IMPACT OF COVER CROPS ON SOYBEAN INSECT MANAGEMENT

A. Whalen, A. Catchot, J. Gore,
D. Cook, T. Irby, R. Brown, and B. Barton

Agronomic Benefits

Cover Crops and Pests

- **Cover crops of wheat, rye, and alfalfa and residue cover increased seedcorn maggot and slug infestations in Ohio soybean (Hammond and Stinner 1987).**

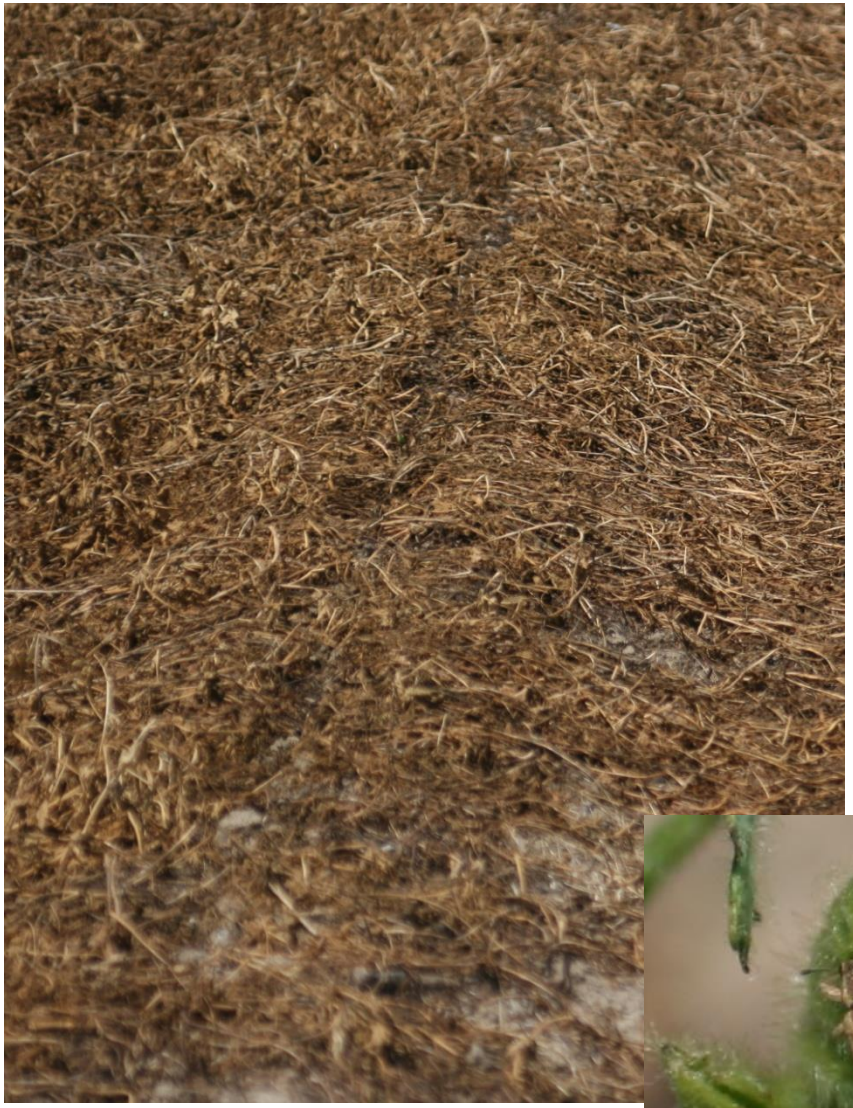
- **Bean leaf beetle and Japanese beetle populations increased with the use of a rye cover crop before soybean in Ohio (Smith et al 1988).**

- **Pea leaf weevil outbreak in Mississippi Delta soybean seed treatment trials and Arkansas soybean fields in 2014 following hairy vetch and Austrian winter peas.**

Pea Leaf Weevil (*Sitona lineatus*)

- Defoliating pest associated with soybean following a winter legume cover crop.
- Adult beetles measure 5 mm. long and are gray-brown in color.
- Adults feed on leaves of legumes; larvae feed on nodules.
- Can be controlled with labeled insecticides but continue to emerge from cover crop residue resulting in multiple applications.
- Seed treatments can help prevent total crop loss.

Pea Leaf Weevil Soybean Damage



Pea Leaf Weevil in Arkansas

DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

New weevil gnawing at Arkansas soybeans

Fast Facts:

Pea weevils confirmed in Arkansas

Pea weevils hitched ride on Austrian field peas used as cover crop

Weevils limited to Phillips County

MARVELL, Ark. -- Arkansas soybean growers are facing a new enemy -- the pea weevil -- an insect that hitched a ride from Europe in a legume used as a cover crop.

So far, the pea weevil's presence is limited to just a few fields south of Marvell in Phillips County where Austrian winter field peas had been used as a winter cover crop. Farmers use cover crops to prevent erosion, hold moisture and add nutrients to the soil. The field peas, being legumes, help add nitrogen to the soil, thanks to a friendly bacteria living in the plant roots that fix nitrogen from the atmosphere.

