2018 Weed Management in Corn

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K-State Research Location at Ashland bottoms where weed control research is being conducted. 2017 C.R. Thompson.

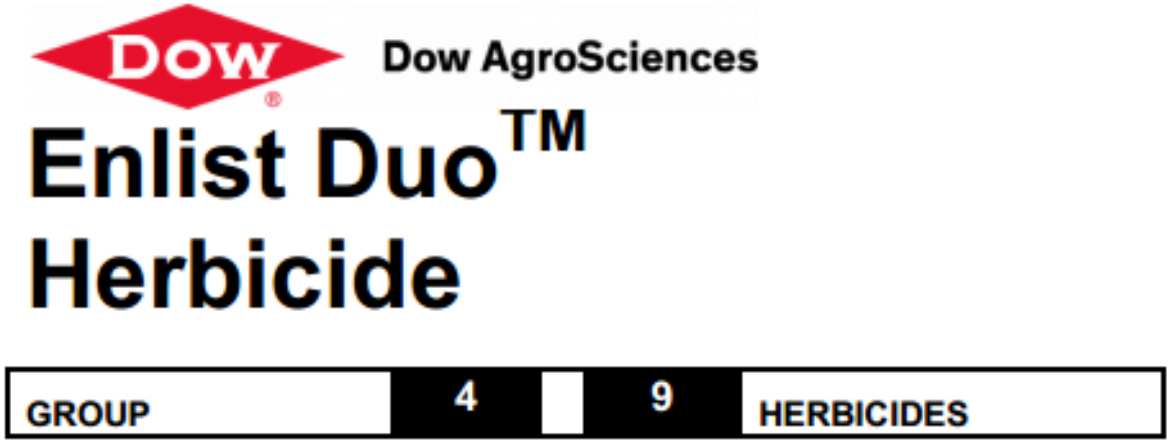
Untreated Plot

Effective Herbicide Program

Corn weed management update?

- **Enlist corn – now approved for foreign trade**
- **Atrazine reregistration**
- **Atrazine degradation**
- **New herbicides**
- **Mesotrione is off patent**

Herbicide registered for Enlist corn, Enlist soybean (lack Chinese and foreign approval for import), and Enlist cotton



KSU Weed Guide page 37 (finding Enlist One) Burndown, Preplant, or Preemergence

- 2,4-D (4) 2 to 3 pt
- 1 to 1.5 of 4 lb/gal **2,4-D***
- Application rates of 2,4-D, spray volumes, and timings differ with company and formulation. Apply 3 to 5 days after planting but before corn emerges. Can control broadleaf weeds for several weeks. Do not use on sandy soils. Avoid spray or vapor drift to sensitive crops. Enlist One herbicide (2,4-D choline) may be applied at 1.5 to 2 pt per acre PRE- or POST-plant and prior to emergence of all corn types, including Enlist corn hybrids.

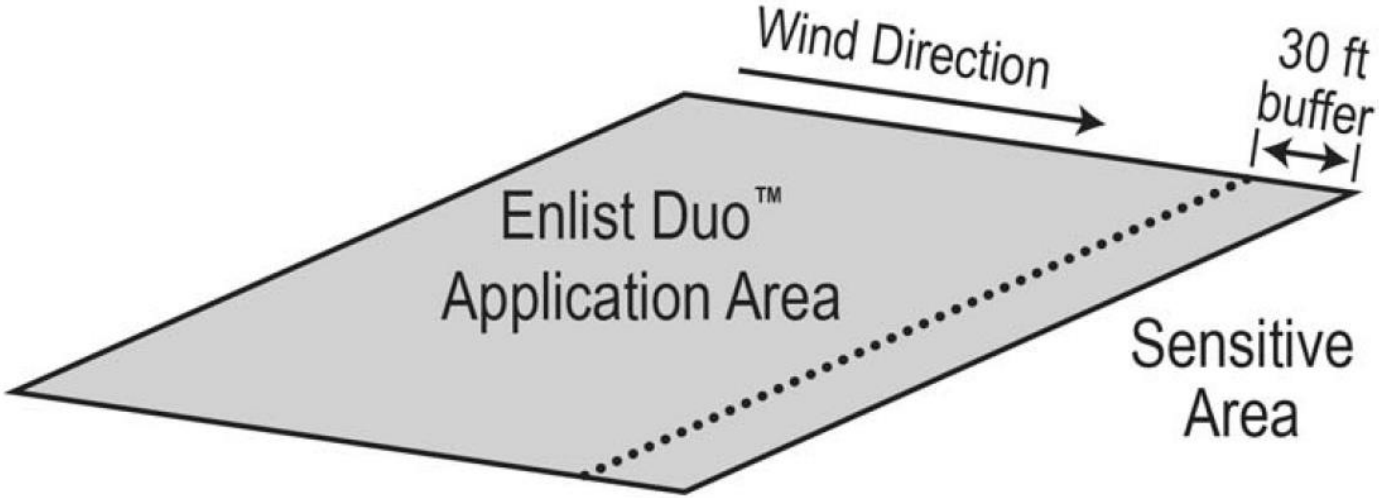
KSU Weed Guide page 49 (finding Enlist One) Postemergence

- 2,4-D (4) 0.5 to 1 pt **amine**
- 0.25 to 0.5 or 0.5 to 0.75 pt **LVE** of 4 lb/gal
- amine or 0.25 to 0.38 LVE **2,4-D***
- Controls or suppresses annual broadleaf weeds. Apply in at least 10 gal of water/a from time corn emerges to tasseling. Do not apply from tasseling to dough stages. When corn is more than 8 inches tall, use drop nozzles to avoid application to corn leaves. Hybrids differ in response to 2,4-D; some are injured easily. Potential for injury is greater when corn is growing rapidly under high temperatures and high soil-moisture conditions. Low rates of 2,4-D in combination with other postemergence herbicides are safer to corn than higher rates of 2,4- D used alone. After application, delay cultivation for 8 to 10 days to allow corn to overcome temporary brittleness. Avoid spray or vapor drift to sensitive crops. Enlist One herbicide (2,4-D choline) may be applied at 1.5 to 2 pt per acre postemergence to Enlist corn up to the V-8 stage or 30 inches tall and up to 48 inches tall if drop nozzles are used.

