



WEED
RESISTANCE
GLOBAL SYMPOSIUM



Science For A Better Life

U.S. Environmental Protection Agency's Approach on Weed Resistance Management

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Paris

► INTRODUCTION

- Background on U.S. Federal Insecticide, Fungicide, Rodenticide Act (FIFRA)
- EPA's Approaches to Managing Resistance
 - Example of Resistance Management for Registration of Herbicides on Genetically Modified Crops
 - Issues for Consideration for Herbicide Registration Review
- Questions

Legal Authority Under Federal Insecticide, Fungicide, Rodenticide Act (FIFRA)

- EPA Office of Pesticide Programs (OPP) registers pesticides under FIFRA
- OPP licenses the pesticide for use on conventionally or genetically modified crops
 - USDA/Animal & Plant Health Inspection Service deregulate trait
 - FDA reviews toxicology issues of trait
- OPP licenses Plant Incorporated Protectants
 - For example, *Bacillus thuringiensis* trait in corn

EPA's Approach on Managing Pesticide Resistance

- Objective is to extend the useful life of registered products for pest control
- Frameworks for different types of pesticides
 - Approaches for fungicides, herbicides, and insecticides may differ as well as pesticides used on GM crops or non-GM crops
- Key Elements to Managing Resistance
 - Clear label information and directions
 - Updating Pesticide Registration Notice on resistance management labeling
 - Training and education
 - Early detection, investigation, and remediation

Example of Resistance Management Approach for Herbicides used on GM Crops

- Label directions
 - Mechanism of Action
 - Best Management Practices
- Early identification, investigation, & remediation of likely resistant weeds
 - Scout before and after pesticide application
- Report likely resistance to registrants or their representatives
 - Registrants report resistant weeds to EPA and stakeholders

Example of Resistance Management Approach for Herbicides used on GM Crops (cont'd)

- Registrants:
 - Stewardship Program for resistance management
 - Training and Education materials
 - Investigation of non-performance
 - Remediation Plan if resistance is suspected
 - Annual reporting of likely and confirmed resistance to EPA & other stakeholders
 - Development of a rapid diagnostic system for resistance

Registration Review

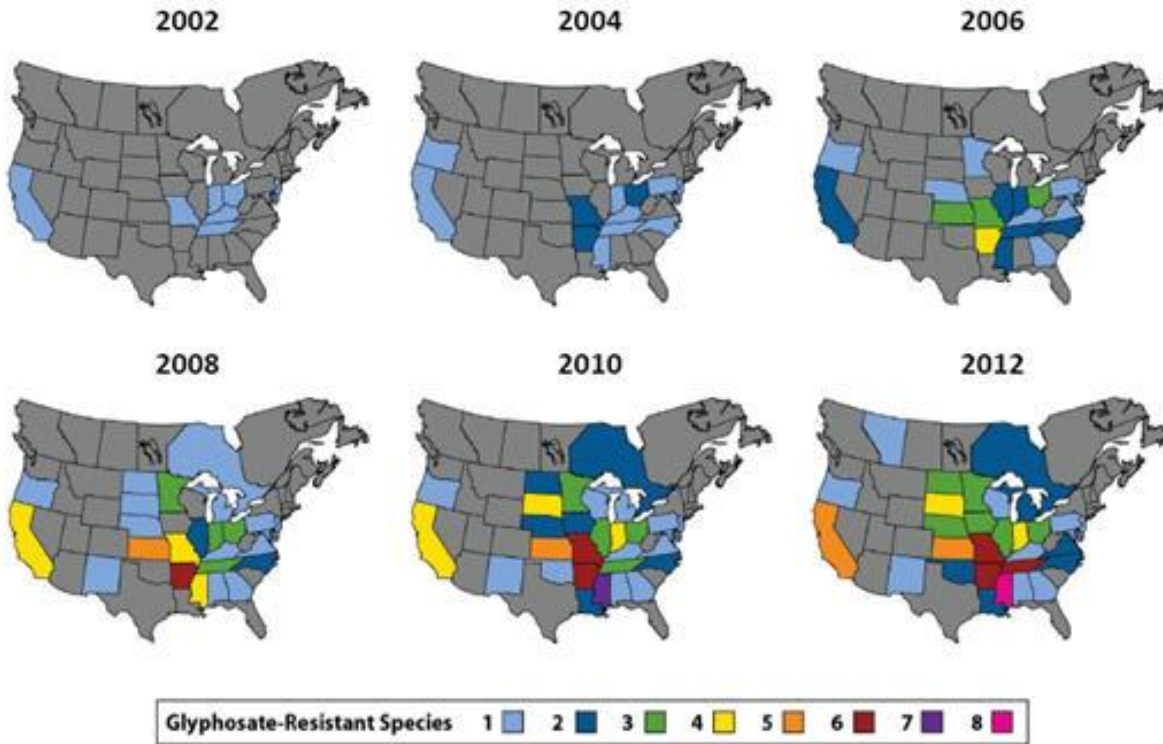
- In addition to the initial registration, OPP conducts Registration Review of registered pesticides every 15 years
 - For health, safety, and environmental purposes
 - Resistant management of herbicides is an area of focus



