GLYPHOSATE & DICAMBA

Department of Environmental & Molecular Toxicology
Pesticide Safety Education Program
Today’s Topics

• What’s up with glyphosate?
  • Status of cancer findings
  • New research

• What’s up with dicamba?
  • The story behind the national debate
  • Lessons we can learn in the northwest
Glyphosate
Non-selective

Dicamba
Selectively targets broadleaves, not grasses
Glyphosate sticks to soil strongly.

Half-life near the surface = 8-9 days on average, up to 197 days

Half-life at deeper levels = ?
It doesn’t reach deeper levels.
Most forms of dicamba turn into acids + CO2

- Half-life less than 14 days near the soil surface with rich organic matter
- Persists longer under dry conditions
- Persists longer deep underground where oxygen/microbes are missing
- One study with realistic field conditions found a half-life of 4.4 days in loam sand
Glyphosate
Binds to soil strongly
Immobile in soil

Dicamba
Weakly binds to soil
Moderately mobile in soil
Does it become vaporous?

No.
Does it become vaporous?

Not much (salts)

... and OMG Yes (acid)
Soybeans damaged 65 yards away…

They applied dicamba products to corn, using lower-volatility forms
- dimethylamine salt, diethanolamine, or trimethyl 1-3-diaminopropane

One hour later, they placed untreated soybeans downwind
Every 24 hours, they replaced the untreated soybeans

- Soybeans showed injury when exposed even four days after the application, but not after rainfall.

Use by Year and Crop

Estimated use in million pounds

- Other crops
- Pasture and hay
- Alfalfa
- Orchards and grapes
- Rice
- Vegetables and fruit
- Cotton
- Wheat
- Soybeans
- Corn

The World Health Organization's cancer agency says a common weedkiller is "probably carcinogenic." The scientist leading that review knew of fresh data showing no cancer link - but he never mentioned it and the agency did not take it into account.
• “Known to the state of California as a carcinogen”
• Curtailed use in public spaces
• Monsanto facing lawsuits

Yet if the IARC panel experts had been in a position to take into account Blair’s fresh data, IARC’s analysis of the evidence on glyphosate would have been different, Blair acknowledged in the court documents reviewed by Reuters.

Agricultural Health Study

2014

Overall Use of Pesticides not Linked to
Depressions among Farmer’s Wives; Pesticide
Poisoning May Increase Risk

AHS Finds Link between Use of Certain
Insecticides and Aggressive Prostate Cancer

Fonofos, terbufos, malathion, and aldrin
2015

Protective Gloves and Workplace Hygiene
Reduce the Risk of Parkinson's Disease

Pesticide Use and Non-Hodgkin Lymphoma
Lindane and DDT
2016

**Kidney Disease**

atrazine, metolachlor, alachlor, paraquat, pendamethalin, and permethrin

**Pesticides and Cancer among AHS Spouses**

Organophosphate insecticides
Agricultural Health Study

2016

Kidney Disease
Rheumatoid Arthritis

or
2017 Rheumatoid Arthritis

fonofos, carbaryl, chlorimuron ethyl, toxaphene and atrazine

mancozeb, maneb, glyphosate, solvents and chemical fertilizers
2017

Allergies Linked to a Lower Risk of Non-Hodgkin Lymphoma

Possible Link between Pesticide Use and Thyroid Disease

chlordane
Recently In Europe

• The EU voted in November, 2017 to extend registration for glyphosate until 2022 (instead of the typical 15-year re-registration)

• In a tweet after the vote, French President said he will order a ban on the use of glyphosate in France "as soon as alternatives are found, and within three years at the latest"
EPA Draft Risk Assessment

• In December, 2017, USEPA concluded that “...glyphosate is not likely to be carcinogenic to humans. The Agency’s assessment found no other meaningful risks to human health when the product is used according to the pesticide label.”
Glyphosate Resistance
Glyphosate-resistant Weed Development in the U.S.
2013: 14 species; 35 states

- Rigid Ryegrass (1)
- Horseweed/Marestail (24)
- Common Ragweed (11)
- Italian Ryegrass (6)
- Giant Ragweed (11)
- Waterhemp (14)
- Palmer Amaranth (19)
- Hairy Fleabane (1)
- Johnsongrass (3)
- Kochia (7)
- Junglerice (1)
- Annual Bluegrass (3)
- Goosegrass (2)
- Spiny Amaranth (1)

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Dicamba

1,968 actively registered products

- Trimec, Tri-Power, Triple, Triplet, Three-way, Trillium
- Weed & Feed, herbicides for use on turf/lawns
- Broadleaf Weed Killer
- Horsepower, Banvel, Clarity, Engenia, Xtendimax, FeXapan
You’ll be able to plant Roundup Ready 2 Xtend Crop System soybeans for 2016. But apply the accompanying herbicide or herbicide mix on these soybean varieties that tolerate glyphosate and dicamba? Not so much.

