IPM USE IN UTAH'S TREE FRUIT INDUSTRY SINCE 1996

Marion Murray, IPM Project Leader
Diane Alston, Entomologist
Utah State University, Logan, UT

EXTENSION
UtahStateUniversity

The Utah IPM Program has offered educational services and conducted research in fruit IPM for almost 35 years. Periodic grower surveys provide an assessment of IPM use, grower perceptions and needs, and impacts. The fruit industry surveys have occurred in 1996, 2003, 2010 and 2017, with the latter two funded by grant support from the Western IPM Center (USDA). The results of these surveys inform the Utah IPM Program as trends and changes over time.

The overall goal of the Utah IPM Program is to improve adoption of IPM in the state. In assessing changes over time, we identified the following goals:

1. Assess the overall level of IPM adoption in fruit production.
2. Identify factors influencing IPM adoption.
3. Obtain grower opinions on the value of existing IPM educational materials.
4. Explore the relationships that may exist between degrees of IPM use and farm or farmer characteristics.

SURVEY DESIGNS AND IMPLEMENTATION

The Utah fruit industry was surveyed in 1996, 2003, 2010, and 2017. A summary of the delivery method and response rate for each survey is provided in Table 1. The questions were structured to learn about acreage of fruit produced and how it is distributed, IPM and pesticide management practices, IPM perceptions, and ways in which farmers get IPM information. Demographic information was also gathered. When the 1996 and 2003 surveys were implemented, they addressed different objectives that were appropriate to that time, and are therefore slightly different from the 2010 and 2017 surveys. The 2010 and 2017 surveys were almost identical. They were created and tested by members of the Utah IPM Program Advisory Committee, which included faculty and staff from the Utah State University Extension, growers, and industry representatives, and both were delivered by the Utah office of the National Agricultural Statistics Service.

Much of the comparisons in this document involve the 2010 and 2017 surveys. There are several questions, however, that overlap among all four surveys, allowing us to make comparisons to the changes in IPM practices, perceptions, and preferred information sources over the last 20 years.

Table 1. Mode of delivery, survey response rate, acreage, and crop represented by the Utah tree fruit industry IPM surveys.

Survey Year	Delivery Method	Response Rate	% of Fruit Acreage Represented	Order of Top Crops Represented
1996	Mail; USU Extension	26% (260 contacted)	48% (Of 7,920 acres)	apple, tart cherry, peach
2003	Mail; USU Extension	24% (250 contacted)	19% (Of 7,180 acres)	apple, peach, sweet cherry
2010	Mail and phone; National Agricultural Statistics Service (NASS)	74% (382 contacted)	77% (Of 6,800 acres)	tart cherry, apple, peach
2017	Mail and phone; NASS	46% (263 contacted)	86% (Of 6,320 acres)	tart cherry, peach, apple

Demographic information common to the surveys are shown in Table 2. There have been small changes over the years, with the most significant being farm size, where the vast majority of survey respondents are now on farms that are 10 acres in size or less. However, the percentage of growers in the income categories has remained somewhat consistent, which means that farmers have developed ways to financially diversify on their smaller farms. We are seeing that farmers are now older, have more farming experience, and many of them are still planning to remain in farming for more than 15 years.

Table 2. Producer and farm characteristics for each of the four surveys. Dashes indicate that the question was not asked in that survey.

	1996	2003	2010	2017
Small farm (1-10 acres)	44%	39%	56%	66%
Medium farm (11-50 acres)	29%	32%	23%	16%
Large farm (more than 51 acres)	27%	29%	21%	18%
Income less than 25% from farm	65%	58%	75%	63%
Income 25-75% from farm	---	25%	14%	12%
Income more than 75% from farm	35%	17%	11%	25%
Urbanization around farm less than 25%	---	23%	45%	39%
Urbanization around farm 26-75%	---	33%	22%	22%
Urbanization around farm more than 75%	---	37%	32%	39%
Age less than 25 years	5%	---	0%	0%
Age 25-50 years	22%	---	18%	14%
Age 51-60 years	38%	---	30%	29%
Age over 60 years	35%	---	51%	57%
Experience less than 10 years	---	---	26%	13%
Experience 11-30 years	---	---	37%	39%
Experience more than 30 years	---	---	37%	48%
Farm described as Conventional	---	---	66%	65%
Farm described as Organic	---	---	13%	14%

