Hibiscus Bud Weevil – A New Threat to Hibiscus Production

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ABSTRACT

Hibiscus bud weevil, *Anthonomus testaceosquamousus*, was first identified in Florida in 2017 in Miami-Dade County. This small weevil has the potential to have a significant impact on hibiscus growers in Florida with the potential loss of millions of dollars.

This weevil has been reported to feed on malvaceous flower buds in several genera, however, in Florida it has been only found on *Hibiscus rosa-sinensis*. The adult weevils feed on buds and leaves but the primary damage comes from the female weevil laying her eggs inside small buds. The developing larva(e) in the buds causes it to abort resulting in loss of flowers. The insect continues it development in the bud eventually emerging from the detached bud as an adult.

OBJECTIVES AND METHODS

The overall goal of the proposed studies is to develop rearing methods in order to produce enough weevils for subsequent work and to evaluate insecticides used for weevil control.

1) Expand rearing in petri plates on individual buds to large cage rearing.

Rearing remains a time-consuming procedure requiring plants with buds. Infested buds are collected from various sources and put in cages with *Hibiscus rosa-sinensis* 'painted lady' plants with buds. Buds are continuously harvested from caged plants and held in smaller containers within incubators for weevil emergence. Continuous movement of weevils and/or buds to new cages to establish more colony cages is how we grow the colony. When weevils of the same age are needed for research, separate colonies are started by placing eggs into buds which are held for emergence. Rearing continues to be a limitation in large scale tests due to the necessity of using live plants/buds for rearing.

Artificial rearing (rearing weevils on an artificial diet) are being conducted which may be useful particularly when weevils of a particular age are needed.

2) Evaluate contact foliar insecticide sprays for adult control

Mortality of adult weevils from feeding or walking on treated plants was relatively low for all products tested. Xxpire provided the best result with 40% mortality of adults feeding/walking on buds and leaves (**Tables 1 and 2**). Benefit (imidacloprid) provided similar results on the leaves only killing 35% of the weevils. When adults were sprayed directly, there was more mortality than from residual/feeding exposure. Talstar caused 90% mortality followed by Conserve with 50% mortality (**Table 3**).

Although Pylon provided moderate mortality for both residual/feeding and direct contact, it is not recommended because it is not labeled for outdoor use of this pest.

METHODS

Hibiscus rosa-sinensis 'painted lady' plants in 3 gallon containers with buds were selected for the test. Test plants were sprayed with the treatment insecticide to thoroughly cover the foliage and buds. Control plants were sprayed with water. After the insecticide dried, buds and leaves were removed and placed in petri dishes in the laboratory. Leaves were placed in petri dishes separate from the buds. Two adults were placed in each petri dish. The weevils were checked at 4, 24, 48, 72, and 96 hrs. after application for mortality. In the direct exposure test, weevils were sprayed directly with the insecticide treatment.

Petri dishes with buds or leaves and weevils

The insecticides tested for adult control included the following. All products were used at the high rate for weevil/beetles:

- Acelepryn (chlorantraniliprole)
- Acephate (acephate)
- AzaSol (azadrachtin)
- Conserve (spinosad)
- Marathon (imidacloprid)
- Pylon (chlorfenapyr) (off-label)
- Mainspring GNL (cyantraniliprole)
- Sevin SL (carbaryl)
- Talstar (bifenthrin)
- Xxpire (sulfoxaflor + spinetoram)

1. Residual/Feeding mortality from sprayed buds - adults walked on and fed upon buds that were sprayed

Product	Active Ingredient	Rate	% Adult Mortality after 4 days
Xxpire	Sulfoxaflor+spinetoram	0.08 oz/3 gal	40
Pylon	chlorfenapyr	6 oz/ 100 gal	30
Conserve SC	spinosad	0.06 fl oz/gal	15
Orthene 97	acephate	12 oz/100 gal	10
Sevin	carbaryl	1 qt/100 gal	10
AzaSol	azadirachtin	6 oz/50 gal	10
Acelepryn	chlorantraniliprole	16 oz/100 gal	10
Talstar P	bifenthrin	21.7 oz/100 gal	0
Control	water	--	0
Mainspring GNL	cyantraniliprole	8 oz/100 gal	0
Benefit 60WP	Imidacloprid	0.71 oz/100 gal	0

