

## PEST MANAGEMENT DECISION MAKING

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### INTRODUCTION

Pest management in alfalfa is not a simple or straightforward task. Hundreds of different species occur in alfalfa fields. Only a small percentage are harmful (Table 1), while others are beneficial or innocuous. The grower or pest control advisor needs to monitor fields frequently, recognize injury symptoms, properly identify pests and understand the biology of the pest and its potential destructive capability. Once a pest is identified, economic thresholds provide a useful tool. However, often times economic thresholds alone are insufficient to make treatment decisions. "Real-life" field situations are often more complex due to multiple pest outbreaks. Alfalfa pest management practices can also impact adjacent crops. A number of factors need to be considered when deciding if a field should or should not be treated (Table 2).

Table 1. Alfalfa Pests

<b>Pest</b>	<b>Scientific Name</b>
Alfalfa Weevil	<u>Hypera postica</u>
Egyptian Alfalfa Weevil	<u>Hypera brunneipennis</u>
Pea Aphids	<u>Acyrtosiphod pisum</u>
Blue Alfalfa Aphid	<u>Acyrtosiphod kondoi</u>
Spotted Alfalfa Aphid	<u>Therioaphis maculata</u>
Alfalfa Caterpillar	<u>Colias eurytheme</u>
Beet Armyworm	<u>Spodoptera exigua</u>
Western Yellowstriped Armyworm	<u>Spodoptera praefica</u>
WebWorms	<u>Loxostege spp.</u>
Sowbugs	<u>Parcellio laevis</u>
Crickets	<u>Acheta assimilis</u>
Three-cornered alfalfa treehopper	<u>Spissistilus festinus</u>
Leafhopper	<u>Empoasca abrupta</u>
	<u>Aceratagallia curvata</u>
	<u>Acinopterus angulatus</u>
	<u>Peridroma saucia</u>
Variegated Cutworm	<u>Thrips spp.</u>
Thrips	<u>Tetranychus spp.</u>
Spider Mites	<u>Aceria medicaginis</u>
Alfalfa bud mite	Various species
Grasshoppers	

Table 2. Factors to consider in pest management decision making:

1. Pest population
2. Pest ID and biology
3. Predator, parasite and pathogen status
4. Alfalfa variety
5. Weather
6. Time of year
7. Days to cutting and duration of harvest operation  
Cost vs. benefit ratio
9. Plant growth status: A) Stand, B) Vigor, C) Height, D) Presence  
of Weeds, E) Water Status
10. Economic injury and threshold levels

Once treatment has been deemed necessary, the grower or pest control advisor still must select a pesticide from the large number of available products (Table 4). This is also not an easy decision. Some of the factors that should be considered are listed in Table 3.

Table 3. Factors to consider in pest control decision making:

- Method of application: air, ground, or chemigation
- Selection of pesticide or combinations
- Formulation
- 4. Rates
- 5. Effectiveness against target pest(s)
- 6. Mode of action: systemic, contact, stomach poison
- 7. Length of effective control
- 8. Hazards to wildlife
- 9. Hazards to humans
- 10. Hazards to adjacent crops
- 11. Hazards to beneficial insects and bees
- 12. Harvest restrictions
- 13. Weather
- 14. Effect of temperature on pesticide performance
- 15. Time of day
- 16. pH of mix water
- 17. Use of adjuvants
- 18. Legal status: registration & permits
- 19. Limits on number of applications per cutting or season
- 20. Plantback restrictions
- 21. Costs
- 22. Worker safety requirements: safety equipment, employee training,  
closed systems
- 23. Calibration & equipment
- 24. Availability of product & applicator
- 25. Coordination with other cultural practices
- 26. TIMING!! (Most of all!)

All of the above mentioned factors must be integrated in order to make the right pest management decision. There may be more than one "right" decision but an incorrect decision can be costly to both the grower and pest control advisor.

Table 4. Summary of Alfalfa Insecticides This is only a guide; refer to labels before use.

