

NYWGF RESEARCH - FINAL REPORT TEMPLATE

Please fill in by **typing over the red** directions in each section and change font to black.

Funding for fiscal year: April 1, 2025 – March 31, 2026

SECTION 1:

Project title: Evaluating candidate repellents for spotted lanternfly

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New Research **Continued Research** (**CHECK APPROPRIATE BOX**)

Amount Funded \$ 21,242

SECTION 2: (This section should be in depth and akin to an academic report)

Project Summary Impact Statement:

The invasive Spotted Lanternfly (SLF), a large planthopper originally from Asia, has been spreading from its center of invasion in Pennsylvania to neighboring states, including New York, where it represents a serious threat to the grape industry. SLF are inadvertently harvested by machine harvesting, leading to insect contamination at the processing plant or winery, an especially serious threat for the juice industry. In this project we successfully established a lab colony of SLF which we used to screen 6 candidate compounds comprised of insecticides labeled on for use in grapes in NY with short days to harvest restrictions that could be used to repel SLF. Using a lab bioassay choice test where we presented individuals a treated shoot and untreated control shoot, we found that SLF nymphs avoided grape tissue treated with the synthetic insecticide Mustang Maxx and the bioinsecticide Pest Kote but did not show strong discrimination of the synthetic insecticide Actara or the bioinsecticides Azasol (azadirachtin), BoteCHA (*Beauveria bassiana*), or Ecotrol (essential oils). Prior to egg laying, SLF adults also showed strong avoidance of Mustang Maxx but not any of the other tested materials. Once adult SLF began laying eggs, we found no effects of any of the tested compounds on choice; insects spent the vast majority of time off plants regardless of treatment.

Objectives:

- 1. Establish an SLF lab colony at Cornell AgriTech.** Using infrastructure available in the Loeb Lab at Cornell AgriTech, and SLF eggs collected in 2024, we will use potted tree of heaven, a preferred host plant for SLF, and potted pixie grapes, to rear SLF which will facilitate testing repellents under objective 2.
- 2. Evaluate compounds as repellents for SLF.** We will use a lab bioassay system to

assess the behavioral response of SLF nymphs and adults to insecticides labeled for grapes and with short Days to Harvest restrictions, and additional compounds shown to be repellent to other insect species.

Materials & Methods:

Objective 1. Establish an SLF lab colony at Cornell AgriTech.

To facilitate the assessment of candidate repellents, we established a lab SLF colony in the spring of 2025 using nymphs collected from the field near Cornell AgriTech. SLF were reared from eggs to adults within large screen cages placed inside a walk in growth chamber at Cornell AgriTech equipped with temperature, relative humidity and light controls to simulate outdoor conditions. Insects were provided with a mixed host plant diet of potted tree of heaven (TOH), *Ailanthus altissima*, which is the natural host for SLF in Asia and potted pixie grapes, a dwarf *Vitis vinifera* Pinot noir cultivar. TOH, originally grown from seed, and pixie grapes, grown from cuttings maintained by the Loeb lab for the past five years, were maintained in a greenhouse and fresh plants cycled into rearing cages as needed to continuously provide healthy plants for the SLF colony. We collected additional SLF nymphs and adults from the field site as needed during the course of behavioral experiments described under objective 2.

Objective 2. Evaluate compounds as repellents for SLF.

