IPM information delivery to pest control advisers

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The University of California's commitment to developing and encouraging the adoption of integrated pest management techniques over the past decade seems to be producing results. California pest control advisers surveyed looked to UC Cooperative Extension for information and were using many of the IPM techniques.

In an effort to evaluate the use of integrated pest management (IPM) information and techniques developed or promoted by the University of California over the last decade, we surveyed pest control advisers late in 1987. The survey included, but was not limited to, methods resulting from the UC Statewide IPM Project. It was sent to members of the California Agricultural Production Consultants Association (CAPCA), whose membership represents an estimated 73.5% of the state's licensed pest control advisers.

Response by pest control advisers (PCAs) was considered a good indicator of overall agricultural adoption of IPM because of the major role PCAs play in farmers' pest control decisions. In California, anyone outside the public sector who recommends to growers the use of a pesticide or any other pest control method or device must be licensed by the California Department of Food and Agriculture as a pest control adviser. Commercial pesticide applicators cannot apply restricted pesticides on a farm unless the grower has a written recommendation from a licensed PCA. Previous surveys have confirmed the importance of the PCA's role: for example, 75% of tomato growers in 1983 listed PCAs as their most important source of pest control information (*California Agriculture*, January-February 1985).

For this study, surveys were mailed to the 2,469 CAPCA members in November 1987, and a follow-up postcard was sent 6 weeks later. We received 671 or 27% completed surveys by January 30, 1988; 429 or 64% of those respondents stated that they were still actively involved in giving advice in the field. This report includes only the responses from those active PCAs.

For a perspective on the University's overall role in IPM information delivery, the survey asked about the PCAs' major sources of information. The PCAs were then asked about their use of specific information and programs developed by the University of California, including pest management publications, computerized information, and IPM monitoring and sampling programs. Finally, they were asked for their thoughts on the relationship between public policy and the adoption of IPM practices in general.

Major sources of information

Two questions asked PCAs about their sources of pest control information: (1) where they went most often for help in identifying an unusual pest or plant symptom; and (2) where they would go for information about the pesticide to use against a new pest species. In both cases, Cooperative Extension or farm advisors' offices were the first choice (table 1). While Cooperative Extension significantly outranked all other sources for identifying pest problems, pesticide company representatives were placed almost as high as a source of information on pesticides to control a new pest species. Interestingly, PCAs not involved in the sale or application of pesticides were much more likely to use Cooperative Extension as a first source of information in either area.

TABLE 1. Information sources pest control advisers most frequently used to help identify pests and choose pesticides

Information source	Percent of sample stating this is first choice for: ID info	Pesticide info
	%	%
UC Cooperative Extension	37.3	34.3
Pesticide company representative	5.5	33.1
County agricultural commissioner	5.7	6.9
Books & other publications	17.5	3.5
Other personnel in own company	9.7	NI
Farm chemical distributor	NI	6.4
Private laboratory	1.7	NI
Other	2.6	5.8

NI = not included.

When asked which types of problems they most often sought help for, pest control advisers specified plant disease identification. Help in identifying nutrient deficiencies, recognizing toxicity symptoms, and choosing pesticides were other major needs.

UC pest management publications

The survey queried PCAs about the University's series of pest management manuals. These books, covering pest problems, diagnosis, monitoring, and management techniques, include nine produced by the Statewide IPM Project (on alfalfa hay, almonds, citrus, cole crops and lettuce, cotton, potatoes, rice, tomatoes, and walnuts) and two others on grapes and pears. On average, the PCAs owned 3.8 of these manuals, and 86.4% of the respondents owned at least one.

Respondents were in agreement (82.5%) that the photographs for pest identification were the most valuable feature of the books. Many also ranked biological information and monitoring and sampling techniques as very valuable. Over half (58.3%) of the owners of the tomato, citrus, and cotton manuals had used the keys to caterpillar pests to diagnose a problem, and 18.2% of the respondents had copied or modified forms from the IPM manuals for field use.

The most frequently suggested ways to improve the books were to update them more frequently, add more photographs, and include specific pesticide recommendations and application rates. Respondents suggested 20 other crops for which they would like to see similar books produced, with stone fruits and sugarbeets leading the list.

Over half (54.9%) of the PCAs in the survey also used the University's published pesticide guidelines. Those on deciduous fruit and nut tree crops and on citrus were the most frequently mentioned. The Statewide IPM Project is currently updating, expanding, and computerizing these guidelines.

