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Spiromesifen Use and Benefits in Arizona Agriculture

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Summary

- The EPA is seeking public comments in response to published risk assessments for spiromesifen, a tetronic acid insecticide/miticide used for control of mites and whiteflies.
- Our goal at this time is to inform the EPA about specific and critical use patterns of spiromesifen on Arizona crops.
- Spiromesifen is used to a moderate extent on Arizona corn, cotton and melons for control of *Bemisia* whiteflies and mites, including the two-spotted spider mite. It is efficacious and unique in its ability to control both pests.
- Spiromesifen is a selective insecticide / miticide, and has been demonstrated to be "fully selective" in cotton at up 75% of the full label rate. This is the recommended use rate in cotton, and many applications over the past several years in Arizona cotton are applied at or below this rate. Full rates are preferred when controlling mites in cotton. However, even at the full, labeled rate, Oberon is partially selective and safer to non-target arthropods than broad-spectrum alternatives.
- Spiromesifen is one tool used to control sweetpotato whitefly in order to help limit Cucurbit Yellows Stunting Disorder Virus (CYSDV) infections in melons. CYSDV can have severe impacts on melon yield and quality.
- Spiromesifen has a unique mode of action among miticides and in cotton for whitefly control, making it critically important to resistance management in multiple crops.
- Our growers and pest control advisors are very mindful of pollinator management, including good communication with bee keepers and a common practice of spraying at night or early morning, before bees are active in the field. We are unaware of any observations of harm to pollinators are a result of spiromesifen use.

Spiromesifen Use in Arizona Agriculture

Spiromesifen is a tetronic acid insecticide/miticide used for control of mites and whiteflies, which is registered for use across several crops. Reported uses in Arizona are limited primarily to corn, cotton and melons. Spiromesifen is a reduced-risk material that does not persist in the

environment and helps to preserve natural enemies in cropping systems. Arizona pesticide use records indicate low to moderate use of spiromesifen in each of these crops, relative to many other insecticides, but due to lack of a 100% reporting requirement, these data do not tell the full story. Cotton Pest Losses survey information (see below) provides a more detailed and complete picture of spiromesifen use in Arizona and Southern California cotton. Spiromesifen is a valuable and efficacious tool for control of mites and whiteflies, and is particularly useful at times when these pests occur together and both require control in these crops. In addition, spiromesifen represents a different mode of action than other commonly used mite and whitefly materials, and so plays a valuable role in resistance management.

Pest Control Advisors (PCAs) throughout Arizona and southeastern California interviewed were not aware of any concerns about negative impacts of spiromesifen on bees or other pollinators, and touted the insecticide's important niche as a selective miticide that preserves beneficial insects. They also noted routine practices of growers that help to minimize pollinator exposure to pesticides, such as making applications at night or in early morning before bees are active. Multiple PCAs interviewed indicated they have not seen nor heard reports of negative impacts of spiromesifen on pollinators since its registration and use in Arizona.

Cotton

Arizona often leads the world in cotton yield per acre (>1550 lbs.), nearly twice the U.S. average, contributing 9,000 jobs and $700 million to Arizona's economy in 2011 (anonymous 2014). In 2019, Arizona upland cotton had a value exceeding $190 million for cotton and cotton seed production combined (USDA-NASS 2020).

Considered secondary pests in cotton, mites, including two-spotted spider mite, can become problematic especially following applications of broad-spectrum insecticides that wipe out natural enemy populations. They can also become an issue in cotton adjacent or nearby other source crops like melons and bedded alfalfa. Mite populations cause discoloration or dropping of leaves, which reduces energy available to maturing fruit. This can lead to boll loss (Godfrey et al. 2013). In Arizona, up to one third of the yield can be lost to two-spotted spider mites (Ellsworth, unpubl. data).

Silverleaf whitefly (*Bemisia argentifolii*), also known as sweetpotato whitefly MEAM1 or biotype B, is a major pest of cotton in western states. Whiteflies are piercing and sucking insects that extract plant nutrients. In high numbers, they can lead to stunting, poor plant growth and defoliation, but the primary problem is honeydew production by whiteflies (Godfrey et al. 2015). This occurs when honeydew supports the growth of black sooty molds that stain lint, lowering its quality and potentially leading to "sticky cotton," a condition that occurs when excessive sugars on fibers are transferred to ginning equipment and interfere with processing (Ellsworth et al. 1999). Management of whiteflies is paramount to the production of a quality, salable cotton crop.

