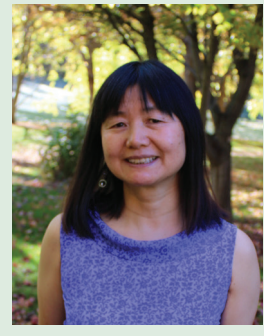


Interaction of resident microbiome and *Listeria* on pears during cold storage



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Project funding dates

January 1, 2023 – December 31, 2024

Acknowledgements

We express our gratitude to the Washington apple industry and the Washington Tree Fruit Research Commission for their valuable input, support, and for providing storage facilities. Our thanks also go to the dedicated team of graduate students and staff from WSU for their valuable contributions.

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Summary

Although there have been no listeriosis outbreaks associated with fresh whole pears, recent recalls and outbreaks associated with other tree fruits due to potential *L. monocytogenes* contamination have prompted the pear industry to implement validated interventions and proactive measures to minimize post-harvest risks. The microbiome of pear surfaces is thought to play a role in the persistence of foodborne pathogens. However, there is a general lack of knowledge on the fate of *Listeria* on pears during storage, as well as the dynamic changes of the pear microbiome over long-term cold storage and the impact of such changes on the survival of *Listeria* on pears. The overall objective is to evaluate the temporal changes of the microbiome and its interactions with *Listeria* on pears.

Objectives

1. Examine the fate of *Listeria* and temporal changes of the resident microbiome on pears and their interactions during long-term cold storage.
2. Evaluate the impacts of organic practices on the microbiome community and persistence of *Listeria* on pears of the selected varieties during long-term storage.

Methods

Unwaxed pears of the selected varieties at commercial maturity will be inoculated with or without *Listeria innocua*, a nonpathogenic surrogate of *L. monocytogenes*, and stored in commercial cold storage facilities for up to 9 months, following the pear industry's storage practices. Pears stored under storage will be sampled at 0, 3, 6, 12, 24, and 36 weeks of storage to examine temporal changes of the microbiome using metagenomic sequencing. The die-off of *Listeria* on pears and the interactions between *L. innocua* and the resident microbiome will also be examined. Total resident bacterial counts, yeast/mold counts, and the selected resident microbes will be further enumerated at each sampling point. Fruit quality attributes will be assessed during storage and correlated with microbial data.

Results to Date

The initial inoculation level of *L. innocua* on pears of the selected pear cultivars was ~6.5 log CFU/pear before storage. Reductions of *L. innocua* on pears were 2.5–2.9 log during up to 36 weeks of storage, irrespective of storage conditions, with most of the reductions achieved during the first 24 weeks of storage (**Figure 1**). The counts of indigenous bacteria on received pears were ~3.5 log CFU/pear, regardless of cultivars, and decreased by 1.2–1.6 log CFU/pear in up to 36-week commercial cold storage (**Figure 2**). Similarly, the initial counts of yeasts and molds of pears at harvest were ~3.5 log CFU/pear across cultivars, increasing by 1.2–1.6 log CFU/pear in up to 36-week commercial cold storage (**Figure 3**).

Benefits to the Industry

Successful completion of this project will provide the fresh pear industry with a better understanding of *Listeria* survival on pear surfaces and its interactions with indigenous microbiota on pear surfaces, offering vital information to optimize agricultural practices and storage conditions to ensure microbiological safety.

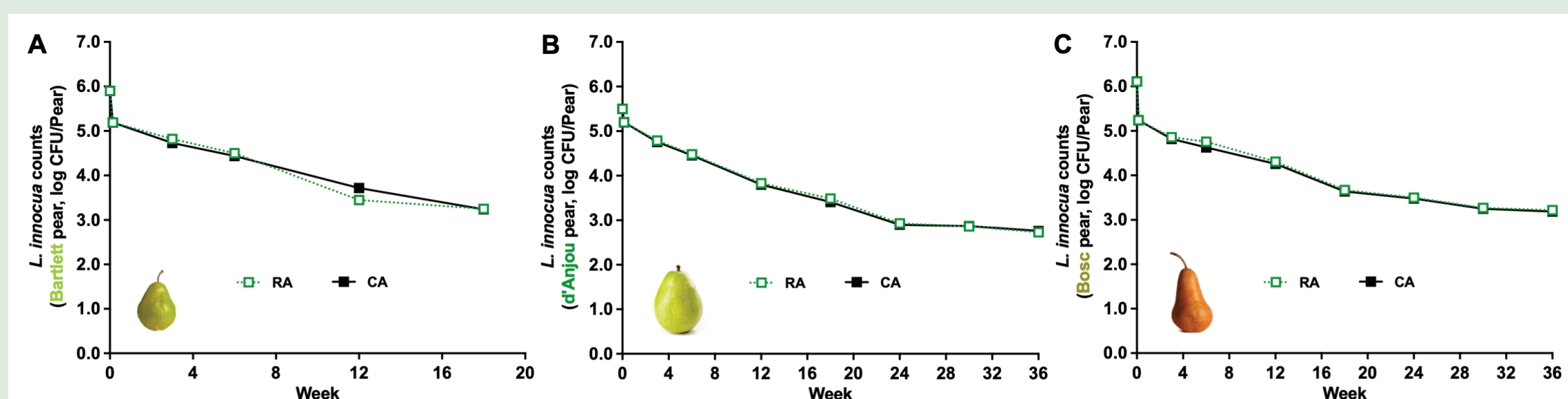


Figure 1. Survival of *Listeria innocua* on pears of the selected cultivars during up to 36 weeks of commercial cold storages. A: Bartlett pear; B: d'Anjou pear; C: Bosc pear. RA: Refrigerated air; CA: Controlled atmosphere. Mean \pm SEM, n = 64.

