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Flumioxazin use in Arizona

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EPA Docket ID: EPA-HQ-OPP-2011-0176
Date: August 12, 2019

Summary

- EPA is seeking public comments in response to new draft human health and ecological risk assessments for the herbicide flumioxazin.
- EPA's risk assessments identified risks of concern for occupational handlers for certain scenarios, including certain types of applications in forestry, aquatic areas, orchards and vineyards, and uses in nursery and landscaping.
- At this time, our goal is to inform EPA about flumioxazin use on different sites in Arizona and to provide stakeholder feedback on some of the benefits of this herbicide in those markets.
- Flumioxazin has several uses in Arizona, including agricultural uses in alfalfa, cotton, beans and vineyards, golf course and landscape uses, as well as for aquatic weed control.
- Most flumioxazin sold by a major distributor in Arizona is for uses in the landscape market. Backpack sprayers and pressurized handguns are used to a great extent for landscape weed control and bare ground applications.
- Flumioxazin does not appear to be used in riparian or forest weed management in Arizona.
- Although flumioxazin is used in vineyards for weed control, backpack sprayers and pressurized handguns are not known to be used on those sites.
- Flumioxazin plays a very important role in aquatic weed management in Arizona, on golf course ponds and other ponds, lakes, water management districts and canals throughout the state. It is a replacement for Copper + diquat / paraquat mixtures and has many environmental and human health advantages over that previously used standard practice, as outlined below. Surface applications to water bodies are typically made with pressurized handguns or backpack sprayers.

Flumioxazin use in Arizona Agriculture

Flumioxazin is used in alfalfa and cotton production in Arizona and has an important role, although its use does not dominate the market. There are also reported uses on beans, including dry beans and garbanzos. It is difficult to provide an accurate estimate overall use in these crops,

because the majority of applications are grower-applied and do not require reporting to the Arizona Department of Agriculture.

Alfalfa

A pest control advisor in La Paz County Arizona explained that flumioxazin is used in established stands of alfalfa, primarily for winter weed control in fall or early winter. It is applied as a pre-emergent herbicide. The majority of applications are at the 4 oz. rate (Chateau). It is not used on all acres each year, but it is one of relatively few weed management tools growers have. Applications target winter broadleaf weeds such as shepherd's purse, London rocket, red sorrel and common groundsel. It is less commonly used in the spring, but it is highly effective against weeds such as common purslane, horse purslane and pigweed, when needed.

Cotton

According to Dr. Randall Norton, Extension Agronomist and Director of the Safford Agricultural Center, flumioxazin (Chateau) is a valuable and efficacious tool for weed control in cotton. It is particularly effective for management of problematic weeds such as morning glory and ground cherry. It offers effective contact and residual control, although residual activity is shorter than some alternatives (e.g., prometryn or diuron). Flumioxazin is applied to cotton at layby as a post-directed application, and helps to sustain good weed management. It is generally applied at the 2 oz rate. Due to recent increases in flatbed cotton production in eastern Pinal County, Arizona, flumioxazin use is on the rise. While other herbicidal modes of action are used in cotton, some to a much greater extent than flumioxazin, its effective range of control and residual activity make it very useful to growers. Flumioxazin is an important component in rotation strategies for herbicide resistance management. Glyphosate-resistant Palmer Amaranth is present throughout the state. Chateau has some of the shortest plant-back restrictions for various rotational crops important in Arizona, compared to other layby herbicides. This may drive increased use in the future. There are no backpack or handgun applications in cotton.

Beans

Flumioxazin is used some years as part of weed management programs in beans in central Arizona, including dry beans and garbanzo beans. A pest control advisor provided details on its use. It is relatively costly, but can be helpful for controlling challenging weeds such as lambsquarter and goosefoot. When it is used, it is applied in a mixture with pendimethalin (Prowl) and Dimethenamid-P (Outlook) and is pre-plant incorporated at the 0.75 oz rate (Chateau). Most beans are planted in flat beds. Applications are made over the bed and watered in, followed by a power mulch to incorporate. Flumioxazin helps broaden the spectrum of control and its residual lengthens the window of weed suppression.

Orchards / Vineyards

According to two pest control advisors in Southeastern Arizona, flumioxazin is one of the primary herbicides used for weed control in vineyards. Broadcast applications are made with a boom sprayer. Mechanically-pressurized handgun sprayers are not known to be used in this industry. Use rates between 8 and 12 oz (Chateau) have been reported. This product is highly efficacious against a broad spectrum of weeds and is one of the few products that is effective against Russian Thistle. It is rotated with other herbicidal modes of action for resistance management.