The Arizona Cotton IPM Program encourages the presence of natural enemies (predators) of whiteflies and other insect pests to support conservation biological control through the use of selective insecticides based on sampling of whitefly, and more recently also, of predator populations (Ellsworth et al. 2012, 2019). According to Dr. Peter Ellsworth, University of

Arizona entomologist and IPM Specialist, although spiromesifen usage is modest in Arizona cotton, it is a very important compound for growers, because at moderate rates, it is fully selective to cotton arthropods and supports conservation biological control in our system. Also, its ability to head off mite infestations before they get out of hand gives this compound the edge over other products that are considered for whitefly control when mites are present. Although mites are a secondary pest issue for us, this attribute is quite valuable to the industry here.

Spiromesifen, at rates of 8 to 10 fl.oz./ac for the 2SC formulation of Oberon, provides selective control of whitefly and mites while preserving natural enemies and other non-target organisms (Ellsworth et al. 2014). Dr. Peter Ellsworth more recently has recommended spiromesifen rates not to exceed 75% of the full labelled rate, or 12 fl.oz., of the 2SC formulation or 6 fl.oz. of the 4SC formulation (Peter Ellsworth, personal communication), except where higher rates are needed for mite control. Based on analysis of data from the Arizona Pest Management Center Pesticide Use Database (Fournier et al. 2017), for reported applications between 2010 and 2019, the median application rate for Oberon 2SC is about 10 fl.oz./ac, with 50% of the data falling between 9 and 12 fl.oz./ac. About 25% of applications exceed the 12 fl.oz./ac rate, with only 3.2% of applications at the maximum rate 16 fl.oz./ac. For the 4SC formulation, about 90% of applications in cotton are made at the maximum rate of 8 fl.oz./ac. Since 2015, the majority of use in Arizona cotton has been with the 4SC formulation of Oberon. **These data show that the majority of applications made in Arizona cotton are made at fully selective rates, supporting conservation biological control in our system when its use is deemed necessary.**

The annual Cotton Pest Losses and Impact Assessment survey gathers data from pest control advisors (PCAs) in Arizona and Southern California on yield impacts by pest along with detailed information on insecticide use. Based on data collected for the 2019 growing season, PCAs checked and managed nearly 70,000 acres in Arizona (N=23) and California (N=3) (Figure 1), indicating a rather large sample size of cotton in the region (about 170,000 acres). 19 different insecticide active ingredients were in use in this region. Spiromesifen was 6th most frequently used active ingredient in this region and tied for 3rd as the most popular whitefly control chemical. More than a third of these PCAs (~38%) used Oberon on cotton in 2019, spraying on average 0.86 times. Most of these users of Oberon sprayed it no more than 1 time. Arizona cotton was sprayed for arthropod pests in total 2.34 times in 2019; the unweighted average for these users (AZ & s. CA) was 3.2 sprays. Thus, for those users who elected its use, Oberon was a very important crop chemical for the control of whiteflies and mites.

According to pest control advisors (PCAs) who work in cotton in central and western Arizona and southeastern California, spiromesifen is a very important and unique control tactic. A PCA who works primarily in Riverside County, California, explained that mites build up in alfalfa, one of their major crops often planted adjacent to cotton. Following cutting of alfalfa, mite infestations in cotton can occur, and are easily managed with a single application of Oberon, which also controls whiteflies. “This is the only product that controls both mites and whiteflies, and it is easy on beneficials,” he explained. A PCA in central Arizona indicated that spiromesifen is “one of the most effective whitefly materials” available, and also offers mite control. If more than one miticide is used, spiromesifen is rotated with products that have different modes of action, to help reduce resistance selection of mite populations.

