

Team: ZAM

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

Problem Statement: From August to November, SLFs mature into their adult form and migrate onto grape crops and up to 400 can perch on a single vine. As the grapes are mechanically harvested, SLFs that cling to the crops also enter the harvesters. There is currently no mechanism to stop SLFs from entering. Even one or two SLFs can contaminate a batch, making the product of those grapes unsellable, wasting resources and increasing the cost of producing viable batches.

Impact: We plan to tackle the SLFs during the harvest, which gives us the most control over the SLFs in grape harvest. The solution would have the least interference and add the least additional work during the grape harvesting process since it can be attached to the harvester.

Concept A: SLF Vacuum

Description: A vacuum attached to the harvester removes SLFs from harvested grapes.

How it would be used:

- Attach to the collector system before the reservoir.
- SLFs are sucked up, juice filtered back, and SLFs deposited into a separate bin/out of harvester

Why it's better than the status quo:

- Remove the SLFs from the harvested grapes, so no SLFs in the final grape collection.
- Automatic sorting between SLFs and grapes, no need for manual differentiation

End-of-semester proof-of-concept:

- Tested vacuum that picks up SLFs and avoids grapes.

Key Risks:

- Finding precise vacuum pressure to only pick up SLFs.
- Smaller grapes and juice are at risk of being picked up.

Plans to Test: Make varying weight-accurate models of grape/SLFs to test vacuum.

Concepts B: SLF Remover via Compressed Air Gun

Description: An attachment to the front of the harvester that identifies SLF's and deploys compressed air for SLF removal during harvest before the grape vines are shaken.

How it would be used:

- Attach mechanism to front of harvester
- Approach grape vine, be alerted if concentration of SLF is high enough → stop & deploy compressed air until SLF concentration has decreased → continue on

Why it's better than the status quo:

- Remove SLFs before grapes are harvested, but doesn't require an extra process to do so (part of harvesting process)
- Air is relatively cheap and reusable (compared to water)

End-of-semester proof-of-concept:

- Mechanism to shoot the compressed air on demand that releases the SLFs from the crop
- Method of mounting to harvester.

Key Risks:

- Compressed air may also remove grapes upon contact with the grape vine.
- Potentially increase the time necessary to harvest: test speed of detector and compressed air.

Plans to Test: Deploy compressed air mechanism 30 times to ensure reliability over time.

Questions for the client

1. Is there any quantitative information on how strong the SLFs can grip onto the crop? This will affect how strong the vacuum and air gun needs to be.
2. Can the most commonly used harvester models be provided to us? This allows us to design mechanisms that will integrate seamlessly with the existing equipment.
3. Can the SLFs continue to grip onto the crop after death; if so, how long? If the SLFs stop gripping shortly after death, this would be another way to ensure their removal (potential via pesticides.)