Use of integrated pest management in alfalfa

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A survey showed that many growers are not aware of current pest management recommendations

Two years after the University of California Integrated Pest Management (IPM) Project began in 1979, a statewide survey of alfalfa hay growers was conducted to test their general knowledge of pest identification and IPM methods and determine their sources of pest management information. The purpose was to identify educational and research needs and establish baseline data for evaluation of the IPM Project alfalfa hay programs.

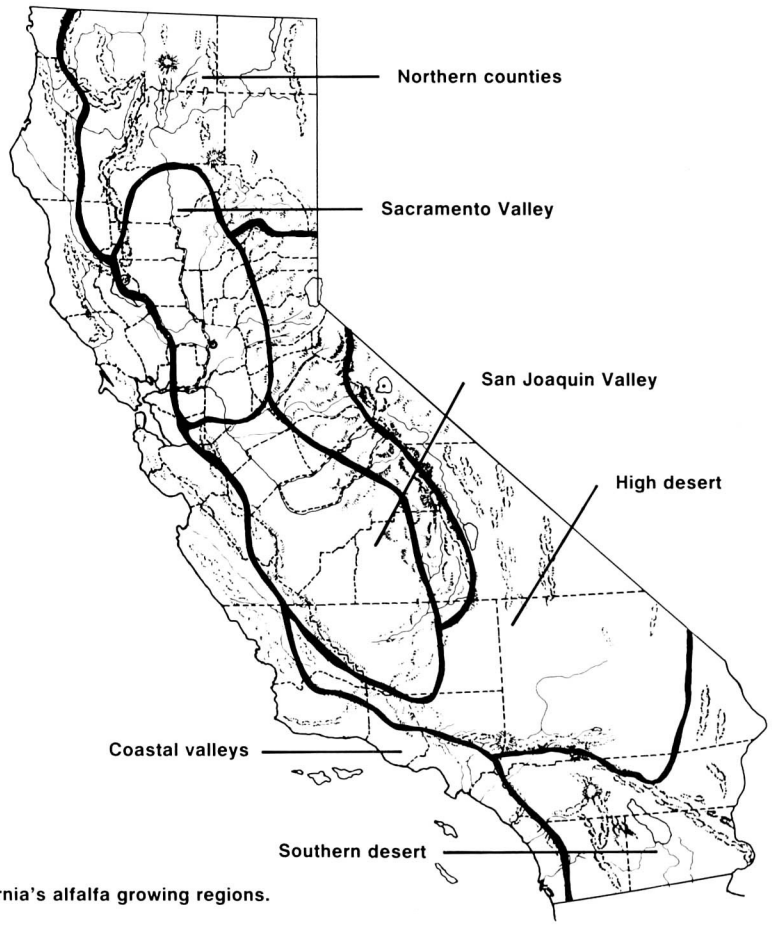
The survey questionnaire was mailed and also distributed at the annual California Alfalfa Symposium in 1981. The mailing lists were compiled by farm advisors in Butte, Shasta-Lassen, Yolo, Tulare, and Imperial counties and included pest control advisors, seed salesmen, researchers, and others. Only the responses from California alfalfa growers were used in this analysis.

Responses were received from 20 counties and divided into six major alfalfa-producing regions for analysis (see map). Because there was only one response from the high desert area, this region was dropped from the analysis. The 171 California grower-respondents represented 84,000 acres of alfalfa hay, or about 8 percent of total state production (table 1). Eighteen percent of the grower responses were from the alfalfa symposium. Of these, almost half were from the southern desert.

Stand life, cutting frequency

Although alfalfa is a perennial crop, its profitable life for hay production lasts only as long as an adequate number of plants are growing vigorously — usually about 3 to 7 years. Plants succumb to a gradual decline, brought on primarily by pathogens, other pests, and adverse environmental conditions. Over 95 percent of the growers surveyed cited stand decline as a prime reason for stand removal. Rotation was given as a reason for removing the stand by 18 percent of the growers, mostly in the San Joaquin Valley and southern desert areas, where alfalfa is grown in rotation with cotton and other crops. Other reasons included economics (5.8 percent), weeds (5.3 percent), and vertebrates (1.2 percent). Some growers gave more than one reason.

The time an alfalfa stand remained in production reflected regional differences in climate, cultural practices, and pest problems. Growers in the northern mountain counties, with a 6-month growing season from mid-April to mid-October, kept their stands an average of 6.7 years. More than 25 percent of these growers reported a stand life of 8 years or more. In contrast, growers in the southern desert area, which has an 11- to 12-month growing season, and the San Joaquin Valley, where hay is actively growing from February through mid-November, reported average stand lives below 4 years. None of the surveyed growers in the desert areas kept their stands for more than 6 years. In the San Joaquin Valley, the maximum stand life reported was 5 years. Stand life in the coastal and Sacramento Valley areas averaged about 5 years.



