

ALFALFA WEEVILS: A NEW LOOK AT AN OLD PEST

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ABSTRACT

Alfalfa is an important crop in California; it is grown largely in the Central Valley, Low Deserts, and intermountain areas but some alfalfa is grown in nearly every county. There are over 1 million acres grown and alfalfa is used as an important feedstuff for the dairy industry (the top ranked agricultural commodity in the state). Alfalfa acreage is likely to increase further as prices of competing livestock protein sources, corn and corn silage, escalate due to their demand as alternative energy sources. Alfalfa also acts as an “insectary” crop for other neighboring fields in the Central Valley and if properly managed will produce an abundance of natural enemies that aid in managing pests. The alfalfa weevil complex (alfalfa weevil and Egyptian alfalfa weevil) is the most damaging arthropod in California alfalfa. Organophosphate, carbamate, and pyrethroid materials are commonly used to manage this pest but there are environmental drawbacks and pest management concerns regarding these applications. The occurrence of organophosphate insecticides in surface waters, particularly chlorpyrifos (Lorsban®), coinciding with the timing of treatment for weevil larvae, has placed added emphasis on refining IPM programs in alfalfa. Pyrethroid insecticides have also recently been implicated in off-site movement on organic matter into waterways. The new conditional agricultural discharge waiver from irrigated lands set forth by the Central Valley Regional Water Quality Control Board for the agricultural community has placed even added importance on protecting water quality. Preliminary water monitoring results have not been satisfactory in many areas. We conducted successful studies in 2004 and 2005 to re-evaluate the weevil treatment threshold and to re-assess the status of biological control for this pest. There is a need for new, biorational insecticides to manage this pest complex. In addition, the aphid complex (several species) is problematic in many alfalfa production areas. While indoxacarb has been registered for weevil control and represents a reduced-risk material, there is perhaps even a greater void for environmentally-friendly aphid management tools. Similar studies were done with experimental, reduced-risk materials against pea aphids. Finally, organic production of alfalfa is a growing industry. Insect pests, particularly the alfalfa weevil complex can be a hindrance to organic alfalfa hay production. Several organic control agents were evaluated for efficacy against this pest.

INTRODUCTION

Alfalfa is one of the largest acreage crops cultivated in California with about 1.1 million acres grown annually in California. Most of the alfalfa planted in California is for hay production, and

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because of its excellent protein and fiber source for dairy industry and other livestock operations, alfalfa industry is most likely to increase stay strong (the dairy industry is the number one valued California agricultural commodity and is nearly twice that of the second place commodity [grapes]). Hay production in California is worth nearly \$1 billion per year (number one valued field crop and in the top 10 overall) with alfalfa accounting for ~\$850 million.

Several insect pests injure alfalfa plants and reduce crop yield and quality. The alfalfa weevil complex is the most damaging arthropod to California alfalfa in most parts of the state. It is routine for most fields to be treated once annually for this pest. The alfalfa weevil complex includes the Egyptian alfalfa weevil (EAW), *Hypera brunneipennis*, and the alfalfa weevil (AW), *Hypera postica*. These pests were introduced from the Mediterranean region to the U.S. in the early-mid 1900's. In California, the AW is thought to flourish in the cooler areas (intermountain and coastal area) and EAW prefers the hotter areas including the Central Valley and low desert areas. These two species are identical in appearance and recent mitochondrial DNA analyses by Bundy et al. (2005) in New Mexico have shown that these "different species" are likely just strains of the same species.

AW and EAW larvae are controlled well with insecticides including organophosphate, carbamate, and pyrethroid materials. However, the occurrence of organophosphate insecticides in surface waters, particularly chlorpyrifos (Lorsban®), coinciding with the timing of treatment for weevil larvae, has placed emphasis on finding alternative means to manage this pest (Long et al. 2002). Chlorpyrifos is a key material in alfalfa with about 1/3 of all chlorpyrifos-treated acreage in the state being in the alfalfa system. Pyrethroid insecticides have drawbacks of being non-selective for natural enemies, and have recently been found to move off-site attached to organic matter and may accumulate in streams (Weston et al. 2004). This class of chemistry is now under review by CA-DPR. Registration of carbofuran, the carbamate representative used for weevil control, is being cancelled federally on most crops, including alfalfa. Water quality and pesticide discharges are of utmost importance in CA agriculture. Irrigated agriculture has operated under an agricultural discharge waiver from 1982 until December 31, 2002, which means agriculture has been exempt from discharge permits. The agricultural community has been working with the Central Valley Regional Water Quality Control Board (CVRWQCB) on specifics of a new conditional agricultural discharge waiver from irrigated lands. The waiver requires monitoring of all pesticides and other constituents of concern (such as nutrients, sediment, turbidity, total organic carbons, toxicity, dissolved oxygen and total dissolved solids). Chlorpyrifos is one of the pesticides commonly found in the water monitoring and use in alfalfa for weevil control is commonly implicated. Therefore, it appears that alternative measures are needed for alfalfa weevil management in alfalfa in California.