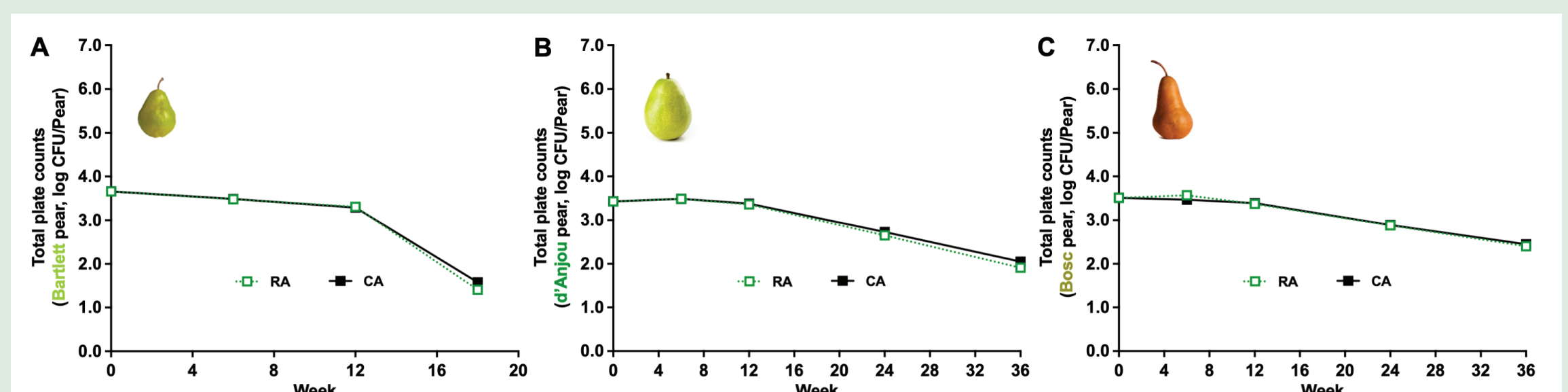


Figure 2. The fate of resident bacteria on pears of the selected cultivars during up to 36 weeks of commercial cold storages. A: Bartlett pear; B: d'Anjou pear; C: Bosc pear. RA: Refrigerated air; CA: Controlled atmosphere. Mean \pm SEM, n = 64.

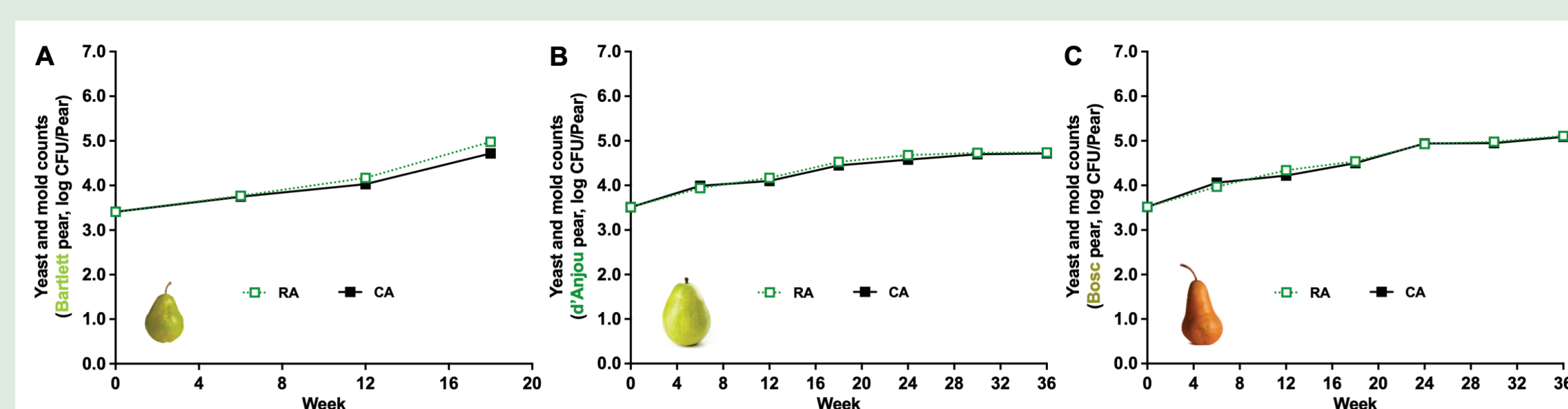


Figure 3. Yeast and mold counts on pears of the selected cultivars during up to 36 weeks of commercial cold storages. A: Bartlett pear; B: d'Anjou pear; C: Bosc pear. RA: Refrigerated air; CA: Controlled atmosphere. Mean \pm SEM, n = 64.