Chemical	Rates <sup>1/</sup> per Acre	Pests Controlled	Days to Harvest	Remarks
<b>Bacillus thuringiensis</b> (Javelin, Dipel, etc.)				
Javelin	.5 - 2 pts	Alfalfa caterpillar	0	Highly selective, safe to beneficials, wildlife, and humans.
	2 - 4 pts	Armyworms		
Dipel 4L	.25 - .5 pts	Alfalfa caterpillar	0	
<b>carbaryl</b> (Sevin)				
80 WP	.67 - 1.88 lbs	Leafhoppers, Armyworms, Cutworms, Weevils	3	Restricted Use Pesticide in CA. Do not apply to wet foliage or when rain or excessive humidity is expected. Can be applied through irrigation systems. Highly toxic to bees.
5% Bait	30 lbs	Cutworms, crickets, grasshoppers		
<b>carbofuran</b> (Furadan)				
4F	.5 - 2 pts	Weevils, aphids grasshopper	.5 pts - 7 days 1 pt - 14 days 2 pts - 28 days	Restricted Use Pesticide, extremely toxic to waterfowl, systemic. Do not apply more than once per cutting, twice per season. Second application limited to one pint. Plant back restrictions.
<b>chlorphryfos</b> (Lorsban)				
4E	.5 pt 1 - 2 pts	Aphids Weevils, Armyworms, cutworms	.5 pt - 7 days 1 pt - 14 days over 1 pt - 21 days	Limited to 4 applications per year, once per cutting. May be applied through irrigation systems.
<b>diazinon</b> (D·Z·N, Diazinon)				
4E	.75 - 1 pt. 2 - 3 pt.	Aphids, Grasshoppers Weevils	7 10	
50 WP	.75 - 1 lb 2 - 3 lbs	Aphids, Grasshoppers Weevils	7 10	
<b>dimethoate</b> (Cygon, Dimetoate 267)				
Dimethoate 2.67E	.75 - 1.5 pts	Aphids, leafhoppers, weevils (reduction)	10	Do not apply during bloom. One application per season, systemic. Cygon 400 is a 4EC.
<b>disulfoton</b> (Di-Syston 156)				
15G	6.7 lbs	Aphids	28	Restricted Use Pesticide, one app. per season. Systemic.

<b>malathion</b> (Cythion, Malathion) 8E	1.5 pts	Aphids, grasshoppers, Weevils, Armyworms	0	Do not apply to alfalfa during bloom.
<b>methidathion</b> (Supracide) 2E	1-2 pts	Weevils, Aphids	14	Restricted Use Pesticide. One application per cutting.
<b>methomyl</b> (Lannate) 90 SP	.25 - 1 lb	Armyworms, Alfalfa caterpillar, weevils, aphids	7	Restricted Use Pesticide. Do not apply to dormant or semi-dormant alfalfa when minimum minimum daily temperature is 50° F or lower.
<b>methoxychlor</b> (Methoxychlor) 2E	4 - 6 pts	Weevil, leafhopper	7	
<b>methyl parathion</b> (Methyl Parathion, Penncap-M) 4E 2FM	.75 pts 1.5 - 4 pts	Weevils, aphids, Armyworms	15	Restricted Use Pesticide. Highly toxic. FM formulation is highly toxic to bees.
<b>mevinphos</b> (Phosdrin, Mevinphos) 4E	.25 - 1 pt	Aphids, alfalfa caterpillar, weevil, grasshopper	1	Restricted Use Pesticide, extremely toxic.
<b>parathion</b> (Aqua 8 Parathion, Phoskill 8, etc.) 8E	3.75 pts (6 oz) CA & NV .5 pts other States	Aphids, Armyworms, Grass- hopper, Weevils	15	Restricted Use Pesticide, highly toxic. Also available as 4E and 6E.
<b>phosmet</b> (Imidan) 50WP	1.5 lbs	Weevils	14	Do not apply more than once per cutting. Do not use spreader, sticker, or surfactant.
<b>trichlorfon</b> (Dylox) 80SP	5 - 20 oz.	Alfalfa caterpillar, cut- worms, webworms	0	Safe to bees, at low use rates less toxic to beneficials.

1/ Rates given are maximum rates; less than maximum rates are legal.  
Formulations: E = Emulsifiable Concentrate; F = Flowable; FM = Flowable Microcapsules;  
G = Granular; SP = Soluble Powder; WP = Wettable Powder

To simplify information, trade names of products have been used. No endorsement of named products is intended, nor is criticism implied of similar products which are not mentioned. Many of these products are available in different strengths and rates must be adjusted accordingly. ALWAYS REFER TO THE LABEL.

A panel of licensed pest control advisors from the Imperial Valley was formed. The panelists were presented with four realistic pest management scenarios. They were asked to respond by indicating if they felt treatment was necessary, if so, which insecticide or combination of insecticides would they use and why.

