UF | IFAS Extension
UNIVERSITY of FLORIDA

An Equal Opportunity Institution

SOLUTIONS

Chemically Speaking

Summer 2017 - Table of Contents:

Visit *Chemically Speaking* on the Web at: http://pested.ifas.ufl.edu/newsletter.html

Chemically Speaking, Summer 2017 is produced by F. Fishel, Pesticide Information Office.
Pesticide Information Office / P. O. Box 110710 / Building 164 / Gainesville, Florida 32611-0710 / Tel. (352) 392-4721

Crop Damage Complaints Related to Dicamba Herbicides

What is Dicamba?

Dicamba is an active ingredient contained in certain herbicides. Herbicides containing dicamba are registered for uses in agriculture, residential areas, and other sites to control broadleaf weeds and woody plants. Older product registrations include uses on cotton and soybeans but are restricted to preplant and postharvest burndown applications only. The product labels for those herbicides specify that restriction. *Only the new registered products, described below, may be applied over-the-top of growing soybeans and cotton.*

New Dicamba Herbicide Products

Late last year, EPA approved the conditional registration of three new dicamba herbicide products for use in-crop (over-top of growing crop plants) as a post-emergent application in Bollgard II XtendFlex cotton and Roundup Ready 2 Xtend soybeans, which are now available for use in the 2017 growing season:

- *DuPont FeXapan Herbicide Plus VaporGrip Technology*, EPA Registration Number 352-913;
- *Engenia Herbicide*, EPA Registration Number 7969-345; and
- *XTENDIMAX with VaporGrip Technology*, EPA Registration Number 524-617.

Agricultural Concerns

Despite the conditional approval of new dicamba products with drift reduction agents and further use restrictions set in place prior to the 2017 growing season, some states are reporting high numbers of dicamba complaints. By early July, we already had reports of hundreds of complaints received by state agencies in Arkansas, Missouri and Tennessee (a significant increase from last year). Both physical drift and volatilization of dicamba from the target application site have been reported. The underlying causes of the various damage reports are still being investigated.

Unlawful applications of dicamba products can result in residues on harvested crops and cause damage to and affect the yields of non-target crops. Depending on the ambient temperatures and growth stage, it can take 7 to 21 days for dicamba symptoms to appear. Classic symptoms of dicamba damage on non-tolerant soybean cultivars exhibit cupping of leaves and, in some cases, puckering of leaves as well. Symptoms generally appear only on new leaves. Crops that have been reported as damaged include, but may not limited to, cotton that is not dicamba-tolerant, ornamental crops, vegetable crops such as tomatoes, certain tree species, watermelon and grapes. Applicators are encouraged to keep detailed records of dicamba applications, including location, wind speed, and temperature at the time of application in the event a drift incident may occur in your area.

If you suspect crop damage has been caused by the off-target movement of dicamba, call your state Department of Agriculture or your state Pesticide Regulatory Agency. EPA is working directly with state lead agencies and is interested in reviewing any information obtained from investigations of possible crop damage related to the use of dicamba.

Compliance Concerns

Each of the new conditionally approved dicamba herbicide products have labeling that provides mandatory directions for use, restrictions and special precautions that *must be followed*. The labels of the new products require very specific and rigorous drift mitigation measures to further reduce the potential for exposure from spray drift including:

- no application from aircraft;
- no application when wind speed is over 15 mph;
- application only with approved nozzles at specified pressures; and
- buffer zones to protect sensitive areas when the wind is blowing toward them.

Except for the new conditionally registered dicamba products, application of a dicamba product during either the cotton or soybean crop growing season is unlawful under FIFRA.

Farmers must follow the requirements on the labels plus any additional restrictions that their states may have put in place. Certain states have imposed additional restrictions on the use of dicamba products and regulatory changes are taking place throughout the growing season. For instance, some states have imposed requirements via a state level mitigation or restriction. Check with state agencies prior to applying dicamba products, as the requirements regarding use this year are fluid and may have state-specific elements. (EPA Compliance Advisory, 7/28/17)

Farmworker Protection Rule Provisions Delayed by EPA

EPA will extend the deadline to meet requirements of its new farmworker protection standard until guidance and training materials are ready to help state agencies implement the changes.