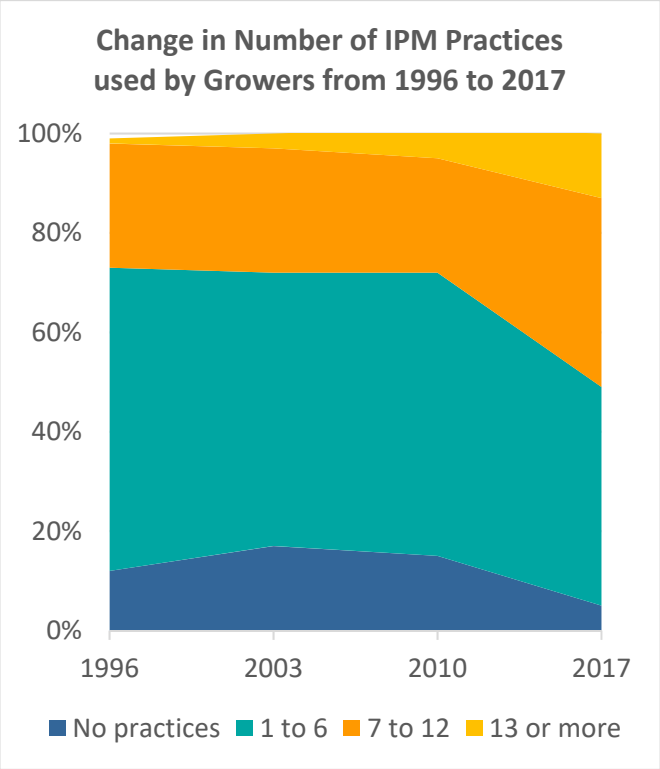
Summarized results are available online for the 1996, 2010, and 2017 surveys:

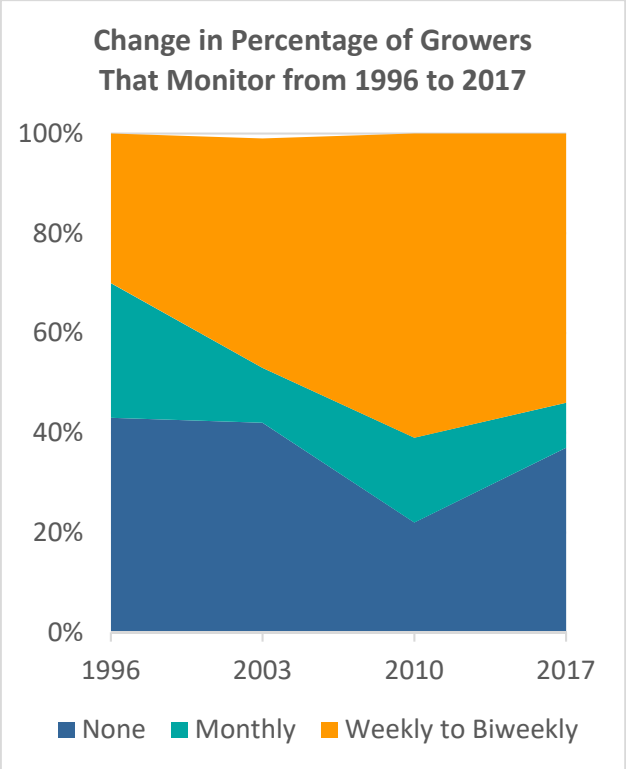
- 1996: https://www.joe.org/joe/1998june/a3.php
- 2010: http://utahpests.usu.edu/ipm/ou-files/veg-fruit-resources/res10-fruit-survey.pdf
- 2017: http://utahpests.usu.edu/ipm/ou-files/veg-fruit-resources/res17-fruit-survey.pdf

PEST MANAGEMENT CHANGES OVER TIME

IPM Practices

In each survey, growers were provided a list of 18 to 22 practices (depending on the survey), and asked to indicate their use of the practice (none, low, medium, high). Using this information, each we then determined a rank, from 1 – 4, of the number of practices used by each respondent for each survey year from none to 13 or more. The resulting trend from 1996 to 2017 is that more growers are using more IPM practices. The greatest jump has been from 2003 to 2017, with a 330% increase in growers using 13 or more practices, and a 70% decrease in the number of growers using no practices at all. Monitoring, one of the most important IPM practices, was asked in a separate question. The greatest improvement was seen in the 2010 survey.



