



Chlorothalonil Use and Benefits in Arizona and Southeastern California
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The EPA is seeking public comments in response to published human health and ecological risk assessments for the fungicide chlorothalonil. We respond on behalf of agricultural stakeholders working in Arizona and Southeastern California. Our goal is to inform the EPA about specific use patterns of chlorothalonil and its crop-specific benefits in our region. Our comments combine stakeholder input received from University of Arizona Extension Specialists, available scientific literature, licensed pest control advisors, and reported pesticide use data from the Arizona Pest Management Center Pesticide Use Database.

Summary

- Chlorothalonil is one of two active ingredients in Ridomil Gold Bravo SC, a fungicide labelled for control of downy mildew and other diseases in onions, garlic, carrots, potatoes, melons and other cucurbits crops.
- Downy mildew is a significant and regular disease of onions in Arizona and the adjacent production region of Southern California. Onion production is expanding in our region, including significant production of onions for seed.
- According to University of Arizona Plant Pathologists and local pest control advisors, Ridomil Bravo Gold is among few effective control options important in downy mildew control. Downy mildew has become much more prominent in recent years.
- Chlorothalonil has important uses in Arizona and Southeastern California for control of downy mildew and purple blotch on onions, and downy mildew and Alternaria leaf spot on cole crops.
- Chlorothalonil has few agricultural uses outside of these crops, and the level of use varies from year to year, based on weather conditions. Nonetheless, chlorothalonil is considered the most effective “go-to” product for control of these diseases, which can have devastating impacts on yields and economic outcomes for growers, if not properly managed.

Chlorothalonil Use on Arizona Vegetable Crops

According to pesticide use data submitted by growers to the Arizona Department of Agriculture and maintained in the Arizona Pest Management Center database (Fournier et al. 2017), chlorothalonil has significant regular uses in onions, including onions grown for seed. Additional agricultural uses are reported on celery and cole crops, including broccoli and cauliflower grown for seed. Chlorothalonil is used to control downy mildew on all these crops, as well as purple blotch in onions, powdery mildew on celery, and *Alternaria* in cole crops grown for seed.

Onions

Onion Production in Arizona and Southeastern California

Arizona produces dry onions and high-quality onion seed for export, primarily in Yuma and La Paz Counties, with a small and declining amount of fresh-market production in Maricopa County. In 2017 (latest available statistics), Arizona harvested 2,154 acres of onions and 1,312 acres of vegetable seed (onion seed data not broken out). Onion seed grown in Arizona contributed to the \$3.8 million in vegetable seed sales in 2017 (USDA-NASS 2019).

Disease Issues

Downy mildew is a significant and regular disease of spinach and lettuces in Arizona, and also causes damage across a number of other vegetable crops, including onions and brassica (cole crops). The conditions conducive to pathogen development are present every year, and active controls and prevention tactics are deployed by growers to manage downy mildew. Symptoms are somewhat similar in lettuce and brassica crops (Koike & Subbarao 2017), although the specific pathogen is different (Matheron 2015). Systemic infections in broccoli and cauliflower can result in necrotic streaks and patches on stems and floret branches. Downy mildew infections of cotyledons of young seedlings can lead to plant death (Koike & Subbarao 2017).

Downy mildew has become a major problem in recent years in onions produced for consumption and for seed. Production is impacted every year, with significant yield losses possible. Downy mildew starts on onions as circular clumps of yellowed plants often clustered together. Affected plant tissue breaks down and collapses. Under humid conditions, the pathogen is visible on older leaves as fine, hair, greyish-white growths. Infected plants are often subject to secondary infection by other pathogens, such as purple blotch. Leaves, stalks and floral parts of onions can be affected, and bulbs can be infected systemically (Swett et al. 2019). Infections can spread quickly in untreated crops, and can lead to significant losses. Downy mildew has been known to destroy entire onion fields. More commonly, yield losses of 60 to 70% have been seen in some fields. In the words of an Arizona / California pest control advisor (PCA), “the disease is known as *Peronospora destructor* for a reason.”