Enlist Duo and Enlist One Herbicides for Enlist Corn (other corns at different rate structure)

- **Enlist Duo, Contains 1.7 lbs glyphosate acid (9) and 1.6 lbs of 2,4-D ae (4).**
  - **Colex-D technology: Dimethylamine salt of glyphosate and a choline salt of 2,4-D. Use 3.5 to 4.75 pts /acre to Enlist corn no larger than V8 or 30 in tall. Drop nozzles up to 48” tall corn.**
- **Enlist One, Contains 3.8 lbs ae 2,4-D choline. Use 1.5 to 2 pt/acre to Enlist corn no larger than V8 or 30 inches tall. Drop nozzles up to 48” tall corn.**
- **Make 1 to 2 post applications with a minimum of 12 days between applications.**
- **May be used PRE or POST, however, total application can not exceed 14.25 pts of Enlist Duo or 4 pts Enlist One / acre / use season**
- **DO NOT aerially apply Enlist Duo**
- **For tankmix partners http://www.EnlistTankmix.com or**
- **http://www.enlist.com/en/approved-tank-mixes**

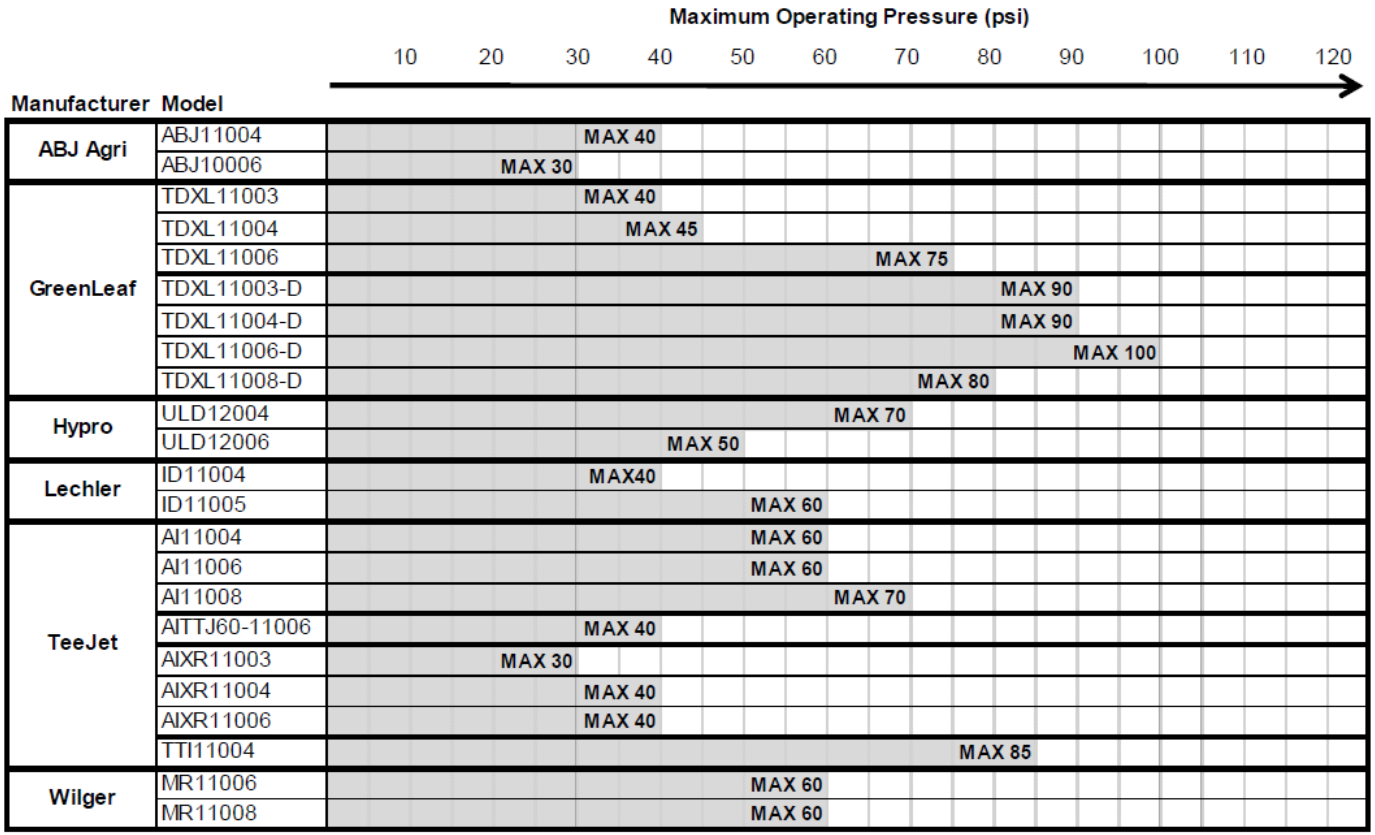
Protection of sensitive areas or state restrictions which ever is most restrictive



At the time of application, the wind cannot be blowing toward adjacent commercially grown tomatoes or other fruiting vegetables (EPA crop group 8) , cucurbits (EPA crop group 9), grapes, or cotton.

Nozzle Selection

The following chart details nozzles and pressure that are allowable for use when applying Enlist Duo herbicide. Do not use any nozzle and pressure combination not specifically allowed in the chart.