Herbicide Resistance Management for Registration Review

- Issues for consideration:
 - How to target the herbicides and crops with the greatest problems with resistant weeds?
 - For example, by MOA, Acetolactate Synthase (ALS) herbicides have over 140 species of resistant weeds
 - By crop, wheat has over 70 species of herbicide resistant weeds

Glyphosate Resistance over Time



Confirmed glyphosate-resistant weed populations in North America, 2002-2012 (Heap 2012).

Herbicide Resistance Issue by Sites of Action

Examples

B – ALS/SU herbicides

C1 – Triazine herbicides

A – Quizalofop

D22 - Paraquat

O – Auxins, 2,4-D

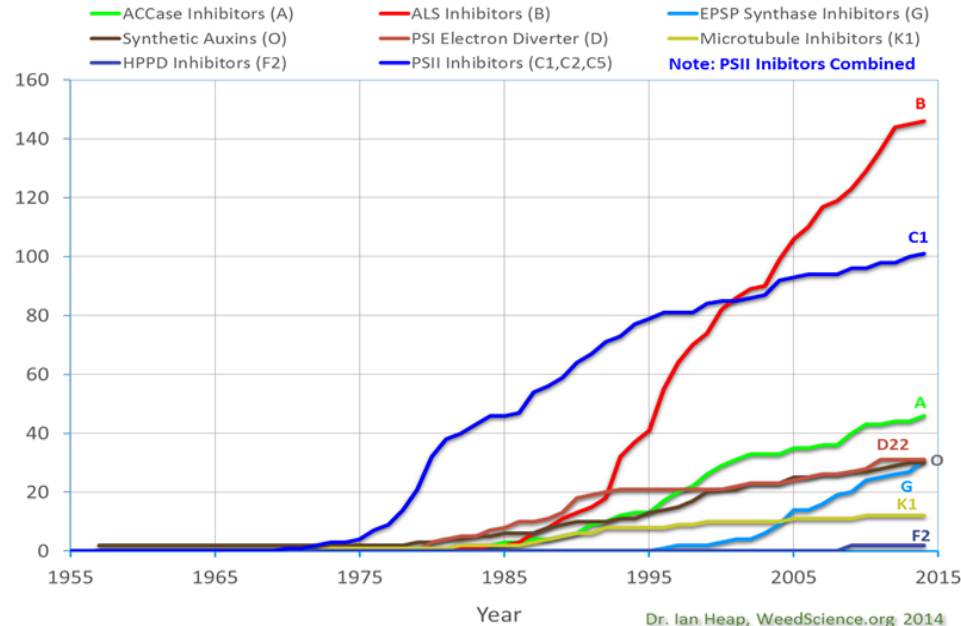
G – glyphosate

K1 – Microtubule Inhibitors Treflan

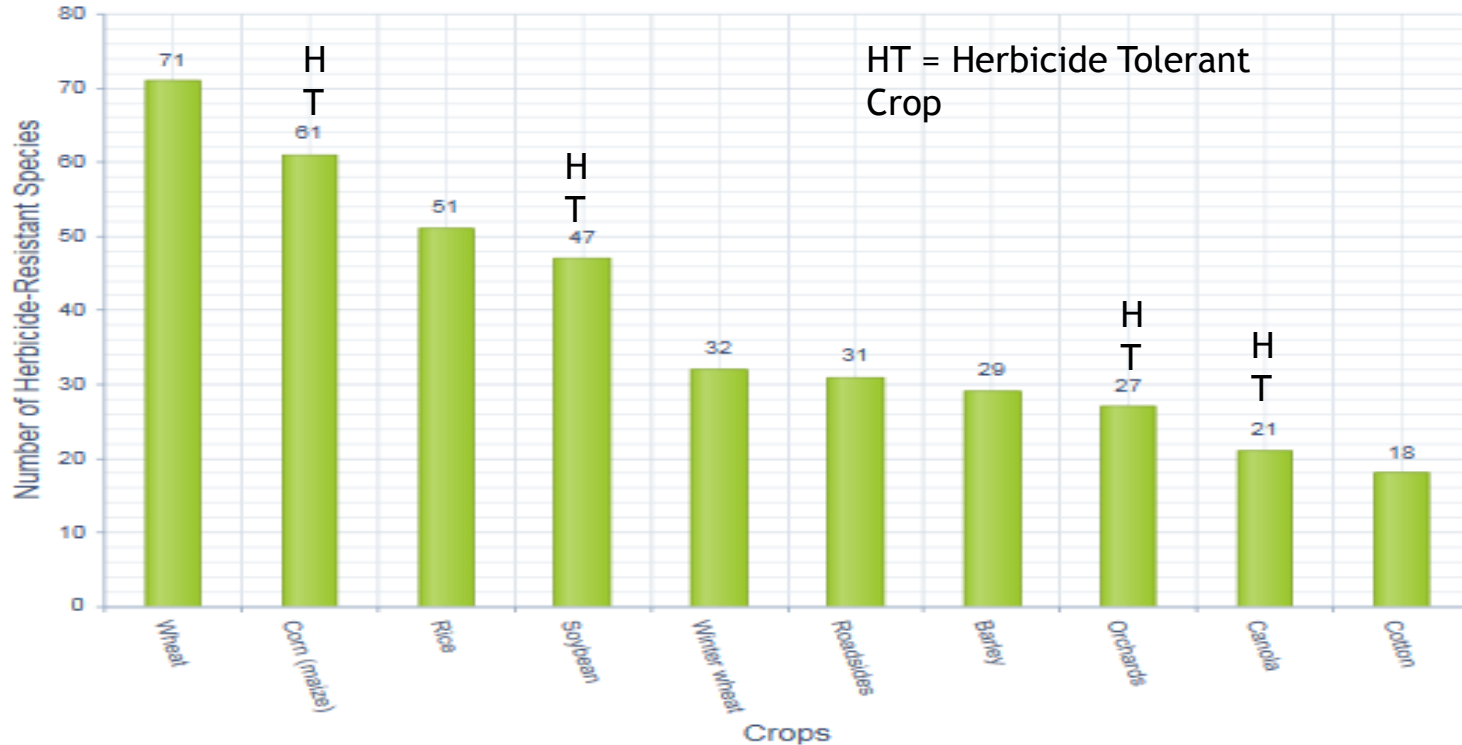
F2 – HPPD Mesotrione

Glutamine Synthase - Glufosinate
with 2 cases is not shown

Number of Resistant Species for Several Herbicide Sites of Action (HRAC Codes)



Number of Herbicide Resistant Weed Species by Crop/Site (Top 10)





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Thank you for listening!