

# ALFALFA INTEGRATED PEST MANAGEMENT

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## ABSTRACT

Integrated Pest Management (IPM) has developed overtime for use in alfalfa and many other crops to manage pests in an integrated manner. The use of IPM involves a combination of “tactics” which include crop management, monitoring of pest populations, and timely control activities to prevent and manage pest outbreaks. Common methods in alfalfa production include biological control by natural enemies, modification of cutting schedules, crop rotation, pest-resistant varieties, and the use of pesticides when required. Selecting pest and disease resistant varieties. Use of economic thresholds will aid in reducing the number of pesticide applications thus conserving natural enemies that, and reduce the chances of secondary pest outbreaks.

**Key words:** pests, beneficial insects, monitoring

## INTRODUCTION

Alfalfa, *Medicago sativa* L. has been cultivated in California since it was first introduced from Chile in 1850 (Barnes et al. 1988). Alfalfa was originally “discovered” in Iran and has been cultivated throughout much of the world. Alfalfa is a perennial crop with a high protein content (15-22%) and lush, dense foliage that is grown for forage as well as for seed. One of the most important characteristics of alfalfa is its high nutritional quality as an animal feed. Specifically, alfalfa contains over 29 vitamins and minerals as well as niacin, panthothanic acid, inocitole, biotin, and folic acid. Alfalfa is also directly consumed by humans in the form of alfalfa sprouts (approximately \$250 million sprouts sold annually in North America).

Alfalfa hay is used primarily as animal feed for dairy cows, but also for horses, beef cattle, sheep, chickens, turkeys and other farm animals. The value of milk, meat, wool and all other animal products is \$132 billion, thus the total value of animal products plus the value of hay reach the \$145 billion level. This far exceeds the combined value of all other high value crops.

Since alfalfa is a perennial crop it provides a relatively stable and favorable habitat for a large number of organisms, including both beneficial organisms that develop in alfalfa fields and expand into other plantings such as cotton and melons, and destructive (pest) organisms.

Damage done by pests found within alfalfa can result in yearly yield reduction, and requires that some type of control action be taken to mitigate these pests. The use of traditional intensive chemical control methods to manage agricultural pests has directly or indirectly led to increasing

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chemical resistance in multiple pests including arthropod insecticide resistance found in alfalfa. As a result, the use of Integrated Pest Management (IPM) has developed overtime for use in alfalfa and many other crops as well to manage pests in an integrated manner, “deemphasizing” the role of insecticides for arthropod pest management.

The use of IPM involves a combination of “tactics” which include crop management, monitoring of pest populations, and timely control activities to prevent and manage pest outbreaks. Common methods in alfalfa production include biological control by natural enemies, modification of cutting schedules, crop rotation, pest-resistant varieties, and the use of pesticides when required. Selecting pest and disease resistant varieties adapted for your particular growing region is one of the most important ways to manage pests. Information can be found through the Alfalfa and Forage Alliance <https://www.alfalfa.org/>. Proper stand establishment, irrigation management, and effective crop management are also critical to encourage a vigorous alfalfa crop that is better able to withstand the effects of weed infestations, insect feeding, and disease incidence (UCIPM 2015).

Proper stand establishment is a crucial IPM strategy for alfalfa because much of the success of alfalfa crops occurs during the stand establishment phase. Alfalfa is generally considered a weak seedling that requires special care during early growth before it becomes a vigorous, deep-rooted perennial capable of producing high yields for many years, when it can successfully compete with weeds, tolerate insect damage, and withstand some diseases. Therefore, weed management, timeliness of planting, and other factors like seeding depth are particularly important.

Once the alfalfa stand has established and is productive, attention must be given to the numbers of potentially damaging arthropods that can migrate from the alfalfa crop that act as refugia (Stilt 1940, Sevacherian and Stern 1974, Mueller and Stern 1974) into nearby susceptible crops (e.g., cotton). The presence of refugia increases the difficulty of controlling pests with chemicals. Applications of ineffective insecticides are not only costly, but increase the possibility of secondary pest outbreaks (Ehler et al. 1973, Eveleens et al. 1973).

