*University of California* *Cooperative Extension*

# *FIELD CROPS REPORT*

**San Joaquin County**

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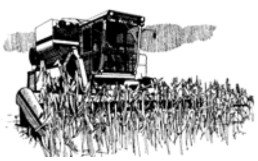
*February 2003*



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## WHEAT FERTILIZATION FOR YIELD AND PROTEIN

**February to April is the time to complete the nitrogen requirement for wheat. Large amounts of precipitation in November and December have moved nitrate nitrogen below roots or denitrified N due to standing water and long periods of saturated soils. Wheat fertilization is broken into two parts; preplant nitrogen for yield and late nitrogen at the boot/flowering stage for protein development.**

When wheat is grown for bread flour, management concerns shift from maximizing yield potential to achieving high bushel weight and grain protein (above 13%). A healthy, irrigated wheat crop with high yield potential should have received between 100 to 180 lbs nitrogen/acre from preplant and topdress applications through the tillering stage. Wheat may require one more application of nitrogen fertilizer after heading to ensure high grain protein content. A wide window (about 3 weeks) of opportunity exists for the nitrogen application, ranging from just after the head has emerged to about 2 weeks after flowering (pollination). This should coincide with mid-to-late April for December sowing. Late season nitrogen rates range from 20-50 lbs nitrogen/acre and should be coordinated with irrigation or with adequate rainfall. Lower nitrogen rates are appropriate for lower yielding crops (2.0 – 2.5 tons/acre) and higher nitrogen rates are best suited for yields above 3.0 tons/acre. Sufficient grain protein may be attained without a late season nitrogen application if wheat yields are less than 2.25 tons/acre, and if preplant fertilizers applications or topdress applications were adequate at the tillering stage. *Generally, cool and dry weather during grain filling results in higher grain yields; management for protein is more critical when yields are higher.*

An application of N near boot stage (before heading), which should occur in mid-to-late March for December sowing, also will elevate grain protein. Typically, the increase in grain protein is about 0.5 to 1.0 percentage points. The grain protein increase with nitrogen applied at boot stage is not as large as the response when applied at flowering. Flowering nitrogen applications usually increase grain protein 1.0 to 1.5 percentage points.

Water-run applications of anhydrous ammonia, UAN-32, and aqua ammonia, or urea topdressed just before irrigation, are the preferred materials and methods for late season fertilization. Topdressing ammonium nitrate just before irrigation is a less desirable option. Irrigated small grains recover ammonium nitrate from the soil into the plant as efficiently as urea or ammonia forms. However, once the nitrogen is in the small grain plant, it is not as efficiently translocated from the leaves to the grain. The result is higher nitrogen content in the straw and lower grain protein when ammonium nitrate is applied. Foliar nitrogen applications also are effective at raising grain protein, but usually cost more.

## MANAGEMENT OF EGYPTIAN ALFALFA WEEVIL AND PROTECTION OF YIELDS WITH SELECTED INSECTICIDES

February marks the month we begin treating weevil larvae in alfalfa fields. Regulatory changes are occurring which challenges our traditional pest management practices and the use of Organophosphate insecticides, i.e. Loresban, Diazanion, & Furadan . In addition, the last two years of weevil control have seen some inconsistent and erratic results. Part of the problem has been weather related with rain and cool temperatures, and some has been the choice of product or use rate for the stage of weevil larvae development. Last year a weevil control experiment was conducted on the Davis campus to evaluate old and new products, predator disruption and influence to yield and quality of alfalfa. Larry Godfrey, UC Davis Entomologist, delivered the results at the 2002 Alfalfa Symposium.

The Egyptian alfalfa weevil (alfalfa weevil in some areas) during most years is the most severe insect pest of alfalfa in California. These pests feed on alfalfa leaves and stems, reducing hay yields. Several insecticides provide acceptable control of this pest. Historically, product choice has been driven by efficacy on the pest, cost, and presence of other pests, i.e., aphids, days before harvest, etc. However, in recent years insecticide usage, particularly organophosphate and carbamate insecticides in alfalfa, has been under increased scrutiny and has been suggested as a factor contributing to the levels of insecticides in surface waters. New classes of products have been registered and others are being considered for registration. These new products, although facilitating protection of surface waters, may not have the optimal properties for IPM in alfalfa. Studies were conducted to evaluate the fit of these materials into alfalfa IPM and to examine the impact of Egyptian alfalfa weevil populations on alfalfa productivity.

Two species of weevils (Alfalfa Weevil [*Hypera postica*] and Egyptian Alfalfa Weevil [*Hypera brunneipennis*]) inflict damage to alfalfa in the West. These insects are very similar; the appearance of the adults and larvae is identical. These pests are examples of an insect introduced into the US from foreign sources. Separate introductions of these pests (probably three) have resulted in the two separate species designations. There are some important biological differences between the alfalfa weevil and Egyptian alfalfa weevil (EAW) with the most obvious being that the former species dominates in cooler climates and the Egyptian alfalfa weevil flourishes in the California Central Valley.