Wendy Cleland-Hamnett, acting assistant administrator for EPA's Office of Chemical Safety and Pollution Prevention, announced the extension in a May 11 letter to the National Association of State Departments of Agriculture.

"After careful evaluation, the EPA believes it appropriate to grant your request to extend the implementation of all revised provisions to the Agricultural Worker Protection Standard (WPS) until the necessary guidance and training have been completed which would allow state lead pesticide agencies to successfully implement the rule changes," Cleland-Hamnett said.

Cleland-Hamnett did not specify a new deadline for compliance, but NASDA and other farm groups have repeatedly asked for an extension until at least Jan. 2, 2018. Shortly before Donald Trump took office as president, the Obama administration denied an extension request from NASDA and the American Farm Bureau Federation.

Cleland-Hamnett said in her letter that EPA would "soon begin the regulatory process to formally extend the compliance date for all revised provisions of the WPS."

Published in November 2015, most of the rule's provisions were scheduled to go into effect Jan. 2, 2017, with the rest slated to become effective a year later.

"Protecting the health and safety of agricultural workers is a fundamental priority for NASDA members," said NASDA CEO Barbara Glenn. However, she said that although states "have been working diligently with EPA to implement the agency's 2015 rule, the lack of needed education and

training materials and other significant challenges with the rule have made the original implementation timeline unrealistic."

NASDA, numerous state agencies, and AFBF said they are concerned that EPA has not clarified its requirements regarding Application Exclusion Zones (AEZ's) and "designated representatives," persons who would be authorized to receive information on behalf of farmworkers about chemicals used at farm operations.

The final rule would prohibit applications within 100 feet of workers for "aerial, air blast, fumigant, smoke, mist and fog applications" as well as applications that use very fine or fine droplet sizes. The AEZ would be 25 feet when the pesticide is sprayed using droplet sizes of medium or larger and from more than 12 inches above the plant medium, according to an EPA fact sheet.

But some state agencies have said that the AEZ provisions should not apply when worker housing is within the exclusion zone.

In August, the Association of American Pesticide Control Officials told Jack Housenger, then the chief of the EPA's Office of Pesticide Programs, that a number of states with strict standards for farmworker housing believe it makes more sense to allow workers to "shelter in place" instead of being forced to leave the AEZ and then returning soon after the application.

Oregon's Occupational Safety and Health Administration, for example, is working on an alternative that would allow "occupants of protected spaces–including fully-enclosed housing–to remain indoors as protection from the potential hazard of spray drift." The state is planning to propose regulations in June.

Environmental and farmworker safety groups opposed any extension, arguing that states have had ample time to comply.

In a May 11 letter to the agency, groups including Farmworker Justice and Pesticide Action Network North America said that "EPA has gone to extraordinary lengths to ensure that growers are ready to implement the WPS within this timeframe and states are prepared to enforce it. Indeed, states with some of the largest agricultural production centers such as California, North Carolina and Florida are implementing the provisions of the WPS that went into effect earlier this year, demonstrating that EPA's revisions can be implemented without meaningful loss in agricultural activity or revenue."

In addition, they said that "farmworkers have one of the highest rates of chemically related illnesses of any occupational group, yet they are among the least protected people from occupational chemical exposures."

NASDA and AFBF also have criticized the "designated representative" provision, claiming it would deprive farmers of a reasonable expectation of privacy for confidential business information. In December, the groups said the rule "subjects farmers to potential harassment and public criticisms for lawful use of EPA-approved pesticides." (AgriPulse, 5/31/17)

Good News for Bees as Numbers Rise and Mystery Malady Wanes

The number of U.S. honeybees, a critical component to agricultural production, rose in 2017 from a year earlier, and deaths of the insects attributed to a mysterious malady that's affected hives in North America and Europe declined, according a U.S. Department of Agriculture honeybee health survey released Tuesday.