We use a choice bioassay system to assess the effect of different insecticides and other compounds on SLF behavior. This was done inside screen cages within a walk in growth chamber at Cornell AgriTech with temperature, humidity and light controls. In the choice assay, two similar sized TOH shoots collected from greenhouse plants or the field were inserted into tubes with water to keep them turgid and then placed in each of 6 screen cages. One shoot in a cage was treated with an insecticide while the second shoot was only sprayed with water. A total 6 insecticides were tested (see Table 1 for list of compounds, rates). Approximately one hour after shoots were treated, we released 5 SLF nymphs or 3 adults from our lab colony into each cage. We then observed location of insects in each cage three to four times on day 1 and 3-4 times on day 2, noting the location of each individual insect as either on the treated shoot, on the control shoot, or off the shoots entirely. Over the course of several weeks, we tested 2nd, 3rd, and 4th instar nymphs. Later in the summer when adults eclosed in the field, we tested male and female SLF both prior to egg-laying and after they had begun egg-laying. Males and females were tested separately. Individual insects were only tested once. For each run of an experiment, we included one cage for each of six insecticides. We summed up the number of observations of individuals on the treated shoot, the control shoot, or off the shoots for a given compound for nymphs, non reproductive adults, and reproductive adults across multiple runs of the experiment for each stage.

Results/Outcomes/Next Steps:

Objective 1. Eggs collected in the fall of 2024 and stored in a cold chamber over the winter did not hatch in the spring of 2025 as hoped. We are not fully sure why. Therefore, we shifted our strategy to collect SLF from a field site near Cornell AgriTech. Using potted tree of heaven plants started from seed in late winter, plus access to potted grape vines, we successfully reared field collected nymphs in cages within our growth chamber. SLF nymphs developed normally and molted through fourth instars in cages and successfully eclosed as adults. The growth chamber was set at about 78° F and 50% relative humidity

and 16 hour daylength. After becoming adults, we shortened the daylength to match conditions in the field (shorter daylength seems to be a requirement for egg laying in SLF). Eventually adults began mating and laying eggs in the colony. Interestingly, some eggs hatched late in the fall, initiating a new cycle. We collected egg masses produced in the colony and moved them to cold storage for the winter. Overall, we were quite successful in maintaining SLF in the lab for use in our behavioral experiments, supplementing the colony periodically with insects from the field.

Objective 2. All six insecticides tested are approved for use on grapes and all have days to harvest restrictions of 1 day or fewer. Mustang Maxx (zeta cypermethrin) is a synthetic pyrethroid insecticide that is labeled for use against SLF (with 2ee label) and is rated as good on SLF adults and excellent on SLF nymphs. Actara (thiamethoxam) is a synthetic neonicotinoid insecticide that is also labeled for SLF on grapes (with 2ee). Actara is rated as excellent against both adults and nymphs. Pest-Kote contains pyrethrin (natural pyrethroid) plus some inorganic ingredients that may have insecticidal properties. Pest-Kote is labeled for use on grapes against SLF. Little efficacy data exists for Pest-Kote. Azasol (azadirachtin from neem) is a botanical insecticide that has broad insecticidal properties. BoteGHA ES is commercialized entomopathogen (*Beauveria bassiana*) that infects nymphs and adult SLF. Finally, Ecotrol is a mixture of essential oils (rosemary, geraniol, peppermint) that is reported to be toxic and/or repellent to some insects.

In the assays using SLF nymphs, we found strong avoidance of TOH tissue treated with Mustang Maxx and to a lesser extent, Pest-Kote (Figure 1). Less than 5% of nymph observations were on the shoot treated with Mustang Maxx over two-day period while around 30% of the observations were made on the control and for close to 60% of the observations of nymphs were on the cage, not on shoots. For the Pest-Kote treatment on the first day, only 6% of nymph observations were made on shoots treated with Pest-Kote compared to 40% for control and 54% on the cage. On the second day, however, 40% of nymph observations were made on Pest-Kote-treated shoots indicating a significant reduction in repellency. Interestingly, SLF nymphs did not seem to discriminate between tissue treated with Actara and control shoots despite good data showing Actara is highly toxic. Indeed, although we did not observe much mortality in our bioassays, we did observe some in cages with one shoot treated with Actara).

