



Developing An Herbicide-Resistant Weed Management Plan

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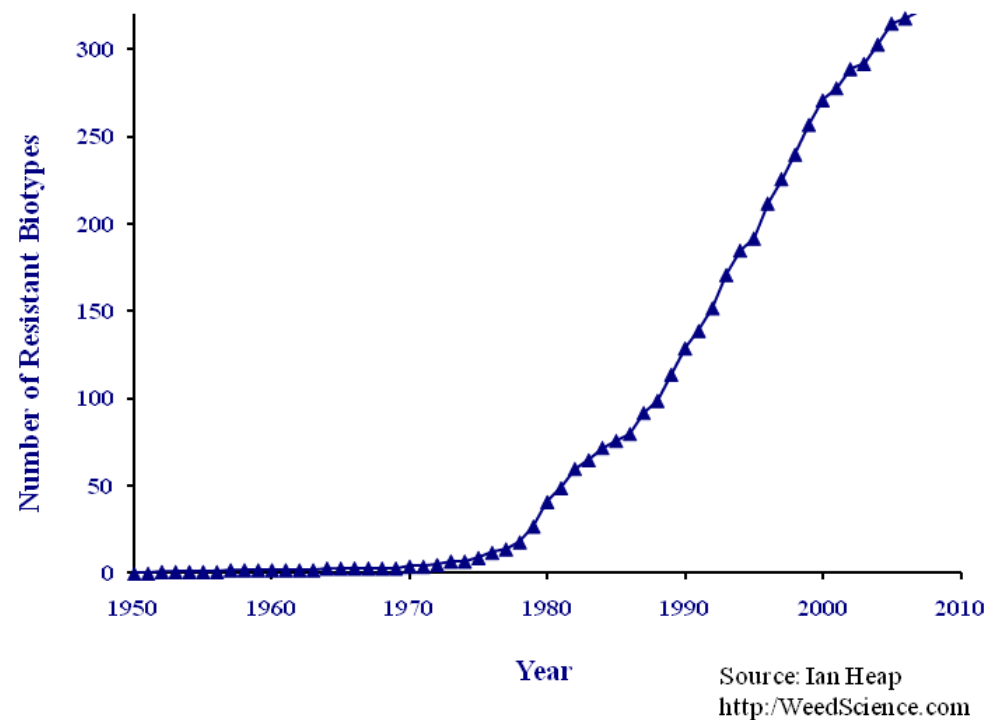
Evolution of Herbicide Resistant Weeds



- n Repeated applications of herbicides with same site of action (i.e. selection pressure)
- n Annual weeds that.....
 - q *occur in high populations*
 - q *are widely distributed*
 - q *are prolific seed producers*
 - q *have efficient gene (seed or pollen) dissemination*

Herbicide-resistance is not a new phenomenon!

Its been happening since 1968!



Source: International Survey of Herbicide Resistant Weeds (<http://www.weedscience.org/In.asp>)

Hindrances to Resistance Management

- n Economics
- n Reluctance to Change
- n Denial
- n Belief that chemical companies will develop “new” products



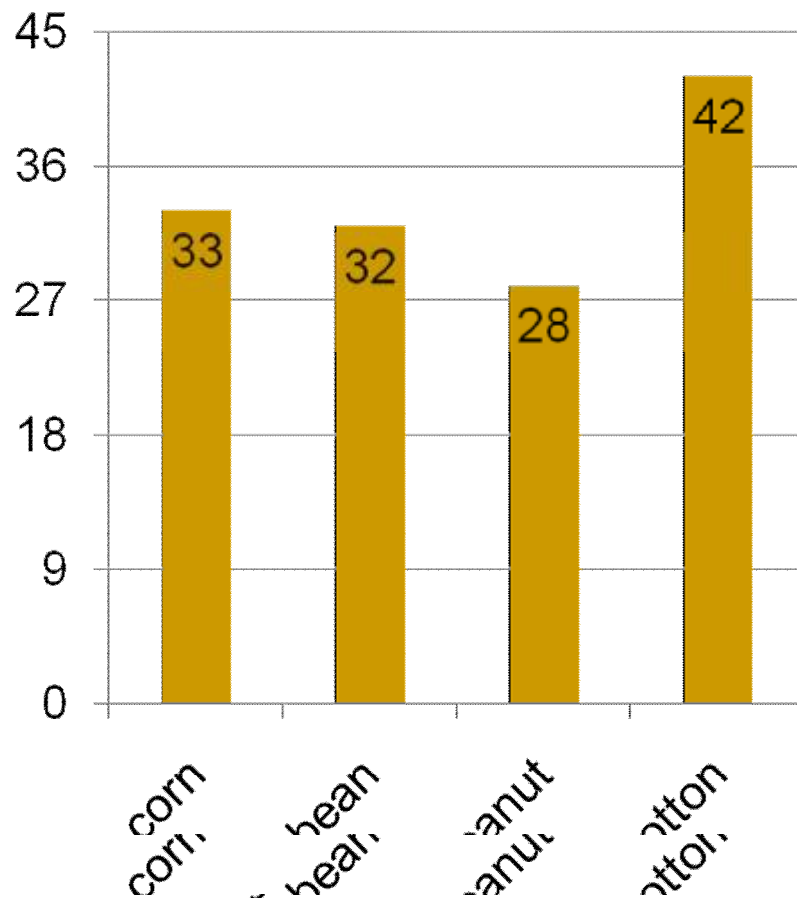
Herbicide Resistant Weed Management Plan