Computer-accessible information

Over the last year, UC has made pest management guidelines, a weather data

TABLE 2. PCAs using degree-day calculations, pheromone traps, and UC guidelines for various pests, and UC resources that have been used to develop or extend these programs

Pest	Crop	PCAs working in crop using program	UC research funds: All sources	UC research funds: UC IPM Project	IPM Manual or other UC IPM pub	Demonstration by area IPM farm advisors
		%				
Codling moth	Pome fruit	93.6%	*		*	*
	Walnut	87.1	*		*	*
Peach twig borer	Almond	71.5	*		*	*
	Stone fruit	66.1	*			*
Navel orangeworm°	Almond	58.3	*	*	*	*
	Walnut	52.6	*	*	*	*
California red scale	Citrus	53.4	*	*	*	*
Potato tuberworm	Potato	52.0	*		*	
Oriental fruit moth	Almond	36.4	*		*	*
	Stone fruit	52.3	*		*	*
San Jose scale	Almond	19.9	*		*	*
	Pome fruit	24.2	*		*	*

* UC resources used.
° Egg traps rather than pheromone traps are used in the navel orangeworm program.

TABLE 3. PCAs who have tried presence-absence sampling programs, and UC resources that have been used to develop or extend these programs

Pest	Crop	PCAs working in crop using program	UC research funds: All sources	UC research funds: UC IPM Project	IPM Manual or other UC IPM pub	Demonstration by area IPM farm advisors
		%				
Spider mites	Cotton	84.6%	*	*	*	*
Spider mites	Almond	70.6	*		*	*
Citrus red mites	Citrus	52.4	*			*

TABLE 4. Adoption of selected UC sampling and IPM decision-making programs by surveyed PCAs

Crop and program	PCAs working in crop crop using program	UC research funds: All sources	UC research funds: UC IPM Project	IPM Manual or other UC IPM pub	Demonstration by area IPM farm advisors
	%				
COTTON					
Lygus-to-square ratio	81.5	*		*	*
Quantitative sampling of root-knot nematode to determine need for control	19.5	*	*	*	
Rapid bioassay for spider mite resistance to pesticides	10.7	*	*	*	*
TOMATOES					
Egg sampling for fruitworms	39.6	*	*	*	*
Fruit sampling for fruitworms	35.6	*	*	*	*
Quantitative sampling of root-knot nematode to determine need for control	22.8	*	*	*	
ALMONDS					
Low acaricide rates for mite control based on predator counts	49.0	*		*	*

base, degree-day calculations, and other IPM programs accessible to private users during non-business hours. Access is by dial-up modem to the Statewide IPM Project's IMPACT computer system.

Almost three-quarters (74.6%) of those in the survey were aware of this system, but only 39.8% had personal computers. About 16% of those with access to a personal computer had tried the IMPACT system, and half of those had used it more than four times.

Monitoring and sampling

A cornerstone of integrated pest management is the use of accurate field monitoring and sampling techniques to evaluate pest populations and the need for controlling them. Development and promotion of these techniques has been a priority of the UC Statewide IPM Project in its research and extension programs, and the techniques are discussed in the pest management manuals as well as other publications. The survey queried PCAs about their use of over 20 such programs developed or promoted to some extent by the IPM Project.

Most of the programs were being used by a substantial number of pest control advisers (tables 2, 3, and 4). Programs on which at least one of the Project's area IPM farm advisors had held demonstrations tended to have higher adoption rates than others. Those that had been the focus of special statewide demonstration efforts by cooperating farm advisors and specialists—such as codling moth, peach twig borer, and presence-absence sampling for spider mites in cotton and almonds—had the highest rates of adoption.

UC personnel not directly associated with the IPM Project have also participated extensively in the development and promotion of these programs. Some, such as the widely adopted codling moth and lygus bug programs, were introduced well before the start of the IPM Project. Many have received partial or complete research funding from sources outside UC IPM (tables 2, 3, and 4).

IPM and public policy

PCAs gave varied responses to questions about their clients' familiarity with four laws that could affect the use of pesticides. Many (62.9%) felt their clients were aware of the California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65), which prohibits discharging into the state's waters chemicals known to cause cancer or birth defects and requires notification of individuals who may be exposed to such chemicals by any means. Less than half, however, felt that growers were familiar with the provisions of any of the other three laws: the U.S. Endangered Species Act of 1973, which is now being reinterpreted to restrict use of certain pesticides in areas where endangered species may be found;

the California Birth Defect Prevention Act of 1984, which mandates the filling of all "data gaps" relative to reproductive effects of pesticides registered in California; and the California Pesticide Contamination Prevention Act of 1987, which is resulting in the designation of pesticide management zones for areas with known groundwater contamination, restricting use of problem pesticides.