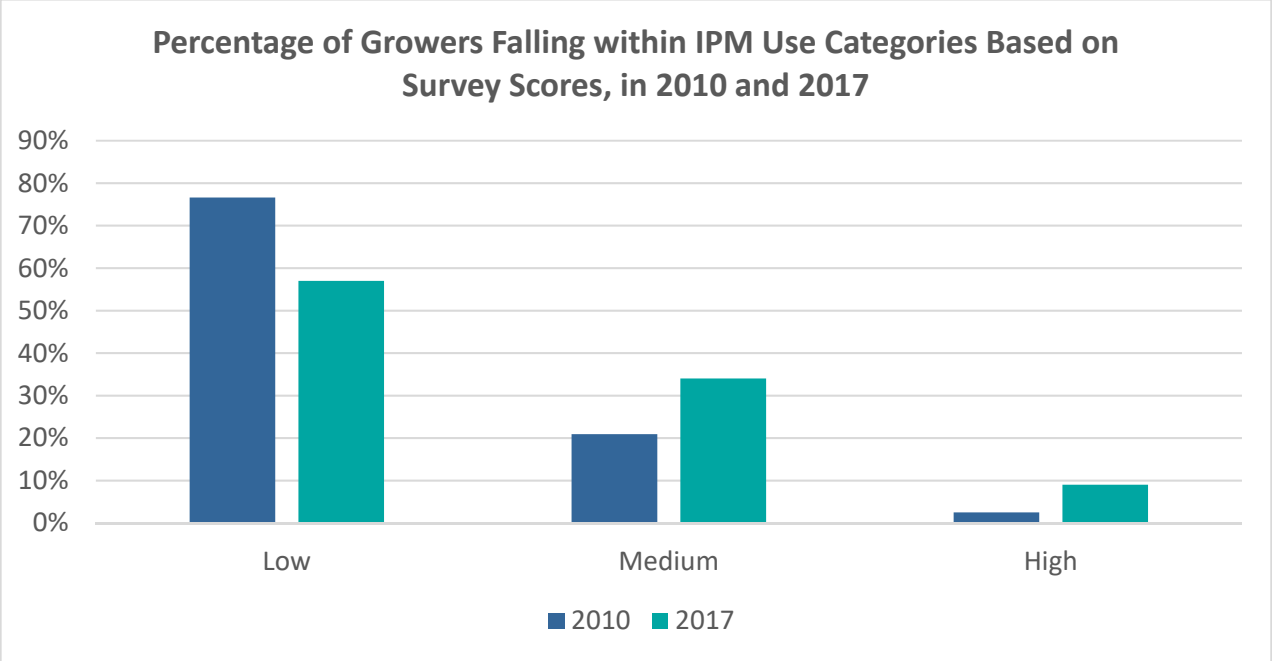


IPM Score

For the 2010 and 2017 surveys, we developed a system where we could assign each respondent a unique IPM score based on their responses. Using this information, each producers' cumulative score was assigned to a low IPM, medium IPM, or high IPM category. The scores were based on points assigned to each possible answer in the surveys, as either 0, 5 (low use), 10 (medium use), or 15 (high use). Assigning these scores can be perceived as subjective; however, the USU team of tree fruit experts understands the potential IPM use in Utah fruits that were addressed by each response in the surveys, and was confident in assigning the scores.

Growers were then assigned to the low, medium, or high IPM adoption category based on their point total, depending on the range for that survey year. The range for low, medium, and high categories was determined by dividing the total possible survey score into thirds.

Because the 2010 and 2017 surveys were almost identical, we were able to use the same assigned scores for each question, and determine overall IPM scores for the 2010 survey, as well. The respondents' IPM scores for each survey mostly fell in the low IPM category, followed by medium, and then high. This scoring system, however, does show a shift over time in the percentage of growers within each category. From 2010 to 2017, the number of producers falling in the medium IPM category increased by 62%, and the number of producers falling in the high category more than tripled.



Determining Treatment Timing

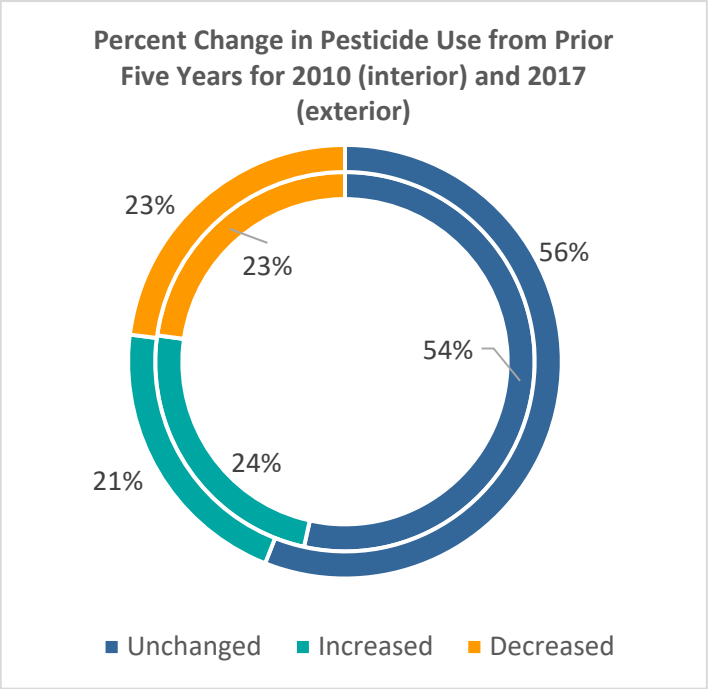
In terms of determining the need for or timing of treatments for insects and diseases, using IPM is very important. Growers were asked to select all the options they use, and in the 2010 and 2017 surveys, their own experience was the most-often selected response (Table 3). There has been a positive trend since 2010, where more growers are relying on insect or disease models and thresholds for decision-making, as well as USU Extension specialists and the seasonal pest advisories.

Table 3. Percentage of growers that indicated they use a tool in determining whether to treat for certain fruit pests.

