

Alfalfa Weevil Pyrethroid Resistance and a Kansas Update



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- Native to Eurasia and North Africa
- Three strains were introduced into the U.S.
 - Western (Salt Lake City, Utah, in 1904)
 - Egyptian (Yuma, Arizona, in 1939)
 - Eastern (Maryland in 1952)

Behavior	Western	Egyptian	Eastern
Aggregate during aestivation	No	Yes	No
Migrate out of fields	No	Yes	No
Pupate	In leaf litter	On plant	On plant
Climate preference	cool	Hot, dry	likely moderate
Population peak	1-3 weeks later	1-3 weeks earlier	1-3 weeks earlier

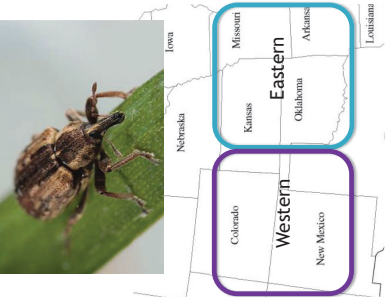


Photo: B. Griffith, University of Nebraska-Lincoln, showing the black head and feet of the alfalfa weevil larva. Photo: B. Griffith, University of Nebraska-Lincoln, showing the black head and feet of the alfalfa weevil larva.



Stubble de-barking prevents regrowth



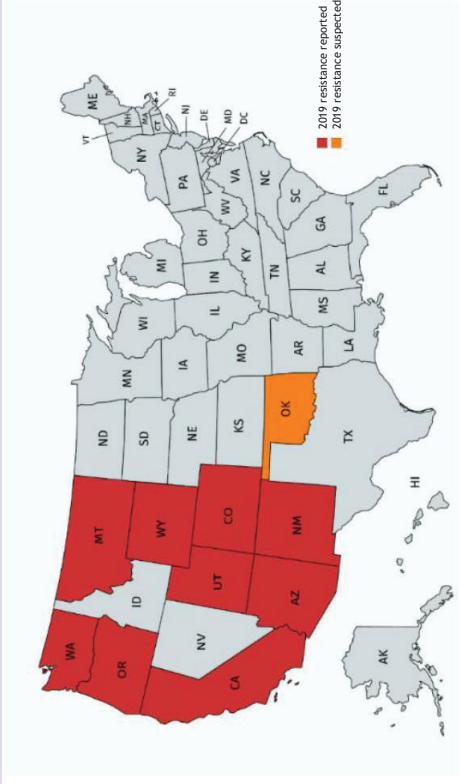
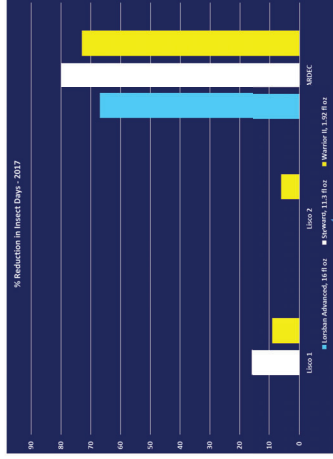


Figure 1. Reporting of Alfalfa Weevil Resistance by State.

2015-Canada



Did not use COC

Note: COC helps get better results with Steward

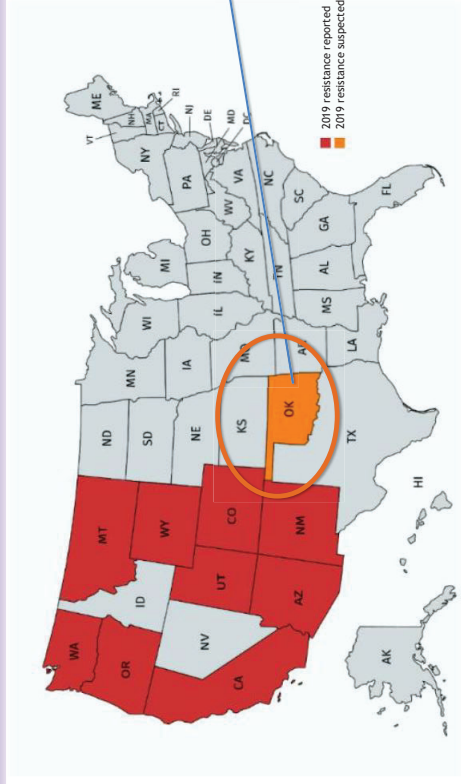


Figure 1. Reporting of Alfalfa Weevil Resistance by State.

