Title and Team Name: Proposed Methods of Spotted Lantern Fly Removal by The Grape.
Client(s): Cornell CALS Extension / E&J Gallo Winery / National Grape
Problem Statement: The removal of adult SLF from grape plants could damage or otherwise contaminate the plants or harvested grapes. Methods requiring the discernment between SLF and grape plants increase the complexity of removal or deterrence methods. Additionally, methods with physical contact between a device and plant may damage the grapes or plants, kill the SLF while still on the plants, or expose the grapes to potentially toxic quassinoids from the SLF remains. Also, chemical pesticides are ineffective against SLF, and increasing pesticide strength poses potential risks to the grape plants.
Impact: Removal or deterrence of SLF without harming vines would result in higher grape yields, minimize dependence on current ineffective chemical control methods, and reduce the time spent monitoring, spraying, or manually removing SLF, resulting in lower labor costs.
Proposed Directions:
A 'vacuum' attached to the harvester to remove SLFs without damaging or removing grape plants.
- Minimum viable product: A small-scale suction device that attaches to harvester and removes SLF into capture chamber without damaging grape plant (removing leaves or grapes, ripping stems)
- Long term: A large-scale device with adjustable suctioning power that efficiently removes SLFs into a capture chamber without damaging grape plants. It attaches to harvester in front of the shaker, allowing access to vines for removal of lantern flies before the grapes are shaken off and added to the harvest.
A decoy device that attracts SLF away from grape plants and then exterminates them.
- Minimum viable product: A small-scale device that draws SLF away from grape plants either through one or more lures (frequency, shape, scent mimicking the Tree of Heaven, light). Uses a capturing mechanism that allows for mass collection of attracted SLF and simple removal/elimination.
- Long term: Multiple larger devices that can be stationed throughout different-sized grape farms.
Key risks/unknowns:
Suctioning device:
1. SLF at different life stages have different grip strengths, and can be removed with wind speeds varying from 64 km/h to 83.8 km/h (Elsensohn et al.)
2. Device may unintentionally vacuum smaller grapes or other parts of the grape plants
3. SLF may be stuck where the device cannot reach/maintain strong airflow
4. Mechanical complexity may interfere with harvester or require high maintenance

Decoy device:
1. Effectiveness of various SLF attraction methods requires more research
2. Attraction methods may attract other harmful insects or creatures

Questions for Client:
1. Can a harvester be easily modified to feature the suctioning device? Is there a location on the harvester where it can be strategically placed before the vines reach the shaker?
    a. If there is no effective location for this device to be mounted, it will not be viable.
2. How important is it to farmers that the SLF are removed? Is it worth risking damage to 10%, 20%, or more of their plants to ensure that their harvests are SLF free?
    a. If farmers are willing to risk some of their plants being harmed, we may be able to use more aggressive methods to eradicate SLF.
3. Is it necessary to remove SLF throughout the growing season, or only before harvesting?
    a. The current vacuum solution works only during harvesting, and would have to be adapted to other vehicles that can operate through the growing season if necessary.

References

Elsensohn, Johanna E et al. “Experimental evidence supports the ability of spotted lanternfly to hitchhike on vehicle exteriors as a mechanism for anthropogenic dispersal.” *Royal Society open science* vol. 11,7 240493. 10 Jul. 2024, doi:10.1098/rsos.240493
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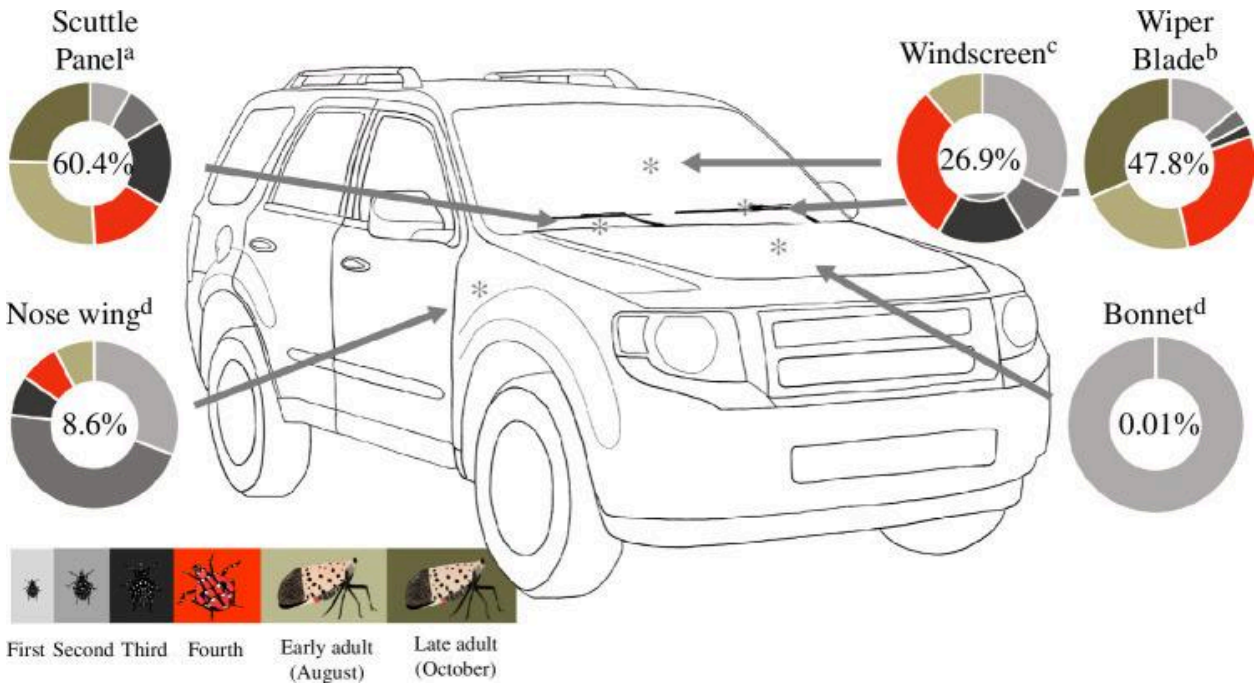

Figure 1: Percentages of different SLF life stages that remained on a car until maximum speed was reached