PEST MANAGEMENT IN ALFALFA - CENTRAL VALLEY AREA

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Introduction

Pest management is the interrelationship of biological, chemcial and cultural factors integrated into a program of maintaining economic crop growth. Pest species elimination is seldom desirable or possible, but in pest management the desired result is to reduce the pest species problem to subeconomic levels while trying to maximize the surviving numbers of beneficial insect species.

Many of us involved in pest management feel that alfalfa production and its pest problem alleviation constitutes the cornerstone of our pest management program in other crops. This is due to the fact that most of our clients have diversified farming operations in which alfalfa's pest problems require the earliest attention. Alfalfa is also one of the ranch's major insectaries for beneficial insect species which later move into surrounding crops. Pest management is the realization and understanding of the interdependence of crop insect populations and of their geographical movement. Pest management programs in February, March and April determine to a significant degree our later insect problems in adjacent crops such as cotton, tomatoes, melons, trees and vines. Indiscriminate use of broad spectrum insecticides in alfalfa adversely effects early and mid season predaceous-parasitic insect populations over wide acreages--certainly beyond the confines of the treated alfalfa field--as well as increase the likelihood of secondary pest problems or target pest resurgence in the treated alfalfa field itself.

Any pest management program in alfalfa must also deal with the reality that seldom do pest species appear singly in economic numbers. Evaluations are usually aimed at problems containing mixed pest species at varying levels relative to their established economic thresholds. In this area there is a lack of objective criteria.

Finally, pest advisors must deal with noninsect problems. Often, these are the most difficult to solve. These problems may deal with varietal differences, soil problems, irrigation management, climatic conditions, soil and plant pathogens and grower idiosyncrasies.

Insect Pests

While the program of this symposium deals heavily with research relative to two of our newer insect pests to Central Valley alfalfa fields, we must not assume our problems end with their management. During 1976, in acreage under our supervision, over ten insect species had to be dealt with, usually in combinations of two to four at the same time. Some pests, like mites, may be only secondary and noneconomic now, but lack of attention, poor material selection and/or over treatment of other pests may create for the alfalfa grower, mite problems not unlike those in seed alfalfa and grape production.

We have broken into three periods the pest season in alfalfa: early, mid and late. The early season pest program is the most important because of residual effects of treatments for both alfalfa and adjacent fields. Most of the insects listed will appear in overlapping sequence with some declining in population while others rise or fall at the same time. Often several were present at the same time in numbers only 10-25% below established individual economic treatment levels, yet economic damage was evident.

A Early season: Late January to mid March

1. Egyptian Alfalfa Weevil (EAW)
2. Blue Alfalfa Aphid (BAA)
3. Pea Aphid
4. Clover Root Curculio
5. Nematodes

B Mid season: March 15 to August 15

1. Pea Aphid
2. Western Yellow Striped Armyworm
3. Beet Armyworm
4. EAW or Alfalfa Weevil
5. Mites
6. Clover Root Curculio

Late season: August 15 to October 15

1. Pea Aphid
2. Alfalfa Caterpillar
3. Western Yellow Striped Armyworm
4. Beet Armyworm
5. EAW or Alfalfa Caterpillar
6. Clover Root Curculio
7. BAA

Early season problems--up to the first cutting--are assigned a relatively high degree of importance due to the potential detrimental effects caused by early decimation of predaceous-parasitic insect reservoirs. Treatments made even at economic levels for EAW on alfalfa not yet ready to grow due to climatic or soil conditions are often disasterous--requiring a second treatment before the first cutting. It is desirable to avoid treatments until after mid March, if at all possible, and it usually is. Insect pest levels cannot be used as the sole criteria in determining treatment programs during this period. Stand vigor as affected by variety, density of stand, soil type and condition, as well as temperature and projected harvest date are all equally important.

Mid season starts for us about the time of the second cutting and continues until mid August. During this period insect pest problems usually remain at subeconomic levels if the alfalfa plant is growing normally and cutting schedules are being maintained. Properly timed early season treatments late in March, will usually carry us through to the second cutting with that cutting itself reducing any residual pest problem. Poor material selection and/or chemical over-use from the early season through April and May can induce mite, aphid and lepodoptera problems during the late spring and early summer months.

Late season pest problems are generally our biggest headache and they involve largely pest species that have been around a long time: pea aphid, alfalfa caterpillar, EAW or alfalfa weevils and armyworms. The simple fact that lepodopterous evaluations in other crops is at its peak at this time means that time for evaluation is at a premium. The warm weather common during this period induces rapid pest development, especially of armyworms and alfalfa caterpillars. Two to three day delays in checking can be disasterous and twice weekly checking is often the minimum that is necessary. The role of moisture, temperature and vegetative growth as influences on alfalfa caterpillar egg deposition needs to be more fully studied. Fields cut and irrigated must be checked thoroughly during the first week following irrigation. In 1976, approximately 70% of our alfalfa pest treatments were made for late season insect pests with alfalfa caterpillars and EAW or alfalfa weevil being the predominate pest species.

This past season, clover root curculio and root knot nematodes were found in relatively high numbers in fields exhibiting strangely slow and retarded growth. Some fields which were normally cut on a 28-32 day schedule were reduced to 40+ day cutting schedules and greatly reduced yields. State and University analysis identified several plant pathogens associated with some of the plants from these fields, but no conclusive cause-effect relationship has been established. Adult clover root curculio populations of 16-20 per 180° sweep were found in Merced County in small areas of some of these fields following an irrigation, but little foliar feeding by the adults was noticed. Early season feeding on the roots by the curculio larvae was noted, but not on all the retarded plants. Hopefully these pests are not going to be of economic importance, but they do deserve watching, especially in fields of weak stands and high treatment frequency.

