

Indiana Weed Survey

What we've learned about weeds in vegetable fields.

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Survey Goals

- Characterize current management practices for fresh market and processing.
- Identify common and problematic weeds.
- Determine perceived constraints to converting to organic vegetable production.

The Survey

- IASS mailed 8 page survey in fall 2006 to Indiana vegetable growers
- Areas of interest
 - Tillage, cultivation
 - Seedbed management
 - Crop rotation
 - Herbicides
 - Weeds
 - Factors that influence management decisions
 - Obstacles to organic production

Responses

- 87 usable surveys were returned
- Primarily fresh market
- Sweet corn, tomatoes, pumpkins, cantaloupe
- Farm size ranged from less than an acre to hundreds of acres.

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Steel in the Field

	Sweet corn	Tomato	Pumpkin	Cantaloupe
# of spring tillage passes	2.5	2.9	2.8	3.2
# of cultivation passes	1.8	3.1	2.2	2.9
Percent that manually weed	42%	85%	75%	85%

Seedbed preparation

	Sweet corn	Tomato	Pumpkin	Cantaloupe
Row width (inches)	33	56*	72*	66*
Percent that use plastic	3%	56%	22%	65%
Percent that use non-plastic mulch	6%	29%	6%	3%
Stake	0%	79%	0%	0%

Cover crops

	Sweet corn	Tomato	Pumpkin	Cantaloupe
Percent that use a cover crop	38%	42%	33%	32%

Corn rotations

- Continuous
- Oats/clover, vegetables
- Corn, soybean, corn, soybean, vegetable
- Corn, cover crop, hay
- Pumpkin, sudangrass, corn

Tomato

- Corn, corn, corn, tomato
- Wheat, beans, tomato
- Oats/clover, vegetables
- Tomato, broccoli
- Melon, peppers, fallow, tomato
- Tomato, cabbage, pumpkin, potato
- Potato, tomato, watermelon, cucumber, cantaloupe

Pumpkin

- Corn, pumpkin, soybean*
- Pumpkin, soybean, wheat, alfalfa
- Pumpkin, melon, pasture, alfalfa
- Corn, hay, hay, pumpkin

Cantaloupe

- Cantaloupe, wheat, corn, bean
- Cantaloupe, wheat, corn, melon
- Cantaloupe, corn
- Potato, tomato, watermelon, cucurbits,
- Corn, corn, corn, cantaloupe

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Weeds

Most common	Difficult to control	Increasing
Pigweed	Giant ragweed	Pigweed
Lambsquarters	Canada thistle	Lambsquarters
Giant foxtail	Lambsquarters	Morningglory
Giant ragweed	Pigweed	Giant ragweed
Common ragweed	Morningglory	Giant foxtail

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 - **Obstacles to organic production**

Obstacles to organic production

- Difficulty controlling insects 73%
- Difficulty controlling weeds 69%
- Difficulty controlling disease 58%
- Too labor intensive 23%
- Certification process too difficult 14%

Any Questions?



Indiana Weed Surveys: What we have Learned about Weeds in Agronomic Fields

Dr. Bill Johnson –
Purdue University
and Dr. Steve Weller

Weeds to Watch: Weeds That Seem to be Expanding Their Habitat Range

Bill Johnson – Purdue University
 Bob Hartzler – Iowa State University
 Dawn Nordby – University of Illinois

Weed Management Field Survey

- Three state project
 - Indiana, Illinois, and Iowa
- Locate 30-35 fields in each state with
 - detailed field history records (5-6 years)
 - herbicide use, specifically glyphosate use ranging from never to quite frequent
 - tillage
 - crop rotations
- cooperators willingness to allow us to sample field in 2004 and again in 2005

Field Survey Methods

- Field size ranged from 10A to over 100 A.
- Almost all fields were in a corn:soybean rotation.
- Weed identity and density collected at 40 stops along an inverted "W" in August and September of 2004.
- Area sampled in each field was roughly 3 to 10 A.

Sampled 10 locations approximately 10 paces apart on each leg.

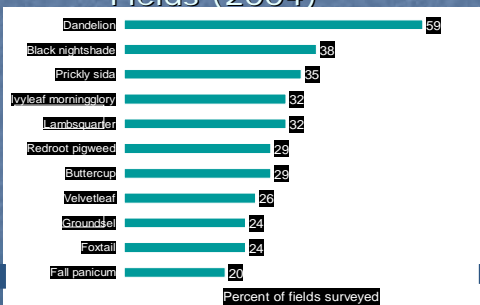


Indiana Field Sites

34 total



Most Common Species Found in Indiana Soybean Fields (2004)



Conclusions

The obvious...

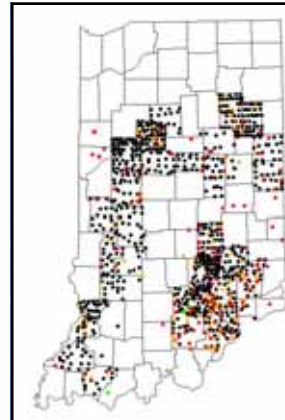
- Predominant weed species are likely to change in response to changes in management tactics
- Management practices will also need to be altered to manage specific weed issues

The unknowns....

- Weed management in agronomic crops is a very efficient system. Sweeping wholesale changes are unlikely.