2. Residual/Feeding mortality from sprayed leaves - adults walked on and fed upon leaves that were sprayed

Product	Active Ingredient	Rate	% Adult Mortality after 4 days
Xxpire	Sulfoxaflor+spinetoram	0.08 oz/3 gal	40
Benefit 60WP	Imidacloprid	0.71 oz/100 gal	35
Talstar P	bifenthrin	21.7 oz/100 gal	25
Pylon**	chlorfenapyr	6 oz/ 100 gal	25
Conserve SC	spinosad	0.06 fl oz/gal	25
Sevin	carbaryl	1 qt/100 gal	25
Orthene 97	acephate	12 oz/100 gal	20
Control	water	--	5
Mainspring GNL	cyantraniliprole	8 oz/100 gal	5
Acelepryn	chlorantraniliprole	16 oz/100 gal	5
AzaSol	azadirachtin	6 oz/50 gal	0

**Off label use

3. Adult mortality from direct contact spray - spray was applied directly to the adult

Product	Active Ingredient	Rate	% Adult Mortality after 4 days
Talstar P	bifenthrin	21.7 oz/100 gal	90
Conserve SC	spinosad	0.06 fl oz/gal	50
Pylon**	chlorfenapyr	6 oz/ 100 gal	40
Xxpire	Sulfoxaflor+spinetoram	0.08 oz/3 gal	30
Orthene 97	acephate	12 oz/100 gal	30
Sevin	carbaryl	1 qt/100 gal	30
Control	water	--	30
Mainspring GNL	cyantraniliprole	8 oz/100 gal	30
AzaSol	azadirachtin	6 oz/50 gal	20
Benefit 60WP	Imidacloprid	0.71 oz/100 gal	20
Acelepryn	chlorantraniliprole	16 oz/100 gal	10

**Off label use

3) Evaluate systemic insecticide drenches for larval control which includes determining if the insecticide can get into the bud

Five systemic insecticides were tested as a drench treatment for their impact on the presence of live weevil larvae and eggs within buds and the number of oviposition and feeding holes on buds. Flagship provided the best control in reducing the number of live larvae, eggs, and holes. This trend was seen with both buds on the plants and on buds that were dropped. No product provided 100% control.

1. A total of 24 plants (4 plants per treatment) (6-inch pot Painted Lady Hibiscus) were drenched with 200ml of each insecticide solution based on the rates below on February 21, 2020.

Product	Active ingredient	Rate	Solution (SI)
Benefit 60WP	imidacloprid	20 g/100 gal	53 mg/L
Safari	dinotefuran	24 oz/100 gal	1.8 g/L
Flagship	thiamethoxam	8.5 oz/100 gal	0.63 g/L
Altus	flupyradifurone	3.7 fl oz/100 gal	289 µl/L
Mainspring GNL	cyantraniliprole	8 fl oz/100 gal	625 µl/L
Water	NA	NA	NA

2. 10 days after drenching, the plants were placed in cages with 20 adult weevils – March 3, 2020

3. 1st evaluation - 7 days later (March 10, 2020) – five buds were removed from each plant and evaluated for the number of holes, number of eggs, and number of live larvae in the buds. All dropped buds within each cage with 4 plants were also collected and evaluated for live larvae.

4. Second evaluation - 7 days later (March 17, 2020) – remaining buds were removed from each plant and evaluated for the number of holes, number of eggs, and number of live larvae or pupae. All dropped buds around the 4 plants were also collected and evaluated.

