

# LAYERED RESIDUAL HERBICIDES

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**K-STATE**  
Research and Extension

## Dicamba update - traits

- XtendFlex
- Resistant to
  - Dicamba
  - Glyphosate
  - Glufosinate



## Volatility reduction agents/ pH buffers 1/27/21

<b>VRA</b> <b>AQUADRAFT™ VRA, a VaporGrip® Xtra Agent</b> Manufacturer/Distributor: Meristem Crop Performance Group, LLC Application Rate: 20 oz/A	<b>VRA</b> <b>Cornbel® Vapor-Shield™, a VaporGrip® Xtra Agent</b> Manufacturer/Distributor: Van Dyest Application Rate: 20 oz/A	<b>VRA</b> <b>F8 Dissension™, a VaporGrip® Xtra Agent</b> Manufacturer/Distributor: GROWMARK, Inc. Application Rate: 20 oz/A
<b>VRA</b> <b>LEVY™, a VaporGrip® Xtra Agent</b> Manufacturer/Distributor: Rosen's Inc. Application Rate: 20 oz/A	<b>VRA</b> <b>Placeholder™, a VaporGrip® Xtra Agent</b> Manufacturer/Distributor: Exaco Application Rate: 20 oz/A	<b>VRA</b> <b>SETTLE™, a VaporGrip® Xtra Agent</b> Manufacturer/Distributor: EGE Products Application Rate: 20 oz/A
<b>VRA</b> <b>Suratta™, a VaporGrip® Xtra Agent</b> Manufacturer/Distributor: CHS Inc. Application Rate: 20 oz/A	<b>VRA</b> <b>TIE DOWN™, a VaporGrip® Xtra Agent</b> Manufacturer/Distributor: Wilbur-Ellis Company, LLC Application Rate: 20 oz/A	<b>VRA</b> <b>Vapex™, a VaporGrip® Xtra Agent</b> Manufacturer/Distributor: KALO, Inc. Application Rate: 20 oz/A
<b>VRA</b> <b>Verified™, a VaporGrip® Xtra Agent</b> Manufacturer/Distributor: Helena Agri-Enterprises, LLC Application Rate: 20 oz/A	<b>VRA</b> <b>VOLACEPT™, a VaporGrip® Xtra Agent</b> Manufacturer/Distributor: Innivictis Crop Care, LLC Application Rate: 20 oz/A	<b>VRA</b> <b>Volminate™, a VaporGrip® Xtra Agent</b> Manufacturer/Distributor: Precision Laboratories, LLC Application Rate: 20 oz/A
<b>VRA</b> <b>Volt-Edge™, a VaporGrip® Xtra Agent</b> Manufacturer/Distributor: Winfield United, LLC Application Rate: 20 oz/A		

<http://www.xtendmaxapplicationrequirements.com/#/realist>

## Herbicide registrations

### Corn

- Impact Core
  - Impact + acetochlor
  - 20-40 fl oz/A through 11"
  - AMS *plus* MSO
- Sinate
  - Impact + Liberty
  - 21-28 fl oz/A through V7/24"
  - AMS *plus* MSO or HSOC

### Soybean

- Kyber
  - Same products as Fierce MTZ (pyroxasulfone + flumioxazin + metribuzin)
- Panther MTZ
  - Same products as Dimetric Charged (metribuzin + flumioxazin)

## Other label updates

- Anthem Flex – sunflowers and soybean added to label
- Anthem Maxx – apply through V6 soybean (was V3)
- Authority Edge – soybean and sunflower added to label
- BroadAxe – rotation restriction for dry beans added (4 months)
- Outlook – increase to 31 fl oz/A/yr (was 21 fl oz/A/yr)
- Zidua – apply through V8 corn (anticipated)

