

Inline Separation of Spotted Lanternflies

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

Problem statement:

During mechanical grape harvesting, Spotted Lanternflies (SLF) present on vines are collected with grapes and transported through conveyor systems into storage bins. More 1–2 SLF per 1000 g can trigger contamination concerns and rejected loads. A single mechanical harvester processes roughly 2–3 tons/hour, meaning contamination risk occurs continuously at a commercial scale. Current harvest streams contain crushed fruit, stems, juice, and debris (“grape soup”), so post-harvest washing or manual sorting can remove up to ~50% of usable yield and is not viable at throughput. We aim to design an inline mechanical system that removes SLF during conveyance without bruising grapes, slowing harvest rate, or requiring major harvester redesign.

Why it matters to the end user:

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:

1. (SLF Inline Sorter) 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:
 - a. Motor-driven roller with bristles attached for preliminary sorting
 - b. Compressed air system to expel leftover SLF
 - c. Vacuum suction system to collect expelled SLF

Proof of concept

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

Why it's better than the status quo:

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

Key risks/unknowns:

1. 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.
2. 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.
3. May not have the right to modify the harvester

Your questions for the client:

1. Are there any sanitation or cleaning requirements for inline equipment?
2. What is the maximum ground speed the harvester must operate at while still being considered effective? And how much can the speed be adjusted?
3. What level of grape loss or displacement is acceptable?
4. What is the maximum upfront cost per harvester that would be acceptable?
5. Is it easy for current harvesters to be retrofitted, or would a new harvest have to be created?

References

evokeAG. "Harvest Optimisation Technology to Remove Matter Other than Grape (MOG)." YouTube, 26 July 2021, <https://www.youtube.com/watch?v=JEM50O9d-M8>.

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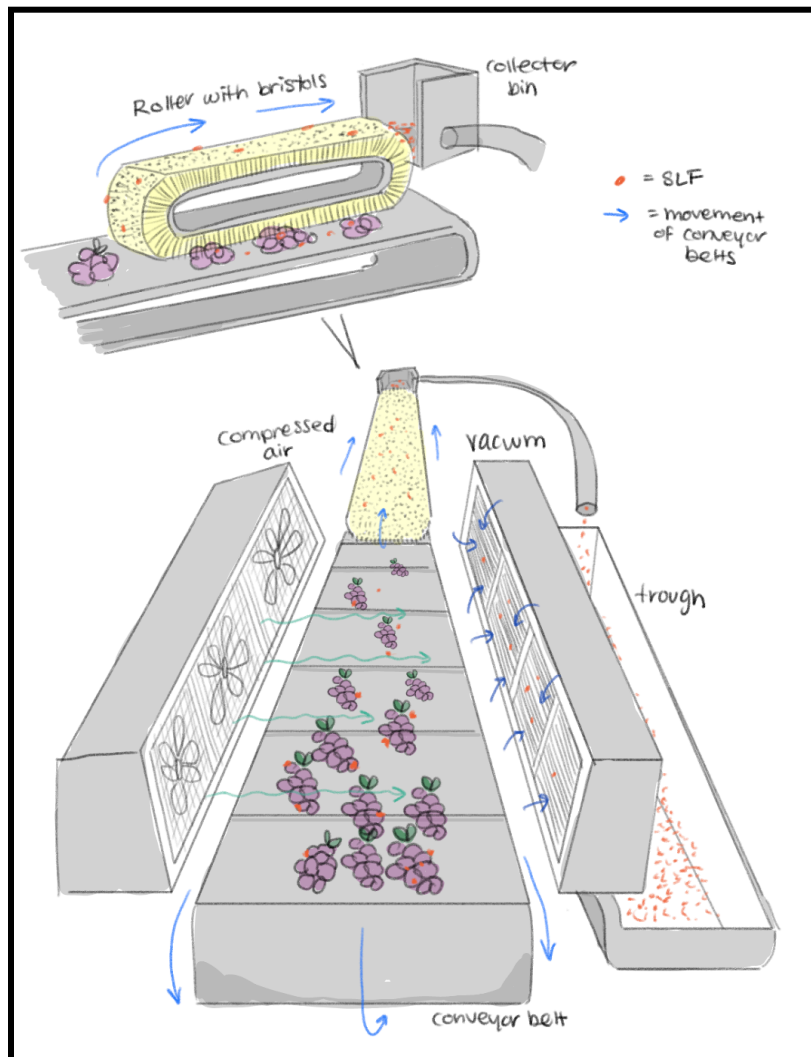


Figure 1: Proposed inline sorting system.