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

Plant Pathology Research Report **PPRR-11**

A Survey of Postharvest Storage Disease Losses in Kentucky Fruits and Vegetables

Nicole Gauthier, *Plant Pathology Extension Specialist*
Kim Leonberger, *Plant Pathology Extension Associate*

Introduction

Specialty crops, such as tree fruits, small fruits, and vegetables, are important commodities for both small and large growers in Kentucky. The ability to store fruits and vegetables provides increased access to local food for more people and for longer durations. However, disease losses can occur in the field and during storage.

Specialty crop growers were surveyed between January 2022 and July 2024 to gain a better understanding of postharvest disease losses. Growers provided general demographic data, as well as information on storage practices and estimations of disease losses during storage. The objective of this survey was to determine the extent of postharvest disease losses for various types of fruit and vegetable crops. Ultimately, Extension specialists and researchers will use this data to prioritize programs and resources by focusing on crops with the greatest postharvest storage losses.

Growers Surveyed

A total of 53 growers responded to the survey. Growers represented a wide range of production acres (Figure 1). Most farms (45%) were less than ten acres, while only a small percentage (11%) were greater than 100 acres.

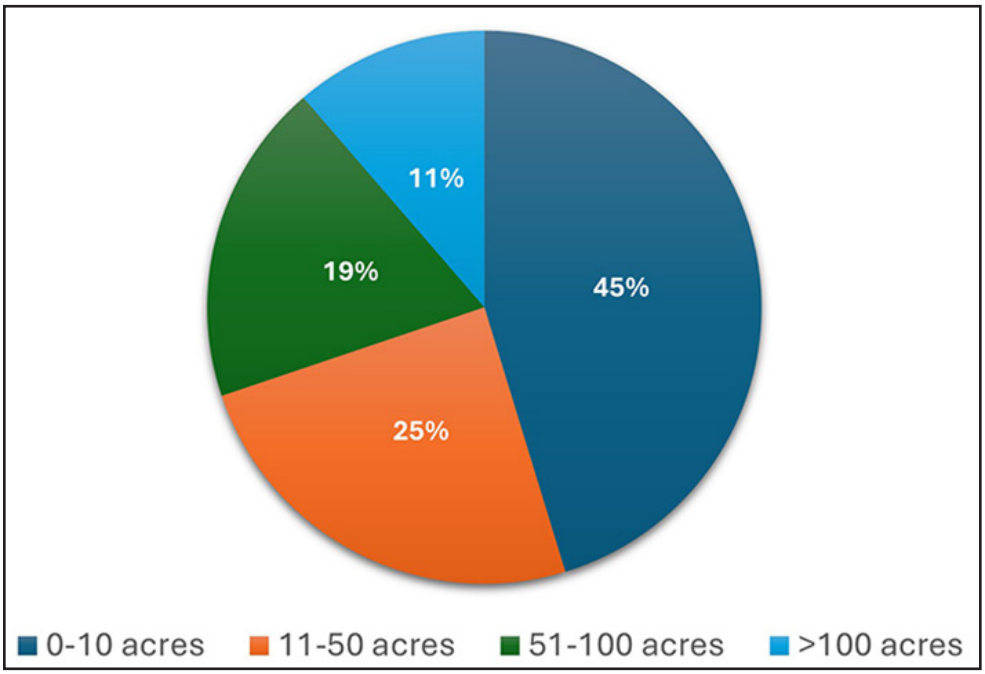


Figure 1. Production acres for fruit and vegetables growers surveyed in this study.

Time In Storage

Growers provided information on the amount of time that fruits and vegetables were stored before sale. Responses were measured for leafy greens (e.g., lettuce and spinach), fruiting vegetables (e.g., tomatoes, peppers, and cucumbers), root vegetables (e.g., potatoes and carrots), tree fruits (e.g., apples and peaches), and small fruits (e.g., brambles and strawberries). Results are presented in Figure 2.

The highest percentage of growers indicated that they stored fruits and vegetables for one week or less. This is likely due to reduced space or equipment for storage, to the longevity of certain fleshy crops, or to the short turnaround time from harvest to sale. Only a small number of growers reported storing produce for more than four weeks.