Despite their perceptions about growers' knowledge of these laws, PCAs felt the laws would affect pest management programs in the future—significantly (55.5%) or slightly (37.6%). Only 6.9% felt the laws would have no effect on the use of IPM. Generally, PCAs thought the use of IPM would be increased because of increased legal requirements and growers' increased awareness of pesticide hazards. However, 21.1% also thought some IPM programs would be discontinued because of loss of pesticides necessary for their implementation.

Conclusions

Over the last 8 years, the University of California and others in the public and private sectors have made significant headway in providing pest control advisers with practical IPM materials and techniques. The PCAs surveyed ranked UC Cooperative Extension as the primary source of information for identifying pests and pesticide use information, and a high percentage had at least one of the UC pest management books. A small number of PCAs have begun to use UC's IMPACT computer system, recently made available to them, to obtain IPM information. Efforts to develop and promote pest monitoring and sampling techniques have paid off, with a substantial portion of PCAs in any given crop using UC-recommended monitoring techniques.

PCAs believe recent legislation will increase growers' adoption of IPM. If so, and if PCAs, who are growers' chief advisers on pest control, continue to see UC Cooperative Extension as their most important source of pest management information, the use of information and programs developed by the University of California will grow in the future.

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Comparison of added fats in diets of lactating dairy cows

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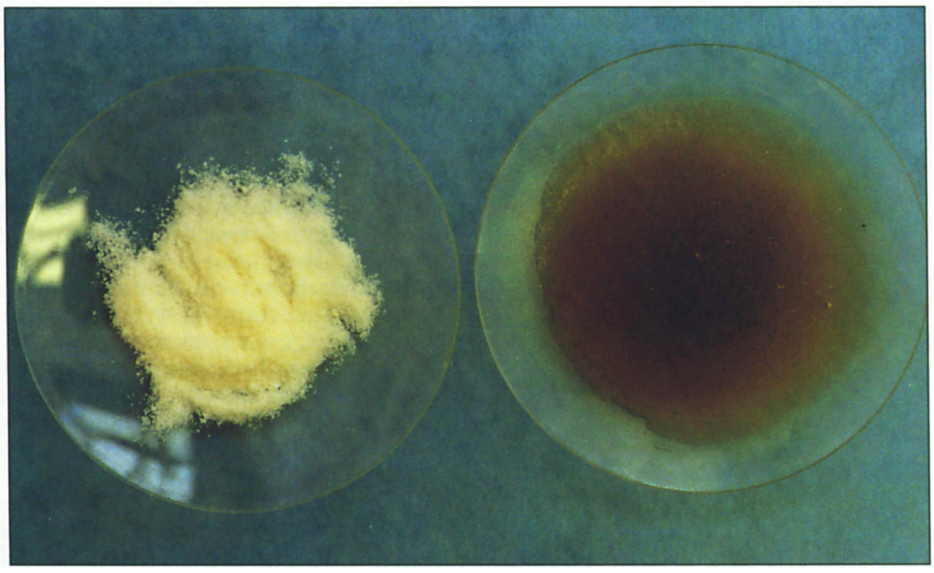
Type of fat—Alifet or grease—did not affect the production or composition of milk or feed intake of dairy cows during a 6-week study. Both types resulted in high feed intakes and similar milk yields.



Alifet (left), a commercial crystalline animal fat in a wheat starch carrier, is added to dairy cow rations in powder form. Liquid grease (right), a combination of waste animal fats and vegetable oils, contains more polyunsaturated fatty acids, believed to be harmful to rumen microbes.

Adding fat to the rations of high-producing dairy cows increases the energy density of the diet and increases milk production during early lactation, when the need for maximum energy intake is greatest. It is for this reason that fats (triglycerides) are frequently added to dairy rations to replace a portion of the cereal component. Ruminants, however, can tolerate only a limited amount of fat in their diets. Dairy rations normally contain between 3% and 5% fat (total ration basis), which is about 10% to 18% of the net energy intake for a dairy cow. (Humans may get 40% or more of their daily caloric intake from fats.) In cows, excess dietary fat has been associated with poor fiber digestion, which ultimately reduces feed intake and milk production.

Ruminant digestion of fats present in typical feedstuffs is depicted in figure 1. Much