Weed management when interseeding alfalfa in corn

Mark Renz

Professor and Extension Weed Specialist

https://renzweedscience.cals.wisc.edu/

Alfalfa-corn interseeded system well studied

- **Crop Ecology**: Osterholz, W, Renz MJ, Lauer JG, Grabber JH. **2018**. Prohexadione rate and timing effects on alfalfa interseeded into silage corn. *Agronomy Journal*. 110: 85-94.

- **Plant Breeding/Genetics:** Grabber, JH; Osterholz, WR.; Riday, H; Cassida, KA.; Willamson, JA.; Renz, MJ. ***Submitted***. Differential Survival of Alfalfa Varieties Interseeded into Corn Silage.

- **Soil Conservation/Water**: Osterholz, W, Grabber JH and Renz MJ. **2019**. Interseeded alfalfa reduces soil and nutrient runoff losses during and after corn silage production. *Journal of Soil and Water Conservation* 74:85-90.

- **Weed Suppression**: Osterholz, W, Carvalho de Souza Dias, JL, Grabber JH and Renz MJ ***in press***. PRE- and POST-applied herbicides options for alfalfa interseeded with corn silage. *Weed Technology.*

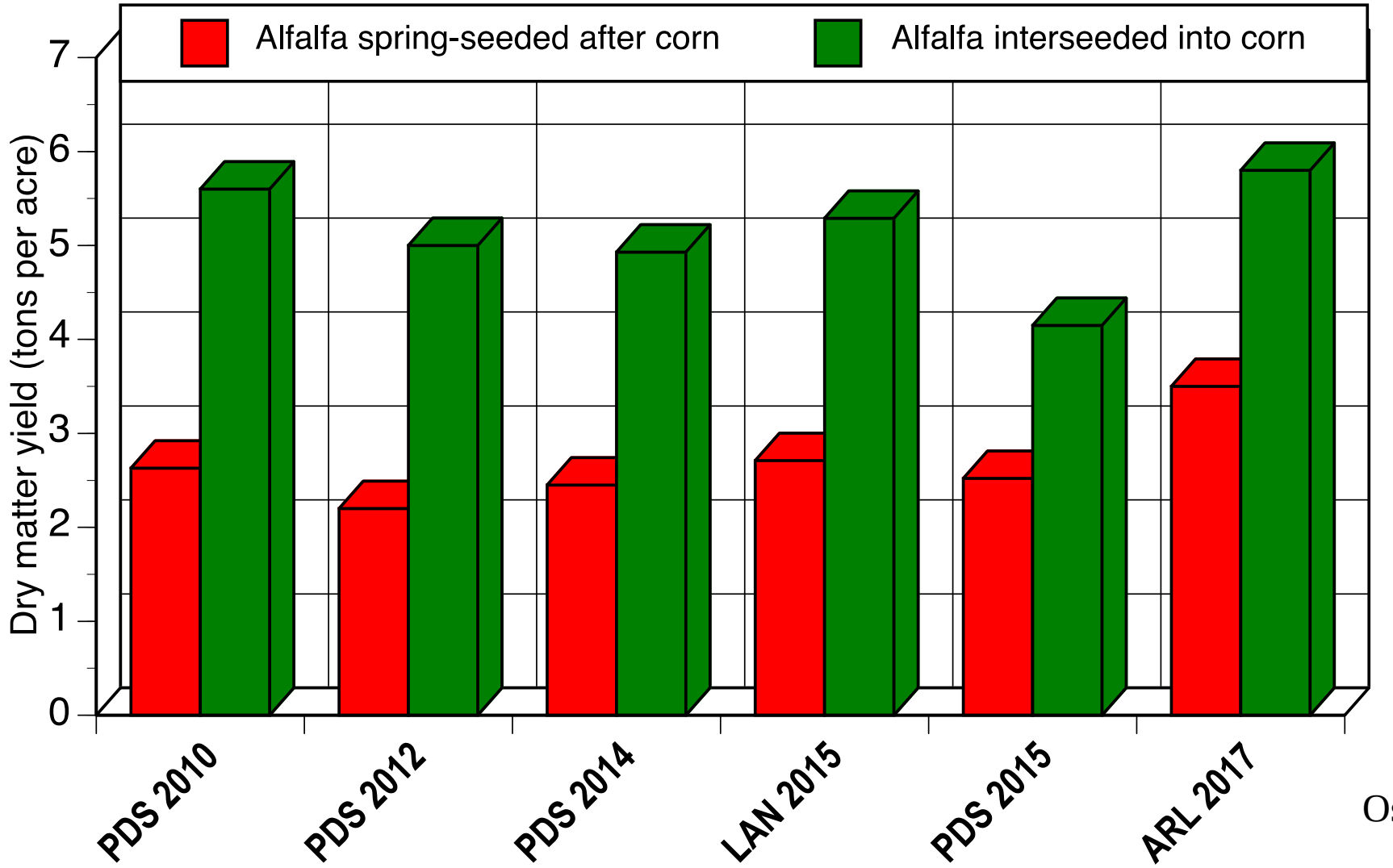
- **Socio Economic Implications** : Osterholz, W, Grabber JH and Renz MJ. ***2020***. Alfalfa establishment by interseeding projected to increase profitability of corn silage-alfalfa rotations. *Agronomy Journal*.

