Biology and management of the consperse stink stink bug, *Euschistus conspersus*

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Introduction

The consperse stink bug, *Euschistus conspersus*, is a native insect to North America. In recent years, the consperse stink bug has been linked to increasing levels of fruit damage in orchards in North Central Washington. This increase in damage has been linked to the decrease in the use of organophosphate insecticides, coupled with several years of excessively hot, dry summer weather. Stink bugs spend the majority of their life cycle on wild hosts that are found on orchard borders, such as mullein and bitterbrush. However, as this food source dries out, bugs migrate into apple orchards in search of food (**Figure 1**). The sporadic nature of the damage, and its proximity to harvest, makes detection and control of this pest difficult. Therefore our research focus has been two-fold: 1) to develop a reliable method of detecting stink bugs in the field; and 2) to develop highly selective control strategies. The key to both objectives may lie in the application of highly attractive aggregation pheromone components to manipulate stink bug behaviour.

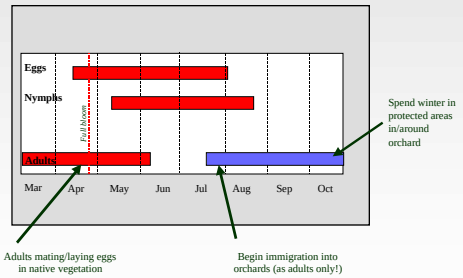

Figure 1. Life cycle of *E. conspersus* in North Central Washington

Stink bugs: Damage detection

Stink bug damage detection is difficult. However, timely detection can aid in the proper application of insecticides. Important points to consider include:

- Damage appears quickly! Visible externally within 24-48 hours after feeding on varieties with red pigment (i.e. not Granny Smith, Goldens). This allows time to make treatment decisions.

- Often confused with physiological disorder known as bitter pit (calcium deficiency).

Bitter Pit

-usually distributed on sides of the apple especially near calyx

-examination of tissue beneath lesion reveals spherical discoloration beneath the surface (Figure 2)

Stink bug

-most often near stem bowl or on the upper half of the apple

-tissue discoloration appears as conical pattern, created by beak of the bug (Figure 3)

Figure 2. Cross-sectional view of bitter pit damage on apple.

Figure 3. Cross-sectional view of stink bug damage on apple.

Stink bug aggregation pheromone

- Produced by adult male stink bugs
- Highly attractive to females, other males, and nymphs
- Bugs aggregate on host plants such as mullein, bitterbrush
- Synthetic aggregation pheromone components placed in polyethylene vials attract large numbers soon after placement (**Figure 4**)
- Compound is attractive to both overwintering (egg-laying), and pre-reproductive bugs (late summer) (**Figure 5**)

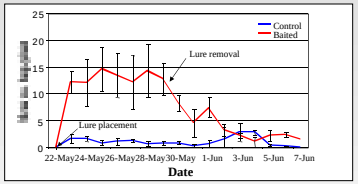

Figure 4. Numbers of reproductive adult stink bugs attracted to mullein plants baited with synthetic aggregation pheromone components.

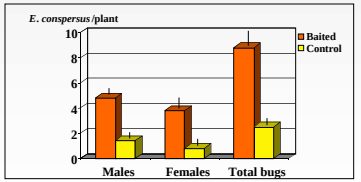

Figure 5. Numbers of overwintering bugs attracted to mullein plants baited with synthetic aggregation pheromone components.

Active space of pheromone: How far will bugs move to lures?

- assessed active space of pheromone lures using mark/recapture technique
- bugs released at 10, 25, and 50 m from baited mullein plants
- released 200-300 bugs/distance, equal numbers males/females
- bugs marked with different colors to denote different release distances
- plants surveyed daily for 1 week following releases
- low recaptures at all distances, data suggest short-range activity (**Table 1**)

Table 1. Numbers of marked *E. conspersus* captured at baited mullein plants, overwintered and summer generation.

Overwintered generation adults

Release distance	% Recaptured	% of total
10 m	4.8	75
25 m	1.2	19
50 m	0.4	6

Summer generation adults

Release distance	% recaptured	% of total
10 m	2.3	88
25 m	0.3	12
50 m	0	0

Chemical Trials:

A series of 4 insecticides were evaluated for efficacy in stink bug control

- Two bioassays used to assess 1) acute (contact) toxicity; and
  2) residual activity of materials applied to host plants

1) Acute toxicity: Insecticides applied directly to anesthetized insects using Potter tower. Mortality evaluated over 1 week period (**Table 2**).

2) Field residual activity: Stink bugs caged on mullein plants previously treated with insecticides and evaluated periodically over a 14 day period (**Table 3**).

Table 2. Corrected mortality rates of consperse stink bugs exposed to insecticides in Potter tower bioassay.

Treatment	Rate (ppm)	Rate (Form./100 gal)	Corrected % mortality 24 h.	48 h.	96 h.	7 d.
Actara 25WDG	75	4 oz.	0	0	0	3
Carzol 92SP	1655	1.5 lb.	90	94	97	97
Provado 2F	150	8 fl. oz.	3	4	4	4
Pyrenone		33 fl.oz.	30	30	34	34

Table 3. Corrected mortality rates of consperse stink bugs exposed to insecticides applied to mullein plants in field bioassay.

Treatment	Rate (ppm)	Rate (Form./100 gal)	Corrected % mortality 24 h.	48 h.	96 h.	7 d.	14 d.*
Actara 25WDG	75	4 oz.	0	6	0	0	0
Carzol 92SP	1655	1.5 lb.	71	87	87	90	64
Provado 2F	150	8 fl. oz.	10	10	13	30	0
Pyrenone		33 fl.oz.	6	6	6	10	0

*Bugs were replaced after 7 and 14 days

Applications

- use of pheromone lures to concentrate bugs at baited host plants on orchard borders in spring and late summer
- 'attract-and-kill' technique on baited plants with high toxicity, high residual chemicals such as Carzol (**Table 2 and 3**)
- use of this technique in 2000 revealed the need for more pheromone sources on borders and use of more effective insecticides
- currently dependent upon existing host plants (i.e. mullein); future work to isolate and synthesize attractive volatiles from wild hosts could lead to portable bait stations that release attractive plant odors in addition to pheromone

Typical stink bug habitat and proximity to commercial orchard