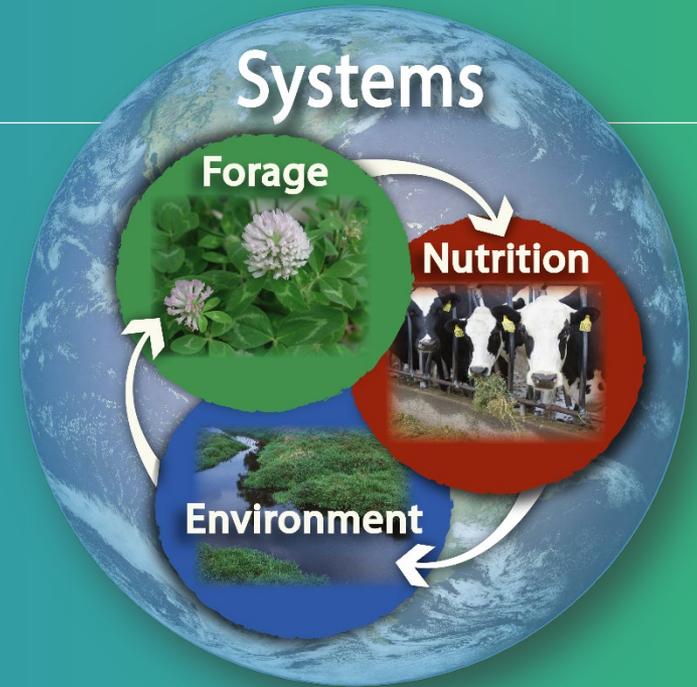




United States Department of Agriculture

Alfalfa Interseeding in Corn Silage



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Corn silage and alfalfa are often grown in rotation to provide forage for livestock, but low yields of spring-seeded alfalfa reduce profitability

(rotation: corn – corn – spring seeded alfalfa – alfalfa – alfalfa)



Forage dry matter yields

Corn silage: 9 t per acre

Established alfalfa: 5 t per acre

Spring seeded alfalfa: 2.5 t per acre



Excessive corn silage production also causes problems...

- **High risk of soil and nutrient loss**
- **Without crop rotation, corn silage yields decline and input costs for fertilizer and pesticides increase**



Goal: Interseed alfalfa into corn to protect soil and jumpstart full alfalfa production the following year

- Alfalfa planted into corn interrows
- Corn silage harvested, alfalfa remains as a cover crop
- Following year(s) alfalfa harvested as a forage crop



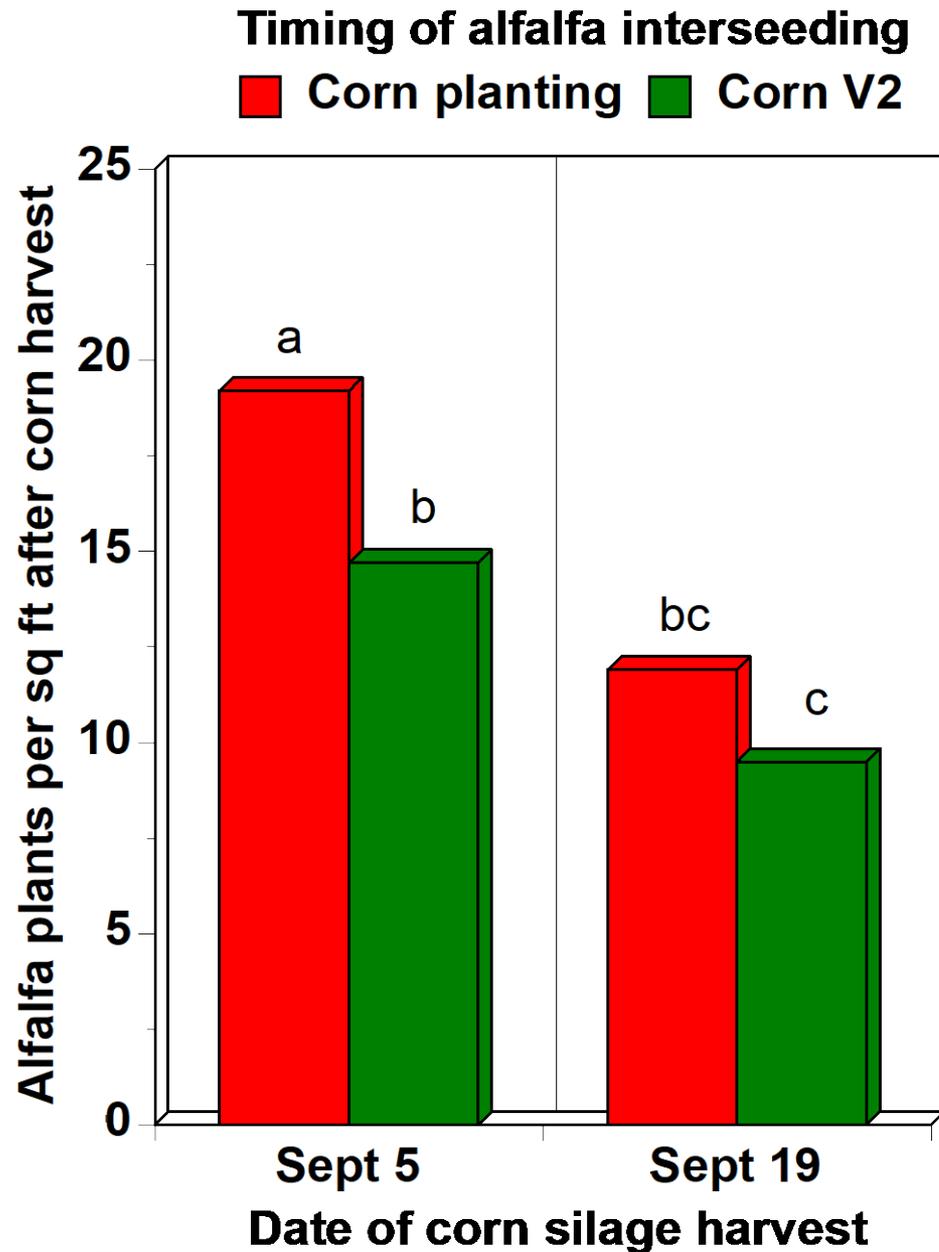
Problem: Interseeded alfalfa is prone to stand failure



Three steps to ensure survival of interseeded alfalfa...