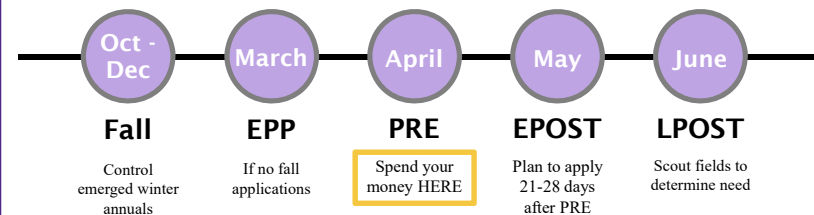
## Atrazine registration review

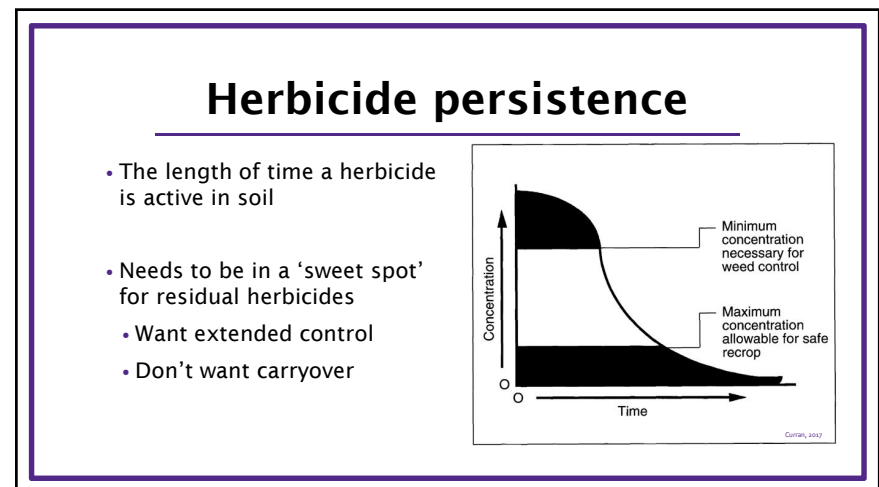
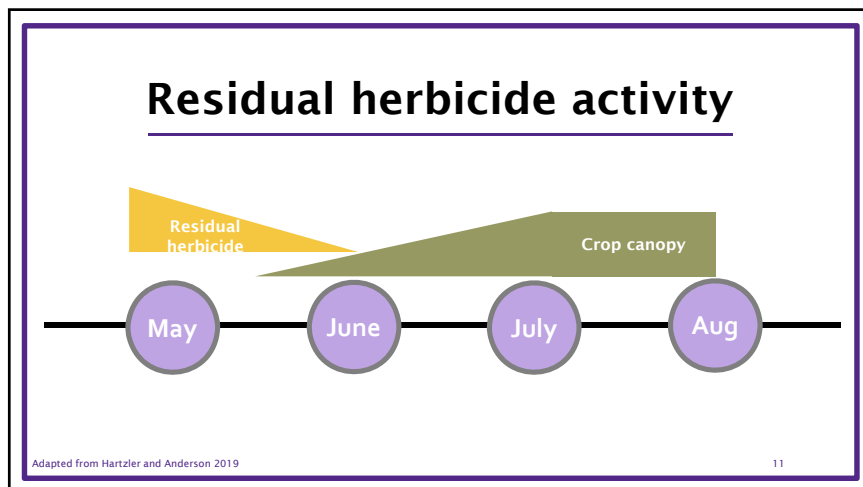
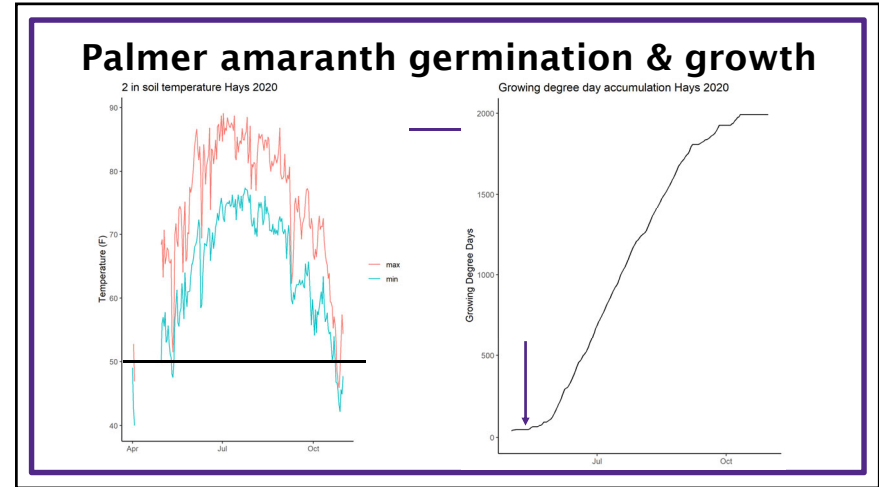
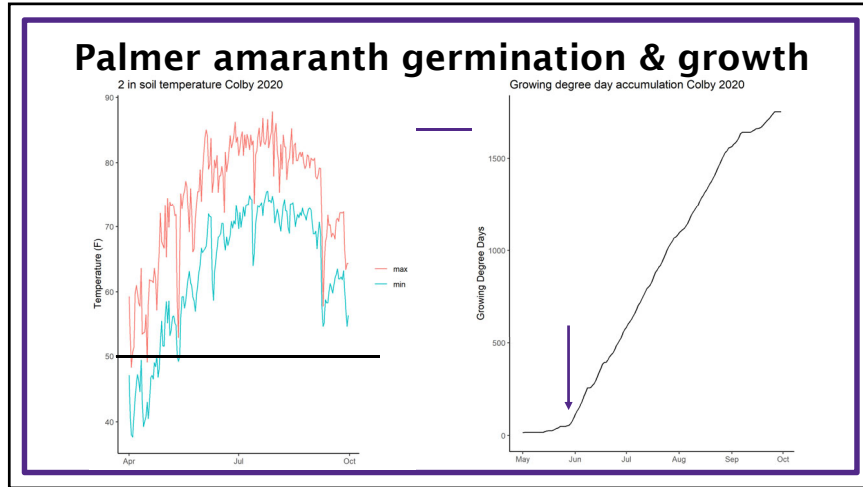
- Interim decision released Sept 2020
- Two more assessments
  - Endangered species assessment (deadline 9/28/21)
  - Endocrine disruptor screening
- Changes most likely to affect Kansas farmers
  - 15 MPH weed speed restriction
  - 5-foot buffer from edge of streams/rivers and endangered species habitat
  - Medium-sized droplets or larger

