Agricultural Experiment Station
Cooperative Extension

Maricopa Agricultural Center
37860 West Smith-Enke Road
Maricopa, Arizona 85138
(520) 374-6200

Response to EPA Proposed Interim Decision for Diuron

Prepared by Alfred Fournier, William McCloskey, Blase Evancho & Wayne Dixon
Arizona Pest Management Center, University of Arizona

July 27, 2022

Re: Diuron, Comments on EPA Proposed Interim Decision
EPA Docket ID: EPA-HQ-OPP-2015-0077

To Whom It May Concern:

The Arizona Pest Management Center (APMC) 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. Through cooperative agreements with Arizona Department of Agriculture (ADA), the APMC 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) agricultural pesticides used in the state of Arizona. Grower self-applied pesticide applications may be under-represented in these data. In coordination with the Western Integrated Pest Management Center, we contribute to federal comments on issues of pest management importance to stakeholders throughout the desert southwest including Arizona, New Mexico, Nevada, Colorado, Utah and the southeast desert regions of California.

At this time, we wish to respond to the Agency's Proposed Interim Decision for conventional uses of the herbicide / defoliant diuron, EPA Docket number EPA-HQ-OPP-2015-0077, on behalf of stakeholders in Arizona and adjacent regions of Imperial County, California. (We do not address anti-microbial uses.) Our comments combine stakeholder input received from University experts, licensed pest management professionals from Arizona and California, growers, and reported pesticide use data submitted to the Arizona state regulatory agency and captured in the Arizona Pest Management Center Pesticide Use Database.

Also, we wish to incorporate by reference comments submitted to EPA by the Arizona Pest Management Center on June 7, 2021, in response to draft risk assessments for diuron, Docket ID# EPA-HQ-OPP-2015-0077-0057.

Diuron use in Arizona and Imperial & Riverside Counties, California

Diuron is registered for use across a wide variety of field and forage crops, vegetable and fruit crops, tree nuts and citrus, as well as turfgrass. However, according to the Arizona Pest Management Center (APMC) Pesticide Use Database (Fournier et al. 2017), diuron use is reported almost exclusively on two crops grown in Arizona: cotton and alfalfa. In addition, both pesticide use reports and conversations with users indicate a significant amount of non-cropland applications for weed control.

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 2012). In 2021, Arizona produced 129,000 acres of upland cotton with a value exceeding $142 million for cotton and cotton seed production combined (USDA- NASS 2022).

The dominant use of diuron in Arizona is as a defoliation treatment in cotton. Diuron is an active ingredient (along with thidiazuron) in Ginstar and Redi-pik, the main defoliants used throughout Arizona's cotton growing regions. The introduction of these products greatly reduced use of and dependence on sodium chlorate, a more hazardous chemical for cotton defoliation. Dr. William McCloskey, retired University of Arizona Associate Professor and Extension Specialist in Weed Science, estimates that about 75% of Arizona cotton acres receive a diuron defoliation treatment most years. Based on pesticide use reporting data, 94.6% of reported diuron sprays on cotton between 2010 and 2019 were with defoliation products containing only 6% diuron. Growers rely on diuron for effective cotton defoliation in Arizona and adjacent production regions of California. **Stakeholders are pleased that EPA has proposed continuation of this use pattern in its Proposed Interim Decision.**

Diuron is also used for layby weed control in cotton. Layby applications are the last ground applications made in cotton before the canopy closes. The goal of layby applications is to provide long residual weed control through the end of the cotton season. The remaining 5.4% of reported diuron sprays in cotton between 2010 and 2019 were applications of diuron 4L formulations, containing 40.7% diuron, used for layby weed control. Reported use rates for these applications range between 0.062 lbs. a.i. /A to 1.26 lbs. a.i. /A, with a mean rate of 0.73 lbs. a.i. /A.

Historically, herbicide treatment at layby was a standard practice across the cotton industry, but with widespread adoption of Roundup Ready cotton in Arizona, this practice became nearly extinct for some time. This situation is rapidly changing due to the evolution of glyphosate-resistant weeds, particularly, Palmer amaranth (pigweed). University of Arizona experts urge growers to maintain a variety of weed control practices in cotton to slow the development of herbicide resistance (McCloskey et al. 2012, Evancho et al. 2021).

According to Blase Evancho, University of Arizona Assistant in Extension located in Central Arizona, more growers of round-up ready cotton are considering or have already returned to layby applications of Diuron 4L. It also remains a viable and important weed control option in

conventional (non-Roundup-Ready) cotton. A grower of Roundup-Ready cotton in central Arizona confirmed that applications of diuron (at 1 lb. per acre with 20 gal of water, to get good coverage) are highly effective against morning glory and other weeds. They deal with a number of weeds that are resistant to glyphosate. The worst of these are Palmer amaranth and a kind of tumbleweed locally known as "careless weed." In addition to the Layby applications with Diuron 4L, they use Prowl (pendimethalin) for pre-plant preventative weed control.