Three steps to ensure alfalfa survival

1. Interseed alfalfa soon after corn planting and harvest corn early



Treatments with unlike letters differ at $P = 0.05$

Three steps to ensure alfalfa survival

1. Interseed alfalfa soon after corn planting and harvest corn early
2. Apply “plant protection” products such as prohexadione, fungicide & insecticide to interseeded alfalfa

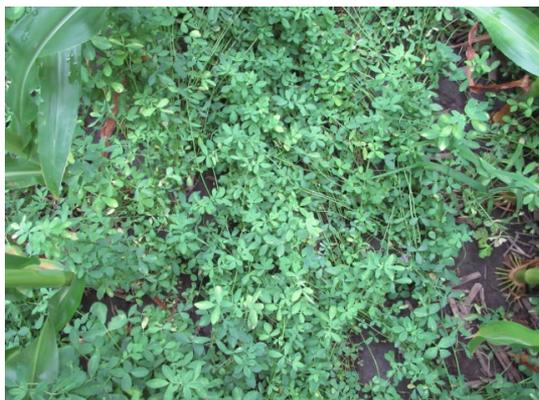


July

August

October

Control



Prohexadione

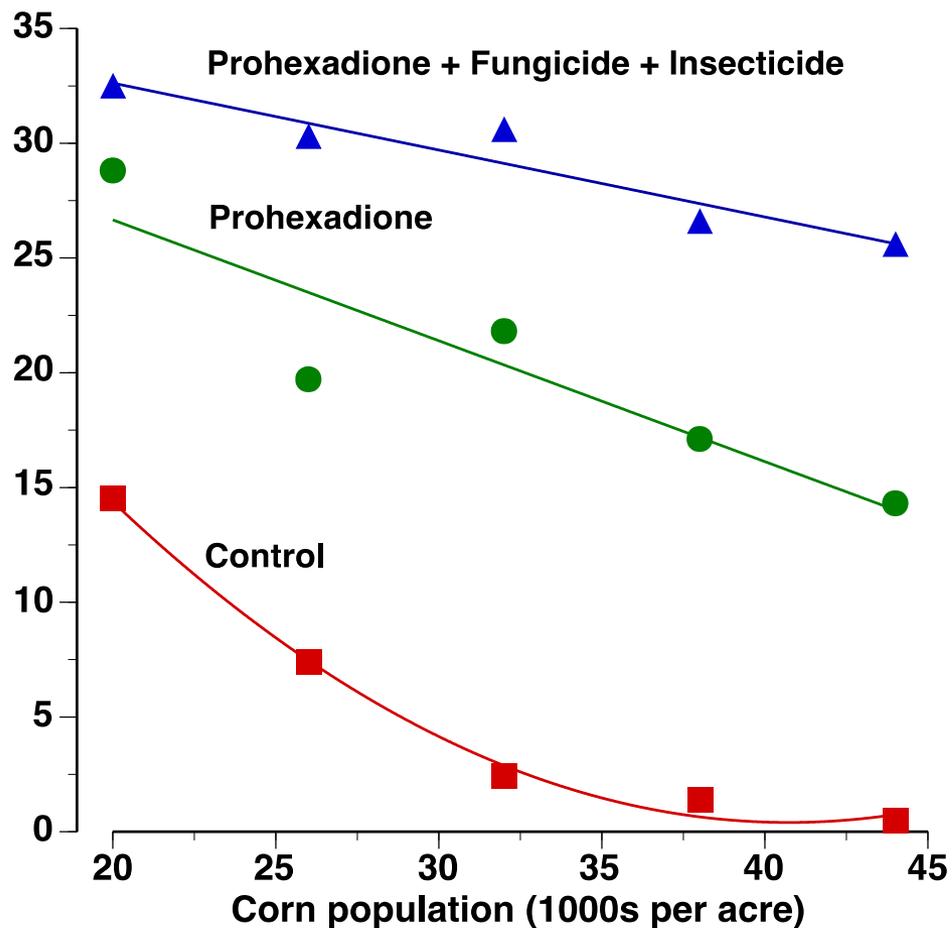


**Prohexadione
+ Fungicide +