lambda-cyhalothrin (pyr)

- poor residual control, larval survival

Oklahoma, Colorado, California, Montana, New Mexico, Utah

cobalt (chlorpyrifos + lambda-cyhalothrin)

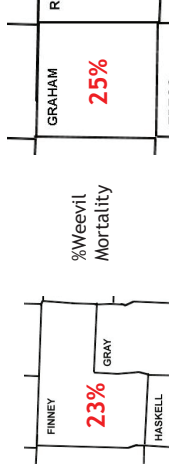
- poor residual control, larval survival

Washington, Wyoming(suspected)



Vials obtained from Colorado pre-dosed with lambda-cyhalothrin .00393 mg ai/2ml acetone

Wild 2nd, 3rd instar weevil larvae collected in May from 2 counties (Ft. Graham/Rooks line) and exposed for 48 hours



Insecticide use patterns and short-range dispersal of weevils result in highly localized areas of resistance



1. Repeated use of the same insecticide or mode of action, poor coverage

Alfalfa Weevil Management Options

Insecticide	Rate
Alpha-cypermethrin (Fastac CS)	3 0.014 to 0.025 lb. a.i./acre (2.2 to 3.8 fl. oz./acre)
Beta-cyfluthrin (Baythroid XL)	3 0.0125 to 0.022 lb. a.i./acre (1.6 to 2.8 fl. oz.) Data indicates that rates of 0.015 to 0.02 should provide the longest protection against larval damage.
Chlorpyrifos* (numerous products)	1 Check label, but generally 1 to 2 pints/acre
Chlorpyrifos plus lambda-cyhalothrin* (Cobalt Advanced)	19 to 38 fl. oz./acre 1+3
Chlorpyrifos plus zeta-cypermethrin (Stallion)	9.25 to 11.75 fl. oz./acre 1+3
Cyfluthrin (Tomstone)	3 0.025 to 0.044 lb. a.i./a (1.6 to 2.8 fl. oz.)
Gamma-cyhalothrin (Proaxis, Declare)	3 0.01 to 0.015 lb. a.i./acre (2.56 to 3.84 fl. oz.) (Declare: 1.02 to 1.54 fl. oz/acre)
Indoxacarb (Steward)	22 6.7 to 11.3 fl. oz./acre
Lambda-cyhalothrin (numerous products)	3 0.02 to 0.03 lb. a.i./acre. Data reviewed so far indicates that the higher rate should provide the longest protection against larval damage.
Lambda-cyhalothrin plus chlorantraniliprole (Voliam Xpress)	6.0 to 9.0 fl. oz./acre 3+28
Methomyl (Lannate)	1 LV 3 pints/acre, SP 1 lb/acre
Phosmet* (Imidan)	1 LV 3 pints/acre, SP 1 lb/acre.
Permethrin (multiple products)	3 0.2 lb. a.i./acre. Results in Kansas research trials have been variable.
Lambda-cyhalothrin plus chlorantraniliprole (Besiege)	5.0 to 10.0 fl. oz./acre 3+28
Zeta-cypermethrin (Mustang MAXX, etc.)	3 0.014 to 0.025 lb. a.i./acre (2.24 to 4.0 fl. oz./acre). Data are limited, but the higher rate should provide the longest protection against larval damage.

*Treatments listed are mainly used for treating alfalfa weevil larvae; products with an asterisk are also recommended for adult alfalfa weevil control.