Strip cutting, in which a portion of the alfalfa field is left uncut, has been suggested as a strategy to limit arthropod movement from alfalfa fields at cutting into nearby susceptible fields (Stern 1969, Rakickas and Watson 1974, Godfrey and Leigh 1994). Leave 10-14 feet wide uncut strips adjacent to every other irrigation border. At the following cutting, uncut strips are left adjacent to the alternate irrigation borders. Uncut strips of alfalfa afford some protection to adjacent crops such as cotton, providing habitat for parasites and predators of aphids, caterpillars, and other alfalfa insect pests. However, the technique is only used during severe arthropod years when growers will strip cut or leave some uncut swaths along field margins.

In the early spring, alfalfa begins to grow in competition with many types of spring weeds. These weeds act as alternative host plants within/outside alfalfa fields and offer diverse sources for food and oviposition for pests. Monitoring of weedy species of plants is considered a technique by which the magnitude and timing of invasion by pest arthropods in adjacent crops can be predicted, but best to control the weeds to keep pests out (Anderson and Schuster 1983).

Chemical insecticide treatments are often the only choice when population pest reduction is needed immediately. Appropriate insecticides should be selected to effectively the pest(s), and avoid injuries to field-workers, and non-target organisms (e.g., natural enemies, pollinators, birds

and fish). Consider the intended uses, restrictions and expectations carefully before selecting a particular product or formulation. Price alone should not be the deciding factor for which product to purchase. Be sure to rotate insecticides across all available classes and modes of action to slow arthropod resistance development.

It is important to re-sample fields following chemical applications to determine the effectiveness of the treatment, especially early in the alfalfa regrowth period. Sampling in alfalfa can be achieved with a standard 15-inch diameter sweep net using “sweeps” from right to left in a continuous 180° arc in front of the sampler. The rim of the net should strike the top 6-8 inches of alfalfa plants with the net held slightly less than vertical so the bottom edge strikes the alfalfa before the top edge. This will facilitate getting the insects into the net. Each 180° arc counts as one sweep. After taking the desired 10 sweeps, quickly pull the net through the air to force all insects into the bottom of the net bag and grasp the net bag at about the mid-point to trap the insects in the bottom of the sweep net. Count the insects of interest and divide totals by 10 to get the average number of insects per sweep. Getting a good representation of insect numbers in the alfalfa field requires a minimum of four sweep net sample areas starting from the field margin and working your way across the interior of the field.

Do not treat alfalfa with pesticides until the economic treatment level for a specific pest has been reached and the predators and parasites have been assessed for their potential role in controlling the pest (see UC IPM guidelines for alfalfa production, [www.ipm.ucdavis.edu](http://www.ipm.ucdavis.edu)). It is also important to determine the amount of parasitism present because the economic threshold takes parasitism into account. Sample for parasitism by pulling the heads from older caterpillars and squeezing the body contents out toward the head end. Use of economic thresholds will reduce the number of pesticide applications that often harm beneficial insects, leading to severe secondary pest outbreaks. Natural enemies can provide control of arthropod pests in many fields. Predators include bigeyed bugs, spiders, minute pirate bugs, damsel bugs, and lacewings.

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## RESOURCES

- UC IPM Pest Management Guidelines: Alfalfa, Publication 3430, University of California Agriculture and Natural Resources, UC Statewide Integrated Pest Management Program, 86 pp. (<http://www.ipm.ucdavis.edu/PMG/selectnewpest.alfalfa-hay.html> ).
- Alfalfa Year-Round IPM Program, University of California Agriculture and Natural Resources, UC Statewide Integrated Pest Management Program, (<http://www.ipm.ucdavis.edu/PMG/C001/m001yi01.html> ).
- Integrated Pest Management for Alfalfa Hay, Publication 3312, University of California Agriculture and Natural Resources, UC Statewide Integrated Pest Management Program, 138 pp.
- Irrigated Alfalfa Management for Mediterranean and Desert Zones, Publication 3512, University of California Agriculture and Natural Resources, UC Statewide Integrated Pest Management Program, 372 pp.
- California Alfalfa Workgroup Homepage, <http://alfalfa.ucdavis.edu/> .