Manufacturer	Model	Maximum Operating Pressure (psi)
ABJ Agri	ABJ11004	MAX 40
	ABJ10006	MAX 30
GreenLeaf	TDXL11003	MAX 40
	TDXL11004	MAX 45
	TDXL11006	MAX 75
	TDXL11003-D	MAX 90
	TDXL11004-D	MAX 90
	TDXL11006-D	MAX 100
	TDXL11008-D	MAX 80
Hypro	ULD12004	MAX 70
	ULD12006	MAX 50
Lechler	ID11004	MAX40
	ID11005	MAX 60
TeeJet	AI11004	MAX 60
	AI11006	MAX 60
	AI11008	MAX 70
	AITTJ60-11006	MAX 40
	AIXR11003	MAX 30
	AIXR11004	MAX 40
	AIXR11006	MAX 40
	TTI11004	MAX 85
Wilger	MR11006	MAX 60
	MR11008	MAX 60

Atrazine registration!

- **Continues to be on track**
- **Off target movement into watersheds may change requirements on the label. Remains to be seen.**
- **Will not be completed for the 2018 season thus atrazine use will remain as it is currently being used for this coming season.**

Best Management Practices for Atrazine

KSU publication MF-2182

- **Physical incorporation reduces losses 67%**
- **Apply atrazine prior to April 15, reduce losses 50%**
- **Split applications, 2/3 rate in March and remainder after planting. Reduce losses by 33%**
- **Use to low atrazine rate PRE-mixes. Ie “Lite” formulations**
- **Use POST vs PRE applications of atrazine. Lower rates used POST. Can reduce losses by 67%**
- **Reduce PRE atrazine rates to 1 pound or less followed by POST 0.5 lb if needed. Combination of these applications improve control.**
- **Use other herbicides without atrazine. Can reduce losses by 100%**
- **Vegetative filter strips reduce flow rate and reduce losses by 50%**
- **Buffer zones. Avoid applications near water sources and environmentally sensitive areas.**

Enhanced atrazine degradation

Research Article

Received: 18 July 2016 Revised: 28 February 2017 Accepted article published: 7 March 2017 Published online in Wiley Online Library: 19 April 2017

(wileyonlinelibrary.com) DOI 10.1002/ps.4566

Enhanced atrazine degradation is widespread across the United States

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Abstract

BACKGROUND: Atrazine (ATZ) has been a key herbicide for annual weed control in corn, with both a soil and post-emergence vegetation application period. Although enhanced ATZ degradation in soil with a history of ATZ use has been reported, the extent and rate of degradation in the US Corn Belt is uncertain. We show that enhanced ATZ degradation exists across much of the country.

RESULTS: Soils from 15 of 16 surveyed states had enhanced ATZ degradation. The average ATZ half-life was only 2.3 days in ATZ history soils, compared with an average 14.5 days in soils with no previous ATZ use, meaning that ATZ degrades an average 6 times faster in soils with previous ATZ use.

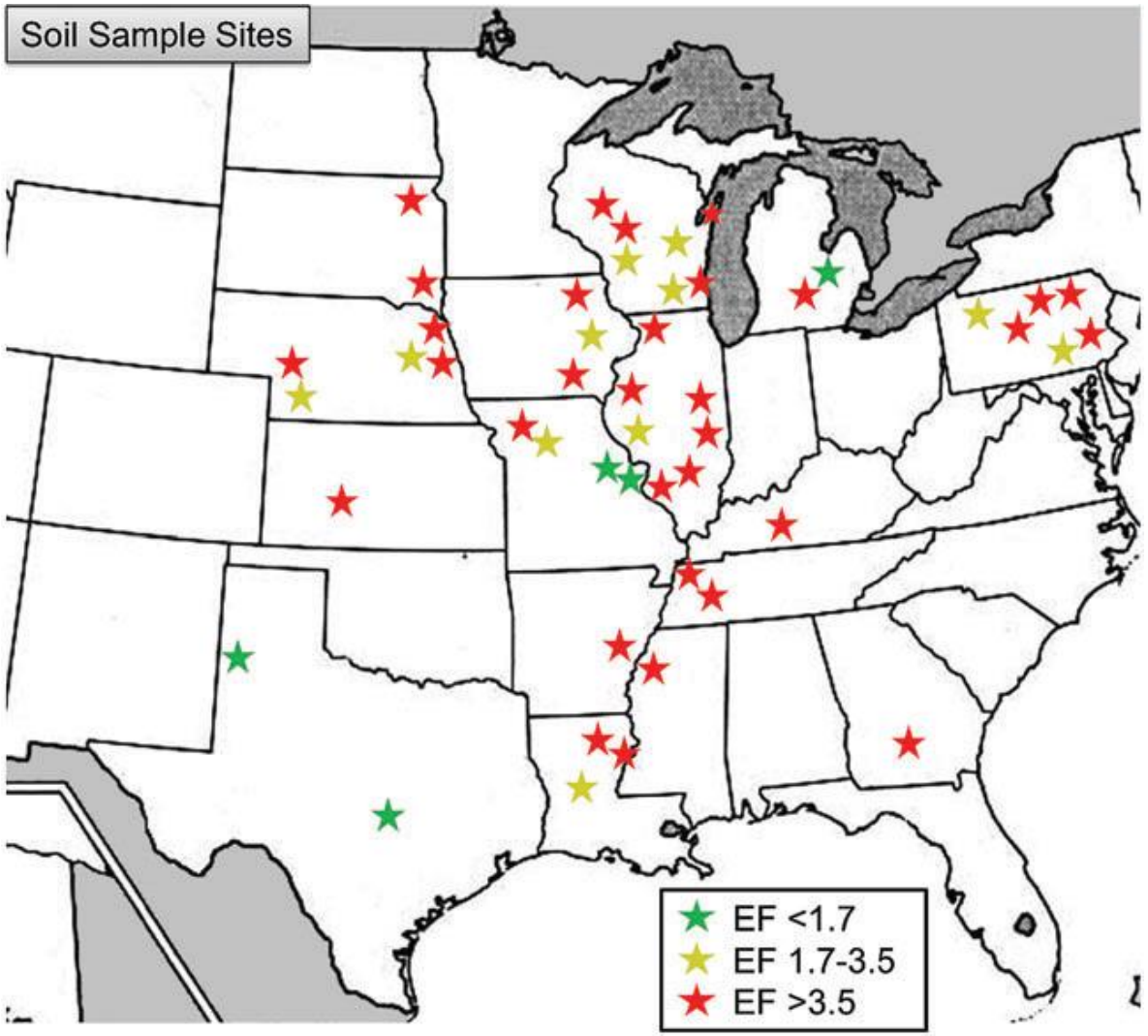
CONCLUSION: When ATZ is used for several years, enhanced degradation will undoubtedly change the way ATZ is used in agronomic crops and also its ultimate environmental fate.