Insecticide**

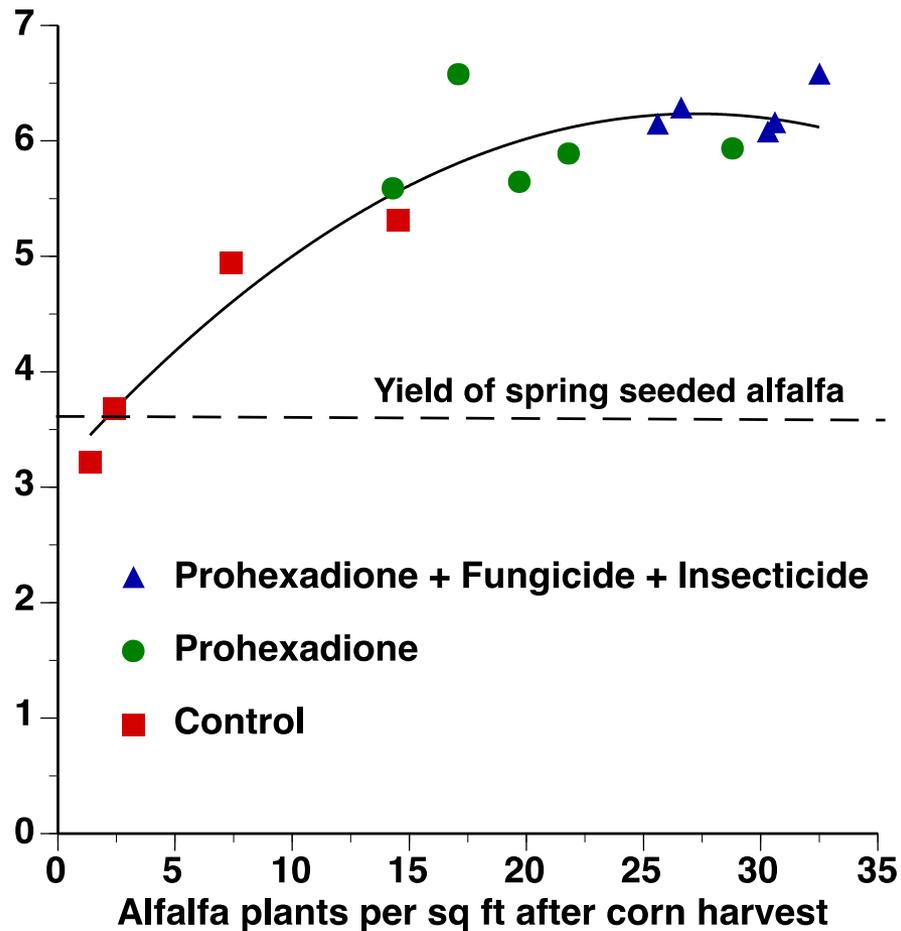


Impact of agrichemical applications and corn population on survival of interseeded alfalfa in 2017 and 1st year yield in 2018

2017 Alfalfa plants per sq ft after corn harvest

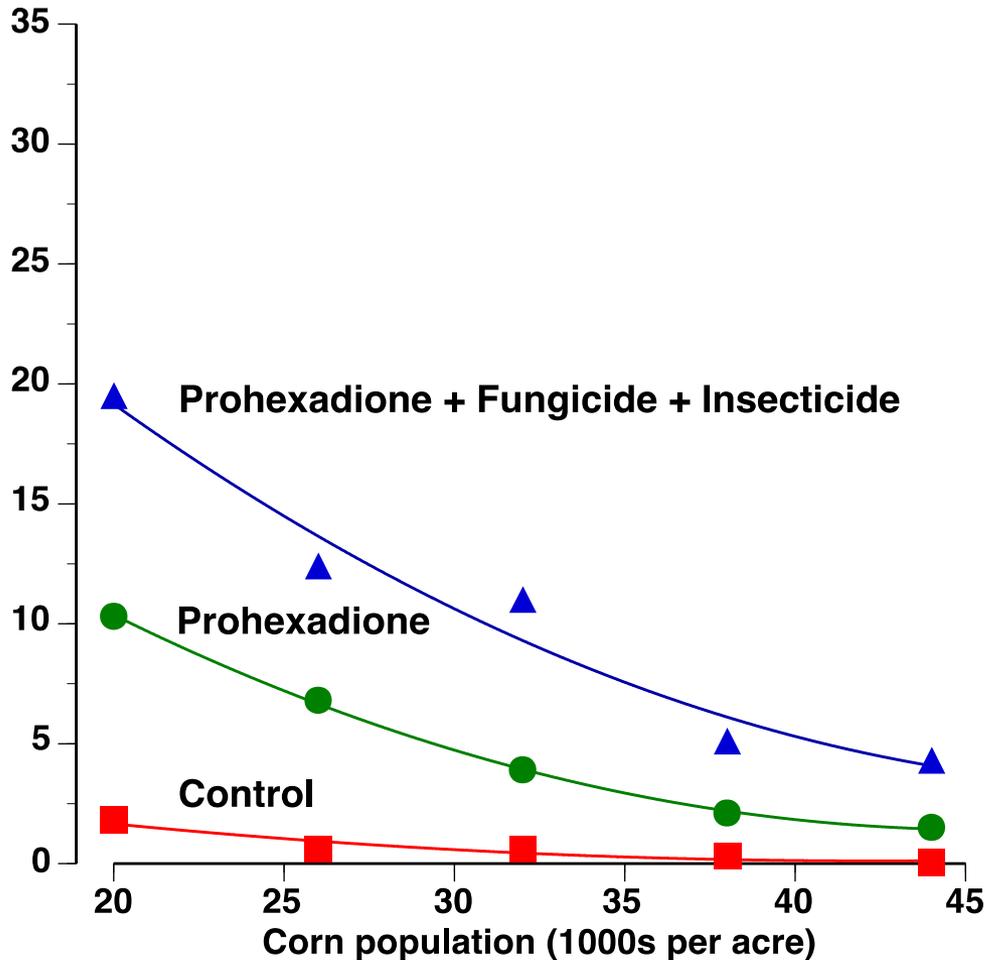


2018 Alfalfa tons per acre dry matter yield



Impact of agrichemical applications and corn population on survival of interseeded alfalfa in 2018

2018 Alfalfa plants per sq ft after corn harvest



2019 alfalfa yield data will be summarized soon!