Interseed alfalfa into corn silage

- Alfalfa planted in corn inter-rows within one week of corn planting
- Spray agrichemicals to improve alfalfa survival
- Corn silage harvested
- Alfalfa re-grows as a cover crop

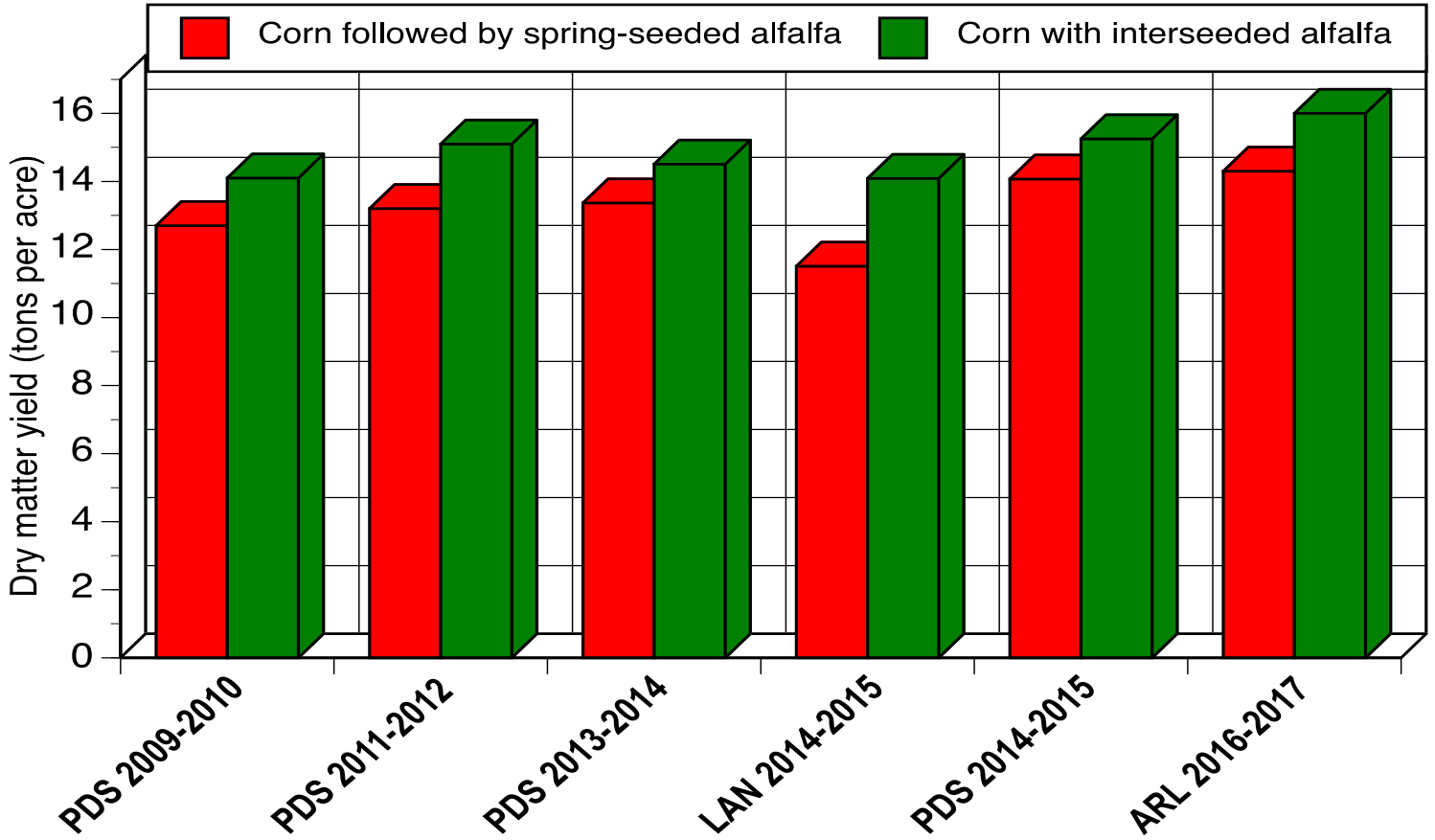
Become a crop in subsequent year(s)