Dicamba Off-Target, Off-Label Crop Injuries Multiply

07/18/2016

Reed and Curtis Storey didn’t plant dicamba-tolerant crops this year, but their soybean crop has been injured twice by applications made by neighboring farmers who did.

The Marvell, Arkansas, farmers aren’t alone. Crop injury complaints continue to mount this summer across the Midsouth, along with heated discussions about who gets the blame.
New Details in Fatal Dicamba Drift Dispute

Last July, Robert Goodson, Phillips County Extension row crops agent with the University of Arkansas, described the damage caused from dicamba drift this way:

"Just three one-hundredths of an ounce can result in a 30% to 40% yield loss," he said at the time. "Even an incredibly low rate can cause major yield loss at the right stage of production," he said. "I think the bare minimum will be 10%, but that's absolute minimum. It could be far worse at harvest."

"It's very unfortunate and shocking," said Scott, "that this happened over a herbicide."
Dicamba Injury Forum

Kevin Bradley
University of Missouri
Crops damaged as identified by complainants:

- 59,862 acres of soybeans
- 6,400 tomato plants
- 73 acres of watermelons
- 18 acres of cantaloupes
- 5 acres of a vineyard
- 2 acres of pumpkins
- 24 acres of certified organic vegetables
- Several residential gardens, trees and shrubs

...by mid-July 2017 in Missouri
Industry Response?

• These are “unsubstantiated” claims.

• This is just like the introduction of RR or LL.

• Dicamba is being blamed when it’s really just metolachlor injury.

• “Investigate don’t speculate. Leaf cupping being observed in soybean fields never exposed to dicamba.”

• Injury is cosmetic and not going to cause yield loss.

• Most of the problems are coming from grower vs. retailer applications.
Industry Response?

• Physical drift
• Sprayer error
• Failure to follow guidelines
• Temperature inversions
• Generic dicamba usage
• Contaminated glufosinate products
• Improper sprayer clean out
  • Not volatility?
Personal Observations:

The majority of fields I’ve been in are injured from one end to the other with no discernable difference in soybean symptomology. This suggests problems with off-site movement through volatility.
Personal Observations:

People are starting to notice what's happening to the trees.
In 2017, off-site movement of dicamba has occurred due to:

- Physical drift
- Nighttime spraying
- Tank contamination
- Use of generics
- Improper sprayer set up
- Etc.
In 2017, off-site movement of dicamba has also occurred with:

- Engenia, FeXapan, and XtendiMax
- Daytime spraying
- Proper sprayer set up
Influence of Application Factors on Dicamba Volatility

Jamie L Long
Department of Botany and Plant Pathology
Purdue University, West Lafayette, IN
PRELIMINARY 2017 DATA

Dicamba Volatility by Herbicide
Field Low Tunnel Experiment

Methods: Sprayed 3 flats with bare soil for each treatment and placed in the center of 2 soybean rows. Injury rating is for soybean plants immediately adjacent to the flats.

- Soybean Injury (%) 21 DAT
- Bar chart showing:
  - Banvel + Roundup PM: 35%
  - Clarity + Roundup PM: 20%
  - Engenia + Roundup PM: 15%
  - Xtendimax + Roundup PM: 5%
  - Xtendimax + Roundup PM + AMS: 40%
Crop Damage Complaints Related to Dicamba Herbicides Raising Concerns

EPA and state agencies regulate pesticides to protect human health and the environment from unreasonable risk. Compliance concerns have arisen related to the use of certain registered pesticides. Specifically, reports of crop damage have been received that appear related to the use of herbicides containing the active ingredient dicamba. This Advisory replaces an Advisory issued in August of 2016 and provides information on the agricultural and compliance concerns raised by these ongoing incidents.
- 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.

- 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.
Dicamba drift investigations as of 10/4/2017

*Total: 2,648
ESTIMATES OF DICAMBA-INJURED SOYBEAN ACREAGE BY STATE

- No data available*
- Less than 100,000
- 100,000-400,000
- 400,000 or more
Monsanto’s Weed Killer, Dicamba, Divides Farmers

Twenty-five million acres have been planted with genetically modified seeds to encourage the spraying of the chemical. Farmers worry about damage to crops.

