Martin-Gatton
College of Agriculture, Food and Environment
Cooperative Extension Service

Plant Pathology Fact Sheet **PPFS-GEN-24**

Postharvest Disease Losses in Fruit & Vegetable Crops

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Importance

Fruits and vegetables are often soft, perishable, and particularly susceptible to a range of damage during harvest and storage. Worldwide, postharvest losses are approximately $150 billion or one-third of the world's food production. Individual growers can experience postharvest crop losses between 25% and 50% of fruit and vegetables. A significant percentage of postharvest losses are caused by plant diseases.

Postharvest diseases can begin before, during, or after harvest. Infection by disease-causing pathogens can occur in the field and/or through wounds during harvest. Under moist conditions or high humidity, these infections can develop into molds, rots, or other decay. Even produce destined for fresh market can develop postharvest diseases during short-term storage.

Infection in the Field

Plant diseases such as fruit rots, leaf spots, and root rots can occur while plants are growing or while fruit are maturing (Figures 1A, 1B & 1C). Management of plant diseases throughout the season, particularly as produce develops, is the first step in preventing infections from transferring to storage.

Field infections can occur days or weeks before harvest. Infections can remain latent (dormant) until produce reaches a particular stage of maturity or until certain environmental conditions are reached. While severely diseased fruit are often culled and discarded during harvest, infected asymptomatic fruit may make their way into harvest bins.

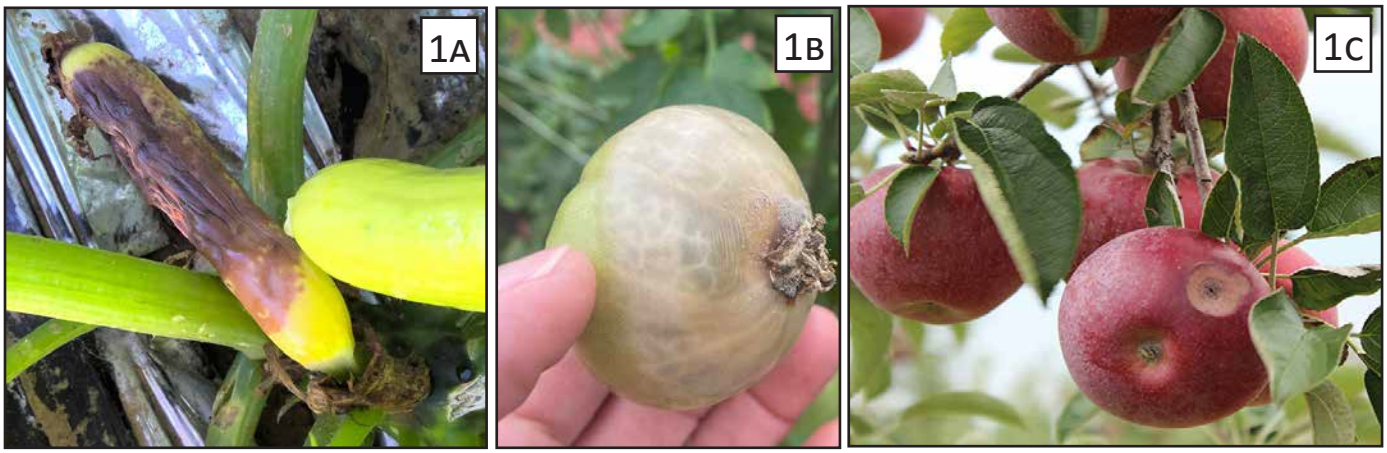

Figure 1. Plant diseases such as **(A)** Choanephora fruit rot, **(B)** Botrytis gray mold, and **(C)** bitter rot can begin in the field or greenhouse and advance in storage. [Photos: Kimberly Leonberger (1A) & Nicole Gauthier (1B & 1C), UK]

Infection in the Field (cont'd)

Management

To manage postharvest diseases caused by field infections:

- Maintain a disease management program all season.
- Discard diseased and damaged produce as soon as it is visible.
- Avoid mixing diseased produce with healthy produce (e.g., in storage bins).
- Apply fungicides at harvest or after harvest if field disease was present.