The number of commercial U.S. honeybee colonies rose three percent to 2.89 million as of April 1, 2017 compared with a year earlier, the Agriculture Department reported. The number of hives lost to Colony Collapse Disorder, a phenomenon of disappearing bees that has raised concerns among farmers and scientists for a decade, was 84,430 in this year's first quarter, down 27 percent from a year earlier. Year-over-year losses declined by the same percentage in April through June, the most recent data in the survey.

Still, more than two-fifths of beekeepers said mites were harming their hives, and with pesticides and other factors still stressing bees, the overall increase is largely the result of constant replenishment of losses, the study showed.

"You create new hives by breaking up your stronger hives, which just makes them weaker," said Tim May, a beekeeper in Harvard, Illinois and the vice-president of the American Beekeeping Federation based in Atlanta. "We check for mites, we keep our bees well-fed, we communicate with farmers so they don't spray pesticides when our hives are vulnerable. I don't know what else we can do."

Environmental groups have expressed alarm over the 90 percent decline during the past two decades in the population of pollinators, from wild bees to Monarch butterflies. Some point to a class of pesticides called neonicotinoids as a possible cause, a link rejected by Bayer AG and other manufacturers.

In the USDA study, beekeepers who owned at least five colonies, or hives, reported the most losses from the varroa mite, a parasite that lives only in beehives and survives by sucking insect blood. The scourge, present in the U.S. since 1987, was reported in 42 percent of commercial hives between April and June this year, according to the USDA. That's down from 53 percent in the same period one year earlier.

Among other factors, beekeepers said 13 percent of colonies in the second quarter of this year were stressed by pesticides, 12 percent by mites and pests other than varroa and 4.3 by diseases. Bad weather, starvation, insufficient forage and other reasons were listed as problems with 6.6 percent of hives.

Colony Collapse. Colony Collapse, while not a main cause of loss, has perplexed scientists for more than a decade since the phenomena of bees seemingly spontaneously fleeing their hives and not returning was first identified in the U.S.

As beekeepers have worked to improve hive conditions, the syndrome has waned as a concern, said May Berenbaum, head of the entomology department at the University of Illinois and a winner of the National Medal of Science.

"It's been more of a blip in the history of beekeeping," she said in an interview. On the other hand, "it's staggering that half of America's bees have mites," she said. "Colony Collapse Disorder has been vastly overshadowed by diseases, recognizable parasites and diagnosable physiological problems."

In the survey, a hive loss was attributed to colony collapse if varroa or other mites were ruled out as a cause; few dead bees were found in a hive, a sign that they fled; a queen bee and food reserves were both seemingly normal pre-collapse; and food reserves were left alone after fleeing.

May said his losses are highly variable depending on where his hives are located and may be affected by farmers improperly spraying pesticides. "It's really tricky" to tease out factors behind bee deaths, he said. "Maybe it's pesticides, maybe it's not. But when I eliminate everything else, it's a distinct possibility."

The U.S. Environmental Protection Agency is reviewing neonicotinoids, proposing bans on spraying them and several dozen other pesticides in fields where bees have been brought in to pollinate a crop.

A pair of scientific studies in Science last month linked neonicotinoids to poor reproduction and shorter lifespans in European and Canadian bees. The research was funded in part by Bayer CropScience and Syngenta AG, the makers of imidacloprid, clothianidin, and thiamethoxam.

"There are numerous things impacting bee health," Syngenta Chief Executive Officer Erik Fyrwald said in an interview in Brussels last month. "One of the very minor elements there is pesticides. So it's amazing to us that the discussion is, as a whole, about pesticides. Not only pesticides, just specifically neonics." (Bloomberg, 8/3/17)

OPINION: When Genetic Engineering is the Environmentally Friendly Choice

Which is more disruptive to a plant: genetic engineering or conventional breeding?