The biology, damage, and insecticidal control for these two pests are identical. The weevil larvae inflict the majority of the damage to alfalfa. The early larval stages feed in the alfalfa terminals and the larger larvae feed on the leaflets. Under severe pressure, the plants can be completely defoliated. This damage generally begins in the late winter/spring (time depends on location) and the damage accumulates over a 4 to 6 week period. The larvae are legless, ~0.25 inch long when fully grown and are pale green with a thin white line down the center of the back; they have a brown head.

In recent years, Egyptian alfalfa weevil has evolved from a univoltine (one generation per year) into a multivoltine (several generations per year) insect. Rather than leaving the field, some adults remain in the alfalfa, mate and continue to lay eggs. These eggs soon hatch, giving rise to a second generation of weevil larvae that continue to cause damage into the second and sometimes third cuttings. Fields should be carefully monitored to be certain that no additional weevil larvae are present after the first cutting. The key period for management of alfalfa weevil and Egyptian alfalfa weevil is usually prior to the first cutting although the second cutting, as noted above, can also be damaged.

## **Monitoring and Management Guidelines**

EAW larvae are sampled using a standard 15” sweep net. Sampling should be conducted in at least four areas of the field and by taking 5-10, 180º sweeps per area. The early stage larvae and shoot larvae are poorly sampled with a sweep net; therefore careful attention should be given to examining terminal buds in the late winter/early spring. Tapping the terminals against a white background (paper, etc.) may dislodge the larvae and make them more visible.

Management options include: 1) early harvest, 2) biological control organisms, and 3) insecticides. Early harvest, within the limits of typical alfalfa production, will kill many of the weevil larvae; however, the regrowth should be monitored for the damage from surviving larvae. Biological control with generalist predators is only marginally effective because the complex of natural enemies has not developed yet during this late winter/early spring period. Specific parasitoids have been introduced into the U.S. for these pests, but have been mostly ineffective for Egyptian alfalfa weevil. Minimal success has been achieved in developing alfalfa varieties resistant to Egyptian alfalfa weevil.

Therefore, insecticides are a primary means of managing weevil pests of alfalfa; one, or at most, two applications of insecticide per year generally provide good control. The economic threshold for initiating chemical control is 20 weevil larvae per sweep. This number will lower with short/dormant alfalfa. Insecticide usage in alfalfa and other croplands has been suggested as a factor contributing to the levels of insecticides in surface waters (Long et al. 2001). Organophosphate and carbamate insecticides have been especially implicated. Long and co-workers showed that pyrethroid insecticides can effectively control EAW larval populations and that these insecticides have properties that make them less likely to accumulate in surface waters.

Protection of the environment is an obvious goal and desire of the alfalfa industry. However, this needs to be done through means that do not compromise the integrated pest management programs that have been developed and implemented in alfalfa over the last 25+ years. For instance, the pyrethroid insecticides have been reported to be very detrimental to populations of predators and parasitoids, i.e., low selectivity, in other field crops (Godfrey et al. 2001).

Alfalfa is frequently called an insectary for beneficials within the Central Valley; fields have been shown to support over 1000 species of arthropods (Summers, 1998). These beneficials can positively impact IPM in alfalfa and in other neighboring crops. Another consideration within the alfalfa system is the potential of various aphid species to become significant pests. Most recently, the cowpea aphid has developed into a pest (Natwick & Lopez, 2000). Many insecticides, including some pyrethroids, have been shown to “promote” populations of aphids either indirectly through their effects on beneficials and/or through a direct effect on the aphid physiology (Godfrey & Rosenheim 1996, Godfrey 1998). The goal of this study was to continue to evaluate the fit of registered and experimental insecticides for pest management programs aimed at Egyptian alfalfa weevil. Efficacy on weevil larvae, and resulting effects on alfalfa production, effects on non-targets, and influence on secondary pests were evaluated (tables 1, 2, & 3).

New ANR Publications that may be of interest:

- # 4047 for $7
  Plant Growth Regulators
  *A study guide for Agricultural Pest Control Advisors*
- #21615 for $12
  Postemergence Weed Control in Seedling Alfalfa and Phytotoxicity Symptoms

**visit our website at:*
*http://cesanjoaquin.ucdavis.edu*
*for a complete listing*

## RICE GROWER MEETING

**Thursday, March 6, 2003**

**8:00 am – 11:00 am**

***Nathaniel's Restaurant***
***1429 Stanislaus Street***
***Escalon CA***

(On the corner of Stanislaus Street & Hwy 120 in Escalon, ½ mile east of McHenry Avenue)