According to Dr. William McCloskey, Extension Weed Specialist, flumioxazin is a good weed control option in pecans and pistachio when tank-mixed with pendimethalin to improve grass control. Currently, it is not widely used in our tree nut crops because Pindar GT (oxyfluorfen + penoxsulam) provides superior control against the same weeds. However, herbicide resistant weeds are becoming a bigger issue for our producers and the time will come when the pendimethalin-flumioxazin tank mixture will be used in rotation with Pindar GT. Use rates are 6 oz to 12 oz/A. In experimental field trials, the 6 oz rates have worked well with pendimethalin. Almost all of our growers have ground spray rigs (most common is PBM orchard sprayers) and make their own applications.

Forestry & Riparian Area Uses

Extension Agent and Yavapai County Director, Jeff Schalau provided information and contacts in Verde Valley area, including a weed management company and a non-profit organization that does riparian restoration work. Arizona forests are not aggressively managed for weeds, and as far as we could identify, flumioxazin is not currently in use for weed control in forests or riparian areas.

Turf and Landscape uses

Flumioxazin is an important and much-used herbicide in the turf and landscape industry. One chemical distributor commented that 90% of their sales of this active ingredient go to the landscape industry, where labelled products are used for pre-emergent weed control in turf, rocky areas (xeriscapes) and bare ground. A commonly used product is SureGuard SC, though there are many others registered. Some landscapers apply it twice annually, six months apart, at the maximum label rate. It is typically applied prior to an anticipated rain event or watered in. **Both backpack and pressurized handgun application methods are extensively used in the landscape industry in Arizona.** Flumioxazin is favored among pre-emergent herbicides in the industry because it is efficacious against a broad range of weeds. There are several other products available for pre-emergent weed control, and landscapers commonly rotate modes of action to help prevent the development of resistance. One advantage of flumioxazin is that it does not stain or color the ground, rocks, etc. like the dinitroaniline herbicides. It can also sit on soil surface longer than the dinitroaniline herbicides waiting for rainfall incorporation into the soil (i.e., less product loss due to photodegradation and volatility).

SureGuard SC is used in the golf course industry and is applied as a broadcast spray. According to Maricopa County Agent, Kai Umeda, a single application is used in the fall to control annual bluegrass in non-overseeded Bermudagrass turf. An additional benefit of these applications is that they provide crabgrass control into early spring.

Aquatic Weed Management

Flumioxazin (e.g., Clipper, Flumiguard), is a unique and important tool for the control of algae and a variety of weeds in water bodies. It is used at golf courses, in ponds, lakes, weed management areas and canals. Based on information provided by an employee of a registrant company that sells flumioxazin products, flumioxazin can be applied as a pre-emergent along shorelines to reduce plant growth, leading to fewer herbicide applications season-long. It is used in canals and irrigation districts in Arizona for winter weed control. This synthetic herbicide

provides a good alternative to the previous industry standard practice of mixing copper with diquat or paraquat. Unlike copper, flumioxazin breaks down quickly in the environment, and it has a less toxic profile than diquat or paraquat. Another alternative active ingredient is fluridone, which is not as toxic as diquat or paraquat.

Flumioxazin can be applied as a pre- or post-emergent treatment. It is generally applied at the 6 to 10 oz rate. Formulations include liquid concentrates and wettable dispersible granules. Applications to water bodies are made either by subsurface sprays (less common) or spot surface applications (more common). **Pressurized mechanical handguns are used for surface applications.** Weeds in deeper water are targeted with sub-surface applications using a drop-hose. These types of applications tend to use the higher maximum rate.

Other sites

Flumioxazin (e.g., Clipper, Flumiguard) is used along railways, powerlines, and on bare ground for pre-emergent weed control. It has advantages in that it is safe for most trees and shrubs and has very limited off-site movement. Flumioxazin bonds strongly with soil and is not very water soluble, which means it has a low potential for ground water contamination.

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 works with the Western IPM Center, representing stakeholders in the desert Southwest states in EPA registration reviews. 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. 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. Dr. John Palumbo is the University of Arizona Extension Entomologist with many years of experience working on integrated pest management of insect pests for vegetable crops in Arizona, particularly for leafy greens, cole crops 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.

Dr. William McCloskey is an Associate Professor and Extension Specialist in Weed Science, with experience in field crops, including cotton, and tree fruit and nut crops. Dr. Randall Norton is an Extension Agronomist with extensive expertise in cotton production and weed management. Jeff Schalau is an Extension Agent and Director of Yavapai County Extension in Flagstaff. He works with stakeholders responsible for weed and pest management in forests and

riparian sites. Kai Umeda is an Area Extension Agent specializing in turf management with particular expertise in golf and recreational turf management.

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.