What are the two most challenging weeds in your crops?

Start the presentation to see live content. For screen share software, share the entire screen. Get help at [polllev.com/app](https://polllev.com/app)

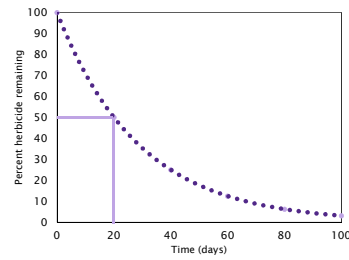
## Corn herbicide application calendar





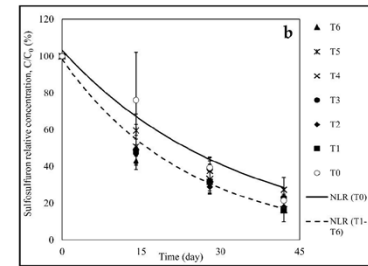
## Herbicide persistence

- Described by the half-life ( $t_{1/2}$ )
  - Time required for one-half of the herbicide dissipate



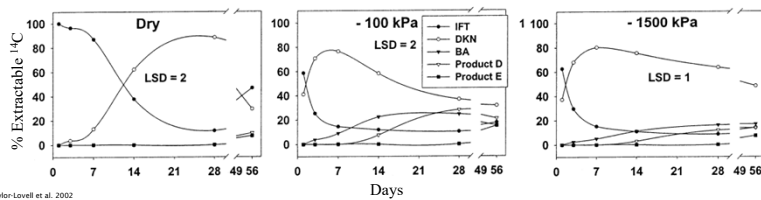
## Microbial degradation

- Influenced by:
  - Sorption
  - Previous applications



## Microbial degradation

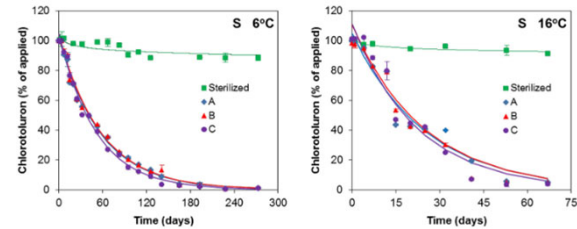
- Influenced by:
  - Moisture



Taylor-Lovell et al. 2002

## Microbial degradation

- Influenced by:
  - Soil temperature



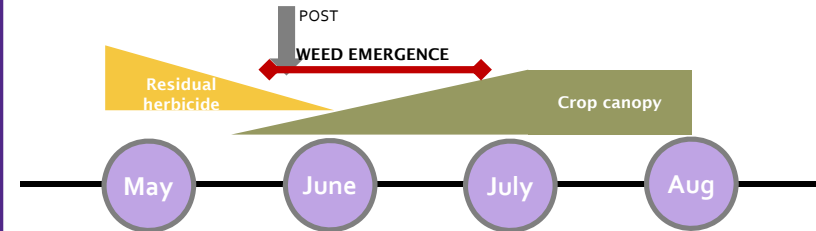
Martin-Benito et al. 2019

## Half-life of some residual herbicides

Herbicide	Example	SOA group	Half-life	Control duration
Pendimethalin	Prowl H2O	3	44 d	
Atrazine	Aatrex 4L	5	60 d	
Acetochlor	Harness	15	4-20 d*	8-12 weeks
S-metolachlor	Dual II Magnum	15	30-50 d	10-14 weeks
Dimethenamid-P	Outlook	15	20 d	
Pyroxasulfone	Zidua	15	16-26 d	
Flumioxazin	Valor	14	12-18 d	
Saflufenacil	Sharpen	14	1-36 d	
Isoxaflutole	Balance Flexx	27	0.5-2.4 d	

Herbicide Handbook, 2014  
\*Ma et al., 2004

## Residual herbicide activity



Adapted from Hartzler and Anderson 2019

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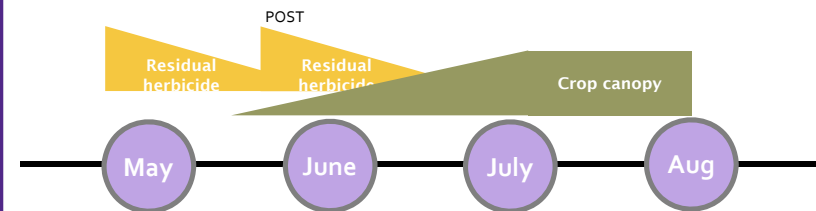
## Weed escapes still produce seed