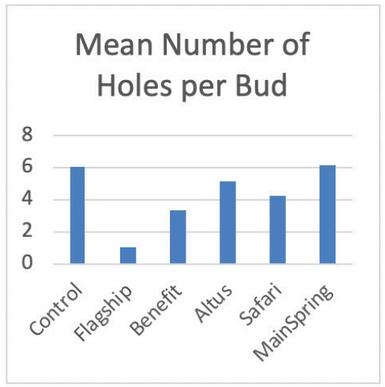
RESULTS

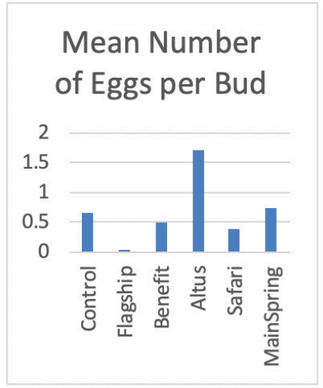
Of the 5 products tested, Flagship (thiamethoxam) provided the best results in that there were fewer holes on the buds, and fewer eggs and larvae in the buds. No product provided complete control. During the first evaluation, on average there were 3 to 6 holes per bud, except for Flagship which had 1 hole/bud; there were on average 0.5 to 1.5 eggs per bud, except Flagship which had 0.05 eggs per/bud; and the average number of live larvae per bud was 1.25 to 1.8 per bud, except Flagship which was 0.3 per bud. (see graphs)

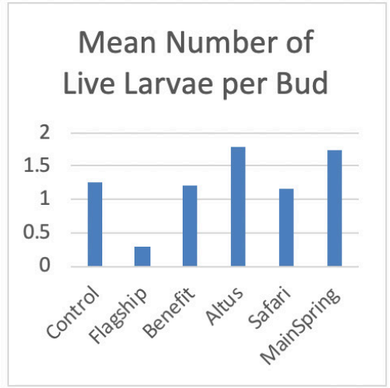
A similar trend was also noted for the dropped buds in which the average number of holes ranged from 2.5 to 4.4, except Flagship which was 1.7 holes/bud. The average number of larvae in the dropped buds ranged from 0.8 to 1.6, except Flagship which was 0.1 larva per bud.

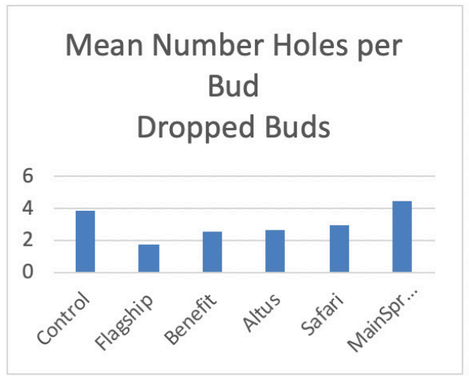
On the second evaluation 7 days after the first, there were fewer buds on the plant to evaluate so the overall number of buds evaluated varied among the treatments. The number of live larvae in buds averaged 0.09 to 1.3 per bud, except for Flagship which averaged 0.4 larvae per bud. **The reduction of larvae in buds treated with Flagship may also be because there were less eggs laid in these buds and not actually killing the larvae.** The adult weevils may perceive something they do not like and therefore there is less feeding and egg laying resulting in fewer larvae. This leaves me with the question if Flagship is sprayed as a foliar application, will it provide the same results as with the drench application. This is the same active ingredient that is commonly used against pepper weevil and it is applied as a foliar application.

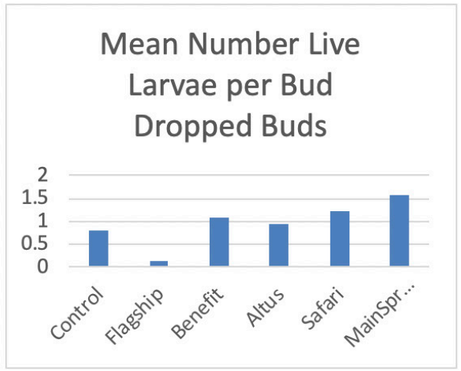
First Evaluation (14 days after drenching)











Second Evaluation (21 days after drenching)