Economic Levels--Objective and Subjective

The determination of economic levels for alfalfa insects pests are fairly crude at best, with adjustments having to be made for the specific noninsect factors existing in each field. Numbers of insects per plant or per sweep tell only a fraction of the necessary story. Time

of season, temperature, plant surface moisture, plant density, plant vigor, crop price, cos of treatment and the nonpest insect population of the field, all play vital roles in determining threshold levels. Seldom are fields uniform in plant growth or insect populations. Areas sampled are usually less than 5% of the total field.

While economic levels for most lepodoptera pest species in alfalfa have been established (EAW at 20± per 180° sweep, alfalfa catepillar at the same levels) the limits for aphids are left for subjective analysis--low, medium or high levels. No objective levels are established for mixed insect pest species--the most common occurance in Central Valley alfalfa fields. Our experience has been that mixtures of two to four pest species are very common with probably only one species being at established objective threshold levels; the balance either just appearing or disappearing. Extensive damage has been noted in untreated portions of fields where two or more pest species were found and all were below 50% of their individual established threshold limits.

The mixture of damaging pests found at any one time requires the most critical identification and determination of each pest's population level. A walnut size ball of pea aphid in the bottom of a sweep net may simply indicate the need to recheck in five days, but if that ball of suspected pea aphids contains 30% BAA, immediate treatment could be warranted. That decision must include, however, an evaluation of current and anticipated weather, cutting or irrigation schedules and time of year.

In 1976, anticipated cutting schedules constituted probably our biggest headache in establishing sound pest management programs in alfalfa. Problems that we felt would be solved by the swather in five days were 50% greater and a real cause for concern when the harvester finally arrived 10-14 days later. Communication between grower, harvestor and pest advisor is a must.

Material Selection--Bio-Control

Once the determination to chemically treat has been made, the choice of materials becomes critical. Pest specie(s), time of season, days to harvest, crop rotation and nontarget predaceous and parasitic species in the field are determining factors in the selection process.

Treatments made prior to first cutting by four weeks or more are usually aimed at mixed populations of EAW, pea aphid and BAA. Growers treating this far in advance of first cutting run a high risk of needing an additional treatment before second cutting. Predaceous insect populations may be fairly low, especially if the aphid population has not been at moderate levels for more than a week, thus treatments this early may offer some advantages to beneficial specie preservation--but only if a second treatment can be avoided. During this early period, our preferred material is Furadan® at 1 pint per acre rate unless tomatoes are planned for the following crop, in which case Pencap M® is substituted. There is, with treatments in late February to mid March, the high risk that not all the EAW eggs are hatched, even though sweep counts are in excess of threshold levels. Aphid flights, with warming weather, are quite likely also, thus necessitating another treatment. The effect of these repeated early season treatments, two to four weeks apart, is to virtually eliminate the slowly developing beneficial insectary in your alfalfa fields. If aphids are at very low levels and the EAW is the only pest exceeding threshold limits, a material like Imidan® is a possible choice as it would tend to leave the aphids as a food source for beneficial species.

Treatments made after the first cutting or within two weeks of the second cutting to mixed populations of EAW, BAA and pea aphid are preferred where possible. Our material preferences are Alfa-Tox at 5 pints per acre and Furadan® at 1/2 pint per acre. At these rates beneficials will reenter and reestablish themselves after about seven days.

Late season pest problems--those after August 15th--are often mixtures of alfalfa caterpillars and armyworms. Treatments in August for worms often lead to rapid aphid buildup two weeks later. Since none of the effective materials available for larvae control is really easy on predaceous insects acting to suppress aphid populations, treatments at this time need to be carefully considered and careful examinations made during the post-treatment period. Lannate®, Alfa-Tox and Phosdrin® are widely used during this period, as is malathion This past year, Phosdrin® gave the poorest control while Lannate® and Alfa-Tox gave the best. There appears to be a rapid buildup of mites in weak areas of the field following an application of Lannate® or malathion. BTB and privately prepared viral compounds have been

successfully used against alfalfa catepillars where they have been the only problem--a rarity. Our feeling is that the late season pest problems in alfalfa are greatly influenced by the early season control programs in alfalfa. The suppressive effect of beneficial insect species which appear early in alfalfa and move to other crops is clearly vital if not fully understood in its day-by-day role in pest management. Mixed beneficial specie populations are far more effective than single specie populations and all species seem to be adversely affected at some, if not all, life stages by the chemical pesticides listed in this paper. The degree of selectivity of all these materials is relative. Rate of application should not exceed that needed to reduce the pest specie(s) to subeconomic levels. One of our most important considerations must be the length of time it takes for beneficial insect reintroduction and survival. With all the materials listed, the higher the rate, the longer before reestablishment can occur. Obviously, it is desirable to leave as high a percentage of established pretreatment beneficials alive as possible. Most of the survivors will come from pupated individuals or from eggs laid just prior to treatment. Most mobile individuals are killed.

Conclusion

In pest management, one of our greatest fears is that in controlling one problem we will induce another. Unnecessary treatments, especially early in the year, are the greatest danger, but one over which we have the greatest control. All of us need to pay the closest attention to the fate of nontarget insects, both beneficials and potential pests. The greatest care must be taken in properly evaluating the damage potential of alfalfa pests at any given time of the season, treating only when this potential obviously exceeds prudent levels based on your experience as well as numerical levels. Remember the importance to other crops of the beneficial insects which move in and out of alfalfa. Experience still accounts for better than 50% of our evaluation, but the value of that experience depends largely on our individual qualities of observation.