Keywords: atrazine; enhanced degradation; environmental fate

Pest Manag Sci 2017; 73: 1953–1961

Distribution of soils sampled.

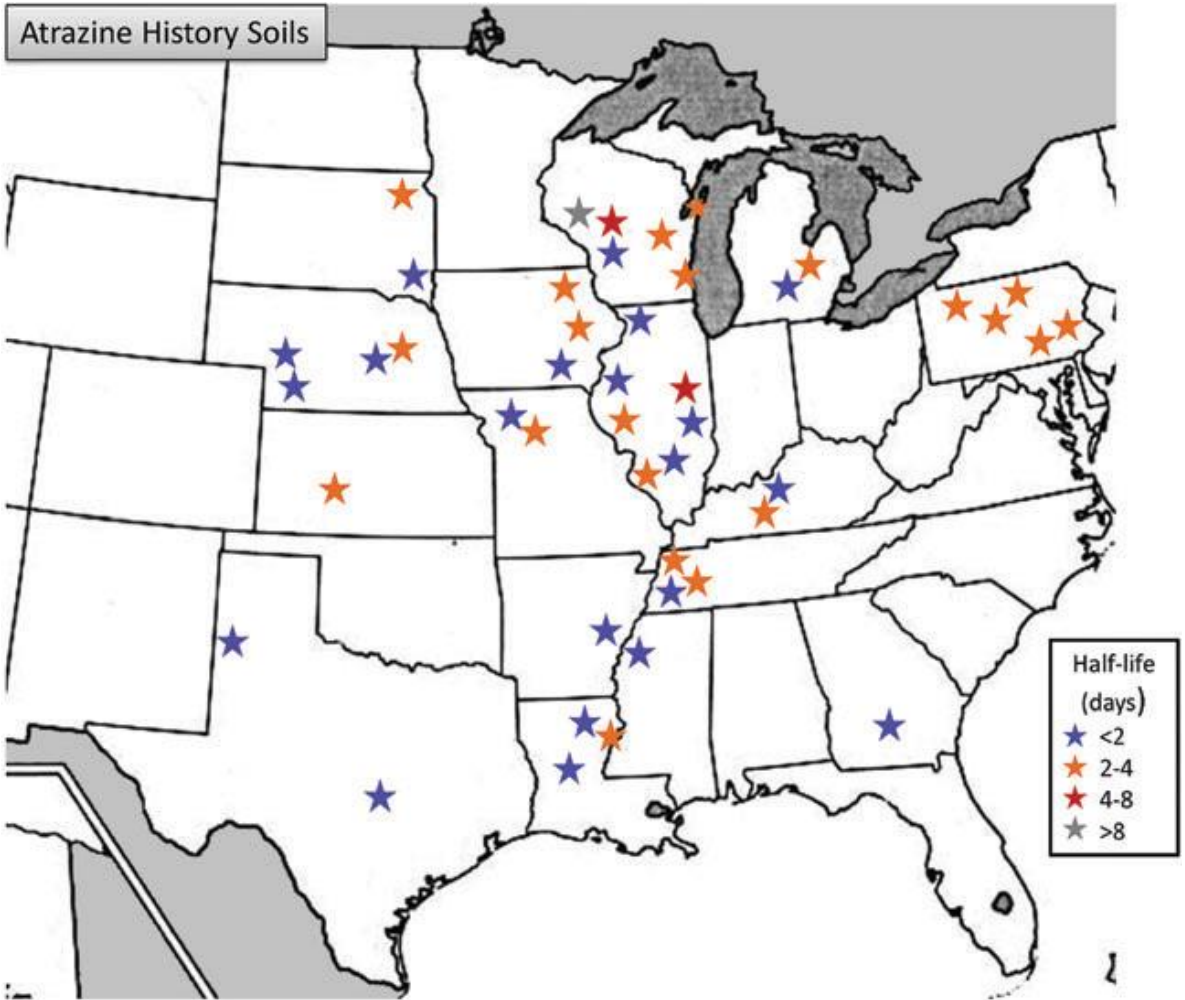
Figure 1. A map showing the locations where soil samples were collected. Enhancement factors (EFs) are color coded, with red representing locations where enhanced atrazine degradation was most apparent, green representing locations where ATZ maintains original persistence and yellow representing locations where decrease in ATZ persistence is agronomically significant but short-term weed control is possible.



***Pest Manag Sci* 2017; 73: 1953–1961**

Sites with Enhanced atrazine degredation.