Infection During Harvest & Handling

Poor handling during harvest can also induce postharvest diseases. Wounds, bruising, desiccation, and exposure to temperature extremes can weaken produce and allow pathogen entry, resulting in disease (Figure 2A). Many of the same plant pathogens that infect crops in the field can also infect wounded or damaged produce during harvest. In addition, opportunistic and saprophytic organisms that do not typically cause field infections can enter tissue and cause disease during storage. Disease may appear soon after produce is moved to the cooler or storage, or there may be a delay in disease development (Figure 2B).

Management

To manage postharvest diseases caused by harvest damage:

- Minimize wounds and bruises during harvest, handling, and packaging.
- Raise bins and buckets off the ground during harvest.
- Cool produce as soon as possible.
- Avoid leaving harvested produce in the heat or sun.
- Wash dirty or muddy produce and dry thoroughly before storage.
- Wash and sanitize bins and equipment before each harvest.

Figure 2. Fruit wounds such as **(A)** abrasions or sunscald can allow entry by disease-causing pathogens, which can later lead to **(B)** disease onset in storage. Damage during harvest may increase the risk of disease development in storage. [Photos: Nicole Gauthier, UK]

Disease in Storage

Improper storage conditions can provide ideal environments for disease-causing organisms to infect (Figures 3A & B). Healthy produce can become diseased in storage when moisture is too high, temperatures are too warm, and pathogens are present. Storing produce at the lowest temperature within its range will slow pathogens and disease development. Recommendations on ideal storage conditions can be found in Vegetable Production Guide for Commercial Growers (ID-36). In addition, free water, such as wet floors, dripping condensers, and damp produce, can provide enough moisture to induce disease development (Figure 3A).

Microbes, including pathogens and opportunistic organisms, can be present on surfaces of produce, bins, and packaging. Equipment, tools, and surfaces should be washed and sanitized to avoid introduction of pathogens. Avoid using wooden storage bins and paper liners, as they cannot be thoroughly cleaned.

Management

To manage postharvest diseases during storage:

- Separate produce by type, harvest date, and field origin.
- Keep produce as cool as possible while remaining within the safe range for the specific produce.
- Monitor storage temperature and humidity.
- Increase ventilation.
- Raise produce off the floor.
- Reduce surface wetness by maintaining equipment and keeping produce dry.
- Follow a strict sanitation program, which is critical.
    - If fruits and vegetables must be washed before storage, they should be completely dry before storage.
    - Keep all surfaces clean; sanitize regularly.
    - Wash and sanitize all bins, tools, and harvest materials before bringing them into coolers or storage units (Figure 4).
    - Inspect stored produce regularly and discard damaged and diseased material immediately.

Figure 3. Conditions such as excess moisture and **(A)** improper storage may allow for disease development. **(B)** A single diseased apple can result in an entire bin of diseased fruit under improper storage conditions.
[Photos: Kimberly Leonberger (3A) & Nicole Gauthier (3B), UK]
Figure 4. Bins and other equipment should be washed and sanitized prior to using for storage of produce. [Photo: Kimberly Leonberger, UK]

Conclusion

Postharvest losses are commonly caused by disease. However, losses can also be initiated by or combined with abiotic issues. Managing diseases during production and following recommended harvest and storage methods can help mitigate losses (Figures 5A & B).

Figure 5. Storage facilities should always be kept clean with **(A)** produce kept off the floor, and **(B)** sorted and stored appropriately.
[Photos: Kimberly Leonberger (5A) & Nicole Gauthier (5B), UK]

Additional Resources

- Vegetable Production Guide for Commercial Growers (ID-36
https://www2.ca.uky.edu/agcomm/pubs/id/id36/id36.pdf

- Southeast U.S. Vegetable Crop Handbook (SEVEW)
https://vegetablegrowersnews.com/2023-southeast-vegetable-crop-handbook/?oly_enc_id=1683J5226656A4V

- UK Plant Pathology Extension Publications
https://plantpathology.ca.uky.edu/extension/publications

February 2024

Acknowledgments

Reviewers: The authors of this publication would like to thank Adam Leonberger, County Extension Agent for Horticulture, and Delia Scott, Horticulture Extension Associate, for their reviews of this publication.

Editor: Cheryl Kaiser, Plant Pathology Extension Support