Successful establishment by interseeding doubles first year alfalfa yields



Osterholz et al. 2018

Successful alfalfa interseeding increases total yields of corn plus first year alfalfa



12% increase
= 1.6 tons per acre

Osterholz et al. 2018

Osterholz, W, Grabber JH and Renz MJ. ***2020***. Alfalfa establishment by interseeding projected to increase profitability of corn silage-alfalfa rotations. *Agronomy Journal*.

Weed management methods evaluated in corn/alfalfa interseeded system

- Imazethapyr (Pursuit) POST + Clearfield corn
  - PRO: control with one application (POST)
  - CON: Few Clearfield hybrids available, ALS resistant weeds
- Glyphosate POST with Roundup Ready corn/alfalfa
  - PRO: effective season long control with one application
  - CON: Glyphosate resistant weeds, cost, RR alfalfa varieties poor survival
- Acetochlor (Warrant) PRE followed by bromoxynil POST
  - PRO: effective early season weed control, use conventional varieties
  - CON: Grass, perennial weed control poor

Herbicide screening (PRE)

Acetochlor (Warrant 1.5 pt/A)
Acetochlor (Warrant 3 pt/A)
Mesotrione (Callisto 3 fl oz/A)
Mesotrione (Callisto 3 fl oz/A)
S-metolachlor (Dual 1 pt/A)
S-metolachlor (Dual 2 pt/A)
Metribuzin (2 oz/A)
Metribuzin (4 oz/A)
Flumetsulam (Python 0.8 oz/A)
Flumetsulam (Python 1.33 oz/A)
Glyphosate (22 fl oz/A)
control

Equal or superior to glyphosate

Inferior to glyphosate

Herbicide screening (PRE)

	Alf Injury 1 MAT	Wd cover 1 MAT	Wd cover 2 MAT	Alf cover 2 MAT	Corn Yield	Alf Yield 2nd year	Alf density 18 MAT
Acetochlor (Warrant 1.5 pt/A)	0	10	17	75	9.1	5.8	10
Acetochlor (Warrant 3 pt/A) ★	0	6	13	78	9.0	6.0	9
Mesotrione (Callisto 3 fl oz/A)	34	4	13	63	9.6	5.6	8
Mesotrione (Callisto 3 fl oz/A)	71	2	5	37	10.1	5.5	7
S-metolachlor (Dual 1 pt/A)	6	7	15	73	9.6	5.7	8
S-metolachlor (Dual 2 pt/A)	24	5	10	71	9.3	5.8	11
Metribuzin (2 oz/A)	0	11	25	67	9.2	5.8	9
Metribuzin (4 oz/A)	4	15	24	65	9.0	5.8	7
Flumetsulam (Python 0.8 oz/A)	21	10	21	66	9.1	5.8	8
Flumetsulam (Python 1.33 oz/A)	35	11	17	60	9.1	5.6	9
Glyphosate (22 fl oz/A)	0	14	0	88	9.2	6.3	9
control ★	0	15	26	68	9.1	6.2	10

Equal or superior to glyphosate

Inferior to glyphosate

Herbicide screening (POST)