	2010	2017
Threshold levels	10%	22%
Insect or disease models	12%	19%
Consultant	19%	25%
USU Extension specialists	34%	40%
USU IPM advisories	50%	57%
Own experience	72%	72%
Time of year	44%	39%

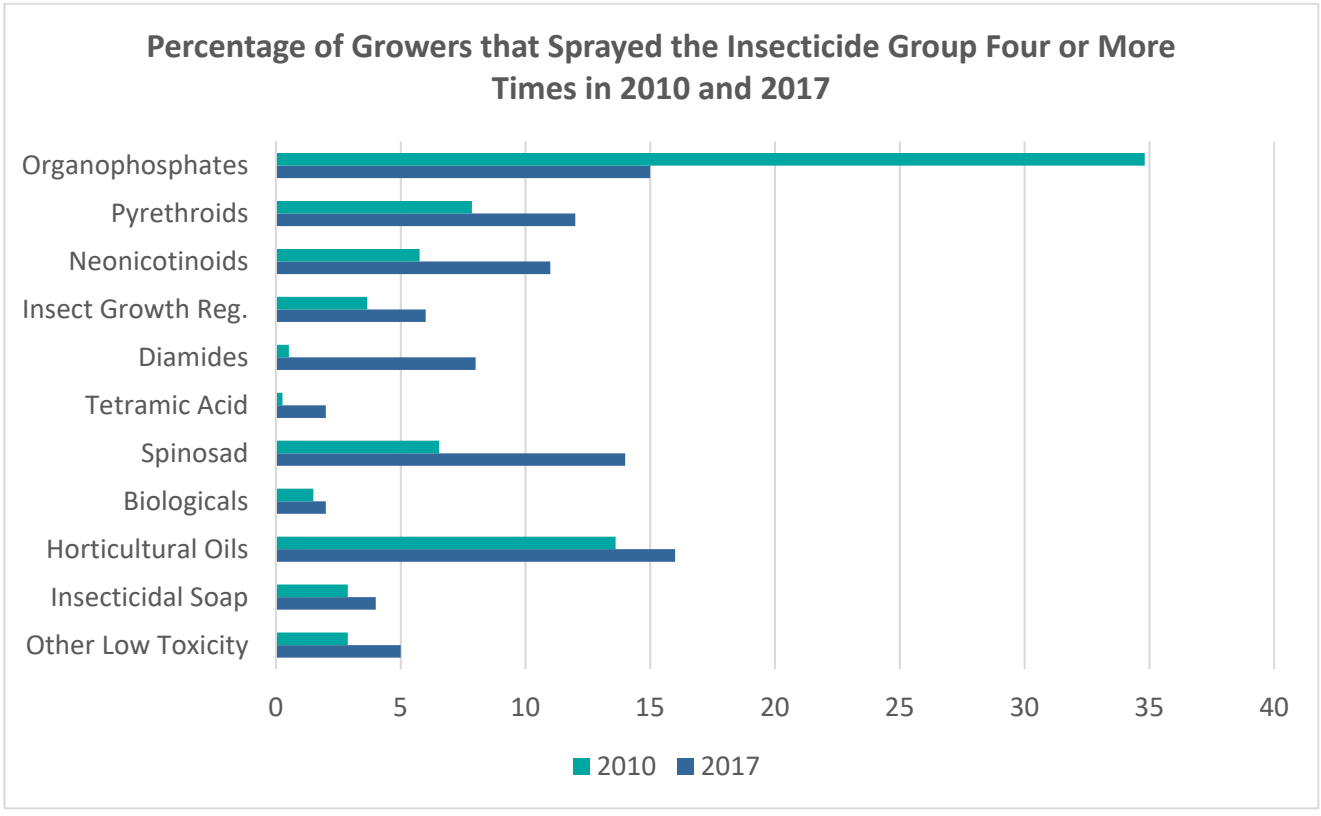
Pesticide Use

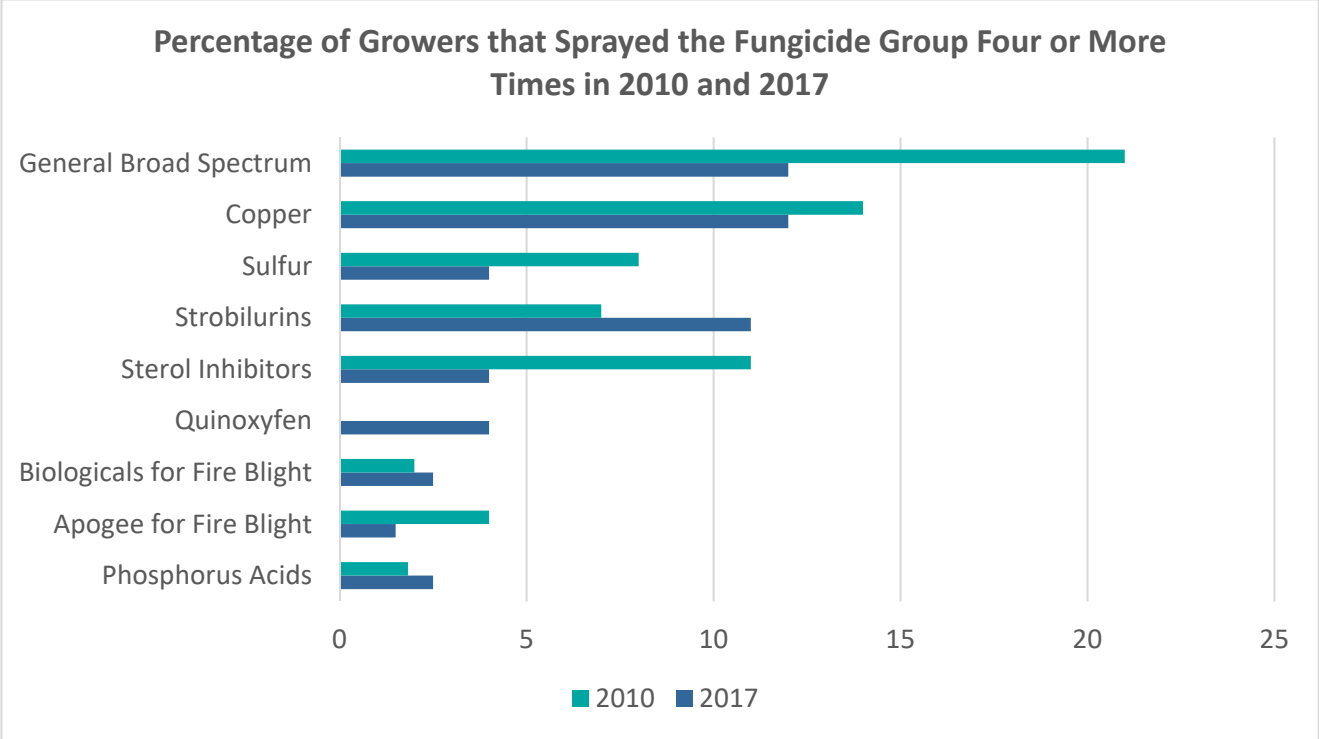
In the 2010 and 2017 surveys, growers were asked to indicate how their overall pesticide use (insecticides, fungicides, herbicides) had changed in the past five years (increase, decrease, or no change). There were no striking differences over time, with the percentage of growers reporting a decrease or no change remaining consistent. The percentage of growers reporting an increase in use, however, was less in the 2017 survey.