Purple blotch is an important disease in Arizona and California onions that is often associated with downy mildew. Purple blotch starts as oval-shaped lesions on the leaves which develop into purple or dark brown concentric circles. Lesions may expand and girdle and kill the leaves (Swett et al. 2019). In advanced stages, purple blotch can lead to severe crop losses. According to a Yuma-area pest control advisor (PCA) who works with onion growers, the past few years

they have seen an increase in downy mildew and purple blotch infections. Access to multiple active ingredients across modes of action is important to avoid resistance issues.

Chlorothalonil Use on Onions

According to the Arizona Pest Management Center Pesticide Use Database (Fournier et al. 2017), statewide reported use of chlorothalonil on onions averaged 1,535 acres between 2016 and 2020, and ranged between 546 acres and 3,423 acres. Because grower-applied applications do not require reporting, these are conservative estimates of use. Fluctuations in use are likely related to weather conditions. Under conditions favorable for development of downy mildew, it is not unusual for a high proportion of onion acres to be treated. On the other hand, in years with very dry conditions (e.g., 2020), many growers may be able to refrain from spraying. A query of the California Department of Pesticide Regulation website identified 1,069 acres of chlorothalonil use on “dry onions” in Riverside County in 2018 (the most recent year available).

Ridomil Gold Bravo SC (chlorothalonil + mefenoxam) is a key product for the production of seed onions in our region, and the most commonly used chlorothalonil product on onions. It is used to control the primary disease problem of downy mildew and has secondary benefits for the control of purple blotch and other diseases. PCAs across the region describe it as a “go-to” product, providing highly effective control of the disease. Some say it is the most effective available option. In research from Thomas Turini, University of California Cooperative Extension, Imperial County, Ridomil Gold Bravo outperformed most other fungicide options, and when used in rotation with Maneb, at that time was the best treatment for control of downy mildew on onions (Turni 2003).

Yuma Region

Yuma County, Arizona and adjacent Bard, California is a center for production of high-quality onion seed for export. About 90% of Yuma County onion production is for seed, estimated by one local PCA at about 900 acres a year.

Onions are treated mainly on a preventative basis, in response to moist conditions or downy mildew concerns in surrounding produce crops, although chlorothalonil can also be used on a curative basis, after symptoms occur. One to three applications of Ridomil Gold Bravo are used, depending on conditions. Applications are made by air or ground, at or near full label rate, typically at 2.25-2.5 pt./A, in rotation with other fungicides. Generally, 5 to 9 fungicide applications may be used over the long growing season for seed onions (September-July), with modes of action rotated for resistance management. Ridomil Gold MZ (mancozeb + mefenoxam) is another important product used in this rotation.

Ridomil Gold Bravo is not registered for use on lettuce or spinach, dominant crops in the Yuma region from September to May. Leafy greens found to have chlorothalonil residues can be rejected due to MRL restrictions. Because of this risk, some pest control advisors (PCAs) will only use Ridomil Gold Bravo at times or in areas where potential for lettuce contamination is not an issue. Those who use it in areas near active production of these other crops apply by ground.

La Paz County / Riverside County

Onion production has increased over the past few years in La Paz County, Arizona and adjacent areas of Riverside County, California, along the Colorado River. Pest control advisors estimate as much as 5,000 acres of onion production in Blythe, CA., alone. About 75% of production in La Paz County and Blythe region is dehydrated onions for the spice market. The other 25% is onion seed production of diverse varieties. One advantage of this region compared to the Yuma area is that they are not surrounded by produce crops that might serve as a transmission source for downy mildew. An economic advantage is that growers are able to provide dehydration onions during a different production window than Yuma or other production areas of California.