	Alf Injury 2 WAT	Wd cover 1 MAT	Alf cover 1 MAT	Alf cover 12 MAT	Alf Injury 2 WAT	Wd cover 1 MAT	Alf cover 1 MAT	Alf cover 12 MAT
	EARLY TIMING				**LATE TIMING**			
Basagran 0.8 pt/a	12	26	70	29	4	19	72	30
Basagran 1.6 pt/a	17	22	68	30	4	12	73	30
Buctril Low ★	8	10	78	36	7 ★	14	74	34
Buctril High	19	16	70	28	10	11	78	38
Butyrac 1.5 qt/a ★	1	14	83	37	5 ★	8	78	28
Butyrac 3 qt/a	0	7	85	33	8	12	77	23
Callisto 1.5 oz/a	33	5	72	31	8	19	78	36
Callisto 3 oz/a	40	15	57	37	7 ★	12	80	40
Roundup 22 oz/a	0	3	91	40	0	4	90	40
Control	0	20	75	33	0	21	73	31

Equal or superior to glyphosate

Inferior to glyphosate

weed control is increased when alfalfa interseeded

30 days after PRE acetochlor application

65% reduction in weed cover when alfalfa is included

Acetochlor followed by bromoxynil kept weed cover < 10% throughout season, but…

45 days after PRE,

2 weeks after bromoxynil

Note no broadleaf weeds, but grasses

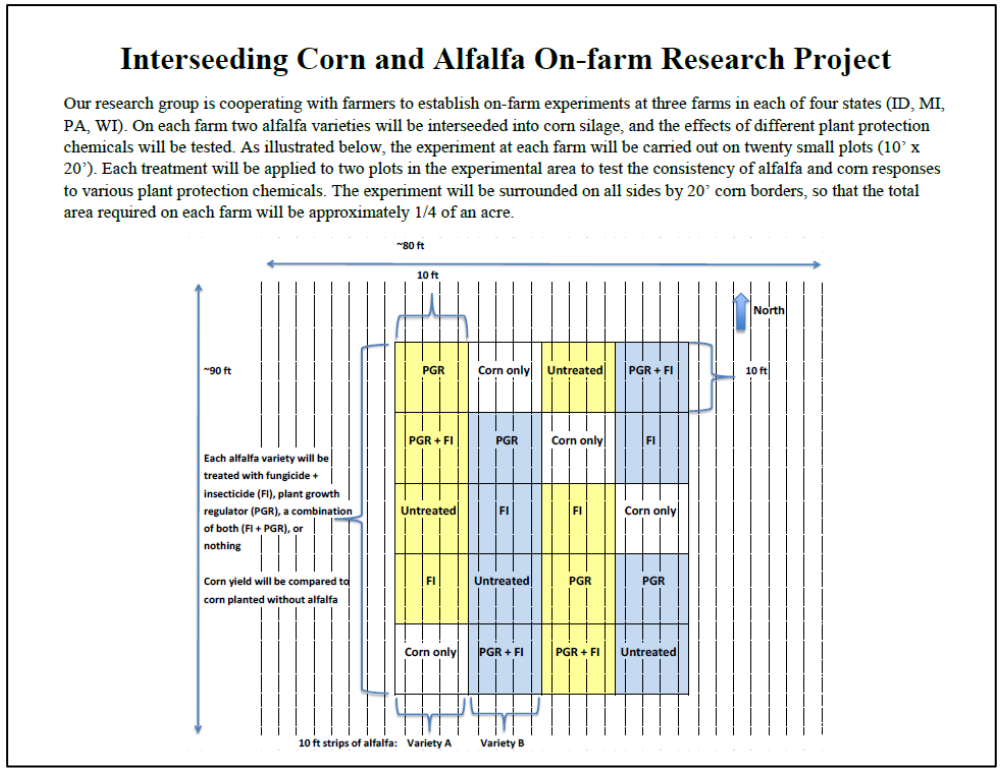
Conclusion about acetochlor + bromoxynil for weed management in corn - alfalfa

- Registered for use in both corn and alfalfa
- Good fit for high performing non-RR alfalfa varieties
- Effective at preventing early season competition of annual weeds
  - Cover maintained < 10% when integrated
- Struggle to control later emerging weeds & perennials
  - Need to manage out of crop to minimize impact
  - Limited field experiments, could other weeds be more of a problem?