In the 2017 survey, slightly more growers decreased pesticide use (23%) than increased (21%), which equates to an overall 6.5% decrease in pesticide use. In 2010, the same percentage decreased (23%), but slightly more increased (24%), equating to an overall 4% increase in pesticide use.

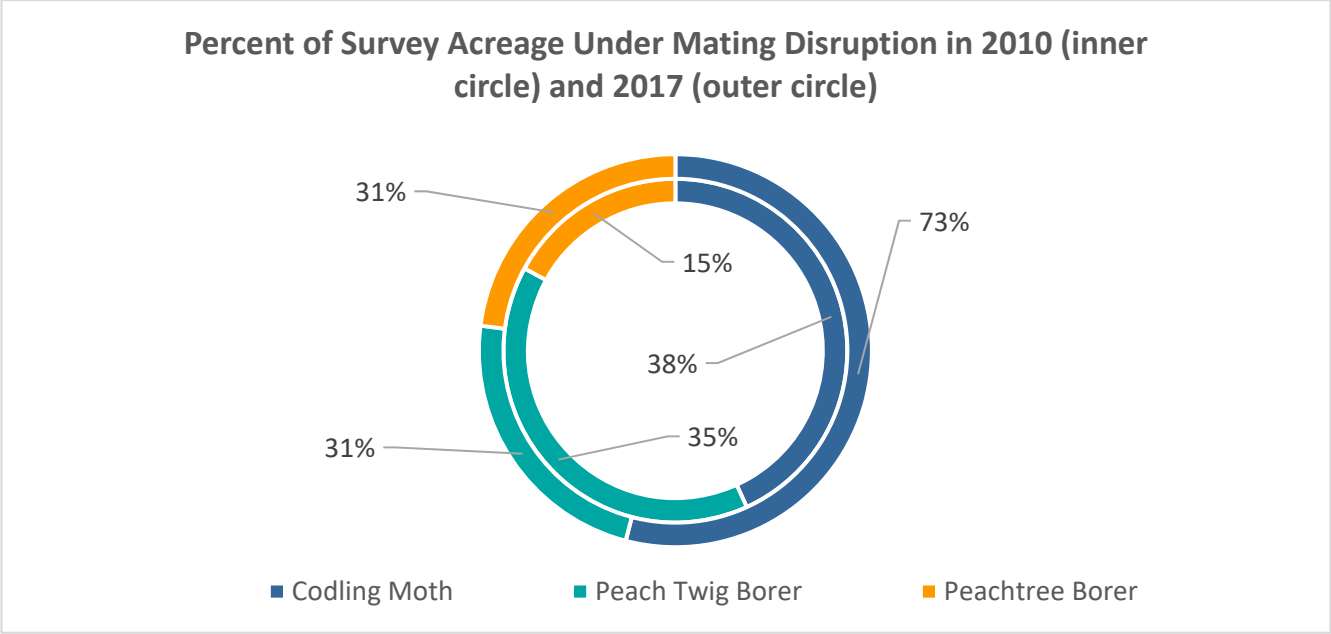
In the same surveys, growers were also provided a list of insecticide and fungicide groups, and asked to indicate their use of chemicals in those groups for the prior growing season (none, low, moderate, high). The responses for this section showed a distinct transition away from some products toward others since 2010. The shift is more evident in insecticides, where more growers are choosing lower-toxicity products such as spinosad, oils, insect growth regulators, and diamides. In fungicides, growers are moving away from the general broad-spectrum options to a mix of conventional, disease-specific fungicides.