According to local pest control advisors, Ridomil Gold Bravo is “the go-to material for downy mildew control in onions” in this region, and the most effective product once symptoms of downy mildew have appeared. Other available products are more expensive and less effective. In years when conditions are favorable, it is common for all acres in an area to be treated for downy mildew. Downy mildew thrives when lower temperatures (e.g., 60-80 degrees F) combine with humidity. When those conditions exist, some PCAs make preventative treatments with Ridomil Gold Bravo. Other PCAs prefer to wait until the first sign of downy mildew is discovered in the field, then treat all surrounding fields on a preventative basis. However, some onion contracts require growers to use preventative treatments for downy mildew.

Ridomil Gold Bravo is generally only used once per season, applied by itself or in combination with a phosphite fungicide. Use rates are 2.25 pts./A to 2.5pts/A. Ground applications are preferred, because they provide better coverage and efficacy than aerial applications. However, if an application is urgent and fields are wet, growers will apply by air.

Far fewer fungicide sprays are needed in the La Paz / Blythe region than in the Yuma region. Typically, only two preventative applications of two different fungicides are used, one of them being Ridomil Gold Bravo. Under humid conditions, when a follow up application is required, a typically choice is a mancozeb product + phosphite. If a third application is used, many growers rotate back to Ridomil Gold Bravo.

Pollinator Protection

Bees do not forage in onions except for onions grown for seed. Onions grown for seed rely on bees for pollination, and it can be difficult to get good pollination and seed-set, even under the best conditions. Optimal seed-set is only achieved about 70% of the time. For this reason, growers are especially mindful not to make applications that could disrupt pollination. According to one Yuma-based PCA, they do not apply chlorothalonil for at least 15 days prior to the arrival of bee hives for pollination. Nor do they spray once the hives are in place. Bees are usually in place for 30 to 50 days. If conditions warrant a fungicide treatment during this time, bee keepers are contacted to remove the hives prior to spraying. This has been a standard practice over the past four years.

According to a Blythe-area PCA, sprays are not generally made when bees are active in the field. If scouting reveals a need to spray, for downy mildew for example, PCAs or growers inform the bee keeper, who may opt to move the hives, or advise them to proceed with the spray.

Other Crops

Based on information from the Arizona Pest Management Center Pesticide Use Database (Fournier et al. 2017), there are relatively few agricultural uses of chlorothalonil reported outside of onions. Other crops occasionally treated include celery and cole crops, particularly broccoli and cauliflower grown for seed. Generally, a small number of acres are reported and not every year. Chlorothalonil use has not been reported on celery since 2014.

Cole Crops. Downy mildew is far less of an issue in cole crops than in onions, cucurbits or leafy greens. Chlorothalonil is not registered for use on leafy greens, and there are almost no reported uses on melons or other cucurbits. Cole crop use is limited, but very important. Once again, Ridomil Gold Bravo is described by PCAs as the “go-to” product for control of downy mildew and *Alternaria* on broccoli and cauliflower grown for seed. Some varieties of cole crops are more susceptible than others to downy mildew. If needed, Ridomil Gold Bravo is applied at full rate, 1.5 pt./A. It is also used on a preventative basis (determined by weather conditions) in cabbage, to control downy mildew.

Celery

According to the one Yuma-based PCA who worked in celery until a few years ago, chlorothalonil has been a go-to product for prevention and control of late blight, downy mildew and powdery mildew. An application of chlorothalonil was typically followed-up with Tilt (propiconazole). Use of these two preventative applications in rotation was, at that time, a standard practice. Chlorothalonil was applied at full rate by ground, early in the season after crop emergence. However, there are no reported uses of chlorothalonil on celery in the APMC Pesticide Use Database after 2014.

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. 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 and the southeast desert regions of California.

Dr. Alfred Fournier is Associate Director of the APMC / Associate Specialist in Entomology, and has expertise in evaluating adoption and impact of integrated pest management and associated technologies. He serves as a Southwest Region IPM Network Coordinator for the Western IPM Center, representing stakeholders in the desert Southwest states. 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.

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