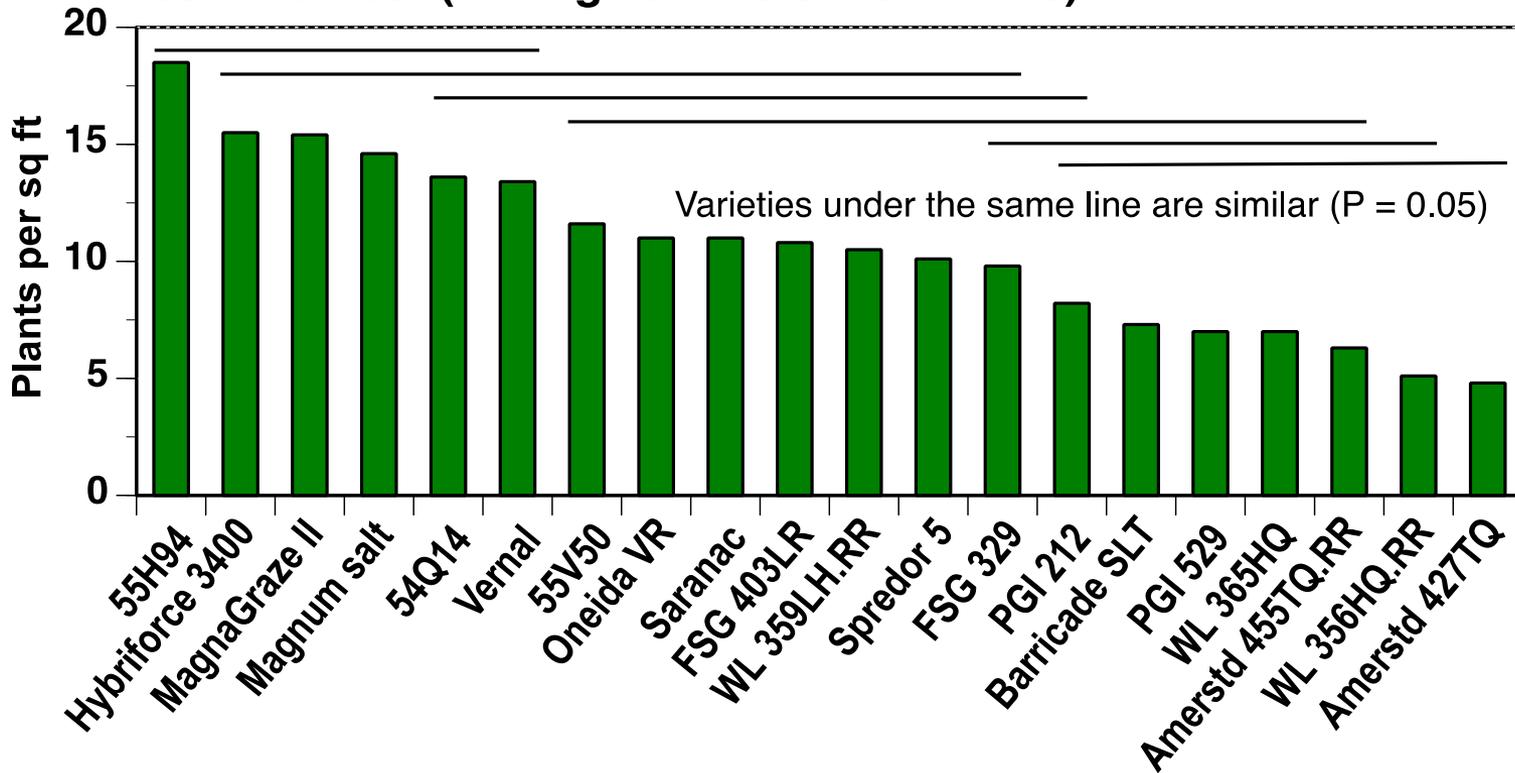
Registration status of prohexadione for use on alfalfa interseeded into silage corn

- Inter-Regional Research Project #4 (IR4) and Fine Americas Inc. submitted a product label to EPA in November 2018 for Kudos 27.5 WDG application on interseeded alfalfa
- Approved product label anticipated for the 2020 growing season

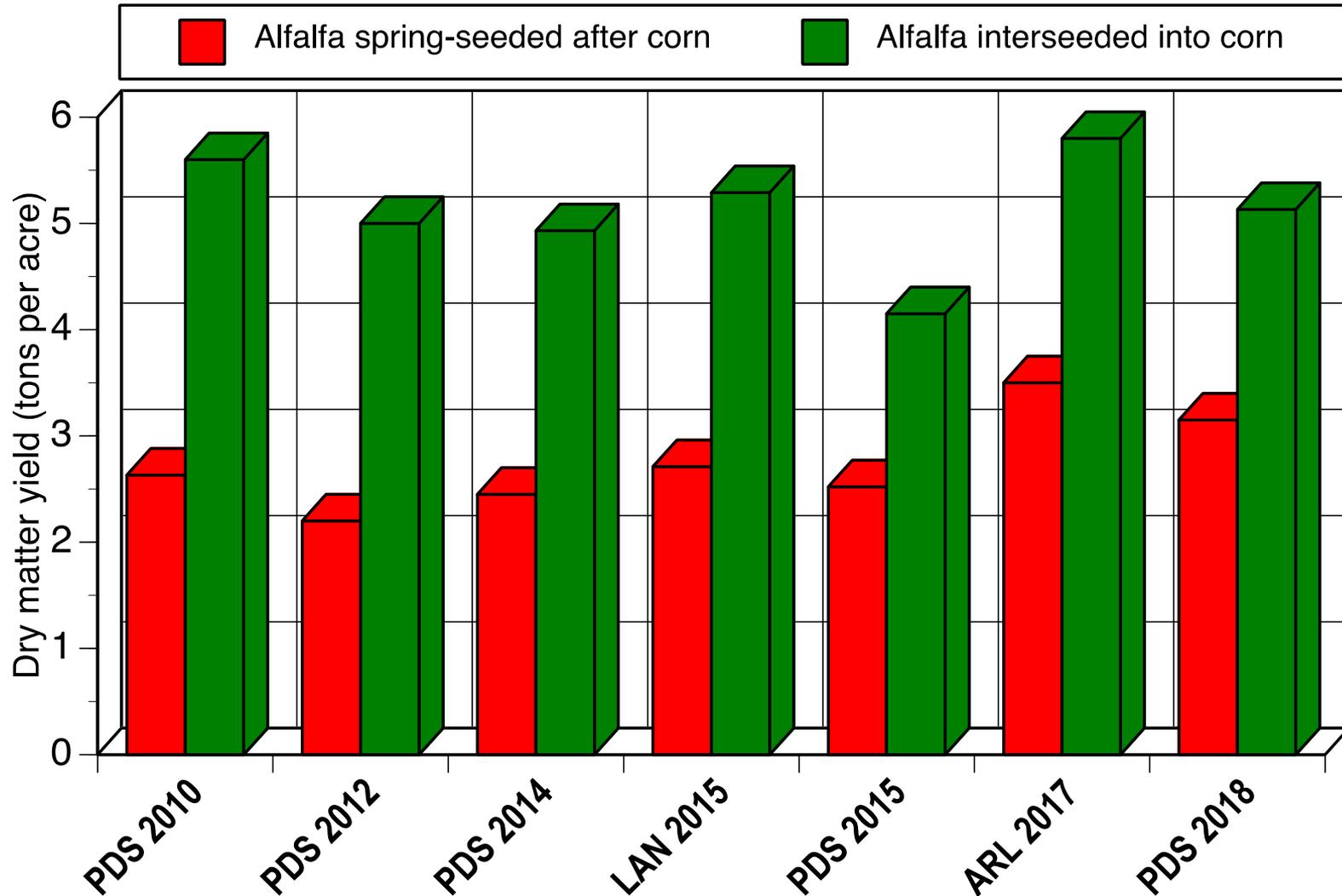
Three steps to ensure alfalfa survival

1. Interseed alfalfa soon after corn planting and harvest corn early
2. Apply “plant protection” products such as prohexadione, fungicide & insecticide to interseeded alfalfa
3. Interseed adapted alfalfa varieties