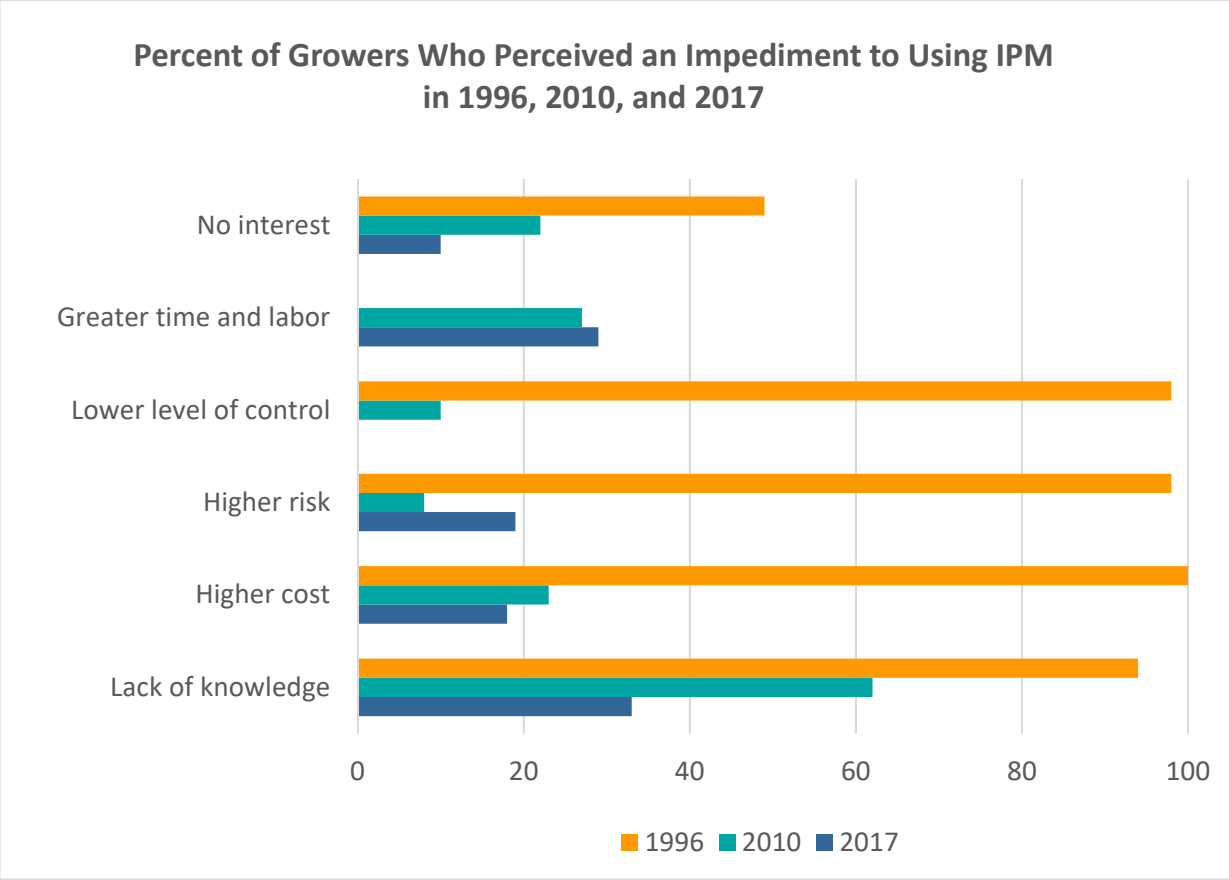
Use of Mating Disruption

Mating disruption (MD) is a highly effective and low-toxic IPM tool for managing three primary pests in Utah: codling moth on pome fruits, and greater peachtree borer and peach twig borer on certain stone fruits. Growers were asked about their use of MD in 2010 and 2017. The amount of acreage under MD represented by the surveys changed the most for codling moth and greater peachtree borer, with a 97% increase for codling moth, and 100% increase for greater peachtree borer. The percentage of acres using MD for peach twig borer has declined since 2010, possibly due to the fact that repeated use of MD for this pest results in an almost zero population level that can allows growers to skip MD use for several years.