### SITUATIONS

Early Season

Time - February 1

Pest - Blue alfalfa aphid, Pea aphid, trace Egyptian alfalfa weevil

Variety - CUF101

Predator, Parasites - None, Low

Stage of Growth - 8 inches

Population - 25 Blue alfalfa aphid / Stem

25 Pea aphid / Stem

5 Egyptian alfalfa weevil / Sweep

Weather - 70° F - Steady, Dry

Symptoms - Plants showing distorted leaves, stunting

Responses

**Jeff McWane**

At first appearance this situation looks straight forward. The aphids are causing economic loss so use a good aphicide to correct the problem. A second look might be worth taking. This field is probably at least three (3) weeks from cutting. Egyptian Alfalfa Weevils are present and there is very little if any beneficial insect help. To exclude weevil control might be a mistake. In this situation, I would lean towards a material or combination of materials that would give long residual control. In this case, I would use one (1) pint of Dimethoate 267 and .75 pints or less of Furadan 4 when possible (no waterfowl present). Another suggestion would be one (1) pint Dimethoate 267 and one (1) 1/2# Imidan 50W (waterfowl present).

**Curtis Pate**

We have plenty of aphids to treat for, especially the blue aphid which can stunt the plant so badly. The CUF 101 variety is tolerant but not immune to aphids. The distorted, stunted plants indicate a lack of attention on this field or a steady build up population that has been just under economic thresholds up to now. I am assuming we have not treated this field this year for aphids and all labeled materials are available.

Since no predators or parasites are knocking the population down, the aphids need to be treated. Malathion and Phosdrin are options for close to harvest treatments but could have a resurgence with such a long time before cutting. I will advocate 1.5 pint Dimethoate 267 at a cost of \$3 per acre. While we are treating here, we should clean up the weevils to avoid flying here twice. The weevils are not economic on their own though. A half a pint of Furadan will do the job for another \$3 per acre.

**Clyde Shields**

Remembering that I do not have all the facts, please use the following recommendations as generally standard ones.

Per acre: One (1) pint Malathion 3 plus .75 pint Dimethoate 267 with a buffer (I use 10-12-0 at .10 pint). (See Comment following these Situations.)

2 First Cutting  
Time - March 1  
Pest - Egyptian alfalfa weevil, Blue alfalfa aphid, Pea aphid  
Variety - CUF 101  
Predator, Parasites - Ladybirds - 10 sweep  
Aphidus  
Stage growth - 15 days to cut  
Populations - Egyptian alfalfa weevil - 25, Mixed Instars / Sweep  
Blue alfalfa aphid - 35 / Stem  
Pea aphid - 30 / Stem  
Weather - 80° F Dry  
Symptoms - Stunted leaves and skeletonized terminal buds beginning  
to appear

#### Responses

##### Jeff McWane

Higher temperatures have caused rapid increases in all insect populations. Although beneficial populations are on the increase they can't be considered a control factor at this point. If the beneficials were in higher numbers or there was visual evidence of predation and parasitism taking place, I would consider using Supracide 2E even though it is much more expensive than other choices. In this case, I would opt for either .5 or .6 pints of Phosdrin or one (1) pint of Dimethoate 267 in combination with .5 pints or less of Furadan 4, where possible. If not, I would use 1.5# of Imidan 50W in place of Furadan 4.

##### Curtis Pate

The weevils have taken off. The aphids are at high levels but the days are warming up. The warmer weather has brought on the ladybird beetles. I'm told that we have ten (10) ladybirds per sweep but not told the lifestage of these beneficials.

At twenty-five (25) weevils per sweep we need to act on this problem. Imidan at a cost \$4 per acre will generally do a good job on the weevil alone but we should be attentive to misses and be prepared to kick it with another material such as Malathion. If the ladybirds are immature the voracious predators will keep the aphids in check. If most of the ladybirds are mature and not feeding heavy we might need to put some Phosdrin in to pick up the aphids. I need to know what the situation was yesterday before I could make the best call for today.

##### Clyde Shields

Per acre: 1.5 pint Malathion 8 plus .75 pint Dimethoate 267 with a buffer (I use 10-12-0 at .10 pint). (See Comment following these Situations.)