<u>What is the impact of weeds on yield?</u>

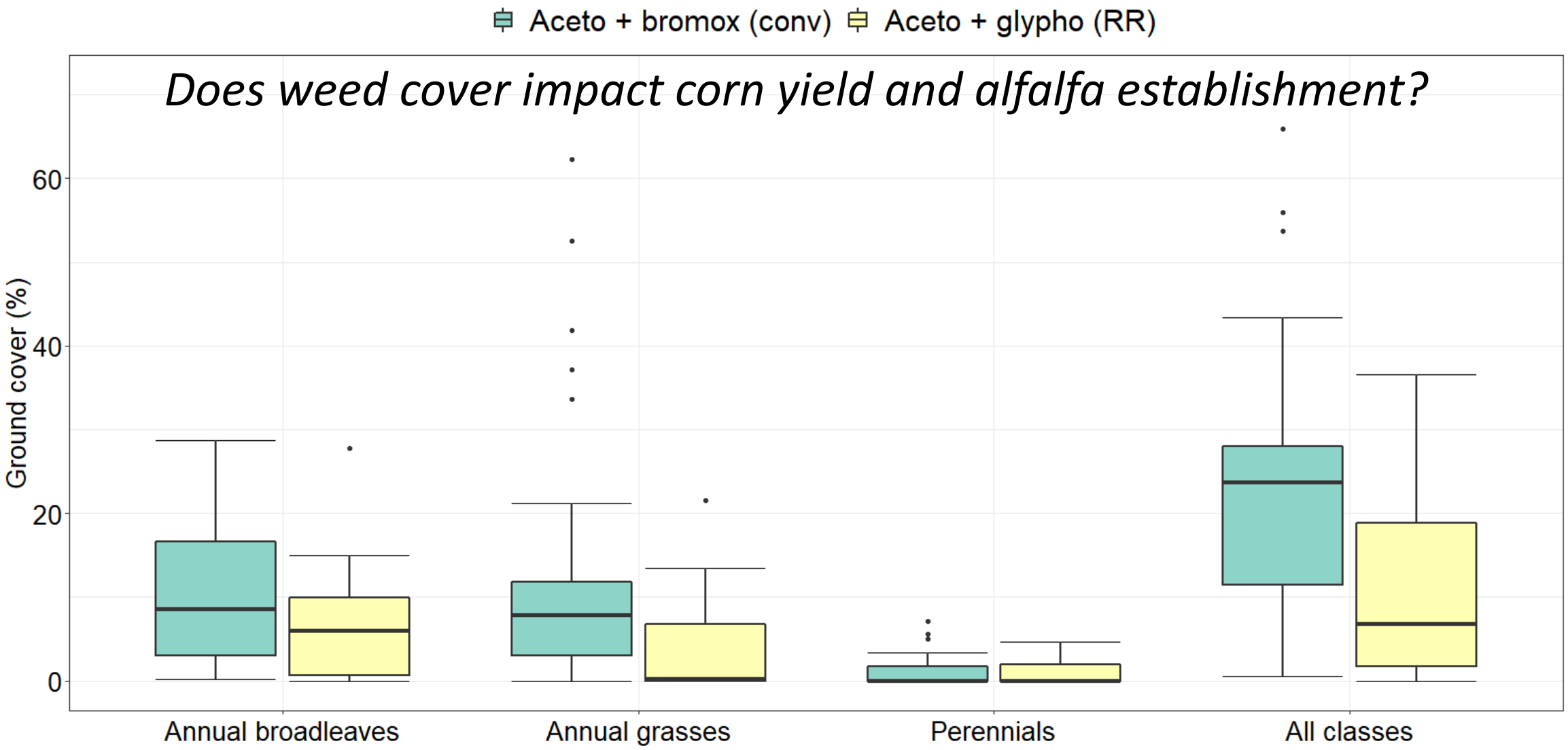
NIFA Funded multi-state effort to optimize alfalfa establishment

- Four states (WI, MI, PA, ID)
  - research station and on farm
  - 28 locations with > 1,000 plots
- Evaluated
  - RR vs conventional system
  - +/-Fungicide and Insecticide
  - +/- prohexadione