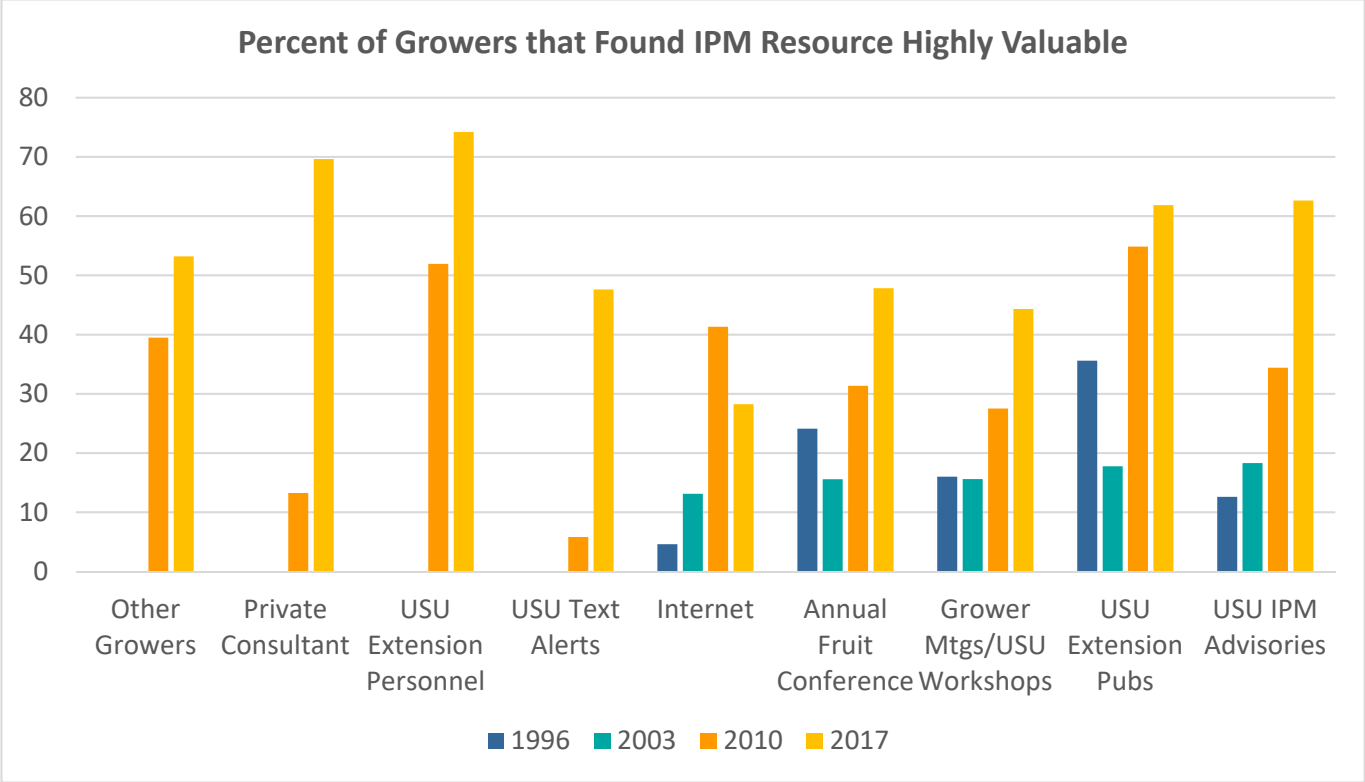
IPM Impediments

To determine barriers to further adoption of IPM, growers were asked in each survey (except 2003) to select factors that might prevent them from using IPM or moving to a higher level of use. There is a significant shift in the perception of various impediments since 1996. The greatest shift is in risk, where growers have realized that the benefits are far greater. For all survey years, the greatest barrier was lack of knowledge, but the percent of growers including this as an impediment decreased by 34% from 1996 to 2010, and by 47% from 2010 to 2017.

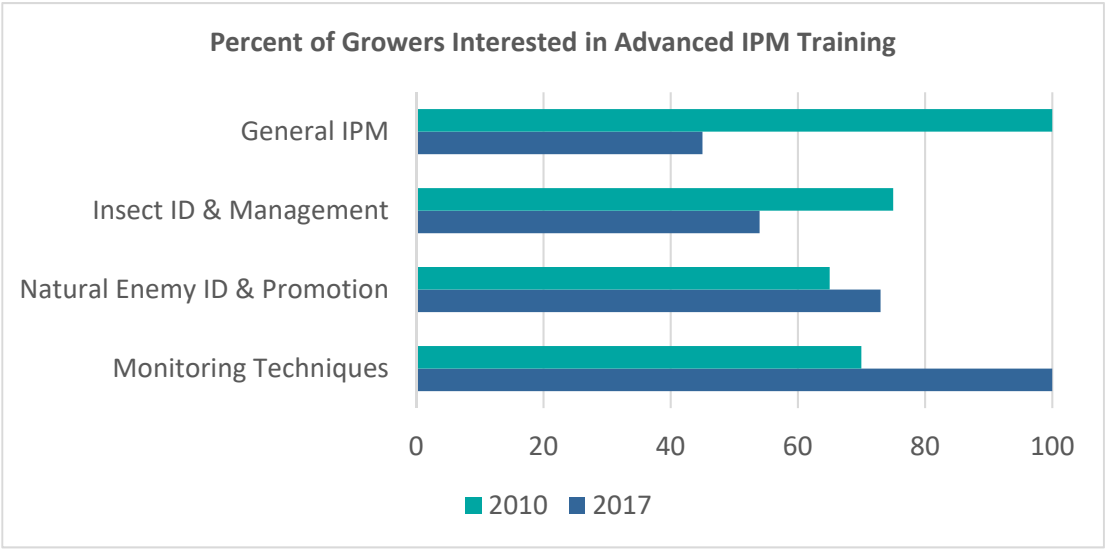


Value of IPM, and Preferred Learning Styles

Growers were asked where they get their pest management information and how much they value that source. All surveys included a question that listed a variety of options for getting IPM information. In 1996, the most preferred options were the annual fruit conference and USU Extension publications. In 2003, almost all sources were equally valuable. In 2010, growers indicated that they valued USU Extension publications/ advisories and specialists as the most valuable, with a similar response in 2017. The primary difference in 2017 from 2010 was an increase in their value of private consultants.