The pea weevils have also been found in Louisiana and Washington State. In all three instances, **"this pest situation is strictly related to this cover crop,"** said Gus Lorenz, extension entomologist with the University of Arkansas System Division of Agriculture. "We're introducing a problem with the cover crops." "It appears that the weevil is a legume feeder," he said. "The immature form feeds on the nitrogen fixing....

Objective

Determine the efficacy of various chemical and cultural control practices on insect pests of soybean following cover crops

Materials and Methods

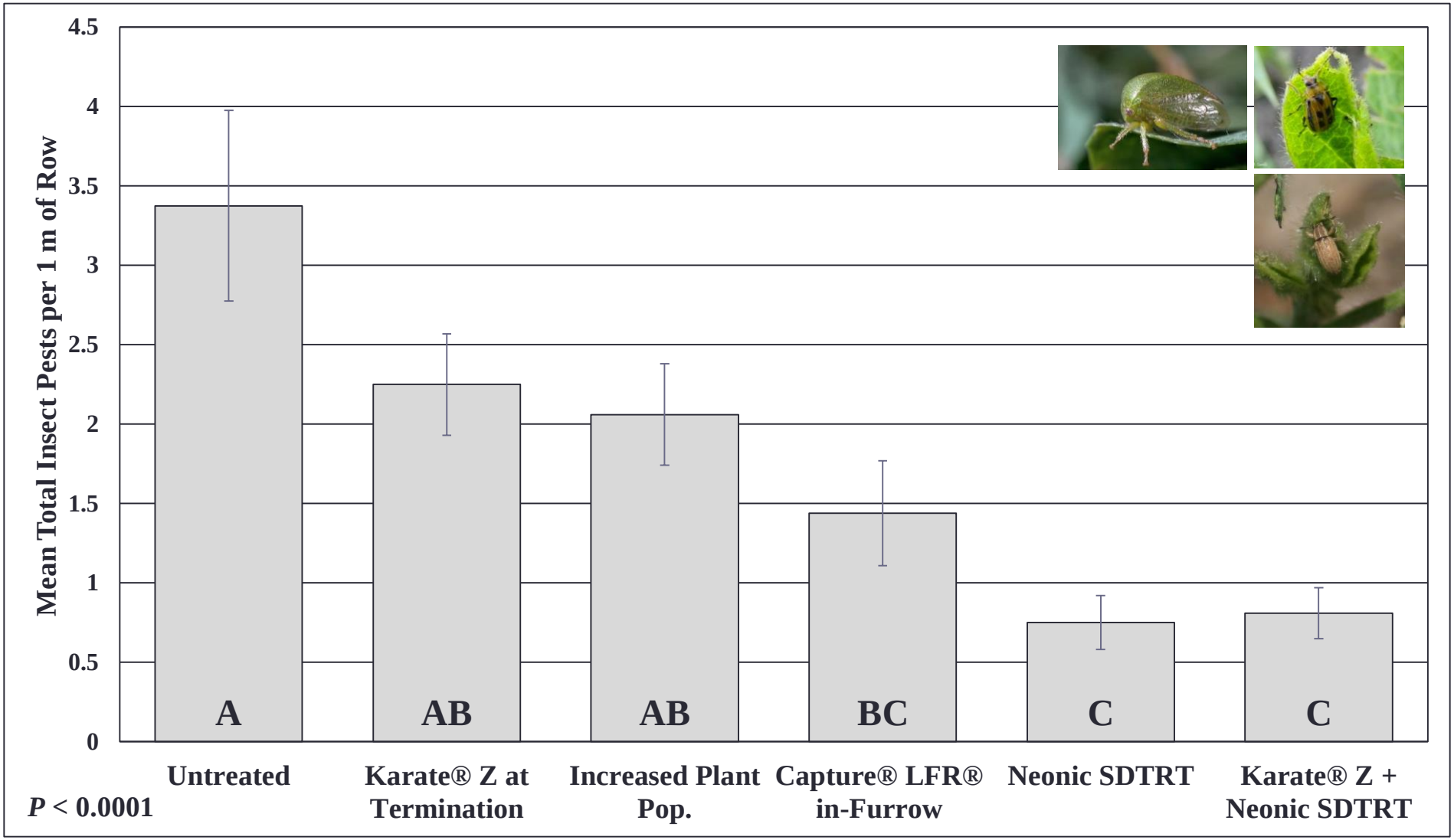
Cover crop treatments:

- Cover crop blend of tillage radish, Austrian winter pea\hairy vetch, and triticale
- Naturally occurring winter vegetation