1. Repeated use of the same insecticide or mode of action, poor coverage
2. Increase in mild winters/lack of extreme cold temperatures
 - ↑ Weevil survival
 - ↑ Egg laying
3. Adult beetle longevity
 - Resistant individuals can pass on genetics for 2 or more years
4. Behavioral differences between weevil strains
 - A topic that needs more regional observations

- Rotate to new Mode of Action
- Indoxacarb (Steward) currently providing control, but being evaluated to confirm continued effectiveness
- Monitor results, **report problems**
- Regional resistance monitoring will be ongoing
- Non-chemical controls



Tractor tracks

Spray gallonage for **ground equipment**:

- 7 inch alfalfa 10-12 gpa
- 8- 15 inch 15-20 gpa
- >15 inches 20 gpa minimum
- Use 30 psi and hollow cone nozzles, adjust spray pattern as suggested by the nozzle manufacturer to overlap near the top of the canopy



Spray gallonage for **aerial equipment**:

Less than 2 gallons of spray per acre has **frequently resulted in unsatisfactory control**. Overall efficacy frequently increases as even more carrier is used.

8"-14"

feeding damage to top 1"-2" inches growth on 30% to 50% of terminals

4+ larvae/stem

Table 1. Approximate degree days required for alfalfa weevil development.

Degree Days or Thermal Units	Stage	Importance
25-300	Eggs/hatch	In stems
301-450	1st and 2nd instars	Leaf pubescence – start sampling
450-600	2nd and 3rd instars	Defoliation
600-750	3rd and 4th instars	Defoliation
750+	Pupa to adult	Adults – some feeding – overwintering

Note: once a week scouting may not be enough during high pressure!

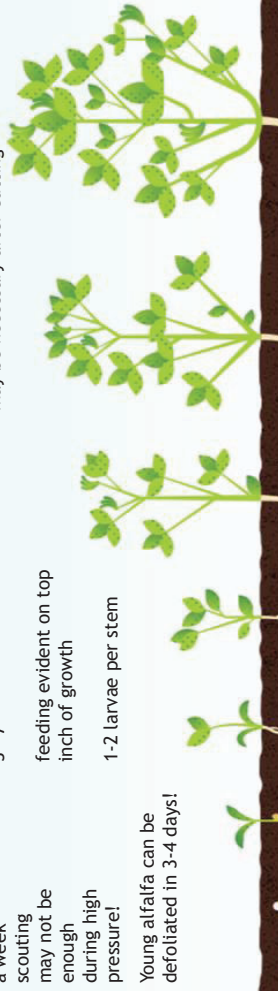
Young alfalfa can be defoliated in 3-4 days!

3"-7"

feeding evident on top inch of growth

1-2 larvae per stem

Note: additional stubble sprays may be necessary after cutting



OPTION a: Early cutting if within 10 -14 days of cutting, the hay is expected to dry quickly, and windrows will be rapidly removed from the field so the relatively delicate larvae are exposed to bright sunlight and drying winds.

OPTION b: Spraying before cutting is advisable if the top 2"-3" injured and harvest cannot be done immediately, or if weather conditions favor larval survivorship and other stresses make rapid regrowth following cutting unlikely.



Stubble sprays: 8+ larvae/sqft (4+ if drought stressed) prevent regrowth

- Consider other little known weevils in our alfalfa



Alfalfa weevil



Clover leaf weevil



Clover root curculio

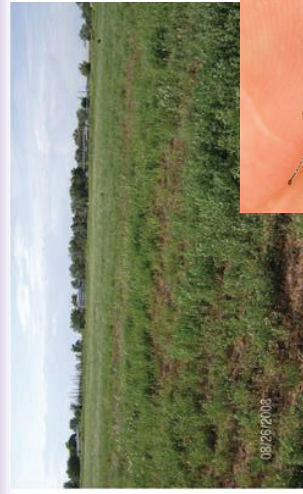
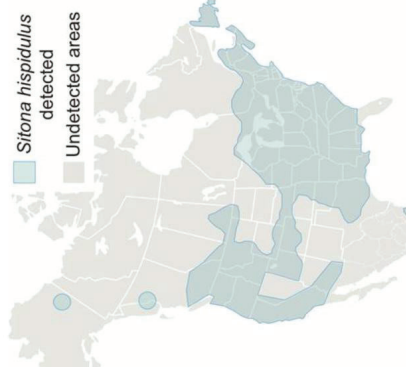


White fringed weevil

Root pests

Foliar pests

- Unseen root damage-often blamed on environmental or nutrient stress



all white-fringed beetles are highly fertile females; no males have been found



Feeds on soybeans, corn, sorghum, alfalfa & more



Questions?

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