

# CONVENTIONAL AND ORGANIC METHODS FOR INSECT PEST MANAGEMENT IN ALFALFA

Rachael Long<sup>1</sup>, Charles Summers<sup>2</sup>, and Larry Godfrey<sup>3</sup>

## ABSTRACT

There are a number of insect pests found in alfalfa hay that can cause significant yield and quality losses if left unmanaged. To control these pests, both conventional and organic growers implement similar integrated pest management practices that focus on maximizing profits while minimizing inputs and costs. As such, both farming practices select pest and disease resistant plant varieties and invest resources to establish and maintain healthy stands, which compete best against pests. The main difference between conventional and organic insect pest management is the availability of pesticides for use in organic production when pest control is needed.

**Key Words:** alfalfa, insect pest management, organic, conventional

## INTRODUCTION

Insect pest management in organic and conventional alfalfa hay production has similar goals of minimizing inputs while striving for optimizing yield and quality. As such, both farming practices have similar approaches to managing pests, with a focus on implementing practices that reduce insecticide use and costs. This is especially important in years when hay prices are low, as we are currently experiencing in 2009, relative to the cost of pesticides.

When growing conventional and organic hay, one of the most important steps is to select varieties that have high levels of resistance to pests and diseases (UC Alfalfa Workgroup, NAFA). In addition, it is important to establish and maintain healthy alfalfa stands since healthy plants compete best against pests. As such, alfalfa fields need adequate fertility, good weed management, and proper irrigation scheduling in alfalfa, as discussed in the 'Integrated Alfalfa Production' manual by Summers and Putnam, 2008.

When producing alfalfa hay organically or conventionally, a good working knowledge of pest biology is also essential in order to better know how to monitor and control them. Details on the biology of pests in alfalfa can be found on the University of California Integrated Pest Management website (UC IPM), and also in Summers *et al.* 2008, "Managing insects in alfalfa". One should also know how to identify and monitor for

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<sup>1</sup> R. Long, UCCE Farm Advisor, Yolo County, 70 Cottonwood St., Woodland, CA 95695, email rflong@ucdavis.edu; <sup>2</sup>C. Summers, Department of Entomology, University of California Davis and Kearney Agricultural Center, 9240 S. Riverbend Ave., Parlier, CA 93648, email CHASUM@ucdavis.edu, and <sup>3</sup>L. Godfrey, Department of Entomology, University of California, Davis, CA 95616, email ldgodfrey@ucdavis.edu. In: Proceedings, 2009 Western Alfalfa & Forage Conference, December 2-4, 2009, Reno, Nevada. Sponsored by the Cooperative Extension Services of AZ, CA, ID, NV, OR, and WA. Published by: UC Cooperative Extension, Plant Sciences Department, University of California, Davis 95616. (See <http://alfalfa.ucdavis.edu> for this and other alfalfa symposium proceedings).

beneficial insects and be aware of the potential impacts of pesticides on natural enemy activity. This will help avoid outbreaks of secondary pests that are usually kept under good biological control, so pesticide use will be minimized.

Specific management practices for major and occasional insect pests are discussed in the following section for both organic and conventional alfalfa production. The main difference between these practices is the availability of organically approved pesticides for organic alfalfa growers that are effective against alfalfa pests. Pesticides are restricted in organic production so always check with your certifier to make sure that the materials used are approved and listed in your organic plan to ensure compliance with U. S. Department of Agriculture and California organic growing standards (CDFA-OP, OMRI, USDA). Specific pesticide recommendations for pest control are not made in this paper because they frequently change depending on the status of the registration. As such, the reader is referred to the alfalfa UC IPM website for the most up to date information on insecticides available for use in both organically and conventionally grown alfalfa hay.

## MAJOR INSECT PESTS

***Alfalfa and Egyptian alfalfa weevils.*** Weevils are one of the most threatening pests of alfalfa as they can cause severe losses to both yield and quality to the first and sometimes subsequent hay cuttings, which are usually the most profitable with high forage quality. Currently there are no effective biological control agents against weevils, so most growers rely on the use of insecticides to control them. Fields are sampled using a sweep net and when weevil numbers reach about 15 larvae per sweep, fields are treated with an appropriate insecticide (UC IPM).

Organic growers used to rely on Entrust (spinosad), which gave about 70% weevil control, but the label was cancelled for alfalfa in 2009. Although efforts are underway to reinstate it for organic alfalfa production, it is not known if these efforts will be successful. Other organically acceptable pesticides evaluated for weevil control included PyGanic, Ecotrol, CedarGuard, and GCMite, but none have been shown to be effective. Another option for organic growers is to sheep off fields, which involves grazing the alfalfa during wintertime when the plants are dormant. Since adult weevils lay eggs in alfalfa stems after migrating into fields, sheep feeding on and trampling these infested stems can help reduce weevil numbers and damage to the alfalfa the following spring. Flaming with propane during dormancy will have a similar affect as the sheep, but is currently too expensive relative to the value of the hay.