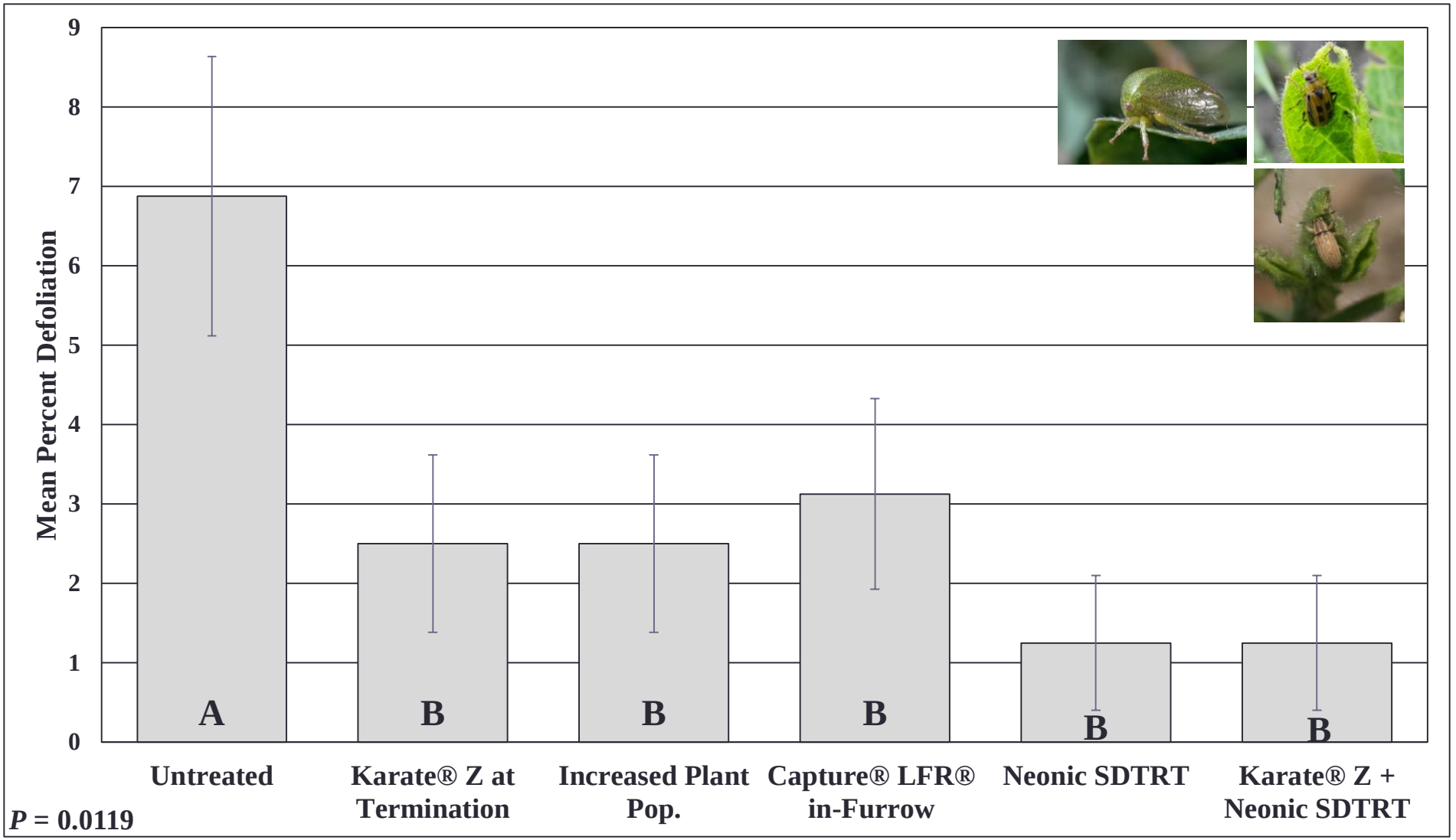
Chemical and cultural control treatments:

Treatment	Application Description
Untreated	Fungicide only treated seed
Karate Z Termination Spray	Foliar application of Karate Z (lambda-cyhalothrin) during cover crop termination
Neonic SDTRT	Neonicotinoid seed treatment on soybean seed at planting
Karate Z + Neonic SDTRT	Foliar application during cover crop termination + seed treatment on soybean seed at planting
Capture Infurrow	In-furrow insecticide spray application of Capture (bifenthrin) at planting
Higher Plant Pop.	Increased seeding rate of 165,000 plants/acre

