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Quinoxyfen Use in Arizona and New Mexico Crops

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EPA Docket ID: EPA-HQ-OPP-2013-0771
Date: February 13, 2017

Summary

- EPA is seeking public comments in response to draft human health and ecological risk assessments for quinoxyfen, a systemic fungicide used to control powdery mildew. It is registered for use on several crops the desert southwest.
- At this time, our goal is to inform EPA about a few important uses of quinoxyfen in selected desert southwest cropping systems.
- Powdery mildew is an important disease that can impact yields and quality of affected crops. The use of preventative fungicidal treatments is important when conditions become favorable for disease development.
- In Arizona, quinoxyfen is used in production of melons (cantaloupe, watermelon, and other melons), head and leaf lettuces, and to a lesser extent in Chile peppers (some years). Arizona pest control advisors particularly stressed the importance of this active ingredient in melons.
- In New Mexico Chile pepper production, quinoxyfen is a go-to product in uncommon situations, such as during wetter summers, when standard rotations of other preventative chemistries fail to maintain powdery mildew below damaging levels. In these circumstances, this chemistry can prevent severe economic yield losses.
- Standard application practices in Arizona crops are protective of bees. Applications are generally done at night to minimize possible exposure of bees to fungicide residues when they would be foraging.
- While there are other products available for management of powdery mildew, quinoxyfen is very efficacious and has a unique mode of action, so it is an important component of chemical rotations for resistance management of this disease.

Quinoxyfen use in Arizona

Based on data from the Arizona Pest Management Center (APMC) Pesticide Use Database (Fournier et al. 2017), quinoxyfen is used primarily in melons (cantaloupe, watermelon, honeydew), head and leaf lettuces, as well as chili peppers (not every year), with few reported

uses on other crops. Use is relatively low, compared with other fungicides in these crops. The highest reported use is in melons, ranging from around 2,500 to 7,000 treated acres annually (13% to 35% of melon acres). However, this is a conservative estimate of actual use, because some growers self-apply the fungicide and such applications do not require reporting in Arizona. In comparison, only around 3% of lettuce acres are reportedly treated with quinoxyfen.

Melons

Arizona produces fresh market cantaloupe and watermelons. In 2016, over 20,000 combined acres harvested were valued at over $98 million (USDA-NASS 2017). According to Dr. Michael Matheron, Extension Plant Pathologist with University of Arizona, quinoxyfen, though an older chemistry, is still very effective against powdery mildew, based on research trials. While there are other fungicides available for powdery mildew control, quinoxyfen has a unique mode of action (MOA), and for this reason is often important in resistance management plans for growers. Matheron & Porchas (2007) explain the problem powdery mildew poses for melon growers:

> Powdery mildew is an annual concern to melon growers in Arizona. The disease on cantaloupes, caused by the fungus *Podosphaera xanthii* (formerly known as *Sphaerotheca fuliginea*), first appears as small, white, superficial spots on leaves and stems. These spots enlarge, become powdery in appearance, increase in number and eventually cover stems and both surfaces of leaves. Young infected leaves may turn chlorotic and die. Severely infected leaves turn brown and desiccate. **Cantaloupe fruit on severely infected plants may ripen prematurely, be of poor quality and become sunburned due to the reduced plant canopy**….The same pathogen causes powdery mildew on watermelons, honeydews, squash and other cucurbits…..If susceptible cultivars are grown, **it is extremely important to have fungicidal protection in place when environmental conditions become favorable for disease development**.

In central Arizona, some growers consistently use quinoxyfen every year in their production practices. (These are grower applications, which are not represented in the pesticide use data summarized above.) “It is one of the most effective products for powdery mildew control,” one PCA said who uses it in rotation as part of their resistance management plan. Typically, it is applied three times per season at label rates. The use pattern is the same in cantaloupes and watermelons.

In southwestern Arizona, some PCAs use quinoxyfen for powdery mildew control in melons, typically as the second chemistry in their rotation; others use it as the standard for powdery mildew control. “It is one of the better products for this disease in melons. There are three to four different ones we can use. They are a bit expensive.” In these cases, all grower applications go on by ground at night. “There is no day time spraying. That’s pretty much standard in our industry anymore. Sprays applied well before sunrise in Arizona should be dry long before bees start foraging.” It was also noted, “Most of our applications [of quinoxyfen] are going on late in the growing season [after pollination], at a point when bees are no longer in use for these crops.” And, “We rotate it with other chemistries. Although use is not huge either in melons or produce,

in terms of acres, this is certainly an important chemistry for us, in terms of consistent effectiveness and also resistance management."

Lettuce

While this active ingredient has some reported use in lettuces each year in Arizona, the PCAs we talked with each emphasized that the melon uses were the most critical use to them. However, given its unique mode of action relative to other powdery mildew controls, and its importance in resistance management rotations, a case could be made for retaining uses in lettuce as well.

Quinoxyfen use in New Mexico

Chile Peppers

In 2016, New Mexico produced 8,700 acres of Chile peppers valued at over $50.5 million (USDA-NASS 2017b). According to a pest management advisor who works with the NM Chile industry, quinoxyfen, though not used every year, remains an important go-to option in wetter summers, when the standard preventative rotation of azoxystrobin (Quadris) and mefenoxam (Ridomil Gold SL) is unable to effectively suppress the pathogen that causes powdery mildew. "Quinoxyfen is very efficacious. In those unusual situations of a wet July, a grower may go to this when powdery mildew starts to get away from us. It works reliably, and can get you to harvest where, without this chemistry, you would effectively lose much of the crop. This doesn't happen often, but when it does, this is a life-saver." He went on to explain that this is not a chemistry that they recommend for routine use, but only in those challenging situations. "We try to avoid the more toxic chemistries as much as possible, and we guard against resistance vigilantly, because we need these products to work for us in the long term." When they use quinoxyfen, it is generally a single application late in the season. Applications are generally made at night to avoid foraging bees.

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. Peter Ellsworth is Director of the APMC, State IPM and Pesticide 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. Dr. Al Fournier is Associate Director of the APMC / Adjunct 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 a Comment Coordinator for the Western IPM Center, representing stakeholders in the desert Southwest states. Dr. Mike Matheron is the University of Arizona Extension Plant Pathologist with many years of experience working on disease management for vegetable crops in the Yuma County production region of Arizona, particularly for leafy greens and melons. 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 Form L-1080 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 compound in our agricultural systems. We actively solicit input from stakeholders in Arizona 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.

References Cited

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