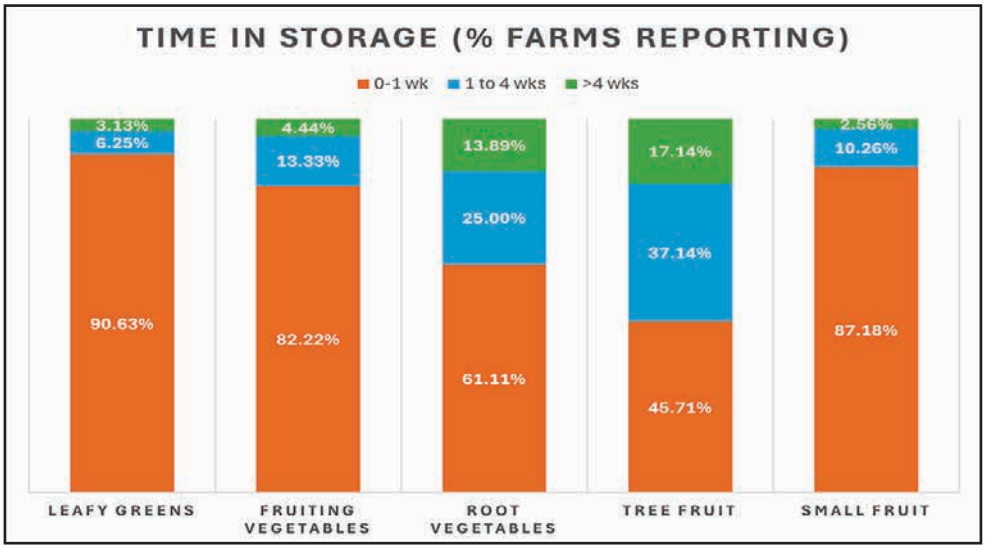
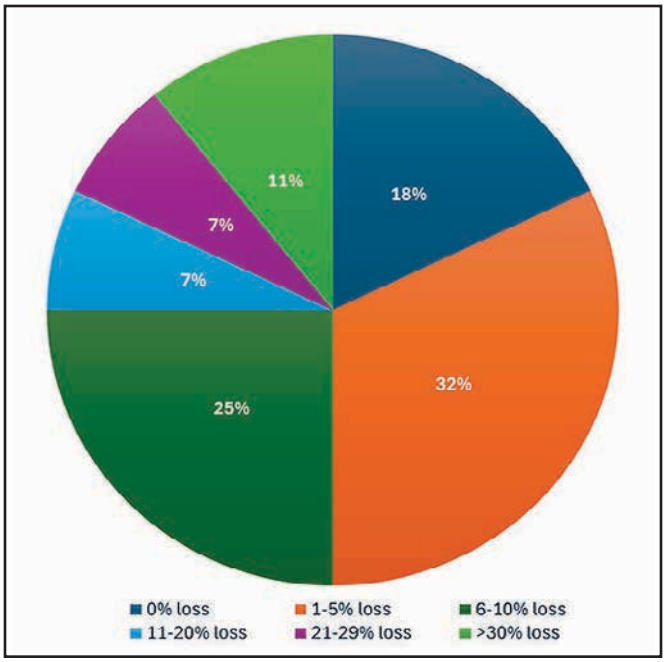


Figure 2: Percentage of farms storing vegetables and fruits for specified time ranges.

Disease Losses In Storage

Leafy Greens

Leafy greens include a wide range of edible plants, including salad greens and cole crops. Those with delicate leaves are most susceptible to damage, but all leafy greens have short shelf lives. According to the survey, over 90% of leafy greens are stored for less than one week before sale. Despite short times, growers reported high disease losses; 25% of growers reported losses above 10%. This is likely due to extreme sensitivity to heat and drought during harvest and to sensitivity to extreme cold and leaf wetness during storage. Pathogens can easily infect damaged and wounded tissue. Postharvest disease losses reported for leafy greens ranged from 0 to 80%.



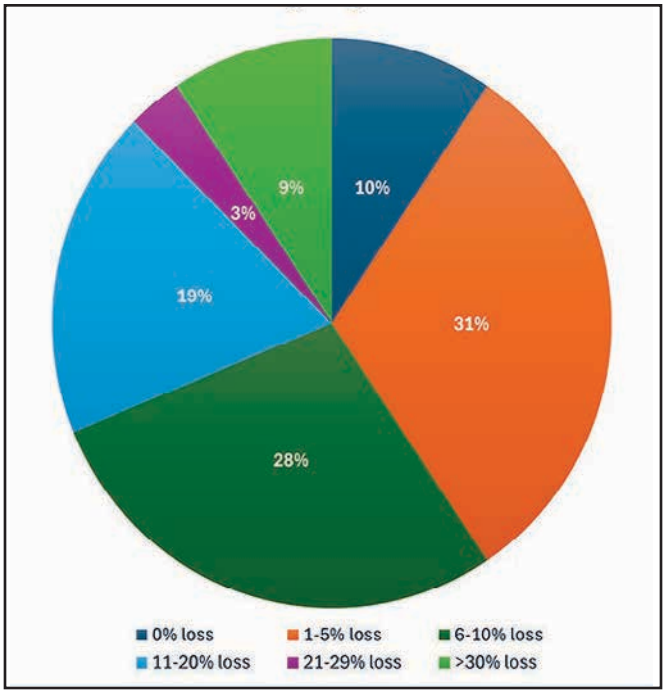
Disease Loss	
Maximum losses	Average loss
80%	12%

Time in Storage		
<1 wk	1 to 4 wks	>4 wks
90.63%	6.25%	3.13%

Figure 3: Percentage of **Leafy Green** growers reporting disease losses in storage.

