

Future of Weed Control in Cotton, Corn, and Soybean

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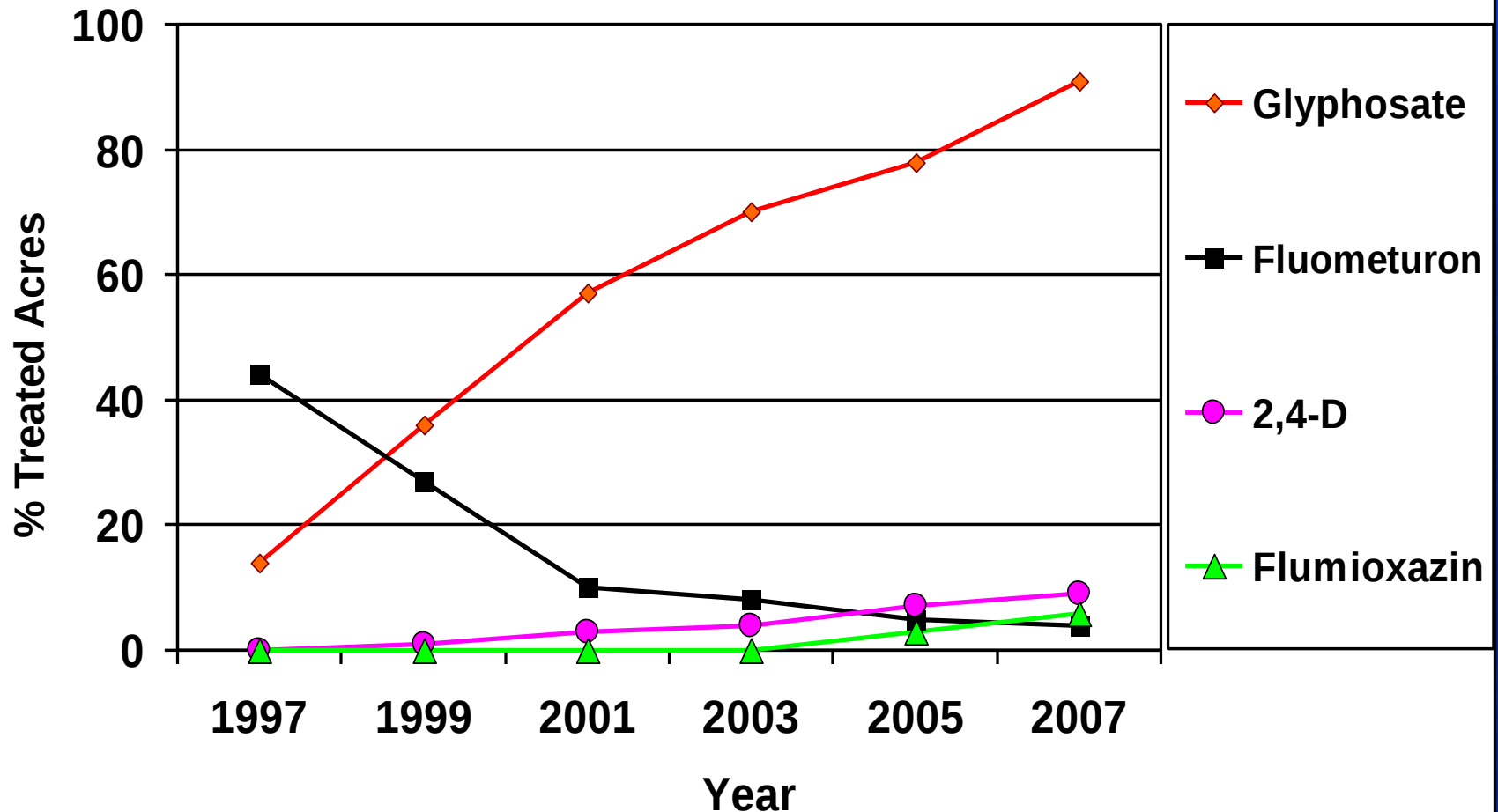
Current State of Biotech Crops

- 10 million farmers in 22 countries
- Area planted to biotech crops has increased 60-fold in 11 years
- 100 million hectares
 - 80% glyphosate resistant

Where Are We Today?

