U.S.D.A. Actions to Address Herbicide Resistance in Weeds

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Topics

• Weeds are an ever present pest in crop production.
• Selection pressures on weed populations
• Evolution of herbicide resistance
• Herbicide resistance and genetically modified crops.
• USDA agency actions
Weeds are a continual pest issue: they survive and persist once established.
Weeds adapt to single management tactics

Mowing selected for a short scape on dandelion (Taraxacum officinale)

Rice culture selected for specialized ecotype of barnyardgrass (Echinochloa crus-galli var oryzicola)

Biological control agent selected a resistant rush skeletonweed (Chondrilla juncea) biotype

Herbicide use selected a resistant Palmer amaranth (Amaranthus palmeri)
Number of Herbicide-Resistant Species by Crop

<table>
<thead>
<tr>
<th>Crop or Situation</th>
<th>Number of Herbicide Resistant Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>66</td>
</tr>
<tr>
<td>Corn (maize)</td>
<td>59</td>
</tr>
<tr>
<td>Rice</td>
<td>51</td>
</tr>
<tr>
<td>Soybean</td>
<td>47</td>
</tr>
<tr>
<td>Roadsides</td>
<td>31</td>
</tr>
<tr>
<td>Barley</td>
<td>27</td>
</tr>
<tr>
<td>Orchards</td>
<td>27</td>
</tr>
<tr>
<td>Winter wheat</td>
<td>27</td>
</tr>
<tr>
<td>Canola</td>
<td>20</td>
</tr>
<tr>
<td>Cotton</td>
<td>17</td>
</tr>
<tr>
<td>Pastures</td>
<td>17</td>
</tr>
<tr>
<td>Railways</td>
<td>14</td>
</tr>
<tr>
<td>Vegetables</td>
<td>14</td>
</tr>
<tr>
<td>Peas</td>
<td>12</td>
</tr>
<tr>
<td>Grapes</td>
<td>11</td>
</tr>
</tbody>
</table>

Dr. Ian Heap, WeedScience.org 2014
Selection occurs when the best adapted plants leave more offspring

- Abundant heritable variation in weeds
- Most successful survive and reproduce
- Weed control selects weeds that are best able to survive the control method used.
- Repeated herbicide use
  - Selects for plants that are resistant OR not affected by that herbicide.

Don’t manage weeds, *manage selection pressure by diversifying tactics.*
USDA Actions

• Press Release from Secretary of Agriculture – October 15, 2014

• USDA Announces Measures to Help Farmers Diversify Weed Control Efforts
  • Several immediate steps were announced
USDA Actions- NRCS

• USDA's Natural Resource Conservation Service (NRCS) will offer financial assistance under its Environmental Quality Incentives Program (EQIP) for herbicide resistant weed control practices that utilize Integrated Pest Management plans and practices.

• This year NRCS solicited proposals under the Conservation Innovation Grants (CIG) Program for innovative conservation systems that address herbicide resistant weeds.

USDA Actions-APHIS

• USDA's Animal and Plant Health Inspection Service (APHIS) will **actively promote use of best management practices (BMPs) in design protocols** for regulated authorized releases of genetically engineered (GE) crops and will **include recommendations for BMPs with the authorization of field trials** of HR crops.
  
USDA Actions- OPMP, EPA and WSSA

• USDA is partnering with the Weed Science Society of America (WSSA) and is providing funds to develop education and outreach materials for various stakeholders on managing herbicide–resistant weeds. The Secretary has directed the Director of the USDA Office of Pest Management Policy, as the point person leading this effort with the USDA.
Conclusions

• Weeds are an ever present pest in crop production.
• Reliance on any single tactic to control weeds results in selection for species or populations that can survive that practice.
• Evolution of resistance to herbicides is not a new problem.
• Herbicide resistance is not unique to genetically modified crops.
• Successful management of weeds requires multiple, diverse tactics.
• USDA agencies are taking measures, in cooperation with EPA, to help farmers diversify weed management.