The bioassay system seemed to work pretty well for adult SLF before they began laying eggs based on the observation that they spent most of their time on either treated or control shoots (Figure 2). For these pre-oviposition adults, we observed discrimination against shoots treated with Mustang Maxx. Only 2% of total observations of adults were on the shoot treated with Mustang Maxx. We did not observe any strong discrimination against shoots treated with any of the other compounds, including Pest-Kote. After SLF adults became reproductive, we observed some evidence of avoiding shoots treated with Mustang Maxx (2% on shoots treated with Mustang Maxx, 11% on control shoots, 86% on the cage), however, individuals spent the majority of time off of either shoot regardless of treatment (70% or greater) (Figure 3). Hence, we conclude that our bioassay method was not appropriate to test repellency of adults once they started laying eggs. Unfortunately, we did not develop an improved method during our studies.

Technology Transfer Plan:

Some of the results from this lab study were presented by my Cornell IPM colleague Kyle

during a webinar on SLF he helped organize with NYSDAM during the winter, 2026. Although the results are not immediately transferrable to grower practices, they do serve as a basis for future field studies. It will be particularly informative to assess whether an application of Mustang Maxx within a few days of mechanically harvesting juice grapes will significantly reduce the number of adult SLF accidentally collected in harvester bins. It would be worth also including Pest-Kote in such a field test, although its repellent effect on SLF behavior may be short term.

Attachments: Table1, Figure 1, Figure 2

SECTION 3: (The goal of this research is to benefit growers and producers across New York State. Result summaries will be shared on the NYWGF website and via email newsletters. To that end, this section should be brief and written in terms understandable for the average grower and producer, as well as consumers and trade interested in our industry.)

Project summary and objectives:

We undertook a study in the lab to screen insecticides labeled on grapes and with short days to harvest restrictions for repellency against spotted lantern fly (SLF) as a potential tool for reducing SLF contamination of fruit in mechanically harvested grapes. We assessed the behavior of SLF nymphs and adults when presented with a choice between one tree of heaven shoot treated with a candidate insecticide and another shoot only treated with water. Nymphs consistently avoided shoots treated with the synthetic pyrethroid insecticide Mustang Maxx (over two days) and shoots treated with Pest-Kote, a botanical insecticide made from pyrethrin (for one day). Young, nonreproductive adults discriminated against shoots treated with Mustang Maxx, but older adults did not spend sufficient time on any shoots regardless of treatment. Future research should evaluate some of these compounds in the field, assessing impact on SLF contamination in harvest bins.

Importance of research to the NY wine industry: ENTER HERE

This project examined the repellent activity under lab conditions of mostly labeled insecticides with short days to harvest as a method for reducing SLF contamination in mechanically harvest grapes. Although the results are not immediately transferrable to grower practices, they do serve as a basis for future field studies. It will be particularly informative to assess whether an application of Mustang Maxx within a few days of mechanically harvesting juice grapes will significantly reduce the number of adult SLF accidentally collected in harvester bins.