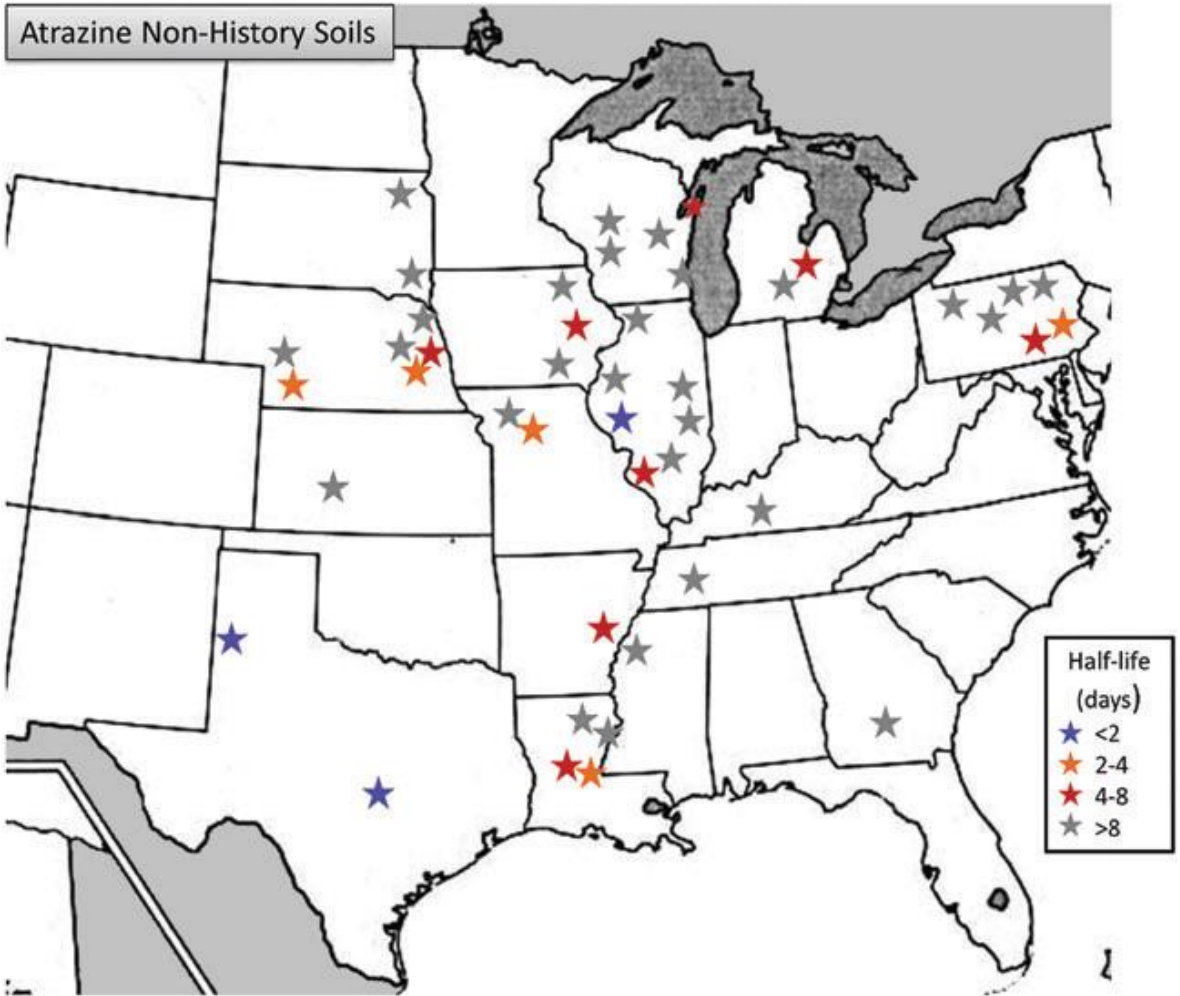
Figure 2. A map showing the locations receiving 5+ consecutive years of atrazine treatment. Half-life values are color coded, with blue representing locations where enhanced ATZ degradation was very rapid, gray representing locations where limited enhanced degradation was detected and orange or red representing levels of degradation in between.



***Pest Manag Sci* 2017; 73: 1953–1961**

Soils without atrazine for 10 years

Figure 3. A map showing the locations receiving no atrazine treatment the previous 10+ years. Half-life values are color coded, with blue representing locations where enhanced ATZ degradation was very rapid, gray representing locations where limited enhanced degradation was detected and orange or red representing levels of degradation in between.



***Pest Manag Sci* 2017; 73: 1953–1961**

What's new?

Search: Chemical weed control for field crops

New *Dicamba* (4) products labeled for corn and sorghum. Restricted Use Herbicides!

- **Xtendimax and FeXapan (2.9 lb ae diglycolamine salt of dicamba with vapor grip technology to minimize volatility).**
  - **Corn 11 to 22 fl oz/a applied PRE to corn planted at least 1.5" deep or post to corn from emergence to 5 leaf or 8 inches tall. On coarse soils or to corn that is 8 to 36 inches reduce the rate to 11 fl oz.**
  - **Sorghum up to 11 fl oz/a PRE (10 days before planting) or POST 2 to 5 leaf stage but before it's 8 inches tall**
- **Engenia (5 lb ae BAPMA salt of dicamba)**
  - **Corn; 6.4 to 12.8 fl oz applied PRE to corn planted at least 1.5" or post to corn from emergence to 5-lf or 8 inches tall. Always use the 6.4 rate when soils are coarse texture or when applied PRE on soils with less than 2.5% OM.**
  - **Sorghum; up to 6.4 fl oz PRE (10 days before planting) or POST 2 to 5 leaf stage but before it's 8 inches tall**
- **Injury to corn from these products will be similar to that of other dicamba products.**