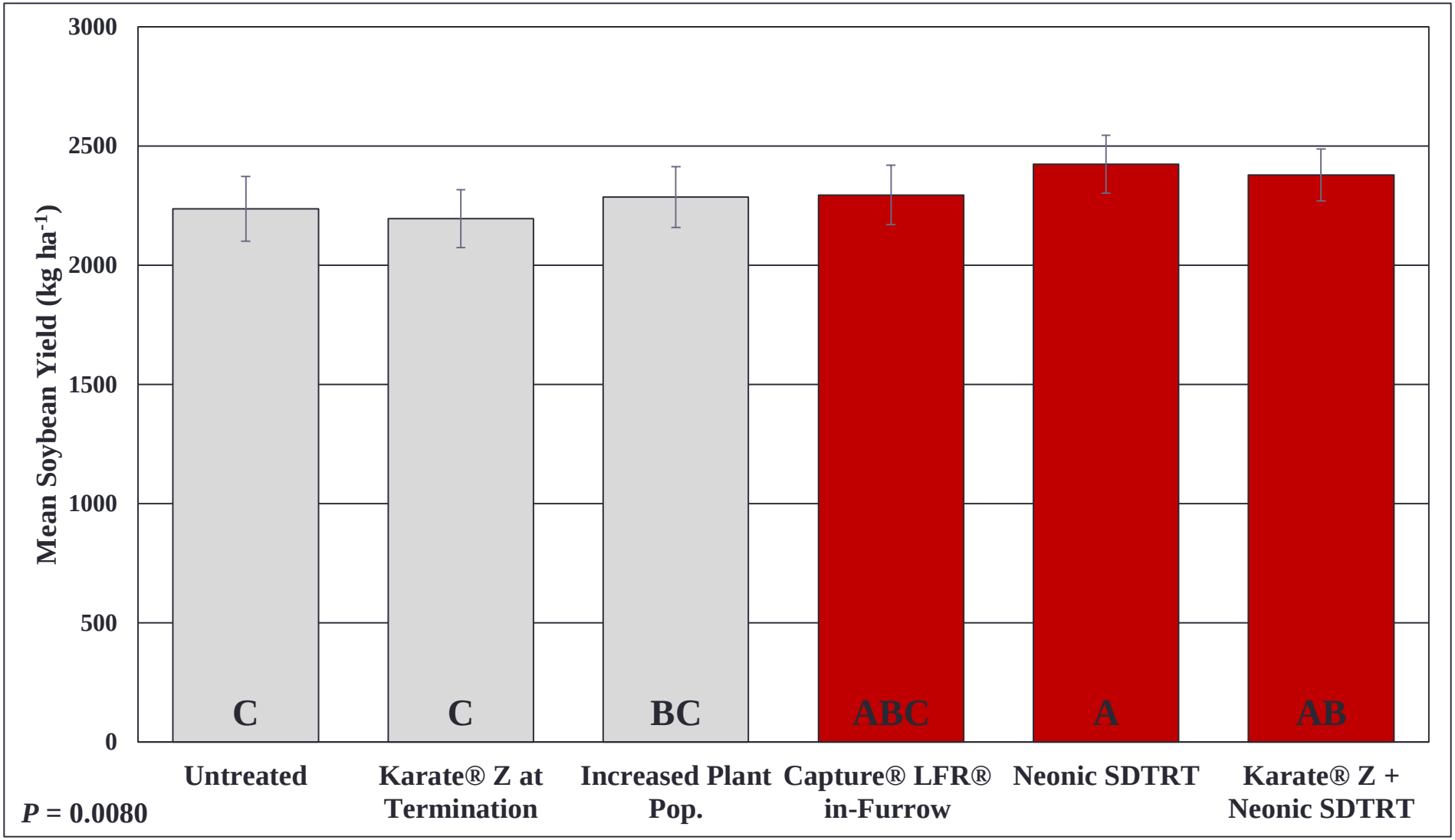
Mean Total Insect Pest Visual Counts for each Control Method



Mean Defoliation Damage for each Control Method



Mean Soybean Yield for each Control Method



Objective

Determine how neonicotinoid seed treatments and termination date of cover crops affects insect damage in soybean following cover crops

Materials and Methods

Cover crop treatments:

- Cover crop blend
- Winter wheat
- Natural winter weeds

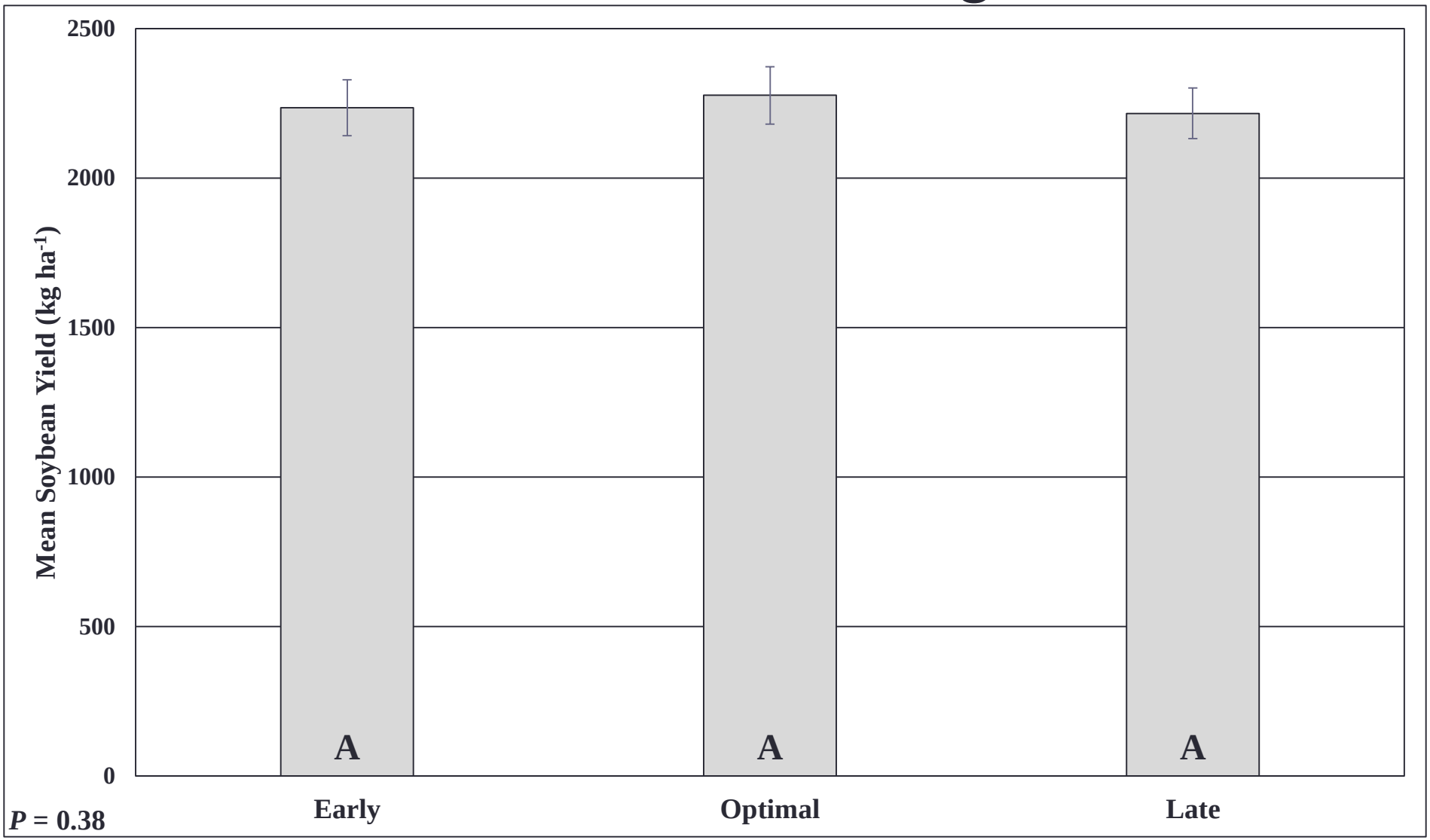
Soybean seed treatments:

- Neonicotinoid seed treatment
- Fungicide only seed treatment

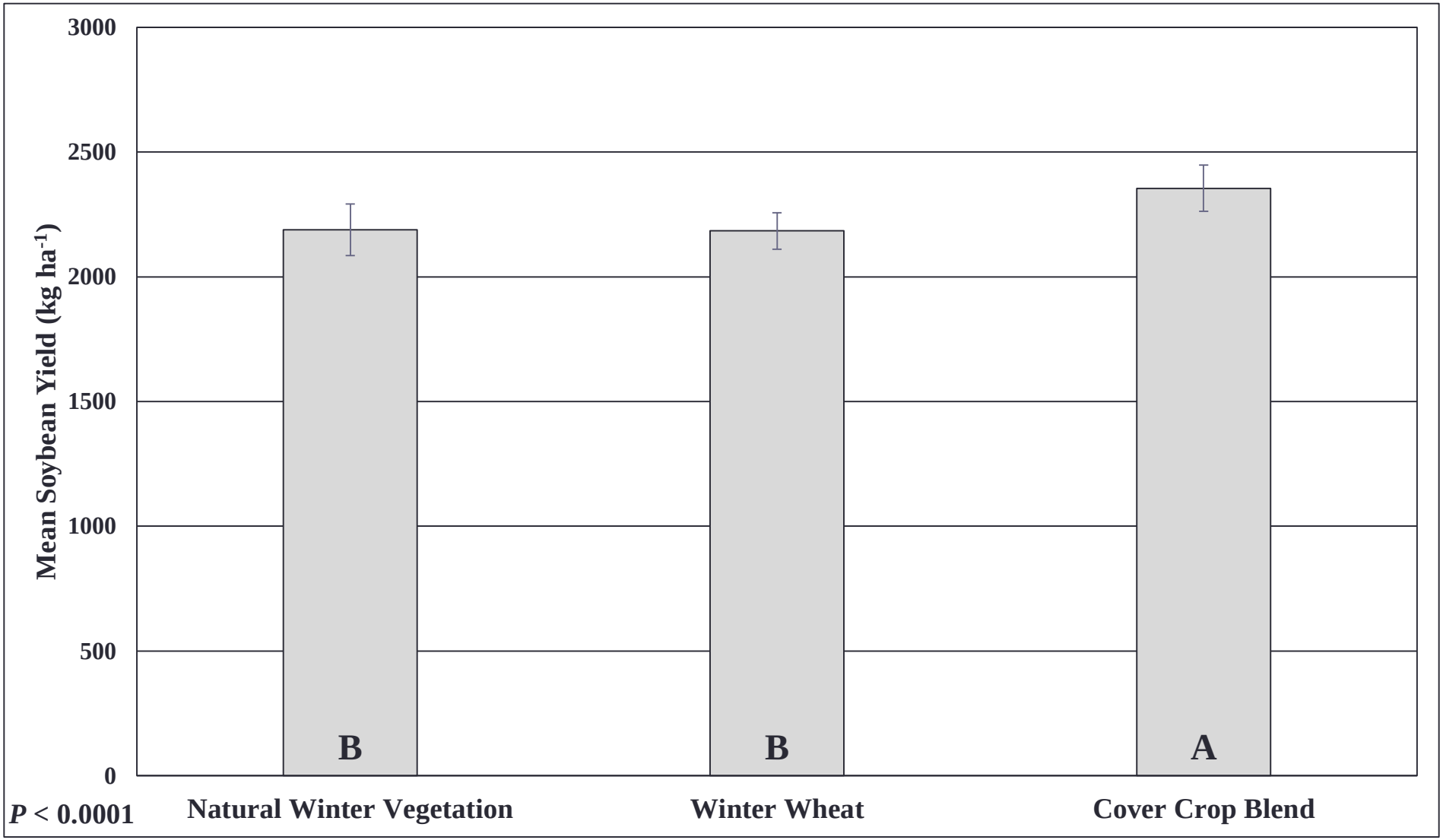
Burndown timing treatments:

Treatment	Application Description	Burndown Window	Planting Window
Early Burndown	6 weeks before planting	March 28 - April 1	May 9-13
Optimal Burndown	4 weeks before planting	April 11-15	May 9-13
Late Burndown	2 weeks before planting	April 25-29	May 9-13

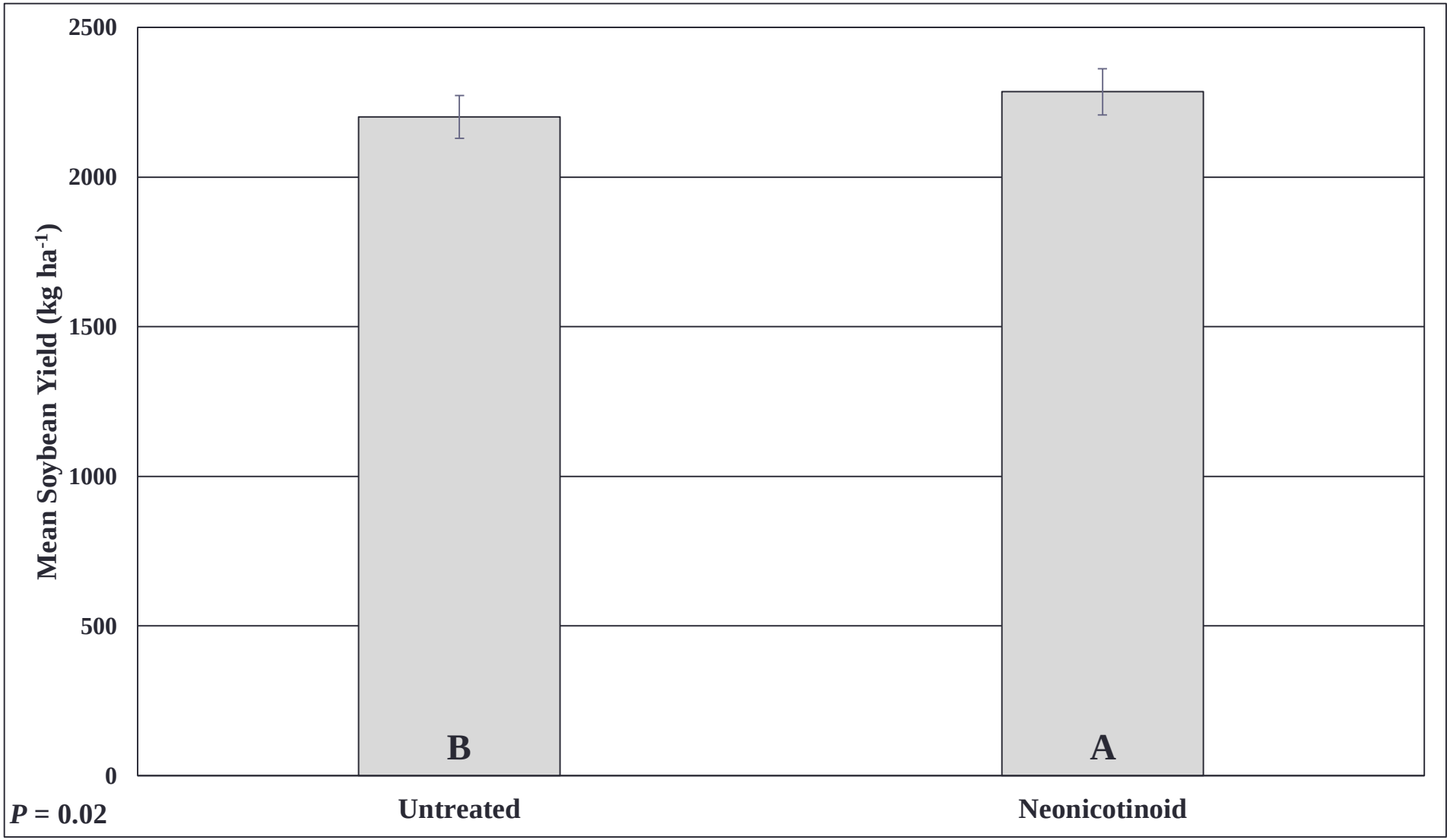
Mean Soybean Yield for each Termination Timing



Mean Soybean Yield for each Previous Cover Type



Mean Soybean Yield for each Seed Treatment



Objective

Determine how various cover crop treatments affect arthropod diversity in Mississippi soybean

Materials and Methods

- **Cover crop treatments:**
  - **Winter wheat**
  - **Triticale**
  - **Austrian winter pea**
  - **Hairy vetch**
  - **A blend of tillage radish, Austrian winter pea/hairy vetch, and triticale**
  - **Naturally occurring winter weeds**

Materials and Methods

- Both cover crops and soybean were sampled for arthropod diversity.
- Sampling methods included:
  - Sweeping cover crops before termination (4 siteyears)
  - Sweeping soybean plots starting at R1 (4 siteyears)
  - Pit-fall trapping soybean plots (3 siteyears)
- All insects and spiders captured were identified to family.
- Capture data was used to determine the mean Shannon Entropy Index and Family Richness of each treatment combination.

