

Preventing SLF Contamination in Grape Harvests

Team: Grape Soup | **Client(s):** Cornell CALS Extension / E&J Gallo Winery / National Grape

Problem statement

Spotted lanternflies (SLFs) are harming grape growers and processors in infested U.S. vineyard regions by contaminating mechanically harvested grapes when insects on the vines are harvested along with the fruit. USDA reports about 923,000 bearing acres of grapes and 5.40 million tons of utilized grape production (2024) in comparable states, and USDA APHIS reports SLF populations in 19 states plus D.C. Current harvesting and shaking methods are not selective enough to remove SLFs without also damaging fruit or reducing harvest efficiency, so insects can enter bins and downstream processing. A recent regional grape program report also identifies mechanized harvesting contamination as a specific SLF risk in highly mechanized grape regions.

Impact

If this problem is solved, wineries would have cleaner harvested fruit, less contamination in juice/wine processing, and potentially less labor/time spent on manual sorting or cleanup.

Proposed direction(s)

We propose a density test system installed at the vineyards receiving area. Harvester bins' contents are emptied into a funnel that filters liquids from solids. The remaining solids (grapes and SLFs) then enter a water-filled flotation tank. Grapes weigh 3-5 grams while adult SLFs weigh fractions of a gram. Due to this difference, grapes sink while SLFs float and are skimmed from the surface. Clean grapes drain from the bottom to continue processing. Our long-term vision is a standalone station integrated into winery receiving areas, sized to handle mechanical harvester outputs. The system would consist of an initial liquid separator, a flotation tank with continuous flow capability, an automated surface skimmer, and a bottom drain leading to existing processing equipment. In the lab, we will construct a small-scale separator to validate separation efficiency using water, grapes, and objects resembling SLF weight. We will measure what percentage of SLFs are successfully removed, how many grapes are lost to the surface, and how quickly separation occurs.

Key risks / unknowns

Key risks and unknowns include whether the density difference between grapes and SLFs is sufficient for separation under actual harvesting conditions, especially with damaged fruit, stems, and debris that may alter buoyancy behavior. In addition, prolonged water exposure could affect fruit quality or introduce contamination risks, and integration into established winery workflows can increase system complexity and maintenance demands. Finally, separation efficiency observed in a lab may not directly translate to large-scale, debris-heavy field conditions.

Questions for the client

1. **What are current workflow/constraints for post-harvest processing?** This question will identify the optimal process placement of our solution while building on existing systems.
2. **What percentage of harvest consists of alternative debris (e.g. stems, leaves), and what is the removal process?** This can inform our design for SLF-specific sorting.

References

U.S. Department of Agriculture, National Agricultural Statistics Service. (2025, May). Noncitrus fruits and nuts 2024 summary. <https://esmis.nal.usda.gov/sites/default/release-files/zs25x846c/mc87rn20c/w37656321/ncit0525.pdf>

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