Liberty (10) label changes for corn

- **Use 22 to 43 fl oz / acre to Liberty Link corn up through the V6 stage.**
- **Maximum Liberty / acre / season is 87 fl oz.**

Harness Max, for all corn, Monsanto

- **Acetochlor (15) (3.52 lb) + mesotrione (27) (0.33 lb) per gallon**
- **1.72 to 2.75 qt/a**
  - **Acetochlor - 1.5 to 2.4 lb/a (27.4 to 44 fl oz Harness)**
  - **Mesotrione – 0.142 to 0.227 lb/a (4.5 to 7.2 fl oz Callisto)**
- **PRE**
- **Coarse 55 to 64 fl oz**
- **Medium 64 to 75 fl oz**
- **Fine 64 to 75 fl oz < 3% OM, else 75 to 88 fl oz**
- **POST – up to 11 inch tall corn**
- **Coarse 40 to 55 fl oz**
- **Medium 55 to 64 fl oz**
- **Fine 55 to 64 fl oz < 3% OM, else 64 to 75 fl oz**

Weed management in corn with PRE/POST vs *EPOST* herbicide programs in corn, 2017 Manhattan. 1720corn Thompson and Peterson.

Treatment	Rate	Palmer	Vele	MoGy	Sunf	Yield
PRE/POST or *EPOST*	Product per acre	% control 5 wks after POST				Bu/a
Degree Xtra / RPM + AMS	3 qt / 1 qt + 8.5 lb per 100 gal	100	73	80	100	138
TripleFLEXII/RPM+AMS	1 qt / 1qt + 8.5 lb per 100 gal	100	95	73	100	147
HarnessMax/RPM+AMS	2 qt / 1 qt + 8.5 lb	98	98	83	100	161
Acuron / RPM + AMS	3 qt / 1 qt + 8.5 lb	100	100	82	100	166
Corvus / RPM + AMS	5.6 fl oz / 1 qt + 8.5 lb	100	100	77	100	152
Resicore / Durango + AMS	2.25 qt + 36 fl oz + 8.5 lb	100	100	80	100	169
TripleFlexII+RPM+Atra+AMS	*1 qt + 1 qt + 1qt + 8.5 lb*	100	97	68	100	156
HarnessMax+RPM+Atra+AMS	*3 floz + 1 pt + 32 oz + 8.5 lb*	100	98	80	100	159
Resicore+Durango+atra+AMS	*1.25 qt+36 floz+ 32 oz + 8.5 lb*	98	100	77	100	170
Halex GT+atra+AMS	*3.6 pt + 1 qt+ 8.5lb*	99	100	82	100	154
HarnessMax / *RPM+atra+AMS*	2 qt / *1 qt + 1qt + 8.5 lb*	100	98	77	100	165
RPM+AMS fb RPM+AMS****	*1qt + 8.5 lb* fb 1qt + 8.5 lb	90	87	72	100	179
Untreated						55
LSD 0.05		8	15	10	NS	35

PRE Apr 25, *EPOST May 18,* POST June 3, **** Not recommended!

Anthem formulation changes FMC

- ***Anthem Maxx***
- **Pyroxasulfone (15) 4.174 lb/gal + Fluthiacet-methyl (14) 0.126 lb/gal, Total ai 4.3 lb/gal**
- **(Old) *Anthem***
- **Pyroxasulfone (15) 2.087 lb/gal + Fluthiacet-methyl (14) 0.63 lb/gal, Total ai 2.15 lb/gal**

Anthem Flex, FMC, for corn, cotton, wheat

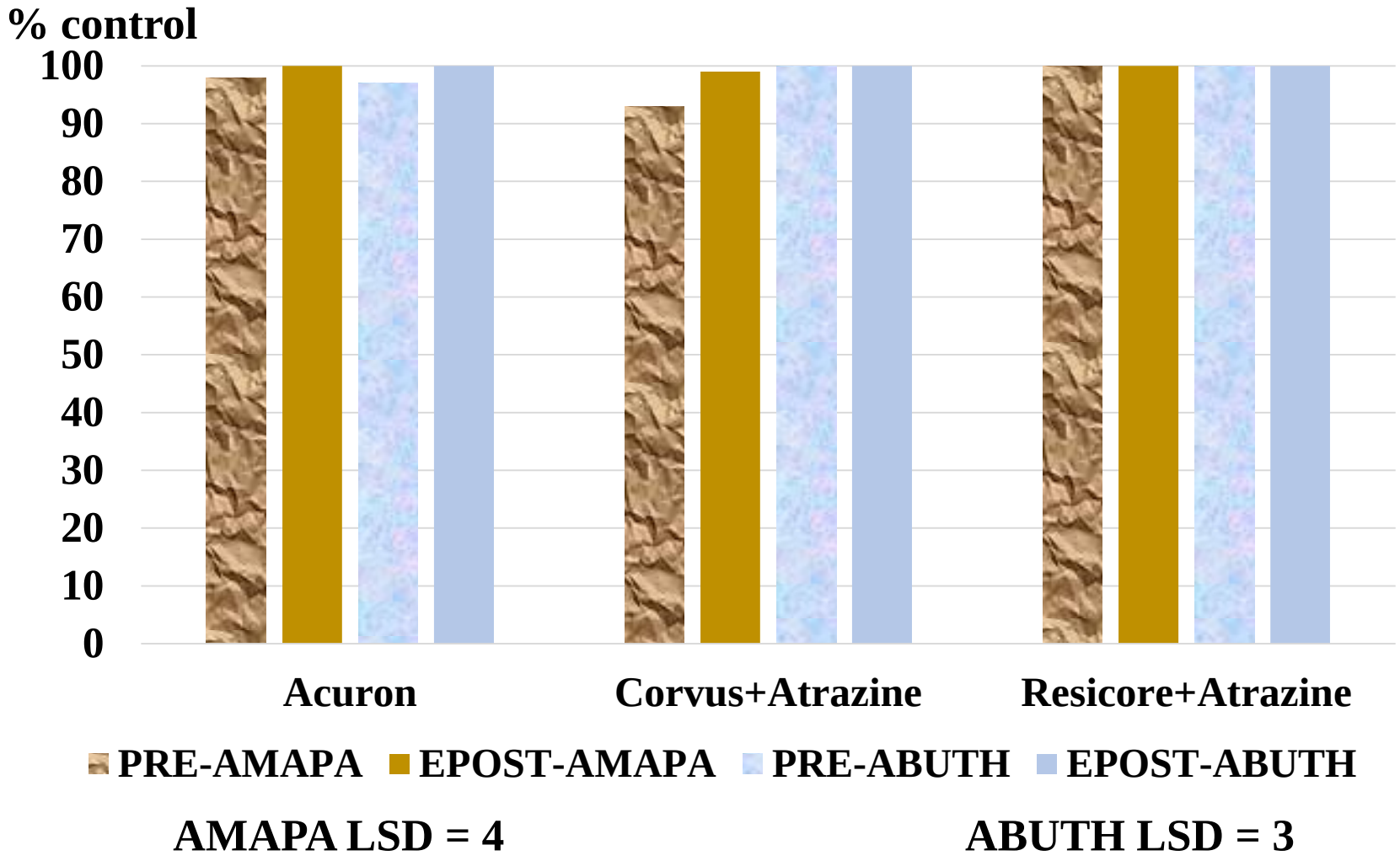
- **Pyroxasulfone (15) 3.73 lb + Carfentrazone (14) 0.27 lb/gal**
- **Use 3.5 to 7.3 fl oz early preplant 15 to 45 days before corn planting**
- **Or 2.75 to 7.3 fl oz prior to corn emergence (no post use)**
- **FL oz/a use rate for all field corn, popcorn, or on sweetcorn planted on medium soils with >2.0% OM or on fine soils.**