Project Results/next steps: ENTER HERE

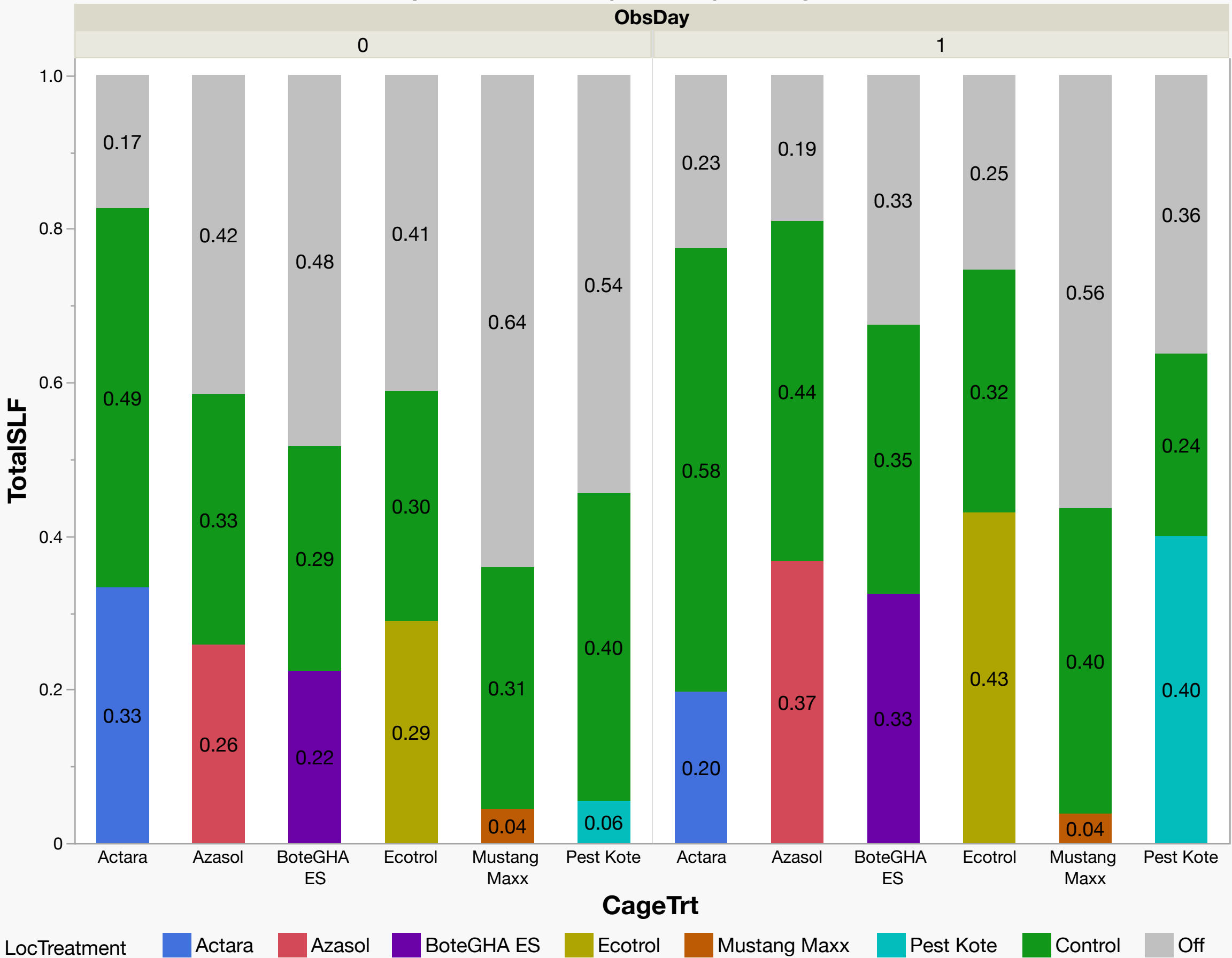
The next steps for this project are to 1) improve bioassay method for assessing the response of mature SLF adults to candidate repellents, 2) testing additional candidate repellents, and 3) testing the most promising candidates under field conditions during harvest.

Supporting attachments: (Choose a maximum of 1 supporting figure or table to demonstrate results if desired)

Table 1. List of products used in SLF behavioral assays investigating repellency.

Compound	AI	Rate/A	Days to Harvest
Pest Kote	pyrethrin, adjuvant	12 fl oz/A	0
Mustang Maxx	zeta- cypermethrin	4 fl oz/A	1
Actara	thiamethoxam	1.4 fl oz/A (3.5 oz/A)	0
Azasol	azadirachtin	6 oz/A	0
BoteGHA ES <small>have</small>	Beauveria bassiana	1 qt/A	0
Ecotrol	Essential oils	4 pints/A	0