Organic growers can also overseed other forages into alfalfa in the fall, including clovers or annual grasses that are not palatable to weevils (Canevari *et al.* 2000). These plants will fill in the stand and make up for a loss in production from weevil damage to the alfalfa the following spring. However, overseeding changes the market value of the alfalfa and should only be used in older or weakened alfalfa stands where the interest is to extend the stand life. Another option is to harvest stands early, prior to significant weevil damage, though yield losses will occur and weevil larvae that survive the harvest may continue to feed on newly growing plants under windrows.

***Aphids: Pea, blue, spotted, and cowpea.*** Aphids damage alfalfa by feeding on plant sap and injecting toxins, which stunt plant growth. Pea aphid and blue alfalfa aphid normally attack the first and second cutting, although they may reappear late summer in August and September. Spotted alfalfa aphid is most prevalent during July and August and cowpea aphid can occur any time of the year. The most important practice to manage aphids is to select resistant plant varieties (NAFA), though resistance is not yet available for the cowpea aphid. Threshold levels are available for the number of alfalfa aphids tolerated per stem by alfalfa growth stage and time of year (UC IPM). Once these aphid threshold levels are reached, management practices need to be implemented to prevent economic losses.

A number of strategies are available for managing aphids in the advent that resistant varieties fail. Fields can be harvested early to escape aphid damage or insecticides can be applied. Conventional insecticides used to suppress weevils and summer worms will often control aphids (UC IPM). Organically certified insecticides such as azadirachtin (Neemix), neem oil (Trilogy), and pyrethrin (PyGanic) will suppress aphid numbers, but will not eliminate them.

***Armyworms and alfalfa caterpillars.*** Summer worm pests are most severe in July and August when feeding damage on leaves and stems reduces alfalfa yield and quality. Management of summer worms involves monitoring fields for these pests as well as their natural enemies, mainly parasitic wasps. These wasps lay eggs inside their worm hosts and may be monitored by pulling apart worms. If the worm is parasitized, there will be a tiny white or light greenish colored larvae inside the worms. Viral diseases may also attack summer worms, causing them to appear yellowish and limp.

When summer worms reach 10 to 15 non-parasitized larvae per sweep, both conventional and organic growers will either harvest early or apply an insecticide (UC IPM), depending on the value of the hay. If hay prices are up and the yield gain associated with controlling worms with a pesticide is cost effective, growers will treat fields. If not, fields will be cut early, as occurred in 2009 with low hay prices.

Some growers will also strip harvest to conserve beneficial insects in the field to help control summer worms. These strips would be about 200 feet long and left at every other levee. At the next harvest the strips would be cut and new ones left to provide a continuous refuge for beneficial insects. Some yield reduction may be incurred, but with enhanced control of summer worms by beneficial insects, these losses are expected to be less than the cost of an insecticide treatment. During summer in some soil types, plants in strips may show some water stress after harvest, but will recover.

Another option to attract beneficial insects to farms is to plant hedgerows of flowering plants around field margins to attract natural enemies that will also disperse into fields to help control pests (Long 2009).

## OCCASIONAL INSECT PESTS

**Cutworms.** The larvae of these pests can cause severe damage to alfalfa, especially to seedling stands where they can cut the plant off at or below the soil line causing stand losses. Established fields are damaged when cutworms cut off new growth or feed on alfalfa foliage. Prior to and after planting in both conventional and organic farming, control weeds in and around alfalfa fields where cutworms may buildup to damaging levels. Monitor for cutworms by looking for plant damage and for worms often hiding under debris and loose soil. In established stands, failure of alfalfa to re-grow the following cutting may be a sign of cutworm activity. If damage continues to increase and cutworms are found, treat with an insecticide. It is recommended that fields be sprayed near sundown when cutworms become more active.

**Leafhoppers.** Damage by *Empoasca* leafhoppers is recognized by a yellow, wedge-shaped discoloration at the tip of each leaf, which may shorten internodes and stunt plants. Leafhoppers are most abundant in July and August and mostly infest from field edges. As a result, if infestations are detected early, sometimes a spray around the field margin may be all that is needed. Organic growers may have to rely on early harvest for control of leafhoppers.

**Ground mealybugs.** These pests are tiny white-colored insects that feed on the roots of alfalfa plants, causing yield and stand losses in characteristic circular patches. They are found primarily in the Sacramento Valley on heavier soils. Management practices involve crop rotation with non-susceptible hosts such as wheat, corn, and dry beans. Applying sulfur has also been known to help control ground mealybugs by locally increasing the soil pH where infestations occur, creating unfavorable conditions.