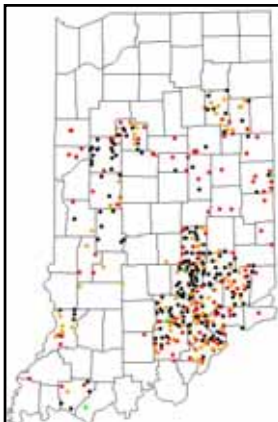
Field Survey to Determine the Geographic Distribution of Glyphosate Resistant Horseweed in Indiana

- Three year project initiated in 2003
- Intensively sample approximately 50 out of 92 counties for:
 - glyphosate resistant horseweed
 - presence of other weeds
 - other field characteristics



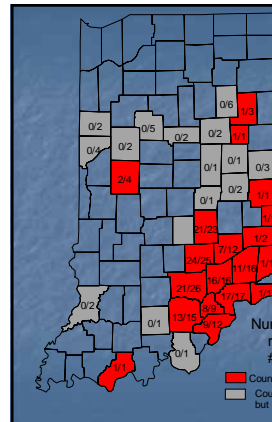
2003 and 2004 Field Survey

- 782 sites surveyed in 2003
- 335 sites surveyed in 2004
- 1117 sites surveyed total



2003 and 2004 Samples Collected

- 395 samples collected in 2003
- 50 samples collected in 2004
- 445 samples collected
 - GPS Random 45%
 - High populations 30%
 - Non-cropped area 22%



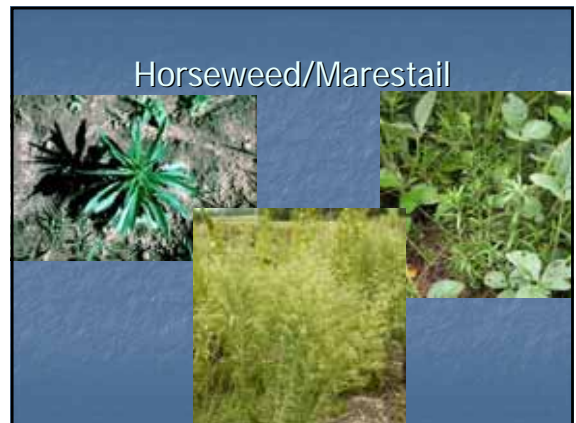
2003 - Samples from cropped fields tested for resistance to 2X (1.5 lbs ae/A) glyphosate

Numbers correspond to resistant # of samples/ # of samples tested

■ Counties with confirmed resistance
■ Counties with samples tested but no confirmed cases of resistance

Glyphosate Resistant Horseweed Field Survey Summary

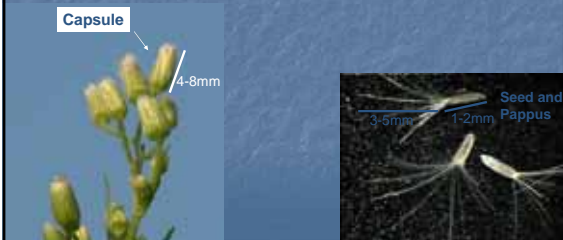
- 2003 results
 - Glyphosate-resistant populations present in 19 counties
 - Dose response studies show resistance ranging from two-fold to 44-fold.
 - Multiple resistance to ALS (Sandea, Pursuit, Matrix) inhibitors detected in at least 20% of glyphosate-resistant populations
 - Gramoxone resistance detected in less than 10% of the populations
 - 2,4-D resistance questionable in 3 samples



Horseweed/Marestail

Horseweed Seed Production

Avg 32 (± 7) seeds/capsule
Up to 960 capsules/plant
when growing in soybean



Glyphosate Resistant Horseweed Field Survey Summary

- 2003 and 2004 samples
 - Giant ragweed, common ragweed, lambsquarter, and dandelion observed very frequently in fields with escaped horseweed.
- 2004 samples had initial discriminating dose application and response was similar as in 2003

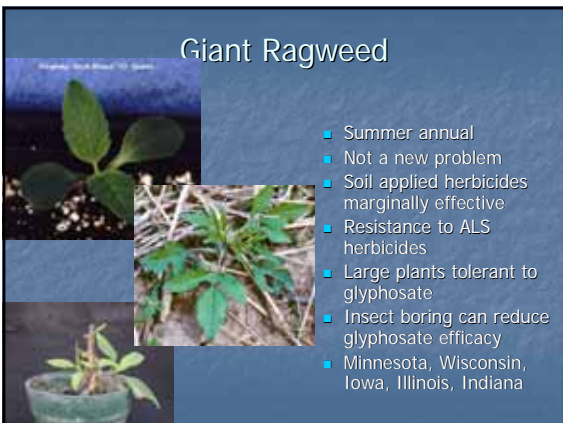
2004 Conclusions

- Glyphosate resistance is a reality
- Resistance to glyphosate and ALS inhibitors present in 11/52 samples tested (21%)
- "Resistance" to 2,4-D in 3/52 samples tested (6%)
- About 22% of all samples resistant to glyphosate and another MOA

Recent Identification of new Roundup Resistant Weeds in Indiana

- 2006 - Recent ID of glyphosate resistance in lambsquarters and giant ragweed in Indiana

Giant Ragweed



- Summer annual
- Not a new problem
- Soil applied herbicides marginally effective
- Resistance to ALS herbicides
- Large plants tolerant to glyphosate
- Insect boring can reduce glyphosate efficacy
- Minnesota, Wisconsin, Iowa, Illinois, Indiana





Sensitive
0.75 lb ae/A – 21 DAT

Noble county



Noble county Sensitive
3.0 lb ae/A – 21 DAT

Lambsquarter Complex



- Summer annual
- Emerges relatively early
- Several chenopodium species are common to the midwest
- ALS herbicides and glyphosate are marginal on large plants
- Insects commonly found in large plants
 - Michigan, Wisconsin, Indiana, Ohio



Jay county – 14 DAT
Survived 3 lb ae/A