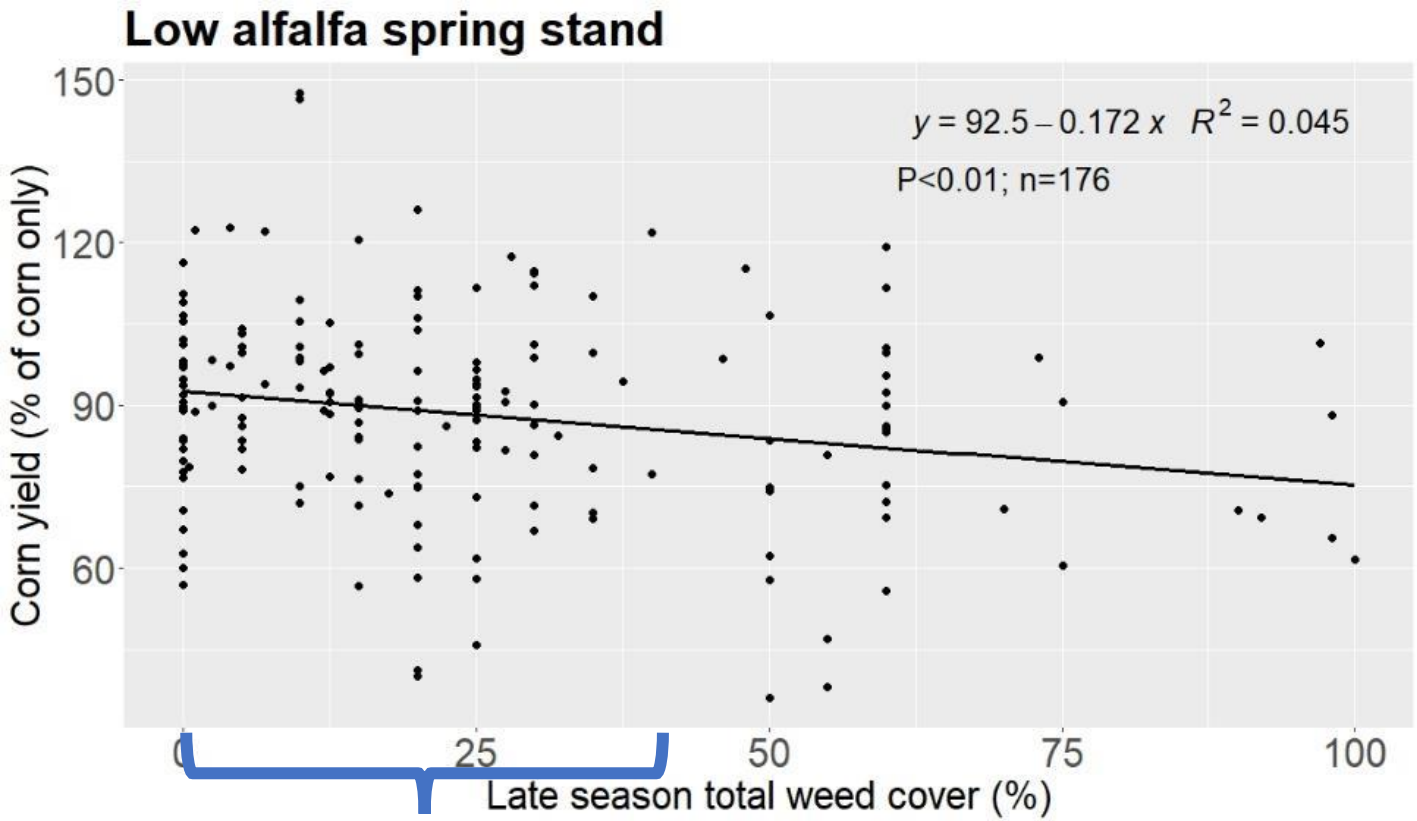
Late season weed cover

averaged over 28 locations



Do weeds reduce corn silage yield?