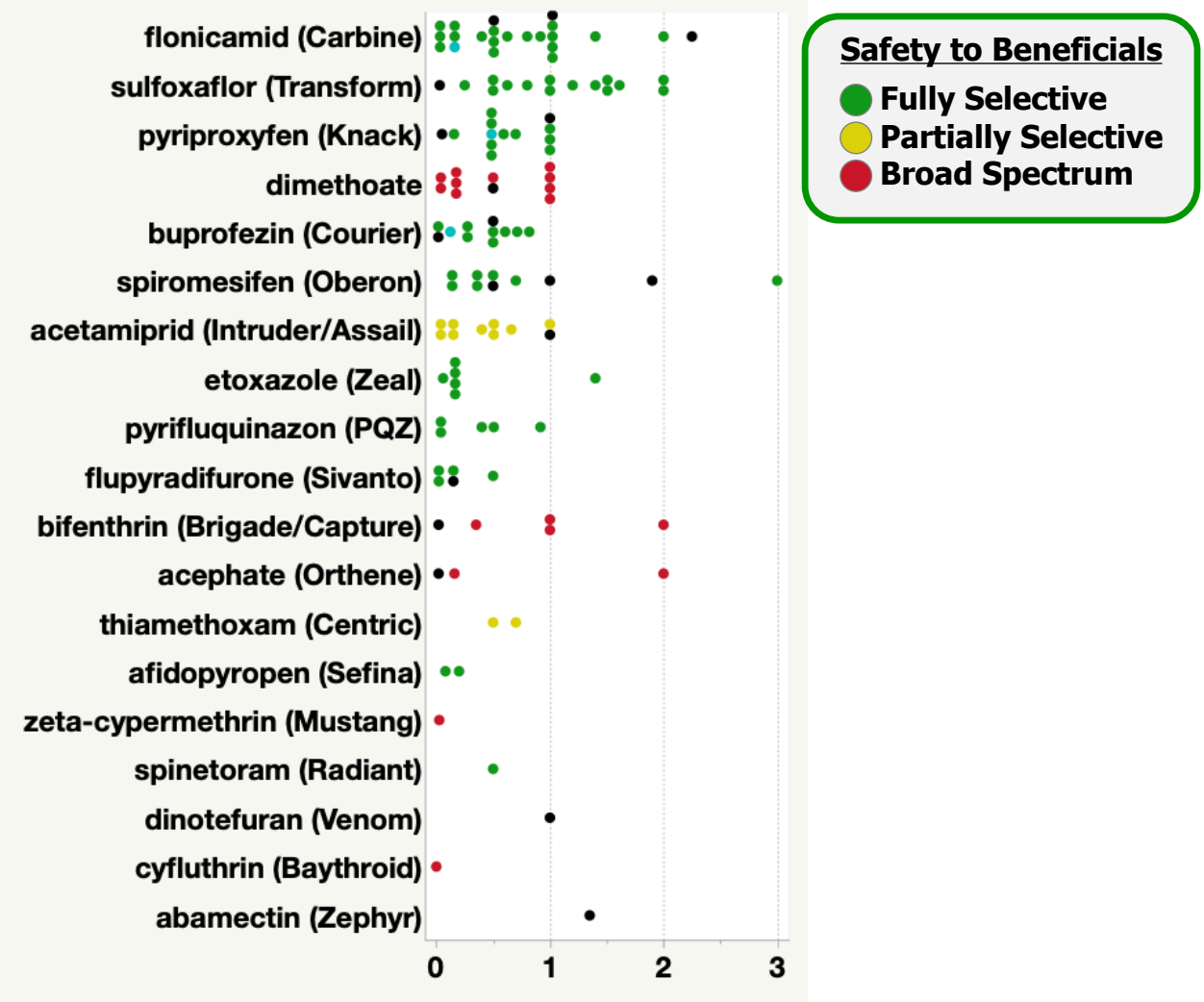

Figure 1. Reported foliar insecticide use counts (each user = 1 dot) and frequency by respondent (N=26) for Arizona (red, yellow and green dots) and southern California cotton (black dots) in 2019. Colored dots represent a reported respondent use and number of times used (% acres sprays * number of times), categorized by safety or selectivity for beneficial arthropods. Source: *Cotton Pest Losses Database*, Ellsworth, unpubl.

Corn

In 2019, Arizona produced 1.45mil tons of silage corn on 50,000 acres, helping to support an $853mil state dairy industry. Growers produced an additional 37,000 acres of grain corn valued at $45.3mil (USDA-NASS 2020).

Two-spotted spider mites and other phytophagous mites can cause significant damage in corn. Active mite stages feed on corn leaves, often in large numbers, removing juices and drying leaves, resulting in reduced tissue for photosynthesis, stalk breakage and a reduction in kernel size (yield loss). Mites reproduce rapidly if not controlled. Spider mites are particularly problematic on silage corn and sweet corn (Godfrey et al. 2008).

Spiromesifen is an important option among miticides for Arizona corn production. Most pest control advisors interviewed said spiromesifen was effective for mite control in corn (one disagreed). Generally, a single application of the 4SC formulation of Oberon is used at full rate (8 fl. oz.) Because of its short pre-harvest interval of 5 days, it can be used very late in the season. Unlike broad-spectrum miticides, spiromesifen is very soft on beneficial insects.