Integrated pest management is coordinated approach used to deal with insect and mite pests that utilizes a combination of biological, cultural, host plant resistance, and chemical tactics in an environmentally and economically sound manner. There are several biological means that could aid in managing the alfalfa weevil complex such as predators and parasites and an entomopathogenic fungus that infects weevil larvae and was found in our earlier studies (Windbiel 2006). Cultural methods can also be important such as differences in susceptibility

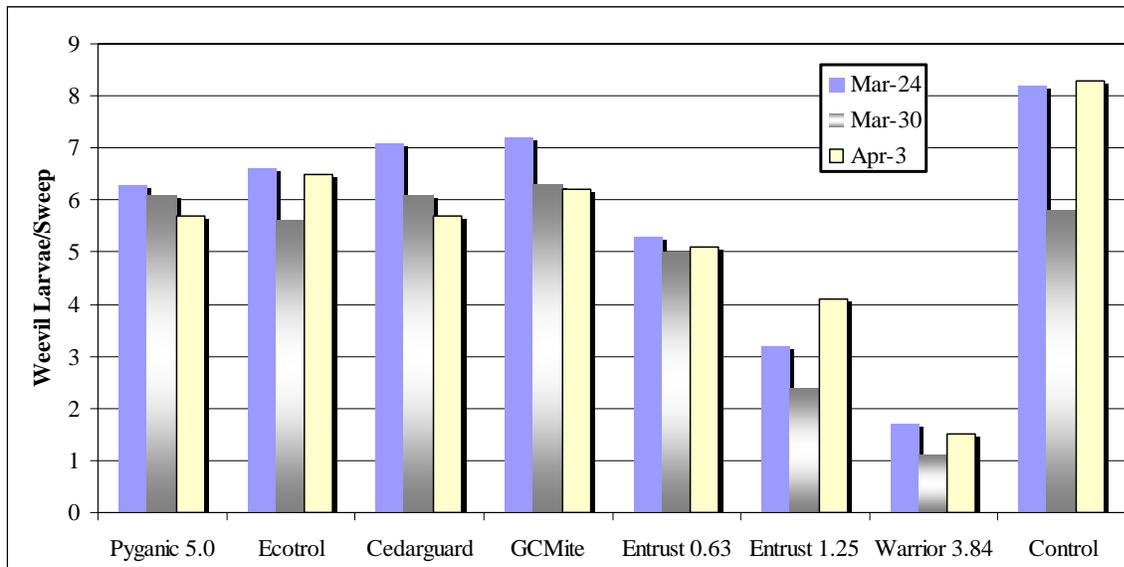
among cultivars. However, insecticides are a key method for managing the weevil complex.

PROCEDURES

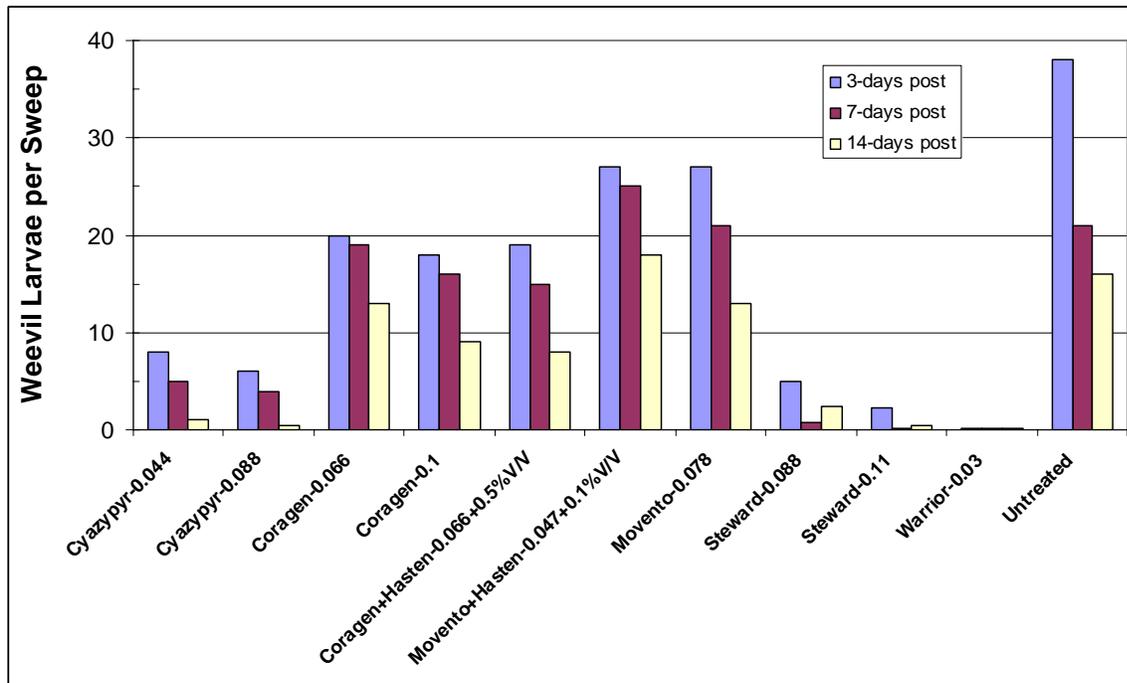
Studies were conducted on IPM of alfalfa weevil and aphid pests in alfalfa in 2007 and 2008. In 2007, organic insecticides were tested against weevil larvae in Yolo and Siskiyou Co. and the work continued in Yolo Co. in 2008. Materials such as Pyganic, Ecotrol, GC Mite, CedarGuard, and Entrust were evaluated. At the Siskiyou site, efficacy was compared with a chemical insecticide. Studies were conducted with reduced-risk insecticides, registered and experimental, against EAW in 2007 (Yolo Co.) and 2008 (San Joaquin Co.). In addition, studies were done targeting pea aphids in San Joaquin Co. in 2008. Some of the products evaluated included cyazypyr, Movento, and Coragen. Studies were done with in small field plots utilizing ground application. Treatments were targeted when the population reached ~15 weevil larvae per sweep.

RESULTS

Organic Options: Entrust provided the best weevil larval control among the organic materials evaluated. Percentage control in the 50-60% range was seen with the higher rate (1.25 oz./A) of this product.



Reduced-Risk Insecticides: Cyazypyr provided very good weevil larval control and was only slightly less efficacious compared with standards Warrior and Steward.



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