**Up to 7 MILLION seeds per acre**

Werner et al. 2020

## Residual herbicide activity



Adapted from Hartzler and Anderson 2019

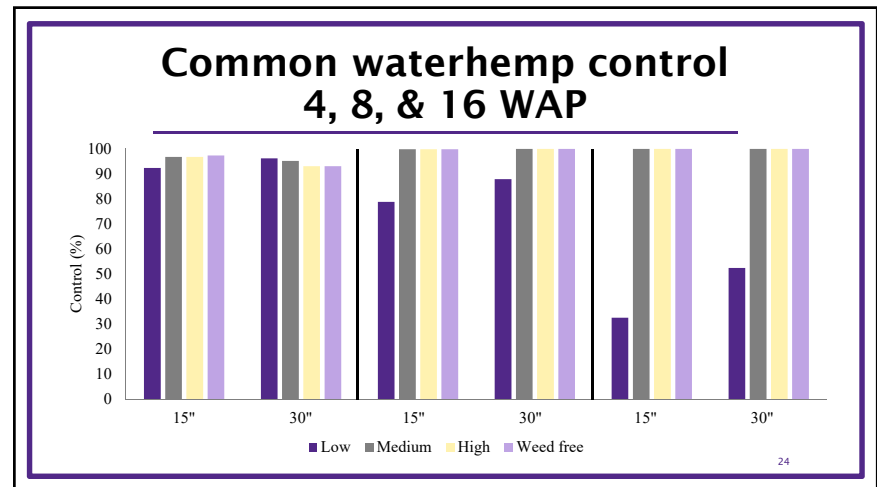
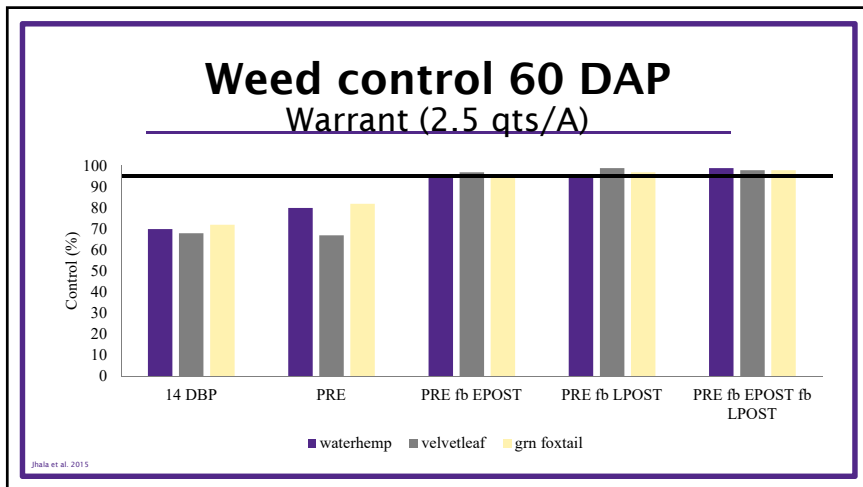
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### Which herbicides have you used as a layered residual?

Start the presentation to see live content. For screen share software, share the entire screen. Get help at [pollvox.com/app](https://pollvox.com/app)

Herbicide	Example	SOA group	Activation	Crop	Restriction
Atrazine	Aatrex 4L	5	NA	Corn Grain sorghum	12" 2-5 lf
Acetochlor	Harness	15	1/4-3/4"	Corn Grain sorghum Soybean	11" 11" R2
Dimethenamid-P	Outlook	15	NA	Corn Grain sorghum Soybean	12" 12" V5
Pyroxasulfone	Zidua	15	1/2"	Corn Soybean	V4** V6
S-metolachlor	Dual II Magnum	15	1/2-1"	Corn Grain sorghum Soybean	12" 75 d PHI V3
Mesotrione	Callisto	27	1/4"	Corn	V8

\*Warrant = 30"  
\*\*V8 anticipated



## Is 95% control enough?

Seed rain year 1  $350,000 \frac{\text{seeds}}{\text{acre}} \times 20\% = 70,000 \frac{\text{viable seeds}}{\text{acre}}$

Plants emerged year 2  $70,000 \text{ seeds} \times 40\% = 28,000 \frac{\text{plants}}{\text{acre}}$

Plants escaped year 2  $28,000 \text{ plants} \times 95\% = 1,400 \frac{\text{plants}}{\text{acre}}$

Resistant plants year 2  $1,400 \text{ plants} \times 84\% = 1,176 \frac{\text{plants}}{\text{acre}}$

Seed rain from resistant plants year 2  $1,176 \text{ plants} \times 487 \frac{\text{seeds}}{\text{plant}} = 572,712 \frac{\text{seeds}}{\text{acre}}$