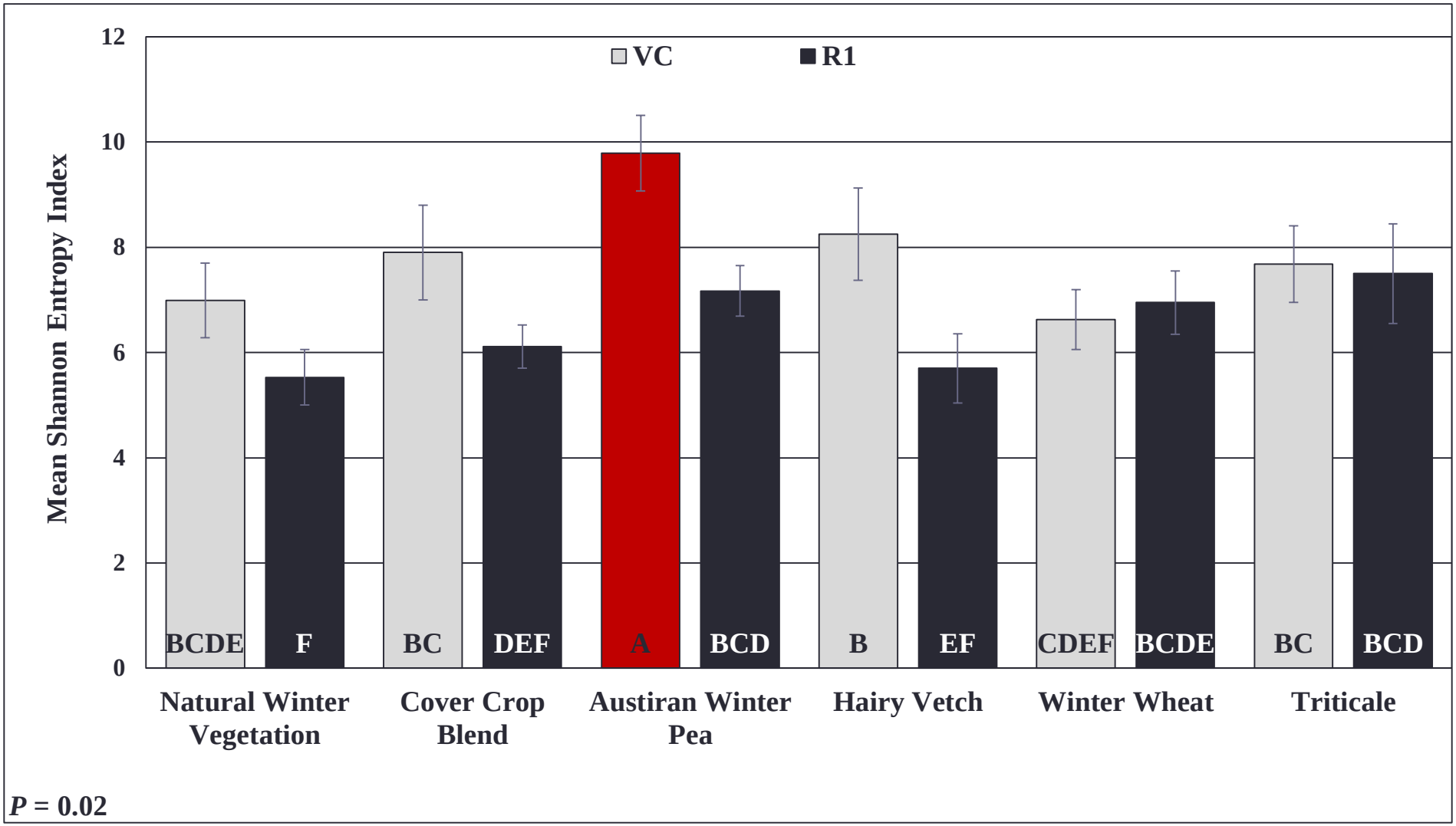
Pitfall Trap Results for Cover Crop Study

- 6 Cover Treatments
- 2 Growth Stages: VC & R1

- Total of 14,504 insects and spiders collected from all plots at all locations over both years.
  - Insecta: 10,875 (74.98%)
  - Araneae: 3,629 (25.02%)

- 9 orders, 46 families collected.