In terms of topics that growers were interested in learning more about, there was a shift in focus from general IPM and insect identification in 2010, to learning about improving monitoring and identifying natural enemies, in 2017.



DEMOGRAPHIC FACTORS AFFECTING IPM ADOPTION

Factors affecting agricultural adoption of IPM include grower or farm characteristics, such as age, farming experience, size of farm, income from the farm, and perceived benefits of IPM. For example, the 1996 survey (Alston et al) found that income from the farm does have an effect on IPM adoption, where more full-time fruit growers used IPM practices than part-time growers, including pest scouting (87% for full-time growers versus 54% for part-time growers).

For the surveys delivered in 2010 and 2017, we continued the investigation into whether demographic factors (age, urbanization around the farm, farm size, farm income [part-time or full-time], years left in farming) had any effect on IPM implementation, such as number of IPM practices used, IPM score, pesticide use, perception of IPM, and value of IPM educational sources. These analyses were carried out using Proc Freq and Chi-square statistics (p=0.05; SAS Institute).

Urbanization around the Farm, Grower Age

Results from both the 2010 and 2017 surveys showed that the amount of urbanization around the farm as well as the grower age had no effect on the use of IPM practices (such as monitoring, using mating disruption, resistant varieties, etc.), IPM score (low, medium, or high use), increase or decrease in pesticide use, perception of IPM, or value of educational products.

Farm Size

Farm size did have an effect on the use of some IPM practices. Regarding the overall number of IPM practices used, we found that in both survey years, more IPM practices were used on large farms, and only smaller farms reported using no practices. In 2017, a majority of growers from larger farms (76%) used 9 or more practices and a majority of growers from smaller farms (68%) used 1 to 8 practices. Only growers from smaller farms (9%) reported using no practices. In both survey years, mating disruption, a highly specific IPM practice, is more likely to be used by larger farms (over 50 acres). In the 2017 survey, growers on large farms were more likely to monitor regularly, and the only farms that reported monthly monitoring were small farms. For the IPM scores that assigned growers to low, medium, or high IPM use categories, in both years, the low IPM category was mostly represented by small farms (less than 50 acres). Both survey years showed that farm size has no significant effect on whether pesticide use increased or decreased over the prior season.

Farm size also has an effect on growers' perception of IPM and educational preference. In the 2010 survey, growers with larger farms were more in agreement to the statement, "IPM costs less," than growers with smaller farms. (There was no significant association in this perception in the 2017 survey). In that same 2010 survey, growers from small and medium farms were more in agreement with the statement that "lack of knowledge limits my use of IPM" than growers from large farms. In the 2010 survey, interest in using IPM did not differ among farm size, whereas in 2017, most of the larger farms (80%) reported an interest in using IPM, while smaller farms were more divided in their responses, with just 47% being interested. In 2017, farmers with large farms valued educational workshops more than those with small farms.

Income from Farming (full-time versus part-time)

Farm income level does have a relationship with IPM implementation. In both 2010 and 2017, full-time growers were more likely to use more than eight IPM practices than part-time growers. Only part-time growers reported using no IPM practices (11%), with most of them (63%) using one to eight practices. The pattern is the same with the IPM scores for both surveys, where the low IPM category is mostly represented by part-time growers. In general for both survey years, more full-time growers used mating disruption and the biological product GF-120 (for cherry fruit fly) than part-time growers. Only the 2010 survey showed slight differences among part- and full-time farmers in pesticide use change, where over the prior five years, full-time growers decreased their pesticide use, and part-time growers remained unchanged.

In 2010, farm income had no significant effect on frequency of pest monitoring whereas in 2017, we found that part-time farmers were more likely to not monitor at all (42% versus 23% of full-time farmers). In the 2010 and 2017 surveys, both part-time and full-time growers that were not currently using IPM expressed equal interest in changing to IPM. In 2017, the growers that expressed no interest in IPM were represented more by part-time (25%) than full-time growers (13%).

In both survey years, we found that both part-time and full-time growers felt the same about their desire to learn more IPM and in their view that lack of knowledge is an impediment to IPM.

Years Left in Production

Growers were asked how much longer they would be farming. Although we found that time left in farming had no correlation with the IPM score of low, medium, or high IPM use, there were other relationships. In the 2017 survey, there were differences in the number of IPM practices used. For growers that use no practices at all, there were more that had just starting farming (11%) than those closer to retirement (4%). On the opposite end, growers using nine or more practices were represented more by new growers (42%) than growers approaching retirement (25%). Years left until retirement had no effect on monitoring frequency in 2010, however, in the 2017 survey, newer farmers were more likely to monitor weekly then farmers approaching retirement (66% versus 44%), and those approaching retirement were more likely to not monitor at all (42% versus 30%).

References:

Alston, D. G. and M. E. Reding. 1998. Factors influencing adoption and educational outreach of integrated Pest management. Journal of Extension 36(3).