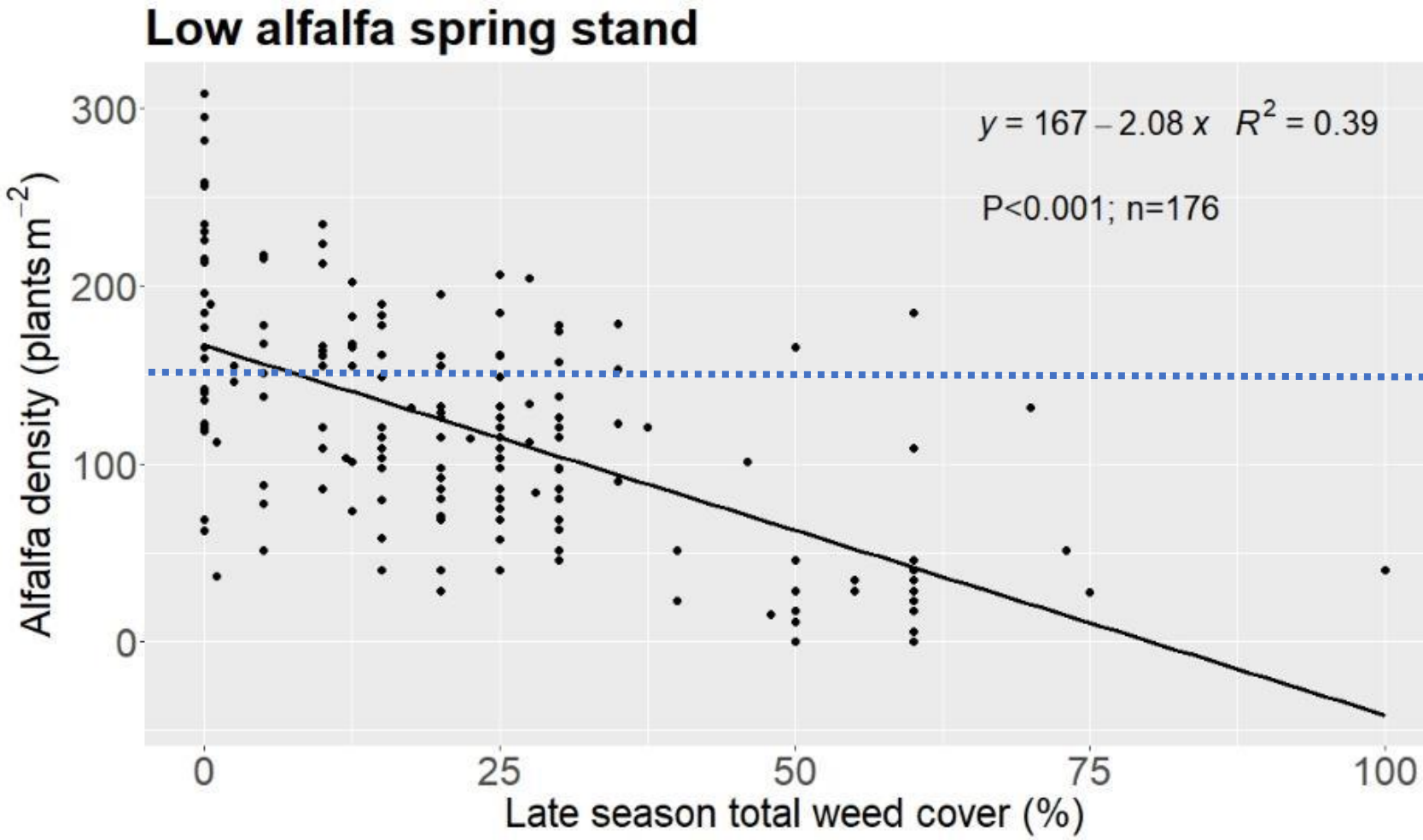
- Response varied by initial (spring) alfalfa establishment
  - fields with **poor spring alfalfa stand (≤150/m²) had reduced corn yield**
    - 1.7 % reduction for every 10% increase weed cover
- When no weeds present interseeded system reduced corn silage yield
  - Low: 7.5%
  - High: 15.7%



Do weeds reduce alfalfa establishment?

Low alfalfa establishment: alfalfa fall density decreased by 21 plants m^{-2} for every 10% increase in weed cover ($p<0.01$)

High alfalfa establishment: NS ($p=0.1952$)



Conclusions

- Weeds control is challenging but options exist
  - Manage difficult to control weeds prior to planting
  - Utilize the benefit of the perennial crop for weed control
  - Work with industry to research/label herbicides (>5 years)
  - 100% weed control may not be needed to optimize yield

- Realize that system is not going to be like monocrop
  - Won’t fit in all locations/environments
  - Expect some yield loss
  - Need to change producer expectations to ensure adoption

Other factors may limit effectiveness/adoption……..