Proportion of Factor(TotalSLF) vs. CageTrt

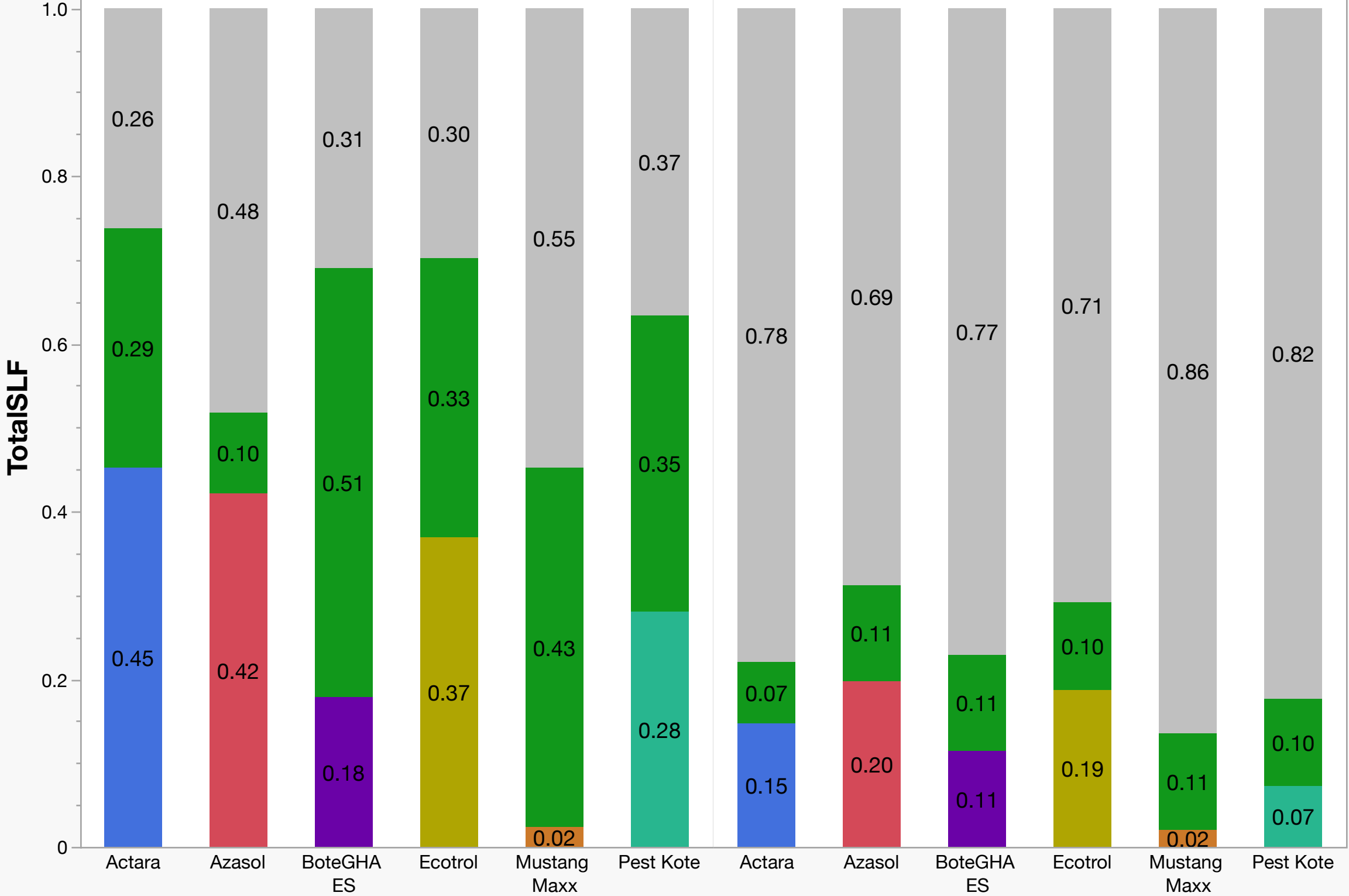


Proportion of Factor(TotalSLF) vs. CageTrt

Adult-ReproductiveState

Pre-ovipositional Adult

Ovipositional Adult



LocTreatment

Actara

Azasol

BoteGHA ES

Ecotrol

Mustang Maxx

Pest Kote

Control

Off