1. Other Control Tactics
 2. Know Modes of Action
 3. Rotating MOA
 4. Tank-mixtures
 5. Residuals
 6. Escape Rogueing
 7. Post-harvest
 8. Future Resistance Concerns
-



Crop Rotation

Yield Loss (%) from 1 AMAPA/row meter



Tillage and/or Cultivation



Tillage and Pigweed



Bottom Plow



Chisel Plow

Source: Twiggs Co., April 22, 2010

Extreme Cover Crops



Row Spacing



Irrigation



Modes of Action

HERBICIDE BRAND NAMES, ACTIVE INGREDIENTS, CHEMICAL FAMILIES,
AND MODES OF ACTION

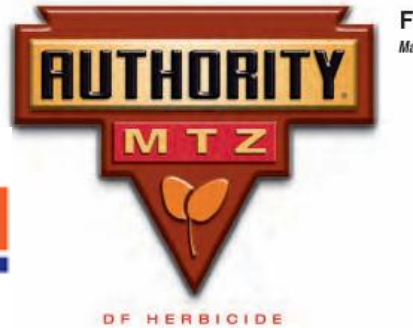
1046 K. Pontinen, International Agreement on Wood Science
 A. Sundby, European Agreement on Wood Science
 T. R. Murphy, Eastern Agreement on Wood Science
 Patrick McCallough, American Agreement on Wood Science

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A long-term resistance plan?

| Crop | PPI/PRE | POST1 | POST2 | MOA's |
|--------------------|----------------|--------------------------------|---------------------------|-------|
| Peanut (No ALS) | DNA + Valor | Cadre | 2,4-DB | 4 |
| Peanut (ALS) | DNA | Paraquat Basagran + Dual | Ultra Blazer + Dual | 5 |
| RR-Cotton | Reflex | Glyphosate + Staple | Direx + MSMA | 5 |
| RR-corn | Micro- Tech | Glyphosate + atrazine | -- | 3 |
| RR- soybean | Boundary | Glyphosate + FirstRate | -- | 4 |
| LL- soybean | Dual Magnum | Ignite + Reflex | | 3 |

Tank Mixtures/Pre-Mixtures



n For herbicide mixtures to be the most effective in delaying the evolution of herbicide resistance they must have (ideally)


- q *Different sites of action*
- q *Similar efficacy and persistence*
- q *Different propensities for selecting for resistance*
 - n *ALS/ACCase – high*
 - n *Auxins/GS - low*

Residual Herbicides

Dual Magnum @ 1 pt/A (16 DAT)



- n Key to future survival
- n Should be used on every acre!!!
- n 1 may not be enough!



Is this weed resistant?
Want to risk it?

Non-Selective Applicators



Hand-Weeding



Post-Harvest Pigweed Problems



- n Decreasing daylight hastens flower and seed production

- q *Flowering (3-4 weeks)*
- q *Seed production (2-3 weeks)*
- q *Some germination at 41°F (8%)*

- n Control Options

- q *Mowing*
- q *Tillage*
- q *Herbicides*
 - n *Gramoxone + 2,4-D or dicamba*
 - n *Residuals i.e. Dual Magnum?*



- n When can we stop worrying about seed production?

PPO Herbicides



- *Resistance has already been reported in other areas!!!*
- *Amaranthus quitensis*
 - 2005 (Bolivia)
- *Common waterhemp*
 - 2001 (Kansas)
 - 2002 (Illinois)
 - 2005 (Missouri)
 - 2009 (Iowa)
- *Common ragweed*
 - 2005 (Delaware)
 - 2006 (Ohio)
- *Wild poinsettia*
 - 2004 (Brazil)

Is this already happening?

| Crop | PPLNT | PRE | POST or PDIR | Harvest Aid |
|---------|-------|---------|-----------------|----------------|
| Soybean | Valor | Reflex | Cobra | Aim |
| Cotton | Valor | Reflex | Valor | Aim/ET |
| Corn | Valor | Sharpen | ET | Aim |
| Peanut | Valor | Valor | Ultra Blazer | Aim |

In a 4 year rotation, we could use 16 PPO's!!!!

Ignite and LL Crops



- **Abuse of Ignite**
 - *LL cotton, corn, soybeans*
 - *may jeopardize future technologies (DHT, Dicamba)*
- **Current resistances**
 - *Italian ryegrass (Oregon)*
 - *Goosegrass (Malaysia)*



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Questions?



www.gaweed.com