OM%	Coarse	Medium	Fine .
<1%	2.75-3.5	3.0-4.5	3.5-4.5
1-3%	3.0-4.0	3.5-5.5	4.5-6.0
>3%	4.0-5.0	4.5-6.0	5.5-7.28

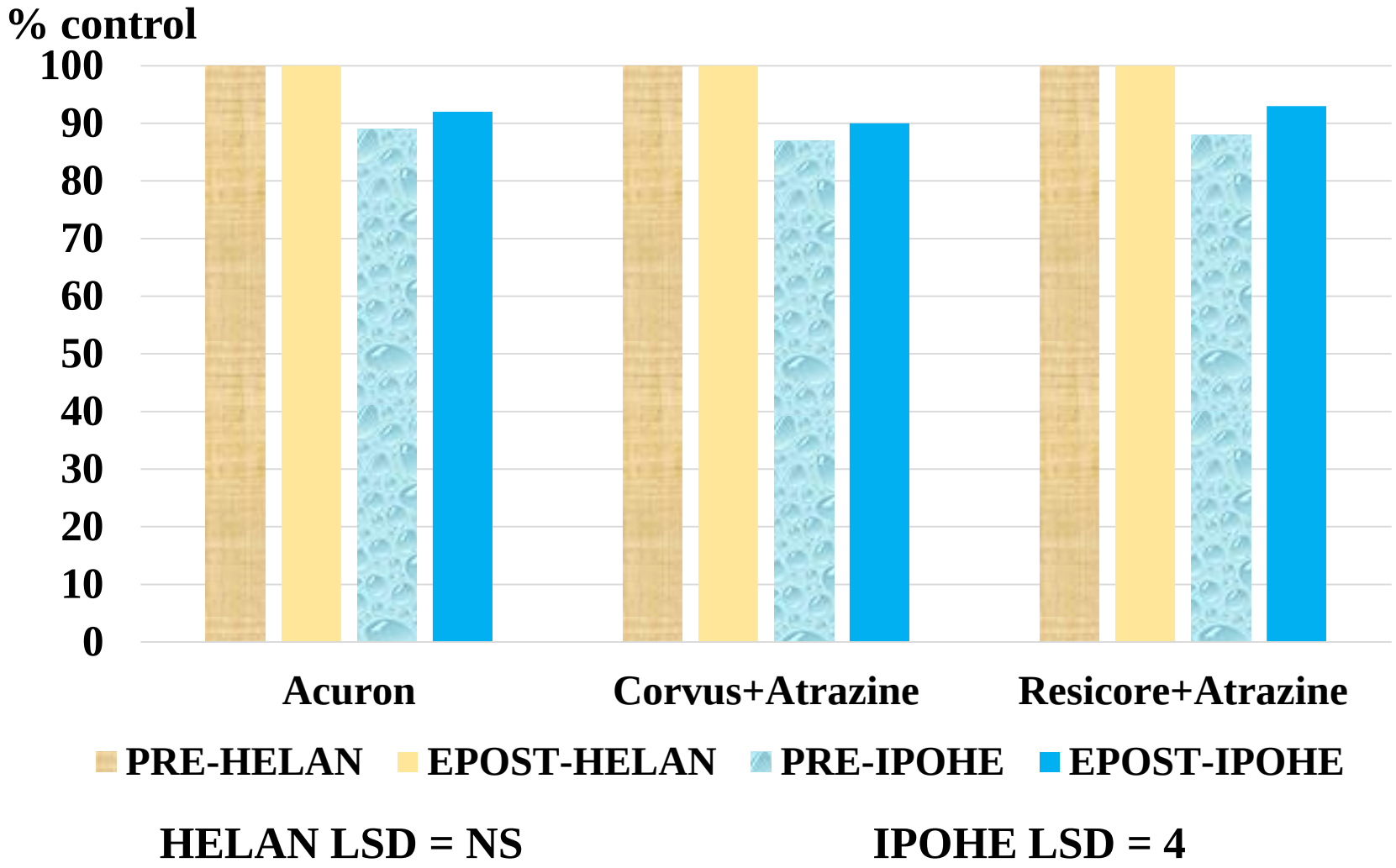
Overlapping residuals to extend control of later emerging pigweeds, Palmer and waterhemp.