A pest control advisor from central Arizona applies diuron + prometryn, for layby weed control in Roundup-Ready cotton. The main targets are resistant palmer amaranth and morning glory. Resistance concerns are getting worse in Roundup-Ready cotton. Also, the price of Roundup doubled this past year. These factors may be driving more growers to adopt layby applications. Another PCA who works with growers in Riverside County, CA and La Paz County, AZ, confirmed a need to return to more layby applications, due to resistance issues. He indicated that diuron use would be an important component of their modified weed control strategies in both cotton and alfalfa moving forward.

Given glyphosate resistance in an increasing number of weeds, the loss of the diuron herbicide use in cotton would have a negative impact on growers of both conventional and Round-up Ready cotton. According to one grower, Diruon 4L "is the most effective and the most affordable layby herbicide we have. None of the other choices are as effective."

The most tenable alternative herbicide for layby weed control in cotton is prometryn (Caparol). According to Dr. William McCloskey, although Diuron 4L provides highly effective control, it cannot be used in areas where growers rotate into wheat or other monocot crops following cotton. Products containing prometryn offer similar levels of control without concern for growers rotating into wheat (William McCloskey, personal communication). Other labeled herbicides are not a good fit for layby applications, either because of the limited range of weeds controlled or insufficient residual activity.

A number of factors related to diuron use as a herbicide in Arizona and southeastern California cotton should be considered in EPA's final decision on diuron use.

1. After Layby applications are made in cotton, the soil under the dense cotton canopy remains virtually undisturbed. There is no activity or equipment in the field between the layby application in early July and harvest time in October or November. The soil is not disturbed after Layby, so the chemical has a long time to degrade.
2. Nearly 100% of fields in Arizona and adjacent regions of California are laser-leveled, completely flat, which virtually eliminates runoff. This is a common practice for water conservation. Desert agriculture is highly dependent on the efficient use of water, and irrigation practices, particularly under increasingly water-scarce conditions in central Arizona, are all geared toward delivering water, just what is needed, and directly to the roots of the plant. This is true for much of the West, which is quite different from how water moves and how crops are grown and managed in the Midwest and the rest of the country.
3. The use rates for Diuron 4L for layby weed control ranges well below the maximum use rate for cotton in Arizona, as noted above.

4. Concerns with resistance management and a relative lack of viable alternative herbicides for this use make it prudent to maintain diuron as an option for layby weed control in cotton.

For these reasons, we hope EPA can reconsider whether layby applications of diuron for weed control in cotton in our region (given the use patterns described) can be maintained without undue risk to workers, human health or the environment.

Alfalfa

Alfalfa is one of Arizona's top crops annually. In 2021, Arizona produced 275,000 acres of alfalfa hay valued at over $468 million (USDA- NASS 2022). Arizona growers have the highest alfalfa yields in the nation with 8.4 tons per acre on average, compared to about 6.4 tons per acre in California. The national average is 3.4 tons per acre (Blake 2019).

Diuron is a commonly used herbicide for winter weed control in alfalfa. Several pest control advisors indicate that Velpar Alfamax Gold (diuron + hexazinone) is a mainstay of their alfalfa winter weed control programs. The long residual and its effectiveness in the absence of water make it well suited for winter weed control here. It is generally applied in early November and provides effective control until February. To be effective, it should be applied immediately after a low cutting. A single application provides long residual for good winter weed control, even for difficult weeds, including Palmer amaranth, sow thistle, knotweed and composite weeds. Some of these weeds are difficult to control with alternatives. Asked about efficacy, one PCA said, "nothing else comes close." However, there are limitations on its use. Young alfalfa can be highly sensitive to diuron, and so it is mainly used in second-year alfalfa fields, which are more resilient. Also, diuron use may be much less common in third-year alfalfa, due to plant-back restrictions that could impact some growers.

From 2014 to 2020, reported use of Diuron ranged from about 5,300 to just over 10,000 acres in alfalfa. Because Diuron is on the Arizona Ground Water Protection List, use reporting is required, so this is expected to be an accurate representation of actual use. Over the past few years, reported use represented about 2.1% to 2.5% of alfalfa hay acres, based on USDA-NASS estimates of acres planted. Although the use level is low, it is consistent year to year, and based on reports from some stakeholders is increasing, for reasons explained below. Based on pesticide use reporting data, 98% of diuron applications in alfalfa are from use of the premix product Velpar Alfamax Gold, which is 55.4% Diuron by weight and also contains Hexazinone. Diuron rates of these applications generally range from 0.80 lbs. a.i. /A to 1.25 lbs. a.i. /A. There is very little use of the straight 4L Diuron herbicide product on alfalfa. The lower use rates help to avoid plant injury.