Melons

In 2019, Arizona produced fresh market cantaloupes and watermelons on 19,000 acres, valued at $115mil (USDA-NASS 2020). Melons grown in Arizona make up a significant portion of the melons produced in the United States. Arizona ranks second only to California in U.S. production of cantaloupes (USDA-NASS 2018).

Sweetpotato whitefly, *Bemisia tabaci*, is a primary pest in desert melons. Although it has a wide host range, melons are one of its most preferred hosts. These whiteflies damage melon crops, impacting fruit quality and yield, and producing honeydew which can give rise to sooty mold. Significantly, they also serve as vectors to transmit the most important virus in desert melon production, the Cucurbit Yellows Stunting Disorder Virus (CYSDV). The virus causes reduction in fruit size and quality (sweetness), impacting yield in both spring and fall melons, though impacts in fall melons tend to be more severe, due to high temperatures and larger whitefly infestation and virus levels (Palumbo 2020). Management of whitefly is critical to reducing the damaging impacts of the virus.

While a good variety of effective materials are available for whitefly management in melons, spiromesifen has the added benefit of mite control. According to one pest control advisor, a single application of Oberon 2SC on spring cantaloupes at the full rate of 8.5 fl.oz./acre, at or just after netting, provides effective control of mites and whiteflies for the remainder of the season. Spiromesifen is sometimes used early in the season, tank mixed with Intrepid (methoxyfenozide) or Beseige (chlorantraniliprole) for looper control, and it provides excellent early season control of whiteflies and mites, suppressing populations before they get to concerning levels.

Who We Are

The Arizona Pest Management Center is host to the University of Arizona's expert IPM scientists including Ph.D. entomologists, weed scientists and plant pathologists with expertise in the strategic tactical use of pesticides within IPM programs that protect economic, environmental and human health interests of stakeholders and the society at large.

Dr. Al Fournier is Associate Director of the APMC / Associate Specialist in Entomology, holds a Ph.D. in Entomology, and has expertise in evaluating adoption and impact of integrated pest management and associated technologies. He serves as an Integrated Pest Management Network Coordinator through the Western IPM Center Signature Program, representing stakeholders in the desert Southwest states in EPA registration reviews. Dr. Peter Ellsworth is Director of the APMC, State IPM Coordinator for Arizona and Professor of Entomology / Extension IPM Specialist with expertise in developing IPM systems in cotton and other crops and measuring

implementation and impact of IPM and pest management practices. Mr. Wayne Dixon holds a B.S. in Computer Information Systems and develops tools and data used in IPM research, education and evaluation, including management of the APMC Pesticide Use Database.

These comments are the independent assessment of the authors and the Arizona Pest Management Center as part of our role to contribute federal comments on issues of pest management importance and do not imply endorsement by the University of Arizona or USDA of any products, services, or organizations mentioned, shown, or indirectly implied in this document.

Our Data and Expert Information

Through cooperative agreements with Arizona Department of Agriculture, the Arizona Pest Management Center obtains use of, improves upon, and conducts studies with ADA's Form1080 data. Growers, pest control advisors and applicators complete and submit these forms to the state when required by statute as a record of pesticide use. These data contain information on 100% of custom-applied (i.e., for hire) pesticides in the state of Arizona. Grower self-applied pesticide applications may be under-represented in these data. In addition, the Arizona Pest Management Center is host to scientists in the discipline of IPM, including experts in the usage of this and other compounds in our agricultural systems. We actively solicit input from stakeholders in Arizona and other Southwest states (Nevada, Colorado, New Mexico and Southeastern California), including those in the regulated user community, particularly to better understand use patterns, use benefits, and availability and efficacy of alternatives. The comments within are based on the extensive data contained in the Arizona Pest Management Center Pesticide Use Database, collected summary input from stakeholders and the expertise of APMC member faculty.

Through the Crop Pest Losses and Impact Assessment program (WIPMC 2018), partially funded as a signature program of the Western IPM Center, the Arizona Pest Management Center conducts annual surveys with state-licensed pest control advisors (PCAs), who are the primary pest management decision makers, in consultation with growers. The surveys, conducted at face-to-face meetings, provide detailed information on crop yield losses to specific insect pests, weeds and diseases, control costs, and pesticide use for the key crops, cotton and lettuce. Cotton data have been collected since 1991 and lettuce data since 2005. Data are collected for all of Arizona and neighboring production regions of California, with typical responses representing up to 65% of acres planted in Arizona. These data provide detailed information on shifting pest trends, chemical use and costs, and often compliment and augment information from the APMC Pesticide Use Database, particularly for pesticide uses for which the state does not mandate reporting.

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