California's alfalfa growing regions.

Highest quality hay is harvested when the growing period between harvests is short, but too-frequent cutting has been given in University of California IPM guidelines as a reason for stand decline. Statistical correlation between stand life and cutting frequency given in survey responses was tested for each region. Stand life decreased significantly with a higher number of cuttings only in the southern desert, where growers averaged nearly eight cuttings annually.

The University currently recommends using regrowth bud development as a guide for timing harvest, and most growers (61.6 percent) said they used this guideline alone or together with other indicators of maturity. Fifty percent used percentage of plants in bloom, which research indicates is less reliable than regrowth bud development: bloom is affected by several factors besides normal plant development, including many pests, day length, smog, water availability, and other environmental conditions.

Few growers surveyed knew that examination of the antennae is the only reliable way to identify two alfalfa pests with different treatment thresholds. Pea aphid antennae (right) are banded; those of blue alfalfa aphid are uniformly dark.

Table 1. Regional differences in alfalfa acreage, average stand life, cutting frequency and insecticide use.

Item	Northern counties	Coastal Valleys	Sacramento Valley	San Joaquin Valley	Southern deserts
Number of respondents (total of 171)	47	9	20	47	48
Alfalfa acreage represented (total of 83,971 acres)	11,427	5,845	7,363	11,804	47,532
Average life of stand (years)	6.7	5.0	5.1	3.5	3.9
Average number of harvests per year	3.1	5.1	5.4	6.7	7.8
Average annual number sprays for weevil	0.2	0.9	1.2	1.2	1.6
Average annual number sprays for other insects	0.2	0.3	1.4	1.8	3.4

TABLE 2. Growers' perceptions of important pest problems in California alfalfa hay growing regions

Pest group	Growers identifying pest group as important				
	Northern counties	Coastal valleys	Sacramento Valley	San Joaquin Valley	Southern desert
	%				
Insects	17	44	65	60	83
Diseases	6	11	5	28	11
Nematodes	0	22	0	6	2
Weeds	83	67	90	70	60
Vertebrates	34	11	15	0	9

Note: totals are more than 100 percent, because some growers mentioned more than one pest group as important.

Other guidelines for cutting included summer calendar schedules of 28 to 33 days (41.9 percent) and 24 to 27 days (4.7 percent) between cuttings, management of weevil or other pests (20.3 percent), buyer's quality specifications (21.5 percent), accommodation of fixed irrigation schedules (13.4 percent), and custom harvesters' schedules (7.6 percent). Most growers indicated that they used at least two factors to determine when to harvest.

Pests and insecticide use

The most striking regional difference in pest problems was between the southern desert, where insects were ranked above weeds in importance, and every other region, where weeds were cited as the biggest problem. Insects were placed second in those other regions, except in the northern counties, where vertebrates were cited as the number-two pest problem (table 2).

The perceived importance of insect problems in the southern desert is confirmed by the frequency of insecticide application (table 1). The average grower there applied 5 sprays for insect pests as compared with 3 in the San Joaquin Valley, 2.6 in the Sacramento Valley, and just over 1 in the coastal areas. In the northern counties, less than half the growers applied any insecticide in an average year.

All regions reported the same major pest insects in the same order of relative importance: Egyptian alfalfa weevil or alfalfa weevil, blue alfalfa aphid, pea aphid, alfalfa caterpillar, and armyworms. The differences in insecticide use may reflect more serious infestations of aphids and lepidopterous pests in the southern desert brought on largely by longer growing seasons and generally more favorable weather for extended insect infestations. In the southern desert, the more serious problems may relate to secondary outbreaks induced when insecticide applications on alfalfa or neighboring crops such as cotton kill natural enemies of pests.

There was a notable range in number of treatments in the desert, with 12 percent indicating that they made no sprays for insects other than weevils and another 12 percent stating that they made 8 or more applications annually for these pests. The remaining 76 percent applied between 1 and 7 sprays each year for insects other than weevils.

Need for education

A major purpose of this survey was to determine if growers were aware of recent pest management developments

and recommendations. Several questions yielded interesting results.

The blue alfalfa aphid can be easily confused with the closely related pea aphid. Both can stunt plant growth, but the blue alfalfa aphid does so at lower populations than the pea aphid; hence, recommended treatment thresholds for the two aphids are different. Despite this need to distinguish the two species, only 29 percent of the surveyed growers knew how to identify them. Both aphids are green and size differences are unreliable, yet 55 percent of the growers used color differences to distinguish the species and another 21 percent used size. The only reliable way to identify the two species in the field is to check their antennae under a hand lens: the pea aphid's antennae are banded; the blue alfalfa aphid's antennae have no bands.