- Cotton
 - *Glyphosate is as important to world agriculture as penicillin is to human health”*
 - 99% of cotton in Mississippi is RR or RF
 - 93% of U.S. cotton is RR or RF
 - **Dr. Stephen Powles – Science 2007**
- Corn
 - 90+% of Mississippi corn is RR
 - 63% of U.S. corn is herbicide resistant or stacked gene
- Soybean
 - 96% of Mississippi soybeans are RR
 - 91% of U.S. soybeans are RR

Herbicide Use in Cotton



Development of Current Weed Control Technology

- Glyphosate
 - Weed control properties identified in 1970
 - Glyphosate-resistance gene first inserted into plants in 1986
- Metolachlor
 - Synthesized in 1972
- Dicamba
 - U.S. patent awarded in 1958
- 2,4-D
 - Synthesized in 1941
- Atrazine
 - Synthesized in 1952



Where Are We Going?

- Many of the new options in weed control in the next 3-5 years will be in the form of traits
 - Expand uses of currently available herbicides
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- New herbicide discovery
 - Time consuming
 - Very expensive
- Integrate new herbicides as they are developed

Glytol/H2

- Developed by Bayer CropScience
- Glytol
 - Glyphosate-resistance similar to RR Flex
 - Different gene and promoter than RR Flex
- H2
 - Glyphosate/glufosinate resistance



Glytol/H2

- Cotton:
 - Glytol – 2009
 - H2 – 2010
 - BG II/H2 – 2011
 - Twinlink/H2 – 2012
- Soybeans:
 - Glytol + HPPD – 2014
 - Glytol + HPPD + Liberty Link – 2016



Liberty Link

- Bayer trait
 - Available in cotton
 - Acreage very limited in Mid-South
 - Licensed to Monsanto for use in corn and soybean
 - Part of SmartStax™ package
- Liberty Link soybeans available in 2009



Liberty Link

- Use of the Liberty Link system will require a change in mindset
- Like anything, has limitations
- Increasing rate will not be cost effective or efficacious



Optimum GAT

- Glyphosate ALS Tolerance
- Developed by DuPont
- Different glyphosate resistance gene than Monsanto
 - Derived from soil bacterium
 - Enzyme binds to glyphosate and breaks it down into non-toxic metabolites
- ALS enzyme insensitive to all 5 classes of ALS-chemistry
 - Proprietary DuPont discovery



Optimum GAT

- Corn: 2010
 - Plans in place to include Bayer's Liberty Link trait with Optimum GAT
 - Glyphosate/Glufosinate/ALS
- Soybean: 2011
- Cotton: ???



Optimum GAT

- Pros:
 - Competition in the marketplace
 - Allows for increased utility of ALS-inhibiting herbicides
- Cons:
 - Allows for increased utility of ALS-inhibiting herbicides
 - Variety/hybrid introgression



DHT

- DowAgrosciences Herbicide Trait
- 2,4-D + “Fop” resistance
 - NOT dicamba resistance
 - NOT “Dim” resistance
- Corn: 2012
 - Offered in conjunction with SmartStax™ package
- Cotton and Soybean: 2013
 - Offered in conjunction with glyphosate-resistance

DHT

- Pros:
 - Use of additional chemistry
 - “Protection” from 2,4-D drift
- Cons:
 - Potential for off-target movement of herbicides
 - Education regarding product selection
 - Crops becoming weeds

HPPD Resistance

- 4-Hydroxyphenyl Pyruvate Dioxygenase inhibitors
- Balance Pro, Callisto, Impact, Laudis
- Will be offered in a three-way stack in soybeans
 - Glyphosate/glufosinate/HPPD
- Potential for development in cotton



Dicamba Tolerance

- University of Nebraska
 - Technology based on a soil bacteria gene discovered at a dicamba manufacturing plant
- DMO gene
- Soybeans have displayed tolerance of up to 5 lbs ai/acre
- Tobacco plants with tolerance of up to 25 lb ai/acre



Future Options

- Three-way herbicide resistance from Dupont
 - Soybeans
 - Discovery phase
- Dicamba + glufosinate tolerant cotton from Monsanto
 - Proof of concept phase
- Paraquat resistance???
- PPO-resistance???
- New active ingredients and modes of action

Conclusions

- For foreseeable future, weed control will be trait based
- New herbicides will be incorporated into existing systems
- Quest for next glyphosate is underway
- “Weed control in the early 2000’s was as easy as it will ever be”
 - Dr. Larry Steckel – Delta Farm Press 2008

Questions



Carolyn Kaster - Asspc. Pres



University of Nebraska 2001