#### 3. Late Summer

Time - August 15  
Pest - Beet armyworm, Alfalfa caterpillar  
Variety - CUF 101  
Predator, Parasites - Apanteles; Others - moderate  
Stage of growth - Mid-cutting - 15 days to cut  
Populations - 1/2" or larger Beet armyworm - 18 / Sweep; 3 Parasitized  
Alfalfa Caterpillar - 12 / Sweep; 10 Parasitized  
Weather - 100° F, Humid  
Field Appearance - scattered "flagging"

#### Responses:

##### Jeff McWane

The beneficial insect population has virtually eliminated the Alfalfa Caterpillar as a factor but the Beet Armyworm is still a big question mark and must be closely monitored. If the nerves give out, Javelin might be a good choice to back up the beneficials. If it appeared beneficial population was not able to prevent yield loss, Lorsban at one (1) pint would be my choice.

**Curtis Pate**

The caterpillars are present but parasitized. The armyworms are flagging and apparently building up. With fifteen (15) armyworms per sweep we have enough to treat. While this is economic to treat for it is not an alarm situation. With fifteen days to harvest we have another day to recheck this field and make a more informed decision.

Unless the case were quite different with only fourteen days to harvest, I would make the call to treat. Environmentally I like the idea of using a Bacillus thuringiensis (B.t.) such as Javelin, but don't leave out the oil or surfactant. If possible go to school on your neighbor that just used B.t. If his treatment left too many worms, go on to a material that will let you sleep at night. A \$9 per acre shot of Lannate makes for good rest and empty pocketbooks. We can save approximately half that if Lorsban has been doing a good job and the days to harvest aren't a problem.

**Clyde Shields**

Per acre 4 pints Jav lin. (See Comment following these Situations.)

4. Late Season

Time - November 1

Pest - Crickets and Sowbugs

Variety - CUF 101, Renovated field

Planted in October

Stage of Growth - Established plants - 8"

New seedlings - 5-6 trifoliolate leaves

Damage occurring near borders on seedlings, plants denuded

Populations - Large number crickets, sowbugs

Weather - 70° F Dry

Responses

**Jeff McWane**

I believe Sevin Bran Bait at about 20-25 pounds per acre is the most cost effective control for situation 4. Recent county regulations have drastically restricted the use of this product, but I would still use it whenever possible.

**Curtis Pate**

A reseeded, renovated field; the seedlings are five to six leaf stage. The established plants are eight inches high. The problem appears to be localized to the borders with crickets and sowbugs feeding.

The feeding pattern indicates that the true culprit is the sowbugs. Seedlings with five to six leaves can sustain the damage without treatment. This situation should be watched though. A good treatment, if and when decided on, would be 20# of Sevin Bait just as the water comes off.

**Clyde Shields**

Per acre: 20 pounds Sevin Bran Bait. However, we seldom treat with bait only; normally we would use another material to pick up grasshopper or worms or flea beetle. (See Comment following these Situations.)

Comment by Clyde Shields

There is actually no way for me to make a proper recommendation using the conditions that have been presented to me without actually inspecting a field. I will only be able to make a standard recommendation for each situation. There are many factors that have to be considered in the field, for example: Will the field be harvested for hay or pastured? Does the field appear healthy? What is the soil quality? What does the grower want to do? What is the predator and pest complex? What are the conditions in the area surrounding the field?

Actually, it is not wise to make a recommendation without physically looking at each field. There are many factors that must be considered, some of which are listed above and others described below:

In order for a proper chemical spray to be applied to a field, the field needs to be checked for insects--both harmful and beneficial--then re-checked on a regular basis, in some cases just a day or two later, so that a trend can be established. Sometimes the field will clean up from

the beneficial insects and sometimes it will need to be treated with chemicals. The selection of the proper chemical is very important also, because in most cases there is only one or two insects that need to be controlled.

If the proper insecticide is chosen for the field, the ecological balance may be only slightly disturbed and the field may not need to be sprayed again for quite a while. If the wrong insecticide is used, it will often kill too many beneficial insects and, within a short time, the problem is worse than ever, necessitating another treatment and thus creating a sort of pesticide "treadmill."

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In conclusion:

This article does not constitute a recommendation. The sole intent of this article and panel discussion is for educational purposes. In California, recommendations must be in writing and can only be made by licensed pest control advisors. The legal status of pesticides changes rapidly, therefore, ALWAYS READ THE LABEL BEFORE USING ANY PESTICIDE. THE GROWER IS LEGALLY RESPONSIBLE for residues on his crops as well as for problems caused by drift from his property to other properties or crops.