For several years UC pest control publications have recommended basing treatment for aphids in alfalfa on stem sample counts. Only 27 percent of the surveyed growers used stem samples to determine need for treatment; 71 percent used sweep net samples, and 50 percent used damage symptoms. Unfortunately, soft-bodied aphids tend to be crushed beyond recognition with sweep net samples, and damage symptoms are not reliable, because aphid populations can be reduced rapidly by natural enemies or weather.

Growers were asked whether a number of different diseases occurred annually in their fields. The responses did not correspond to the regional occurrence of diseases as determined by UC plant pathologists (table 3). A number of diseases, including two of the most economically important (Stagonospora crown rot and southern anthracnose) were markedly underrated. Phytophthora root rot was cited as a more important problem than field survey research would indicate.

Phytophthora root rot can be managed in most growing regions with careful irrigation and use of adapted resistant cultivars, but there are few management options for the other diseases. Growers thus have had little incentive to identify alfalfa diseases. However, some leaf disease symptoms can be confused with weevil damage, and cultivars resistant to several diseases, including Stagonospora crown rot and Stemphylium leaf spot, are anticipated in the next few years, so growers and pest control advisors will need to become familiar with disease symptoms.

Although growers in most parts of the state listed weeds as the major pest problem, fewer than 15 percent of those surveyed kept regular written records of their weed infestations. Quarterly weed surveys are an invaluable part of a pest management program, especially in a perennial crop such as alfalfa, where the same weed species are likely to appear in the same areas of the field from year to year.

Sources of information

Responses to the question about growers' major sources of information for pest management varied greatly by region. No growers in the coastal valleys or Sacramento Valley and only 6 percent in the northern counties used private consultants as compared with 34 percent in the San Joaquin Valley and 63 percent in the southern desert. Reliance on pesticide company representatives was over 85 percent in the coastal valleys, Sacramento Valley and San Joaquin Valley, 42 percent in the southern desert, and only 23 percent in the northern counties. Where information from pesticide company representatives was rated highest, consultation with other growers was lowest, and vice versa. Farm advisors were an important source of information in most regions. Approximately one-third of the growers mentioned UC publications and trade publications as major sources of pest management information.

Conclusion

The survey demonstrated the variety of production practices and pest problems in California's climatically diverse alfalfa growing regions. Any evaluation of grower practices in alfalfa hay must take these regional differences into account. Survey results also indicate that many growers are not aware of current pest management recommendations and do not know how to identify certain key pests and diseases. It is hoped that continued efforts to disseminate IPM information and demonstrate IPM techniques will increase grower use of the integrated pest management approach. Since growers in different regions rely on different pest management information sources, effective dissemination methods are likely to vary among the regions.

TABLE 3. Grower reports of annual occurrence of diseases compared with research-based estimates of disease incidence

Disease	Growers reporting diseases and research disease estimates*				
	Northern counties	Coastal valleys	Sacramento Valley	San Joaquin Valley	Southern desert
	%				
Common leafspot	19 (>80)	56 (>90)	30 (100)	64 (100)	46 (100)
Southern anthracnose	0 (>50)	0 (>50)	0 (>75)	0 (10)	10 (10)
Stephylium leafspot	0 (<10)	0 (100)	0 (90)	13 (100)	6 (100)
Spring black stem	6 (<10)	33 (>50)	5 (100)	6 (30)	0 (25)
Downy mildew	0 (unk†)	11 (100‡)	25 (100‡)	30 (100‡)	58 (unk)
Stagonospora crown rot	4 (unk)	2 (100)	15 (100)	15 (100)	15 (15)
Phyophthora root rot	26 (unk)	22 (<15§)	60 (25)	62 (30)	56 (40)
Scald	4 (0)	0 (0)	30 (0)	45 (0)	75 (20)

*Numbers in parentheses are estimates of the percentage of fields showing disease symptoms annually based on a report to the Alfalfa Forage Research Advisory Committee (AFRAC) subcommittee on pathogens by UC plant pathologists and research by D.G. Gilchrist, Department of Plant Pathology, UC Davis.
†Unk = unknown, no information on field occurrence available.
‡On susceptible cultivars only.
§<15% of all plants in all fields although local fields may go as high as 100% if poorly managed.

TABLE 4. Surveyed growers' sources of pest management information

Information Source	Growers identifying source as important				
	Northern counties	Coastal valleys	Sacramento Valley	San Joaquin Valley	Southern desert
	%				
Private consultants	6	0	0	34	63
Agricultural commissioners	19	11	10	23	21
Farm advisors	90	22	75	60	42
Other growers	46	33	15	13	38
UC publications	33	11	30	28	38
Trade publications	30	57	35	21	25
Pesticide company representatives	23	89	100	85	42

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