**Table 1. Insecticide Evaluation on Egyptian Alfalfa Weevil**

| | | - - - % Weevil Control - - - | | |
|---|---|---|---|---|
| **Treatments** | **Rate/A (product)** | **14-Mar** | **21-Mar** | **26 -Mar** |
| Imidan 70W | 1 lb. | 83.7 | 90.0 | 94.0 |
| Warrior ** | 3.84 fl. oz. | 79.1 | 83.4 | 96.4 |
| Novodor (2 appl. @5 days apart) ** | 1 gal. | 0.0 | 1.3 | 12.3 |
| Furadan 4F | 1 qt. | 71.0 | 72.7 | 93.8 |
| Lorsban 4E | 1.5 pts. | 67.1 | 72.5 | 87.9 |
| F0570 (0.8) | 3.2 fl. oz. | 80.3 | 82.9 | 95.7 |
| F0570 (0.8) | 4 fl. oz. | 83.0 | 88.1 | 97.1 |
| Baythroid 2EC ** | 2.8 fl. oz. | 71.3 | 81.9 | 96.2 |
| Baythroid 20 WP ** | 99.4 g | 83.0 | 81.9 | 93.8 |
| Steward SC (1.25) | 2.56 fl. oz. | 38.4 | 74.0 | 88.2 |
| Steward SC (1.25) | 4.6 fl. oz. | 44.3 | 82.6 | 94.2 |
| Warrior | 3.84 fl. oz. | 81.3 | 83.2 | 97.5 |
| Novodor ** | 1 gal. | 0.0 | 0.0 | 5.7 |
| Untreated | --- | --- | --- | |

*** With crop oil*
*Treated on 3/11/02*
*Based in 25 sweep/Avg*

**Table 2. Pea Aphid Control & Beneficials Counts**

| Treatments | Rate (product/A) | Beneficials per 25 sweeps * | Pea Aphids / 25 sweeps 10 DAT | Pea Aphids / 25 sweeps 21 DAT |
|---|---|---|---|---|
| Imidan 70W | 1 lb. | 9.0 a | 7.0 cd | 37.5 b |
| Warrior ** | 3.84 fl. oz. | 2.0 ab | 0.25 d | 12.25 b |
| Novodor (2 appl. @5 days apart) ** | 1 gal. | 7.0 ab | 23.5 a | 29.75 b |
| Furadan 4F | 1 qt. | 2.75 ab | 5.25 cd | 37.5 b |
| Lorsban 4E | 1.5 pts. | 7.0 ab | 4.5 cd | 18.5 b |
| F0570 | 3.2 fl. oz. | 1.25 b | 3.0 cd | 31.25 b |
| F0570 | 4 fl. oz. | 1.25 b | 0.75 d | 18.5 b |
| Baythroid 2EC ** | 2.8 fl. oz. | 2.25 ab | 1.5 d | 23.0 b |
| Baythroid 20WP ** | 0.22 lb. | 3.5 ab | 2.5 cd | 28.25 b |
| Steward SC | 2.56 fl. oz. | 3.5 ab | 21.5 a | 45.25 b |
| Steward SC | 4.6 fl. oz. | 5.0 ab | 14.0 abc | 114.25 a |
| Warrior | 3.84 fl. oz. | 2.25 ab | 0.5 d | 7.0 b |
| Novodor ** | 1 gal. | 6.75 ab | 19.0 ab | 25.25 b |
| Untreated | --- | 6.75 ab | 8.25 abc | 22.75 b |

** data from 10 DAT*
*** with crop oil*

**Table 3. Yield & Quality Results**

| Treatments | Rate (product/A) | Dry Wt. Yield (lbs./A) | Crude Protein (%) | ADF (%) |
|---|---|---|---|---|
| Imidan 70W | 1 lb. | 1852.4 bc | 26.8 a | 26.1 a |
| Warrior ** | 3.84 fl. oz. | 2089.6 abc | 26.8 a | 26.2 a |
| Novodor (2 appl. @5 days apart) ** | 1 gal. | 1201.5 de | 26.6 a | 26.8 a |
| Furadan 4F | 1 qt. | 2055.0 abc | 27.2 a | 26.3 a |
| Lorsban 4E | 1.5 pts. | 2298.2 ab | 26.4 a | 26.9 a |
| F0570 | 3.2 fl. oz. | 1931.6 abc | 27.4 a | 26.8 a |
| F0570 | 4 fl. oz. | 2080.2 abc | 26.8 a | 26.9 a |
| Baythroid 2EC ** | 2.8 fl. oz. | 2018.8 abc | 26.9 a | 26.5 a |
| Baythroid 20WP ** | 0.22 lb. | 2359.1 a | 27.3 a | 26.5 a |
| Steward SC | 2.56 fl. oz. | 1669.9 cd | 27.0 a | 26.7 a |
| Steward SC | 4.6 fl. oz. | 2018.2 abc | 27.3 a | 26.3 a |
| Warrior | 3.84 fl. oz. | 1847.1 bc | 26.5 a | 26.7 a |
| Novodor ** | 1 gal. | 1120.1 e | 26.4 a | 28.0 a |
| Untreated | --- | 1234.1 de | 27.3 a | 26.1 a |

*** with crop oil*