It often surprises people to learn that GE commonly causes less disruption to plants than conventional techniques of breeding. But equally profound is the realization that the latest GE techniques, coupled with a rapidly expanding ability to analyze massive amounts of genetic material, allow us to make super-modest changes in crop plant genes that will enable farmers to produce more food with fewer adverse environmental impacts. Such super-modest changes are possible with CRISPR-based genome editing, a powerful set of new genetic tools that is leading a revolution in biology.

My interest in GE crops stems from my desire to provide more effective and sustainable plant disease control for farmers worldwide. Diseases often destroy 10 to 15 percent of potential crop production, resulting in global losses of billions of dollars annually. The risk of disease-related losses provides an incentive to farmers to use disease-control products

such as pesticides. One of my strongest areas of expertise is in the use of pesticides for disease control. Pesticides certainly can be useful in farming systems worldwide, but they have significant downsides from a sustainability perspective. Used improperly, they can contaminate foods. They can pose a risk to farm workers. And they must be manufactured, shipped and applied — all processes with a measurable environmental footprint. Therefore, I am always seeking to reduce pesticide use by offering farmers more sustainable approaches to disease management.

What follows are examples of how minimal GE changes can be applied to make farming more environmentally friendly by protecting crops from disease. They represent just a small sampling of the broad landscape of opportunities for enhancing food security and agricultural sustainability that innovations in molecular biology offer today.

Genetically altering crops the way these examples demonstrate creates no cause for concern for plants or people. Mutations occur naturally every time a plant makes a seed; in fact, they are the very foundation of evolution. All of the food we eat has all kinds of mutations, and eating plants with mutations does not cause mutations in us.

Knocking Out Susceptibility

A striking example of how a tiny genetic change can make a big difference to plant health is the strategy of "knocking out" a plant gene that microorganisms can benefit from. Invading microorganisms sometimes hijack certain plant molecules to help themselves infect the plant. A gene that produces such a plant molecule is known as a *susceptibility gene.*

We can use CRISPR-based genome editing to create a "targeted mutation" in a susceptibility gene. A change of as little as a single nucleotide in the plant's genetic material — the smallest genetic change possible — can confer disease resistance in a way that is absolutely indistinguishable from natural mutations that can happen spontaneously. Yet if the target gene and mutation site are carefully selected, a one-nucleotide mutation may be enough to achieve an important outcome.

There is a substantial body of research showing proof-of-concept that a knockout of a susceptibility gene can increase resistance in plants to a very wide variety of disease-causing microorganisms. An example that caught my attention pertained to powdery mildew of wheat, because fungicides (pesticides that control fungi) are commonly used against this disease. While this particular genetic knockout is not yet commercialized, I personally would rather eat wheat products from varieties that control disease through genetics than from crops treated with fungicides.

The Power of Viral Snippets

Plant viruses are often difficult to control in susceptible crop varieties. Conventional breeding can help make plants resistant to viruses, but sometimes it is not successful.

Early approaches to engineering virus resistance in plants involved inserting a gene from the virus into the plant's genetic material. For example, plant-infecting viruses are surrounded by a protective layer of protein, called the "coat protein." The gene for the coat protein of a virus called *papaya ring spot virus* was inserted into papaya. Through a process called RNAi, this empowers the plant to inactivate the virus when it invades. GE papaya has been a spectacular success, in large part saving the Hawaiian papaya industry.

Through time, researchers discovered that even just a very small fragment from one viral gene can stimulate RNAi-based resistance, if precisely placed within a specific location in the plant's DNA. Even better, they found we can "stack" resistance genes engineered with extremely modest changes in order to create a plant highly resistant to multiple viruses. This is important because, in the field, crops are often exposed to infection by several viruses.

Does eating this tiny bit of a viral gene sequence concern me? Absolutely not, for many reasons, including:

- These snippets and the plant defenses they trigger were part of our diet long before genetic engineering was invented.
- The inserted genetic material comes from viruses that infect plants, not mammals.
- We are inserting extremely limited, incomplete fragments of the virus's genome.
- These viruses—and so these molecules—are much, much more abundant in naturally infected crops (which we eat all the time) than in GE crops.