Fruiting Vegetables

Fruiting vegetables include solanaceous crops and cucurbits. While some of the fruits, such as winter squash, have moderately long storage lives, many of these fruiting vegetables, particularly fleshy fruits such as tomatoes and peppers, are stored for short periods. Many fruiting vegetables are consumed fresh. Fruiting vegetables are easily wounded during harvest and packing, which can make them susceptible to fruit rot and mold pathogens. Further, many diseases found in production fields can infect fruits and transfer to storage. Postharvest disease losses reported for fruiting vegetables ranged from 0 to 100%.



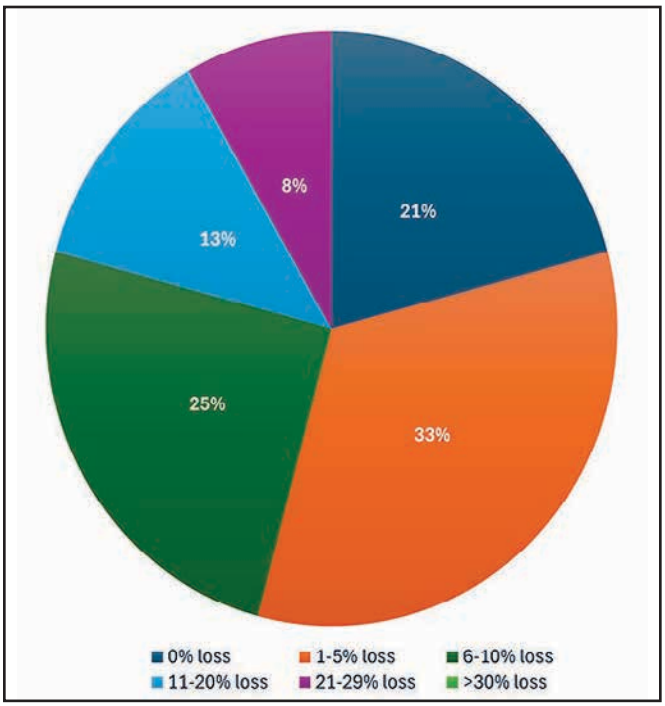
Disease Loss	
Maximum losses	Average loss
100%	13%

Time in Storage		
<1 wk	1 to 4 wks	>4 wks
82.22%	13.33%	4.44%

Figure 4: Percentage of **Fruiting Vegetable** growers reporting disease losses in storage.

Root Vegetables

Root vegetables, including beets, carrots, and potatoes, are known for their long storage lives. In Kentucky, some root vegetables, such as carrots, are popular fresh market items and are stored for short periods. Other root vegetables may be stored for several months. Field diseases, particularly those that are soilborne, can infect roots and tubers, transfer to storage facilities, and cause storage rots. Bruising and wounding during harvest and handling can also increase disease susceptibility. Thick skins and the curing process can help healthy root vegetables remain in storage for long periods. Over 20% of growers reported zero losses during storage, and the maximum postharvest disease loss reported for root vegetables was 25%.



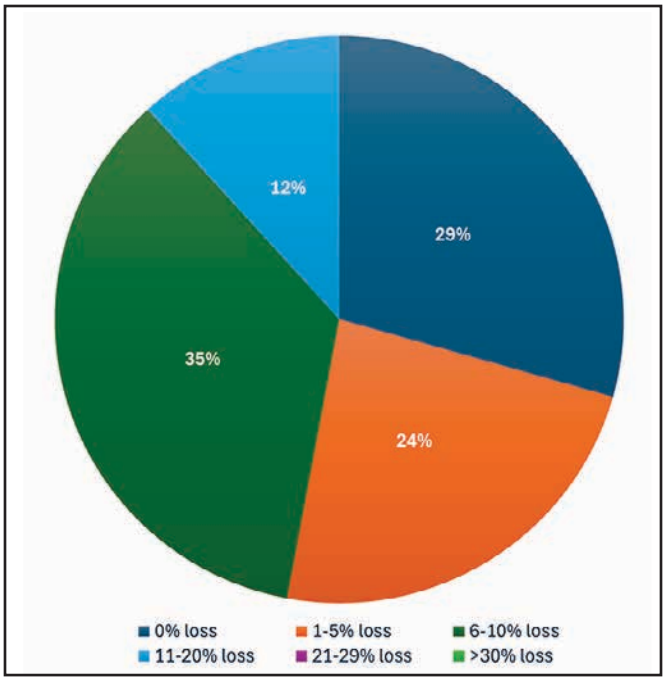
Disease Loss	
Maximum losses	Average loss
25%	8%

Time in Storage		
<1 wk	1 to 4 wks	>4 wks
61.11%	25.00%	13.89%

Figure 5: Percentage of **Root Vegetable** growers reporting disease losses in storage.