By DANNY HAKIM  SEPTE. 21, 2017
In 2017: 20 million acres of dicamba-tolerant crops were planted

3.6 million acres of off-target damage

In 2018: 40 million acres of dicamba-tolerant crops are expected to be planted
Herbicide Drift: EPA’s Weak Dicamba Regulations Ensure the Damage in 2018 Will be Widespread

BY STEVE SMITH
- Post-emergent dicamba herbicides will be classified as “restricted use,” requiring that applicators must be certified (or work under the supervision of a certified applicator);
- Applicators/farmers must receive special training, and maintain more detailed records of when, where, and under what atmospheric circumstances applications are made;
- Applications are limited to when maximum wind speeds are below 10 miles per hour (mph) (down from 15 mph);
- Reducing the times during the day when applications can be made; and
- More rigorous tank-clean out requirements to prevent cross contamination.
‘Dicamba Drift’: Monsanto Defends Herbicide as Farmers Say It Harms Crops

by DANIEL ARKIN

NEWS RELEASE

REPORT: MONSANTO SUING ARKANSAS STATE OFFICIALS FOR BANNING USE OF DICAMBA HERBICIDE

For Immediate Release
MONDAY, OCTOBER 23, 2017
2018
Engenia® Herbicide
Spray Checklist

Nozzle: Visit www.engeniatankmix.com for a list of approved nozzles.

Ground speed: ≤ 15 mph, recommend 5 mph on field edges

Boom height: ≤ 24 inches above target

Approved tank-mixes & adjuvants: See www.engeniatankmix.com

Sensitive crops: DO NOT spray if wind is blowing toward neighboring sensitive crops including non-dicamba-tolerant soybeans

Use rate: 12.8 fl oz/A

Spray volume: ≥ 10 GPA, recommend 15–20 GPA

Weed height: ≤ 4”
Buffer zones:
Leave 110' downwind buffer to non-crop areas as needed according to label directions

Wind speed:
Only spray when wind is between 3–10 MPH

Avoid inversions: DO NOT apply when temperature inversions exist at the field level

Daytime spraying: Only apply from sunrise to sunset

Training: Complete dicamba or auxin-specific training

Record keeping: Including application and tank cleanout

Sprayer cleanout: Triple rinse, use a detergent-based commercial cleaner before and after application

Rain free interval: DO NOT apply if rain is expected within 24 hours after application

Rainfast: 4 hours

Additional state restrictions may apply.
Engenia Herbicide is a US EPA Restricted Use Pesticide.
Battle Over Monsanto’s Potent New Weed Killer Heads to Court

Agricultural giant challenges Arkansas restrictions on dicamba after farmers say it damaged neighboring fields

November 8, 2017
ROBERT DELANEY; JERRY STOOGSDILL; HEINCO FARMS; MATTIS FARMS; RANDY FENDRICK; LGO FARMS PARTNERSHIP; HUNTER TREE FARMS; HEITMANN FARMS INC., and HEITMANN BROTHERS, LLC,

Plaintiffs,

v.

MONSANTO COMPANY, BASF CORPORATION, E.I. DUPONT DE NEMOURS AND COMPANY, and PIONEER HI-BRED INTERNATIONAL INC.,

Defendants.

Case No.: 4:17-cv-02031-JMB

JURY TRIAL DEMANDED
Tennessee becomes the fourth state to restrict the use of Monsanto ...

Tennessee has become the fourth state to impose restrictions on Monsanto’s flagship herbicide, dicamba. Farmers in the state have stated

naturalnews.com
EARN AN ADDITIONAL $6/A CASH BACK*
GROW YOUR INCENTIVES. NOT WEEDS.

*when you use XtendiMax® herbicide with VaporGrip® Technology, a restricted use pesticide
Minnesota has announced restrictions on the use of the herbicide dicamba for 2018 in response to complaints by soybean growers across the country that it harmed their crops.

June 20 cutoff date for applying the herbicide, and prohibited applications when the forecasted high temperature for the day is above 85 degrees.
North Dakota releases new protocols for Dicamba

By Renée Jean rjean@willistonherald.com  Nov 30, 2017  ● (0)

The state’s additional requirements are:

- No applications may be made after June 30 or after first bloom.
- No applications may be made using 80-degree or less spray nozzles.
- No applications if air temperature exceeds 85 degrees F.
- Applications during the day, not within one hour of sunrise or sunset.
- Applicators must maintain a speed of 12 mph or less.
- Prior notification must be given to NDDA, including the applicator’s name and the time, date and location of the...
WHAT IT MEANS FOR US...
GLYPHOSATE & DICAMBA