Stand density of prohexadione-treated alfalfa varieties after corn harvest (average of two sites in 2015)



Successful establishment by interseeding roughly doubles first year alfalfa yields

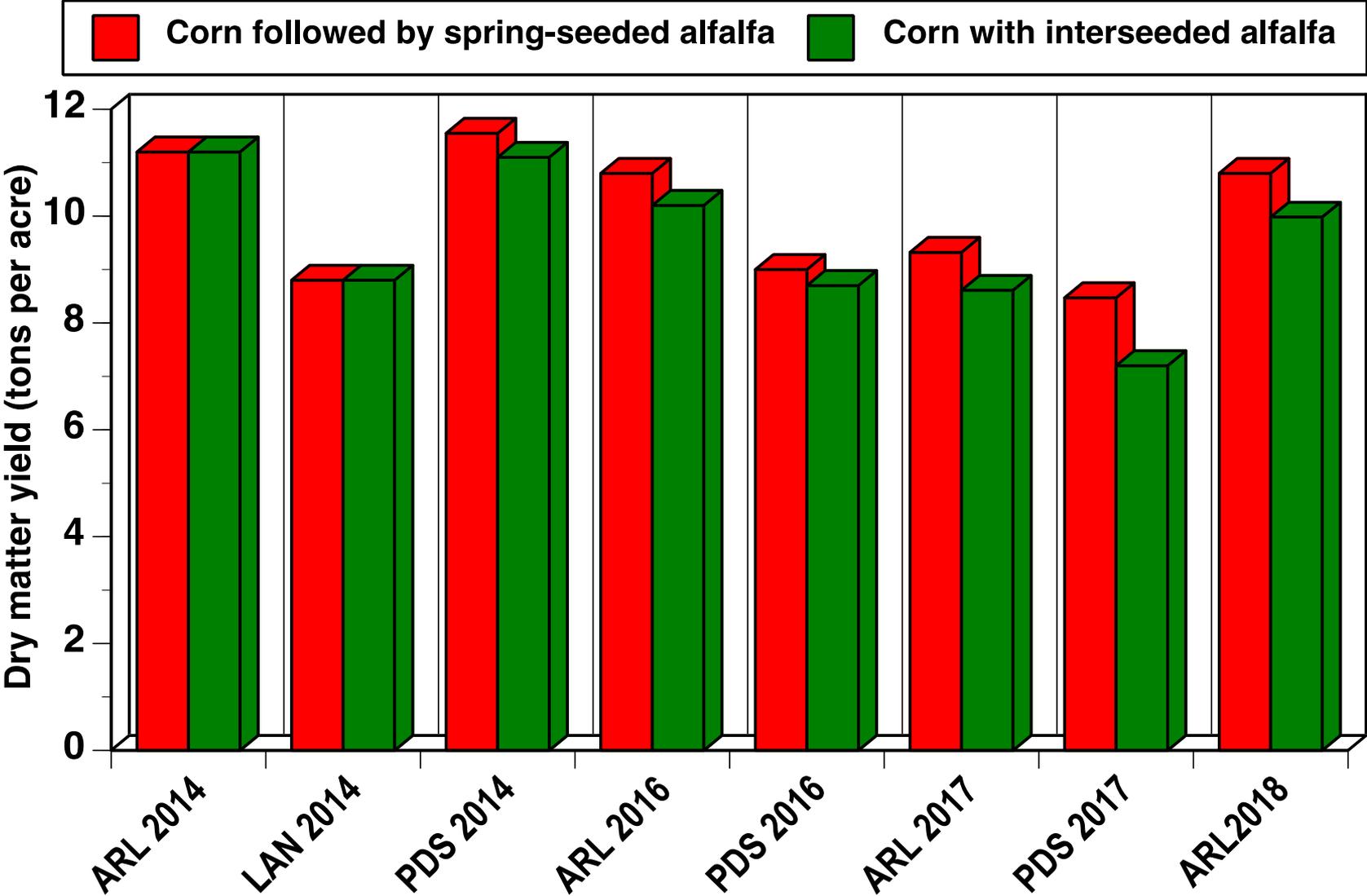


Treatments differ at $P = 0.05$

**Yields of corn silage
grown with interseeded
alfalfa**

Alfalfa interseeding effects on corn silage yields

