop a farm-level quality control program that will allow for constant, detailed, and strict supervision from picking through shipping.

10. Emphasize the benefits of correct fruit handling and storage to wholesale and retail customers because they may be unfamiliar with the commodity.

Minimizing Water Loss and Fruit Rotting

Fruit maturity, the temperature within harvested berries, and the environmental conditions that berries are exposed to will directly affect any water loss, shriveling, softening, or rotting of berries. It is critically important to

1. Harvest frequently. Depending on the time period of the season, picking frequency could vary from one to five times per week.

2. Begin picking fruit early in the day, around sunrise, when the field heat is low. Lower field heat means a lower internal fruit temperature and, subsequently, requires less cooling of the fruit.

Both the above points require the farm manager to accurately estimate labor requirements and to plan an efficient harvest schedule. Prior managerial experience should be used to estimate these needs.

3. Protect harvested fruit from direct exposure to the sun by promptly transferring filled flats to a shaded field station, which could be an area in a permanent farm building or a temporary shed stationed under a large canopy tree. At all stages of handling, be sure the berries are not in direct contact with soil and are protected from birds and bird droppings. Growers who have a precooling facility should move the fruits there as quickly as possible (fig. 3). Forced-air cooling can be used to precool berry crops. In forced-air cooling, the pallets are stacked in two rows in a cold room with space left between the two rows to form a tunnel. A box fan is placed on one end of the tunnel, and a tarpaulin is placed over the cartons at the other end. Negative pressure created by the tunnel pushes the warm air out of the cartons and into the room.

   Virginia Cooperative Extension publication 442-060/AREC-118P, "Forced-Air Produce Cooler," describes construction of a forced-air cooler in detail. It is available at https://pubs.ext.vt.edu/442/442-060/442-060_pdf.pdf.

   Additional information on precooling systems can be found in the article "Pre-cooling Systems for Small-Scale Producers," available at http://ucce.ucdavis.edu/files/datastore/234-1594.pdf.

Figure 3. 'Prime-Ark 45' blackberries picked early in the day and brought to the shed. These berries were then precooled and placed in the cooler for the weekend markets. Berries in buckets are intended for processing. (Photo courtesy of Anne Geyer, Agriberry Farm, Mechanicsville, Virginia.)

4. Transfer fruit from the precooler to the main cold storage area when the fruit temperature has dropped by seven-eighths of the difference between its original temperature and the desired 32 degrees Fahrenheit. Fruit is adequately precooled when seven-eighths of the excess heat has been removed. How can a grower determine this time? The grower needs to remember that removing seven-eighths of the excess heat from fruit takes three times as long as it takes to remove half of the excess heat. Let's assume the original fruit temperature at picking or soon after harvesting is 90 F. To calculate one-half excess heat removal time, first use the formula to determine the drop in temperature needed:

(original fruit temperature − desired fruit temperature)/2.

For example,

(90 F − 32 F)/2 = 58 F/2 = 29 F,

so the temperature of the fruit will need to drop by 29 degrees. A one-half cooled fruit will have an internal temperature of

90 F − 29 F = 61 F.

The time needed to cool fruit from 90 F to 61 F is then used to predict when the load of fruit should be removed from the precooler. This prediction is based on the idea that the rate of cooling is constant. Thus, if the fruit were one-half cooled in one hour in the precooler, it would take three hours to make it seven-eights cool. In the absence of a good precooling facility, growers can expect shelf life of the fruits to decrease.

5. Monitor humidity in cold storage; relative humidity should be maintained at 90-95 percent. Avoid saturating the atmosphere because water accumulation on the fruit will encourage mold development and may damage fruit appearance.

6. Keep fruit temperature as near as possible to 32 F throughout the storage, shipping, and merchandising processes. To determine fruit temperature, insert a thermometer into the fruit container. Do not use storage room air temperature as an indicator of fruit temperature as it could be different. Blackberries can be held for two to 14 days at 31-32 F depending on variety and level of ripeness; raspberries can be stored for two to five days under the same conditions (fig. 4).

Figure 4. Berry and other fruit containers are seen stacked in a cooler. Cardboard "master" containers have holes in the sides to allow for cooling, along with reinforced corners for stacking and minimizing injury to the berries. (Photo by J. Samtani, author.)

7. Open doors to the cold storage room only as needed and tightly close them immediately after entering or exiting the storage area to prevent temperature fluctuations within the unit. Where possible, loading dock temperatures should also

be controlled to avoid berry heating during truck loading or unloading.

8. Prevent "sweating" of the fruit after refrigeration by sealing pallets or individual flats in moisture-proof wraps before removal from cold storage. This keeps moisture from condensing on cold fruit. These overwraps may be opened or removed for display at retail markets after the fruit has warmed to a temperature slightly above the dew point for the surrounding air. If fruit has warmed during transit, overwraps definitely should be opened before being returned to low storage temperatures at the destination. This minimizes moisture condensation, which may have accumulated inside the container from transpiration during the warmer shipping period.

Recommended Cultural Practices and Procedures

Postharvest fungal rots may be further reduced by certain cultural practices and procedures.

1. Select planting sites with good air movement and soil drainage.

2. Orient rows parallel to the direction of predominant summer winds to encourage moisture evaporation from fruit and foliage.

3. Follow proper plant densities and spacing at establishment, then prune and train berries to optimize sunlight penetration and air circulation in the plant canopy. Information on training and pruning of caneberries can be found in the 2008 Southeast Regional Bramble Production Guide, available at www.smallfruits.org/SmallFruitsRegGuide/Guides/2008/08BrambleguideMay22.pdf.

4. Use drip irrigation to avoid wetting the foliage and fruit.

5. Use effective culling procedures such as frequent harvesting and removal of over-ripe, damaged, or rotten fruit from the field.

6. Follow a preventive fungicide program based on the developmental cycles of the plant, the fruit, and/or the disease-causing organisms, as well as on the climatic conditions favorable to disease formation.

7. Use an effective integrated pest management program to control insects whose feeding activities may cause injuries that predispose the fruit to rot. This may include insects that act as vectors of fungi during visits to multiple plants, flowers, or fruits. In recent years, spotted wing drosophila (*Drosophila suzukii*), an insect that attacks ripening or ripened fruits, has been an issue with caneberry production in the United States. It is beyond the scope of this publication to discuss the nature and extent of damage caused by pests. Information on pests that attack caneberries and their control measures can be found in the 2015 Southeast Regional Caneberries Integrated Management Guide, available at http://www.smallfruits.org/SmallFruitsRegGuide/index.htm

Resources

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