There are several potential alternatives to diuron use for winter weed control in alfalfa. Alternative herbicides include Pursuit + Raptor (imazethapyr + imazamox) and Velpar DF (hexazinone without diuron), which, oddly, is more expensive than the premix. One PCA estimated that switching to Velpar DF would increase costs by about $5/acre up front, but that additional herbicide applications would likely be needed, due to shorter residual and a narrower range of weed control, further increasing costs. Another PCA said he would likely apply tank

mix combinations of herbicides in place of Velpar Alfamax gold, which he said would double grower cost and result in less effective weed control, and potentially additional applications. Chateau (flumioxazin) was mentioned as a potential alternative, but control would be "very short-lived" in comparison to Velpar Alfamax Gold. Metribuzin and acetochlor (e.g., Warrant) are also alternatives, but have the same drawbacks as the others. All of these herbicides (including diuron) pose risks of crop damage. (This is one reason that diuron is used at low rates.)

Weed resistance issues are becoming increasingly significant in Arizona and southeastern California. A PCA who works with several alfalfa growers in La Paz County, Arizona and Riverside County, California remarked, "We are in the middle of resistant weed crisis right now." Their main resistant weed concerns are with Palmer amaranth. It is becoming difficult to control with glyphosate in some parts of the Parker Valley (and throughout other areas of Arizona). Other weeds with apparent resistance issues in his region include Mexican sprangletop. Diuron is already used in flood-irrigated alfalfa fields in this region. In mixtures with hexazinone (e.g., Velpar Alfamax Gold) it greatly enhances weed control outcomes. Recently, growers have been **increasing the use of diuron** across many acres of alfalfa in Riverside County, and some PCAs plan to add diruon back into winter weed management for alfalfa on both sides of the river as part of the standard weed control program this winter. This is a big alfalfa growing region, so this could lead to a significant increase in diuron use.

Resistance issues were mentioned by growers and PCAs in other parts of Arizona as well. In some areas, we are seeing increased weed resistance issues with imazethapyr and imazamox, among the main alternatives to diuron. Resistance is a real concern, given the potential loss of access to diuron for alfalfa weed control.

Despite a relatively low-level of diuron use in alfalfa, its particular niche for lasting winter weed control without irrigation makes it an excellent fit for our system, particularly given diuron's effectiveness against challenging and glyphosate-resistant weeds. **Given growing concerns with management of resistant weeds and the limitations of alternative herbicide choices in alfalfa, we ask that EPA reconsider whether the use pattern we've described, on water-retaining laser-leveled fields, may fall below the level of concern identified in the risk models.**

Ditch-bank Weed Control

Diuron is also used for ditch bank weed control, to prevent the spread of weeds into crop fields. This use pattern is apparently on the rise, due to the presence of glyphosate-resistant weeds. Treatment of glyphosate-resistant weeds in areas adjacent to crop areas with a different type of herbicide is one important tactic in weed resistance management plans. One advantage of diuron compared to some of the other options is its effectiveness in the absence of water. Application are not watered-in. Nearly all water district canals throughout Arizona are concrete-lined. It is the road/berm and upper shoulder of the canals that are treated with diuron. There are effective alternatives for this use pattern, but costs should be expected to increase, as well as the number of applications needed to maintain an effective level of control.

Thank you for the opportunity to comment. Please contact me if you have any questions.

Dr. Alfred Fournier, Associate Director,
Arizona Pest Management Center
Maricopa Agricultural Center
University of Arizona
37865 Smith-Enke Rd., Maricopa, AZ 85138
fournier@cals.arizona.edu

References

Anonymous. 2012. Research-Based Integrated Pest Management (IPM) Programs Impact People, Communities and the Economy of Arizona. University of Arizona Cooperative Extension, Arizona Pest Management Center.
https://cals.arizona.edu/apmc/docs/APMC%20Impact%20narrativep1-4_4-29-14.pdf

Blake, Cary. "Alfalfa: High cutworm damage, gains made in TRR control in Arizona." Western Farm Press, August 17, 2016. Available online at:
http://www.westernfarmpress.com/alfalfa/alfalfa-high-cutworm-damage-gains-made-trr-control-arizona. Accessed June 7, 2021.

Evancho, B., W. McCloskey, N. Pier, K. Caffrey. 2021. Resistant Palmer Amaranth Control: Best Management Practices. University of Arizona Cooperative Extension.
https://acis.cals.arizona.edu/docs/default-source/ipm-shorts/palmerBMP

Fournier, A., W. Dixon, P.C. Ellsworth. 2017. Arizona Pest Management Center Pesticide Use Database. University of Arizona Cooperative Extension.

Fournier, A.J., W. McCloskey, B, Evancho, P.C. Ellsworth, W.A. Dixon II. 2021. Diuron Use and Benefits in Arizona Agriculture. Docket ID: EPA-HQ-OPP-2015-0077. 6/7/21.
https://www.regulations.gov/comment/EPA-HQ-OPP-2015-0077-0057

McCloskey, W., A. Mostafa, P.C. Ellsworth. 2012. An Impending Disaster for Arizona Cotton? Glyphosate Resistant Palmer Amaranth. University of Arizona Cooperative Extension.
https://acis.cals.arizona.edu/docs/default-source/ipm-shorts/resistantpalmershort.pdf

USDA NASS 2022. 2021 State Agricultural Overview: Arizona. United States Department of Agriculture, National Agricultural Statistics Service.
https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=ARIZONA