



Regulating Resistance

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EPA's Perspective on Herbicide Resistance in Weeds



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Discussion Topics

- Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)
- EPA's Approach to Managing Resistance
 - Current
 - Future
- Resistance Management for Biological Pesticides



Legal Authority Under FIFRA

- EPA registers pesticides under FIFRA (Federal Insecticide, Fungicide, Rodenticide Act) - a risk and benefit statute
 - Risk of resistance may be considered part of the regulatory decision
- EPA licenses the pesticide for use on conventionally bred or genetically modified crops
 - USDA/APHIS/Biotechnology Regulatory Services makes deregulation decision on genetically modified crops
- EPA licenses Plant Incorporated Protectants (e.g., Bt crops)

Approach to Managing Resistance

- EPA's goal is to extend the useful life of registered products used for pest control by slowing the development of resistance to fungicides, herbicides, and insecticides
 - Effective resistance plans should retain flexibility for growers
- Fungicides, Herbicides, and Insecticides
 - Some registrants have specified practices for resistance management
- Plant Incorporated Protectants (PIPs)
 - EPA requires resistance management practices

Approach to Managing Resistance

- Herbicides used on Herbicide Resistant Crops – EPA has developed a new approach to resistance management
- First required for Enlist Duo
 - Label directions
 - Training and educational information
 - Early identification, investigation, and remediation of likely resistant weeds
 - Registrant must report resistant weeds to EPA and stakeholders

Approach on Herbicide Registration for Herbicide Resistant Crops -- Label Elements

- Label must contain Mechanism of Action
- Include generally agreed upon best management practices
- Because early identification of problem is critical to managing resistance, the following items will be placed with the directions for use so that they are clearly visible:

User or consultant:

- Scout before application to identify weed and size
- Scout after application to determine if application was effective
- Report of poor performance/likely resistance to registrant or their representative

Approach on Herbicide Registration for Herbicide Resistant Crops – MOA and Best Management Practices

- Modes of action for both 2,4-D and glyphosate
 - Groups 4 and 9
- BMPs
 - Developed by the Herbicide Resistance Action Committee, Weed Science Society of America, CropLife America
 - Most elements of the BMPs describe cultural and mechanical practices to slow the spread of resistant weeds

Approach on Herbicide Registration for Herbicide Resistant Crops -- Best Management Practices

- **Some examples of BMPs:**

- Herbicides - use broad spectrum soil-applied herbicide and rotate this product herbicides with different modes of action (i.e., non group 4 and 9)
- Non chemical weed control practices - mechanical cultivation, cover crops, crop rotation, weed-free crop seeds
- Manage weeds in/around fields both during and after harvest

Approach on Herbicide Registration for Herbicide Resistant Crops -- Scouting

- **Scouting Requirements:**

- Before application to determine weed species/size
- After application to detect escapes
- Report incidence of non-performance to Dow
- Control weed through mechanical means or use of another herbicide with a different MOA

Approach on Herbicide Registration for Herbicide Resistant Crops – Terms of Registration

- Develop a Stewardship Program for resistance management
- Develop Training and Education materials
- Investigate cases of non-performance
 - Use Norsworthy et al. 2012 criteria for determining likely herbicide resistance
- Develop a Remediation Plan for use if resistance is suspected
 - Registrant must take immediate action to control likely resistant weeds

Approach on Herbicide Registration for Herbicide Resistant Crops – Terms of Registration

- Annual reporting of likely and confirmed resistance to EPA
 - Enough information to describe nature and extent of infestation
 - Early notification is important
- Reporting of likely and confirmed resistance to other stakeholders
- Work to develop a rapid diagnostic system for resistance

Registration Review and Resistance Management

- EPA conducts Registration Review for health, safety, and environmental risk of registered pesticides every 15 years
- Resistant management is one area of focus for many of the currently registered herbicides
- Glyphosate registration review this summer

OPP Regulation of Plant Incorporated Protectants

- Resistance management is required for every registered Bt PIP (terms and conditions of registration)
 - Bt cotton: 1996
 - Bt corn: 1996
- Stewardship program
- Key components:
 - Refuges (structured, seed blend)
 - Grower Education
 - Compliance Assurance Program
 - Resistance Monitoring
 - Remedial Action
- Resistance would have evolved much faster without these requirements



Importance of Managing Insecticide Resistance

- Higher selection pressure for resistance with PIPs than conventional insecticides
 - Season-long expression of Bt toxins at high levels
 - Target pests have multiple generations per year (up to 6)
 - Some pests feed almost exclusively on corn or cotton (ex. European corn borer, pink bollworm)
- Preservation of Bt susceptibility
 - Benefits for the environment and human health



Corn Rootworm (CRW) Monitoring – Next Steps



- Draft proposal to enhance CRW Insect Resistance Management submitted to industry (ABSTC) in September
- Areas for improvement:
 - Integrated Pest Management (IPM) as a component of CRW resistance management
 - Responses to unexpected damage in Bt corn fields
 - Elimination of requirement for annual random sampling of CRW from the Corn Belt
 - Use of on-plant assays for resistance determinations
 - Enhancements to current remedial action plans
- Proposal available online:
 - Docket# EPA-HQ-OPP-2014-0805 ([regulations.gov](http://www.regulations.gov))
 - Public comment period closed April 15, 2015

Questions?

