

Inline Separation of Spotted Lanternflies

Team: Di-Vine Intervention **Client(s):** Cornell CALS Extension / E&J Gallo Winery / National Grape

Problem Statement

Mechanical grape harvesters and grape growers working with clients like Cornell CALS Extension, E&J Gallo Winery, and the National Grape Association are trying to remove Spotted Lanternflies (SLF) from grapes during harvest in conveyor systems on mechanical harvesters, but SLF get collected with grapes, but more than 1–2 SLF per 1000g can trigger contamination concerns, leading to rejected loads. Current post-harvest washing or manual sorting removes only up to ~50% of SLF and reduces usable yield, making these methods ineffective at commercial throughput. The challenge is designing an inline solution that removes SLF without bruising grapes, slowing harvest, or requiring major harvester redesign, all while handling a harvest stream of crushed fruit, stems, juice, and debris.

Impact

Growers and processors lose economic value when contaminated loads are downgraded or discarded. A reliable inline separator would preserve yield, reduce labor-intensive inspection, and allow uninterrupted harvest at commercial speed. If this problem is successfully addressed, the likelihood of SLF contamination would be reduced, there would be an increase in production, and it would also be less disruptive to the ecosystems since it would be performed post-harvest.

Proposed direction:

Primary Concept: SLF Inline Sorter

What it is:

One potential prototype we have discussed is a conveyor belt that utilizes pneumatic and physical sorting to remove SLF from the grape mass that is collected by a mechanical grape harvester. The sorting system would consist of:

- Motor-driven roller with bristles attached for preliminary sorting
- Compressed air system to expel leftover SLF
- Vacuum suction system to collect expelled SLF

How it would be used:

- Based on an estimated adult spotted lanternfly mass of about 0.2–0.3 grams, an air jet velocity of 5–10m/s would generate enough force to dislodge the insect.
- Once the grape mass falls into the grape harvester and onto a conveyor belt, compressed air is blown from one side and a vacuum is sucked from the other side to remove any flies that move through.
- There are varying levels of compressed air as the grapes move through the conveyor to get flies that may be adhering to grapes or heavier.

Why it's better than the status quo:

- More specialized toward SLF than the current MOG (materials other than grapes) systems

End-of-semester proof-of-concept:

Test conveyor belt with an effective sorting system attached to the conveyor

Key risks / Unknowns

- Our solution only mitigates the problem, but doesn't handle the harmful effects SLF have on the vitality/productivity of grape vines. Could lead to reduced yields from harvests.
- Volumetric flow rate of grapes on the conveyor belt. If this is too high, it will be very hard to sort bugs underneath large amounts of grapes. Also, a challenge if grapes/bugs get smushed together.
- May not have the right to modify the harvester

Questions for the client

1. Are there any sanitation or cleaning requirements for inline equipment? *Decision affected:*
2. What level of grape loss or displacement is acceptable? *Decision affected:*
3. Is it easy for current harvesters to be retrofitted, or would a new harvest have to be created? *Decision affected:*
4. What is the maximum upfront cost per harvester that would be acceptable? *Decision affected:*

References

- evokeAG. "Harvest Optimisation Technology to Remove Matter Other than Grape (MOG)." YouTube, 26 July 2021, <https://www.youtube.com/watch?v=JEM50O9d-M8>.
- Kurtural, S. Kaan. Mechanical Harvesting – Tools of the Trade. Department of Viticulture and Enology, University of California, Davis, https://wineserver.ucdavis.edu/sites/g/files/dgvnsk2676/files/inline-files/MechanicalHarvest_tools_tradeSKK.pdf.
- WECO Sorting – "The Science of Optical Sorting," A Duravant Company. "WECO TomatoTek II Sorter in Slow Motion." YouTube, 14 Apr. 2022, <https://www.youtube.com/watch?v=iSd4RgrFOtg>.

Figure

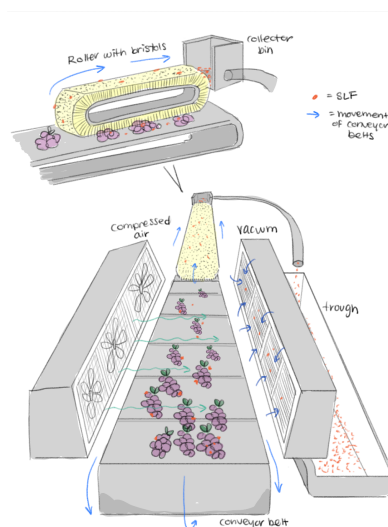


Figure 1: Proposed inline pneumatic sorting system