200 lbs per acre nitrogen fertilizer applied

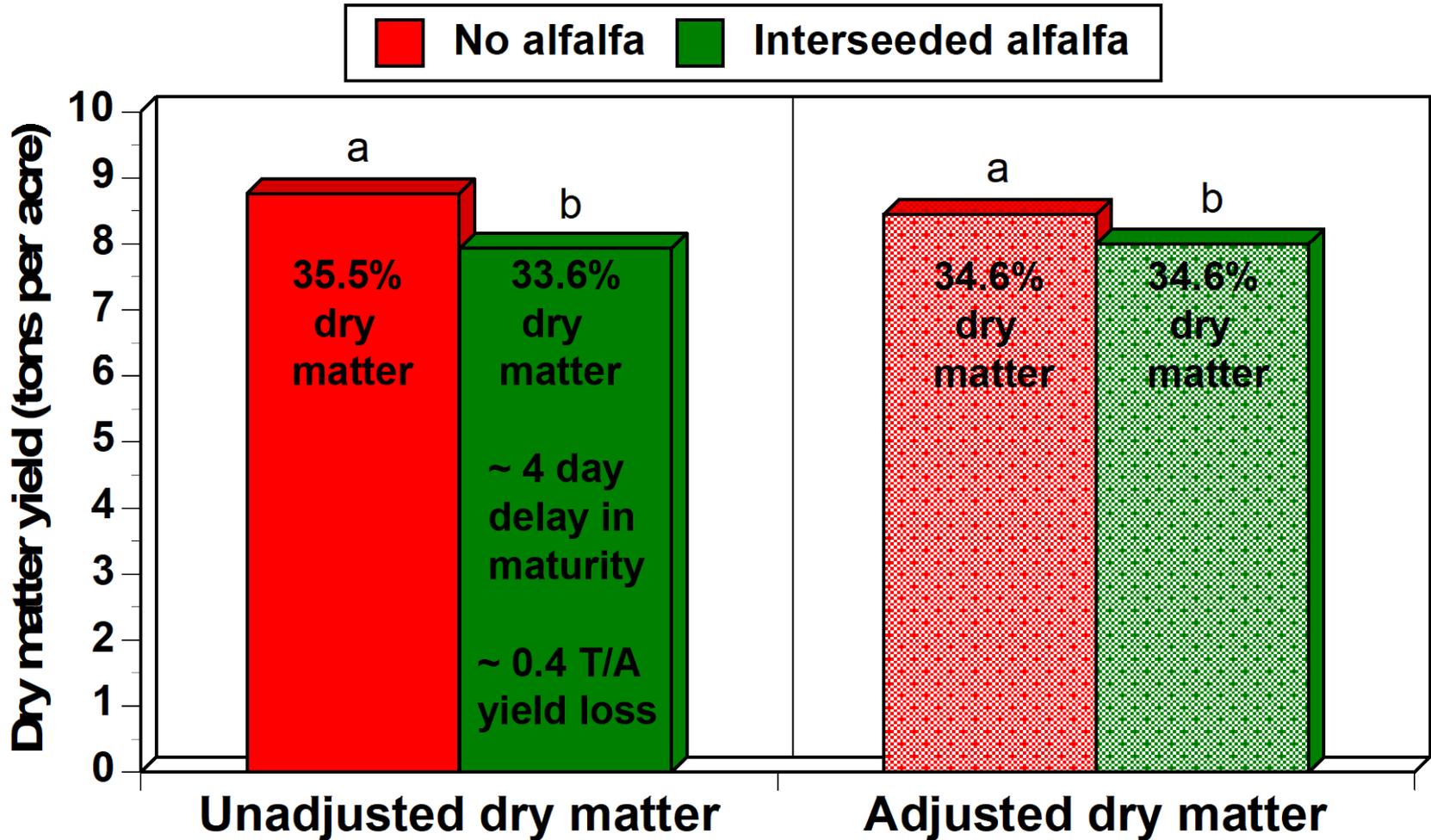


**Many factors probably
influence yields of corn silage
grown with interseeded alfalfa**

Some examples...

Dry matter content at harvest: Effects on corn silage yields

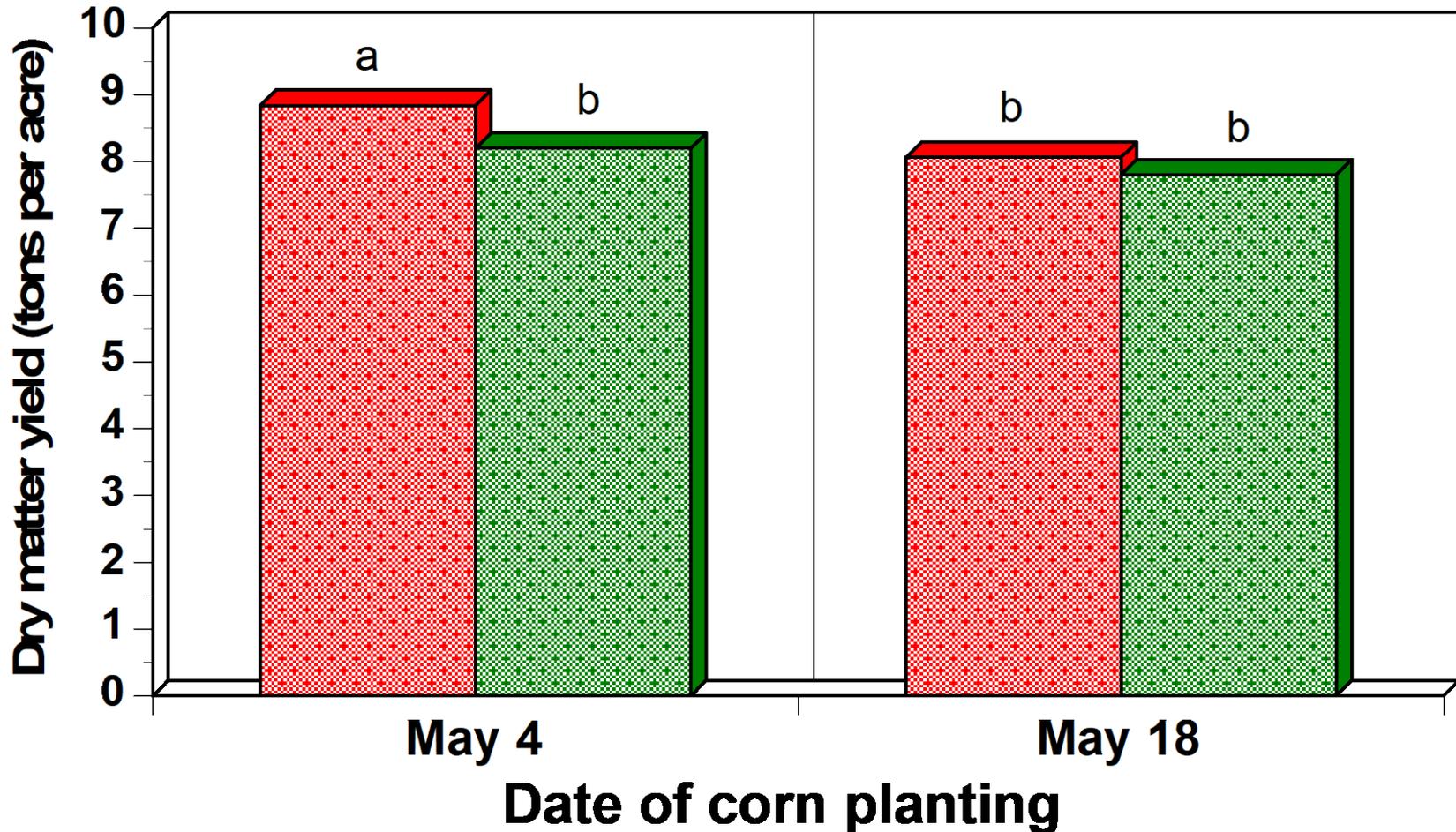
200 lbs per acre N applied at Prairie du Sac, Wisconsin 2017