**Webworms and loopers.** The larvae of these insects feed on alfalfa foliage, but are seldom damaging to alfalfa and control is rarely needed.

**Clover root curculio.** The larvae of these weevil pests feed on alfalfa roots, more commonly in the lighter soils of the San Joaquin Valley, but are seldom of concern in California.

**Bean thrips.** These pests feed on alfalfa leaves and stems and may cause stand losses in seedling fields. Damage has the appearance of the foliage being burned and the most telling feature of this pest is the large quantity of black fecal spots found on the leaves and stems. If stand loss occurs, fields should be treated with insecticides.

**Spider mites.** Characteristic symptoms of these microscopic pests include a yellowing of leaves that are covered with fine webbing. Since these pests are favored by water stress, proper irrigation management will help ensure that this pest remains uncommon in alfalfa.

**Silverleaf whitefly.** This insect has never reached levels capable of causing serious injury to alfalfa in the Central Valley. They may, however, be serious pests in the Imperial Valley. Plant whitefly resistant varieties if this insect is a persistent pest in your area.

**Grasshoppers and crickets.** Though seldom pests in alfalfa, grasshoppers and crickets may damage this crop when they migrate into fields. Grasshoppers fly in, typically after a wet spring favors population growth and then vegetation begins to dry. Sometimes treating field margins with insecticides will help control these pests. Usually infestations last only a few weeks. Crickets (usually Mormon crickets) typically are pests only once or twice in a decade and cannot fly. To control these pests, growers can install barriers such as water traps or soil pits to halt invasions.

**Threecornered alfalfa hopper.** Adult female hoppers can girdle alfalfa stems when depositing eggs in the plants, causing dieback. These pests are commonly found in desert alfalfa, and more recently in the San Joaquin Valley.

**Blister beetle.** These insects are toxic to livestock from a chemical they carry known as cantharidin. Although blister beetles are found in other states, they are seldom a problem in California, but one should keep an eye out for them. They particularly like to aggregate on blooming alfalfa, are more active in the spring, and are often found on field edges. If found, identify the infested area, mark it, avoid baling blister beetle infested hay, as even dead beetles in ingested hay will cause toxicity to livestock.

## CONCLUSION

Whether farming alfalfa hay organically or conventionally, is essential to know the biology of pests and how to monitor them, as well as how to identify beneficial insects, to effectively manage pests in this crop. It is also important to know the alfalfa market and production costs relative to the value of the hay to help make good decisions on the most economical insect pest management practices when needed. Above all, preparation prior to planting, including varietal selection and proper stand establishment, as well as maintaining healthy stands will go a long way to ensuring a strong alfalfa stand that will compete best against insect pests.

## LITERATURE CITED

- Canevari, W, D Putnam, W Lanini, *et al.* 2000. Overseeding and companion cropping in alfalfa. UC ANR Publication number 21594, <http://anrcatalog.ucdavis.edu/>.
- CDFA-OP. California Department of Food and Agriculture, California Organic Program, [http://www.cdfa.ca.gov/is/i\\_&c/organic.html](http://www.cdfa.ca.gov/is/i_&c/organic.html).
- Long R, S Orloff, R Meyer. 2007. University of California Cooperative Extension sample costs to produce organic alfalfa hay in California, <http://coststudies.ucdavis.edu>.
- Long RF. Establishing hedgerows on farms in California. UC ANR 8000 Series, *In press*, <http://ucanr.org/pubs.cfm>.
- McCaslin M and A Van Deynze. 2008. Coexistence for organic alfalfa seed and hay markets, <http://alfalfa.org/CSCoexistenceDocs.html>.
- NAFA. National Alfalfa and Forage Alliance, <http://alfalfa.org/varietyLeaflet.html>.
- OMRI. Organic Materials Review Institute, <http://www.omri.org>.

- Summers C, L Godfrey, and E Natwick. Managing insects in alfalfa. *In* Irrigated alfalfa management for Mediterranean and desert zones. UC ANR publication number 3512, <http://alfalfa.ucdavis.edu>.
- Summers C and D Putnam [Eds]. 2008. Irrigated alfalfa management for Mediterranean and desert zones. UC ANR publication number 3512, <http://alfalfa.ucdavis.edu>.
- UC Alfalfa Workgroup. University of California Cooperative Extension, <http://alfalfa.ucdavis.edu>.
- UC IPM. University of California integrated pest management guidelines for alfalfa. <http://ipm.ucdavis.edu/PMG/selectnewpest.alfalfa-hay.html>.
- USDA. U. S. Department of Agriculture National Organic Program (NOP) regulations. <http://www.ams.usda.gov/nop/>.