Tree Fruit

Apples and peaches are the most popular tree fruits. Some apple and pear cultivars can remain in storage for long periods, but they are typically sold as fresh market fruits in Kentucky. Fleshy peaches and plums have short shelf lives and must be consumed or processed soon after harvest. Postharvest tree fruit disease losses are likely higher for stone fruits, but overall postharvest losses for tree fruits were lower than losses for other crops reported in this survey. Nearly 30% of growers reported zero losses during storage, and the maximum postharvest disease loss reported in this survey was 20%.

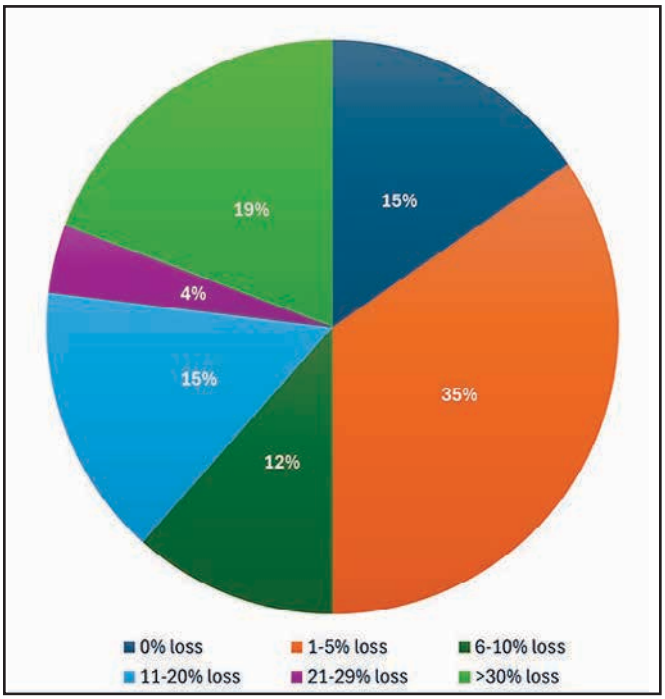


Disease Loss		Time in Storage		
Maximum losses	Average loss	<1 wk	1 to 4 wks	>4 wks
20%	6%	45.71%	37.14%	17.14%

Figure 6: Percentage of **Tree Fruit** growers reporting disease losses in storage.

Small Fruit

Small fruits represented in this study included blueberry, blackberry, raspberry, and strawberry. Due to their tender flesh, small fruits are typically stored for short periods; 87% of surveyed growers reported storage times of less than 1 week. Although small fruits are susceptible to a range of fruit rot pathogens in the field, these fleshy fruits are also easily damaged during harvest. Postharvest rots consist primarily of secondary invaders that thrive on ripe fruit. As a result, high levels of molds and rot can develop in short storage periods. Nearly 40% of growers who participated in this survey reported losses above 10%. Postharvest disease losses for small fruits ranged from 0 to 65% with an average loss of 14%.



Disease Loss		Time in Storage		
Maximum losses	Average loss	<1 wk	1 to 4 wks	>4 wks
65%	14%	87.18%	10.26%	2.56%

Figure 7: Percentage of **Small Fruit** growers reporting disease losses in storage.

Conclusion

This survey revealed high levels of disease losses for fruits and vegetables in short-term storage. Produce with the highest postharvest losses were (1) small fruit, (2) fruiting vegetables, and (3) leafy greens, all of which have fleshy skin and are at the highest risk for physical damage during harvest and handling.

Postharvest losses can be reduced by managing diseases in the field, during harvest, and in storage. Reducing postharvest losses begins with healthy produce. Managing field and greenhouse diseases helps reduce the number of bacterial and fungal pathogens that transfer into storage. Harvest practices should prioritize minimization of bruising and wounding, protection from cross-contamination, and rapidly transferring produce to cooling facilities. In storage, even if for short periods, proper temperature and humidity are important. Risk for infection by opportunistic decay pathogens can be significantly reduced by considering sanitation at every step of the harvest and storage process. See *Postharvest Disease Losses in Fruit and Vegetable Crops* (PPFS-GEN-24).

More than 90% of growers surveyed indicated that it is important or extremely important to receive additional resources such as publications and trainings focused on reducing postharvest losses.

Additional Resources

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

- Postharvest Disease Losses in Fruit & Vegetable Crops (PPFS-GEN-24)
https://plantpathology.ca.uky.edu/files/ppfs-gen-24.pdf

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Editor: Cheryl Kaiser, Plant Pathology Extension Support