- **A soil active herbicide is added to an effective postemergence herbicide program.**
- **A soil active PRE herbicide program is delayed and applied early POST to extend residual control. BUT must be effective to control the emerged weeds. Risk/reward.**
- **Sometimes a PRE treatment is not able to be made because of wind, rainfall, or other and the crop emerges. Check the label. Get the PRE applied EPOST ASAP!**

Effect of PRE and EPOST (2 collar corn) applied herbicides on weed control 7 weeks after POST treatments were applied (1714corn Thompson / Peterson).



Effect of PRE and EPOST applied herbicides on sunflower and morning glory control 7 weeks after POST treatments were applied (1714corn Thompson Peterson).



HELAN LSD = NS

IPOHE LSD = 4

Weed management in V2 corn with DiFlexx and Status tankmixes, 2017, 1719corn, Thompson and Peterson.

Treatment	Rate	Palmer	Vele	Mogy	Sunf	ShCn
	Prod. / acre	% control 5 wks after application				
Corvus + Atrazine	4.5 fl oz+ 1 pt	99	100	98	100	100
Corvus + Atrazine + DiFlexx	4.5 fl oz+ 1 pt + 8 fl oz	100	99	99	100	100
Corvus + Atrazine + Status	4.5 fl oz+ 1 pt + 3 oz	100	100	98	100	100
Acuron	2 qt	99	100	98	100	100
Acuron + DiFlexx	2 qt + 8 fl oz	99	100	99	100	100
Acuron + Status	Q qt + 3 oz	100	100	99	100	100
Capreno+Atra+RPM+AMS	3floz+1pt+32oz+8.5lb	98	100	97	100	100
Capreno+Atra+RPM+DiFlexx+AMS	3floz+1pt+32oz+8floz +8.5lb	98	100	97	100	100
Capreno+Atra+RPM+Status +AMS	3floz +1pt + 32 oz + 3oz +8.5lb	97	100	96	100	100
Halex GT+atrazine	3.6 pt + 1 pt	99	99	98	100	100
Halex GT+atrazine+DiFlexx	3.6 pt + 1 pt + 8 fl oz	100	100	99	100	100
Halex GT+atrazine+Status	3.6 pt + 1 pt + 3 oz	99	100	97	100	100
LSD 0.05		1	NS	3	NS	NS

Treatments applied on May 15 to cotyledon-1” Palmer and Coty-2lf Vele

Weed control in corn with Harness Max and Comparisons, 1720corn, 2017 Manhattan. Thompson and Peterson.

Treatment	Rate	Application	Palmer	Vele	MoGy	ShCn
	Prod. / acre		% control 52/14 days after PRE/EPost			
Degree Xtra	3 qt	PRE	100	43	50	63
TripleFLEX II	1 qt	PRE	100	60	57	85
Harness Max	2 qt	PRE	100	97	82	93
Acuron	3 qt	PRE	100	100	89	94
Corvus	5.6 fl oz	PRE	95	93	88	100
Resicore	2.25 qt	PRE	100	100	82	97
TripleFLEX II+ atra + RPM+AMS	1qt+1qt+27oz+8.5	EPost	100	100	95	100
HarnessMax+atra+RPM+AMS	40oz+1qt+27+8.5	Epost	100	100	100	100
Halex GT+atrazine+AMS	3.6pt+1qt+8.5	EPost	99	100	97	100
Resicore+atra+Durango+AMS	1.25qt+1qt+30+8.5	EPost	100	100	100	100
Roundup PowerMax	32 fl oz	EPost	90	95	83	100
LSD (0.05)			3	10	10	24

PRE's applied on April 25 and Epost May 18 to V3 corn, Coty to 3" Palmer, 1-3" Vele

Mesotrione (27) off patent for PRE and POST in corn or PRE to sorghum

- **Mesotrione is the active in Callisto and is off patent.**
- **Generics and Callisto currently are all 4 lb ai/gallon.**
- **Callisto was > $5 / fl oz**
- **Current price of mesotrione generics < $2 / fl oz**
- **Incinerate, BL4, Explorer, Tenacity, Bridle, Willowood Mesotrione and many others!**
- **$8 to $12 / acre (4 to 6 fl oz) of mesotrione added to a chloroacetamide+atrazine will provide much improved control of broadleaf weeds compared to the chloroacetamide+atrazine alone. Will enhance control of pigweeds, velvetleaf, kochia, and others**
- **Growers maybe inclined to increase frequency of use?**

Herbicide resistance in KS!

Kochia

- **ALS inhibitors (2)**
- **Triazines (5)**
- **Glyphosate (9)**
- **Dicamba (4)**
- **ALS+Triazine+Glyp+Dica (2, 5, 9, 4)**

Waterhemp

- **ALS inhibitors (2)**
- **Triazines (5)**
- **ALS & PPO (2, 14)**
- **Glyphosate (9)**
- **HPPD (27) or 2,4-D (4) ????**

Palmer amaranth

- **ALS inhibitors (2)**
- **Triazines (5)**
- **Glyphosate (9)**
- **HPPD+Triazine+ALS (27, 5, 2)**
- **HPPD+Triazine+ALS+ Glyphosate???? (27, 5, 2, 4)**

Questions about weed management in corn?

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