Treatments with unlike letters differ at $P = 0.05$

Timing of corn planting: Effects on adjusted corn silage yields

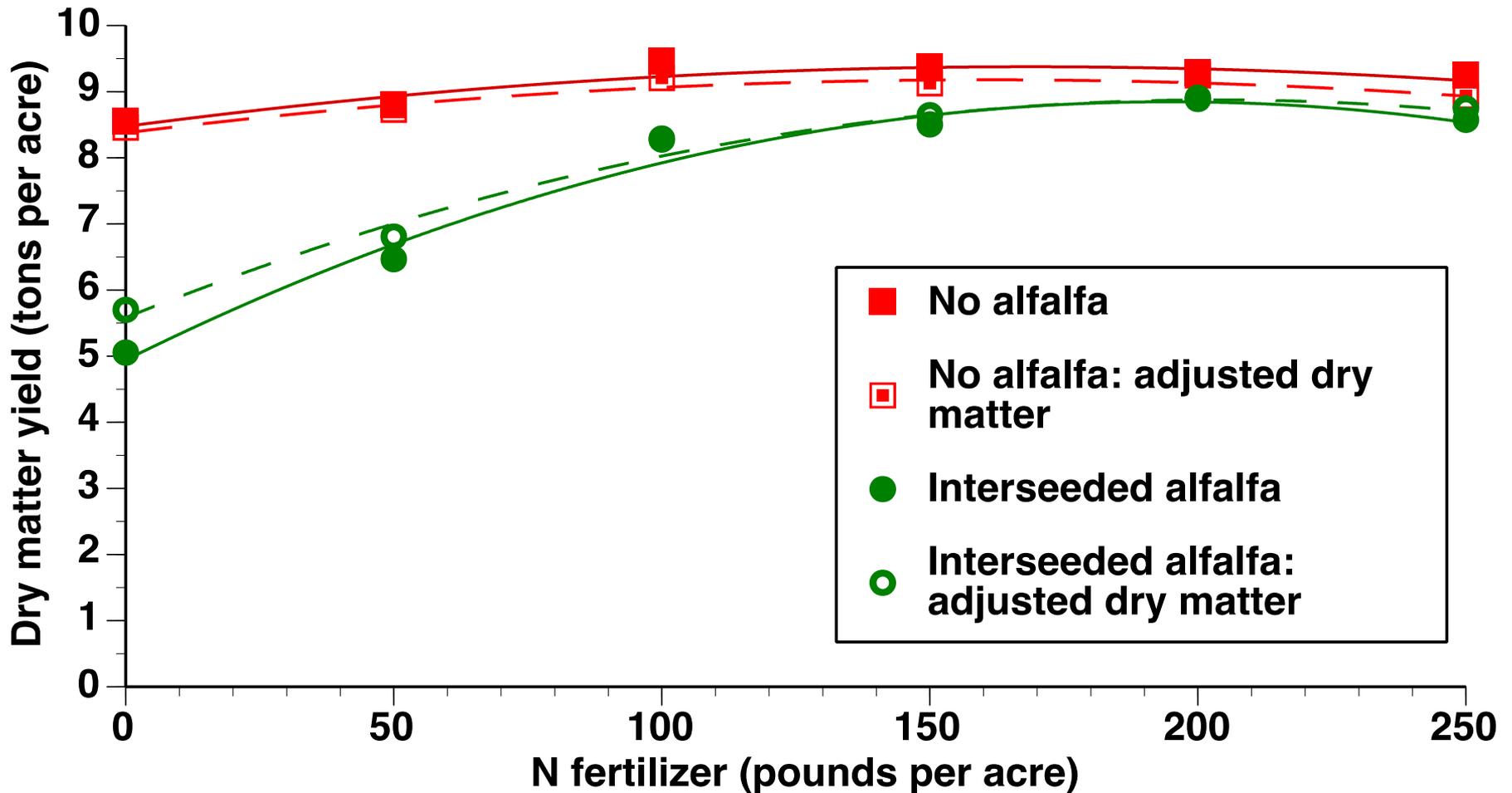
Prairie du Sac, Wisconsin 2017



Treatments with unlike letters differ at $P = 0.05$

Response of corn silage yield to nitrogen fertilizer

Arlington, Wisconsin planted May 15, 2017



**Is interseeded alfalfa an
effective cover crop?**

Establishing alfalfa by interseeding rather than conventional spring seeding reduces soil and nutrient loss from cropland