Tweaking Sentry Molecules

Microorganisms can often overcome plants' biochemical defenses by producing molecules called *effectors* that interfere with those defenses. Plants respond by evolving proteins to recognize and disable these effector molecules. These recognition proteins are called "R" proteins ("R" standing for "resistance"). Their job is to recognize the invading effector molecule and trigger additional defenses. A third interesting approach, then, to help plants resist an invading microorganism is to engineer an R protein so that it recognizes effector molecules other than the one it evolved to detect. We can then use CRISPR to supply a plant with the very small amount of DNA needed to empower it to make this protein.

This approach, like susceptibility knockouts, is quite feasible, based on published research. Commercial implementation will require some willing private- or public-sector entity to do the development work and to face the very substantial and costly challenges of the regulatory process.

Engineered for Sustainability

The three examples here show that extremely modest engineered changes in plant genetics can result in very important benefits. All three examples involve engineered changes that trigger the natural defenses of the plant. No novel defense mechanisms were introduced in these research projects, a fact that may appeal to some consumers. The wise use of the advanced GE

methods illustrated here, as well as others described elsewhere, has the potential to increase the sustainability of our food production systems, particularly given the well-established safety of GE crops and their products for consumption.

Editor's note: The views expressed here are those of the author, Paul Vincelli, Provost's Distinguished Service Professor, University of Kentucky. (Ensia, 7/27/17)

Pesticide Registrations and Actions

- On August 8, the Florida Department of Agriculture and Consumer Services (FDACS) has accepted the Section 24(c) Registration request for the use of Escort XP (metsulfuron methyl), EPA Reg. No. 432-1549, in lake restoration projects in dewatered zones of lakes in Florida. The assigned Special Local Needs registration number is SLN FL-170004 and must appear on the label. (FDACS Letter, 8/8/17)

- On August 8, the FDACS has accepted the Section 24(c) Registration request for the use of Escort XP (metsulfuron methyl), EPA Reg. No. 432-1549, only for control of old world climbing fern (*Lygodium microphyllum*) in Florida. The assigned Special Local Needs registration number is SLN FL-170005 and must appear on the label. (FDACS Letter, 8/8/17)

- On May 31, the FDACS revised the 24(c) Registration labeling for Chateau Herbicide SW, EPA Reg. No. 59639-99, EPA SLN No. FL-080007 for preemergence and postemergence weed control between rows of transplanted or seeding fruiting vegetable crops, okra, cucurbit vegetable crops, and head and stem vegetable crops using raised bed plastic mulch production system. The revised labeling includes the use of a SW (soluble wettable) granule formulation for additional new crops, which include head and stem brassica vegetables: broccoli, Brussels sprouts; cabbage: cabbage, Chinese, napa; cauliflower; cultivars, varieties, and/or hybrids of these. (FDACS Letter, 5/31/17)

- On May 30, the FDACS has accepted the Section 24(c) Registration request for the use of Static Spinosad ME (spinosad, methyl eugenol), EPA Reg. No. 62719-592, for control of fruit fly pests in the family Tephritidae. The registration number EPA SLN No. FL-170003 has been assigned and must appear on the label. (FDACS Letter, 5/30/17)

- On July 19, the FDACS has accepted the Experimental Use Permit for the use of A13617V Turf Herbicide (pinoxaden); EPA Reg. No. 100-1256, FL17-EUP-01 for control of tropical signal grass, bull and thin paspalum on golf courses and sod farms in Florida. The permit is authorized through December 31, 2018. (FDACS Letter, 7/19/17)

- On July 13, the FDACS has accepted the Section 24(c) Registration request for the use of Glystar Plus Herbicide (glyphosate), EPA Reg. No. 42750-61, for control of broadleaf weeds in perennial peanuts grown for hay in Florida. The registration number EPA SLN No. FL-170002 has been assigned and must appear on the label. (FDACS Letter, 7/13/17)