Reductions in runoff
due to interseeding
alfalfa in corn

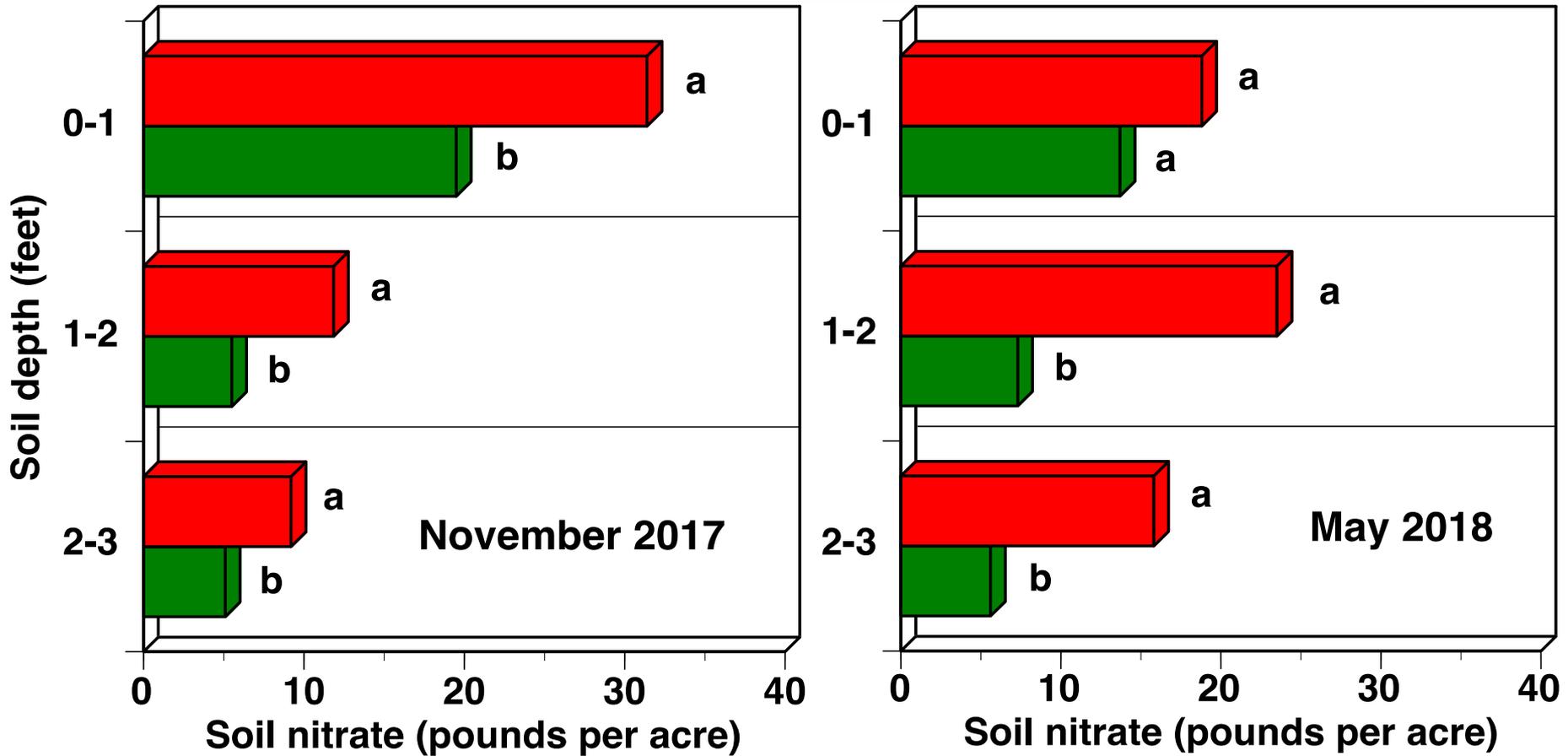
| Timing of runoff study | Soil | N | P |
|---|------|-----|-----|
| Early June during corn production | 45% | 23% | 36% |
| October after silage corn harvest | 86% | 72% | 62% |
| Following April before alfalfa production | 87% | 75% | 82% |



Residual soil nitrate after corn silage

Arlington, Wisconsin

■ Corn then spring-seeded alfalfa ■ Corn with interseeded alfalfa



Treatments with unlike letters differ at $P = 0.05$

**But will interseeding of
alfalfa be profitable?**

Average net return (\$ per acre) of a CS1-CS2-CS3/A1-A2-A3-A4 rotation as influenced by interseeding success rate and corn silage yield drag

| | | Success of alfalfa establishment by interseeding (%) | | | | | | | | |
|--------|----|--|-----|-----|-----|-----|-----|-----|-----|-----|
| | | 100 | 95 | 90 | 85 | 80 | 75 | 70 | 65 | 60 |
| Corn | 0 | 159 | 157 | 155 | 152 | 150 | 147 | 145 | 143 | 140 |
| silage | 5 | 153 | 151 | 149 | 146 | 144 | 142 | 139 | 137 | 135 |
| yield | 10 | 147 | 144 | 142 | 140 | 138 | 136 | 134 | 131 | 129 |
| loss | 15 | 141 | 138 | 136 | 134 | 132 | 130 | 127 | 125 | 123 |
| (%) | 20 | 134 | 132 | 130 | 128 | 126 | 124 | 122 | 119 | 117 |
| | 25 | 128 | 126 | 124 | 122 | 120 | 118 | 116 | 114 | 112 |

Net return of rotation with spring seeded alfalfa = \$130 per acre per year

Potential problems with interseeding



Wheel traffic damage of interseeded alfalfa

**Wet soil conditions
at corn silage harvest
in early September**



**Stand recovery
by mid October**



Photos by Brad Holtz

Ongoing work

- **Best rates and timing for prohexadione, fungicides, insecticides, and herbicide application**
- **Optimal planting and harvest management**
- **Long-term survival and yield of interseeded alfalfa**
- **Corn hybrid selection**
- **Fertilizer and manure management**
- **Breeding alfalfa for improved interseeding survival**
- **Evaluate success of the interseeding system in different states**
- **Promote alfalfa interseeding to producers, industry, NRCS, crop insurance...**

USDA-NIFA grant project in 2018 and 2019 will be “Identifying Factors to Optimize Establishment of Alfalfa Interseeded in Corn”

- **Investigators: Mark Renz and Will Osterholz (Univ. of Wisconsin), John Grabber and Dave Bjorneberg (USDA-ARS in Wisconsin & Idaho), Kim Cassida and Erin Burns (Michigan State Univ.), and Jessica Williamson (Penn State Univ.)**
- **Some key findings thus far....**
 - **Seedbed must be suitable for alfalfa establishment**
 - **Weed control best with Roundup-ready production system**
 - **Agrichemicals (prohexadione etc) improved alfalfa establishment more in WI than in other states**



NAFA-Alfalfa checkoff grant project in 2020 and 2021: “Forage Production of Alfalfa Established in Silage Corn vs. Conventional Production Systems”

- **Investigators: John Grabber (Wisconsin) and Dave Bjorneberg (Idaho)**
- **Objectives:**
 - **Evaluate the timing of corn planting, alfalfa interseeding, and corn harvest on corn silage yield and 1st year alfalfa forage yield and quality**
 - **Compare yield and quality of interseeded alfalfa systems to several conventional alfalfa production systems used in Wisconsin and Idaho**



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QUESTIONS?

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