Mean ENS for the Epigeal Community of each Previous Cover Type and Soybean Growth Stage



Major Families Collected over all Cover Types and Treatments (>1% of the Overall Total Catch)

Insect Families	Number	% of Total Catch
Formicidae	2,826	33.64%
Gryllidae	721	8.58%
Staphylinidae	506	6.02%
Carabidae	502	5.98%
Anthicidae	454	5.40%
Phoridae	319	3.80%
Latridiidae	130	1.55%
Nitidulidae	115	1.37%
Sciaridae	99	1.18%
Cydnidae	94	1.12%

Araneae Families	Number	% of Total Catch
Lycosidae	1,588	18.90%
Linyphiidae	492	5.86%

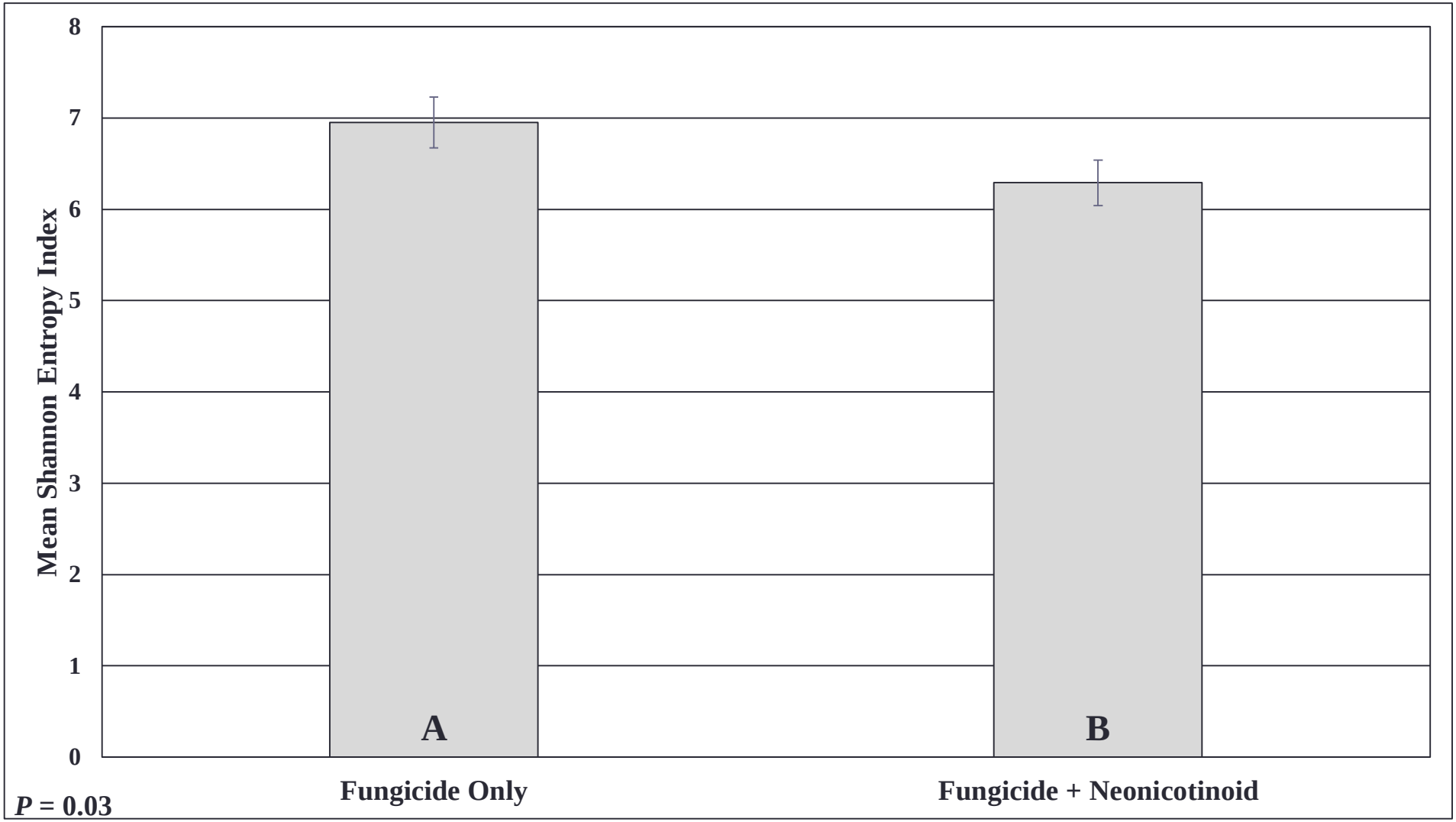
Minor Families Collected over all Cover Types and Treatments (<1% of the Overall Total Catch)

Insect Families	Number	% of Total Catch
Acrididae	81	0.96%
Elateridae	63	0.75%
Curculionidae	57	0.68%
Anisolabididae	56	0.67%
Ulidiidae	48	0.57%
Scarabaeidae	44	0.52%
Blissidae	34	0.40%
Platygastridae	32	0.38%
Chrysomelidae	26	0.31%
Pompilidae	25	0.30%
Membracidae	13	0.15%
Tetrigidae	11	0.13%
Corylophidae	10	0.12%
Geocoridae	10	0.12%
Mycetophagidae	9	0.11%
Reduviidae	6	0.07%
Noctuidae	5	0.06%
Cicadellidae	4	0.05%

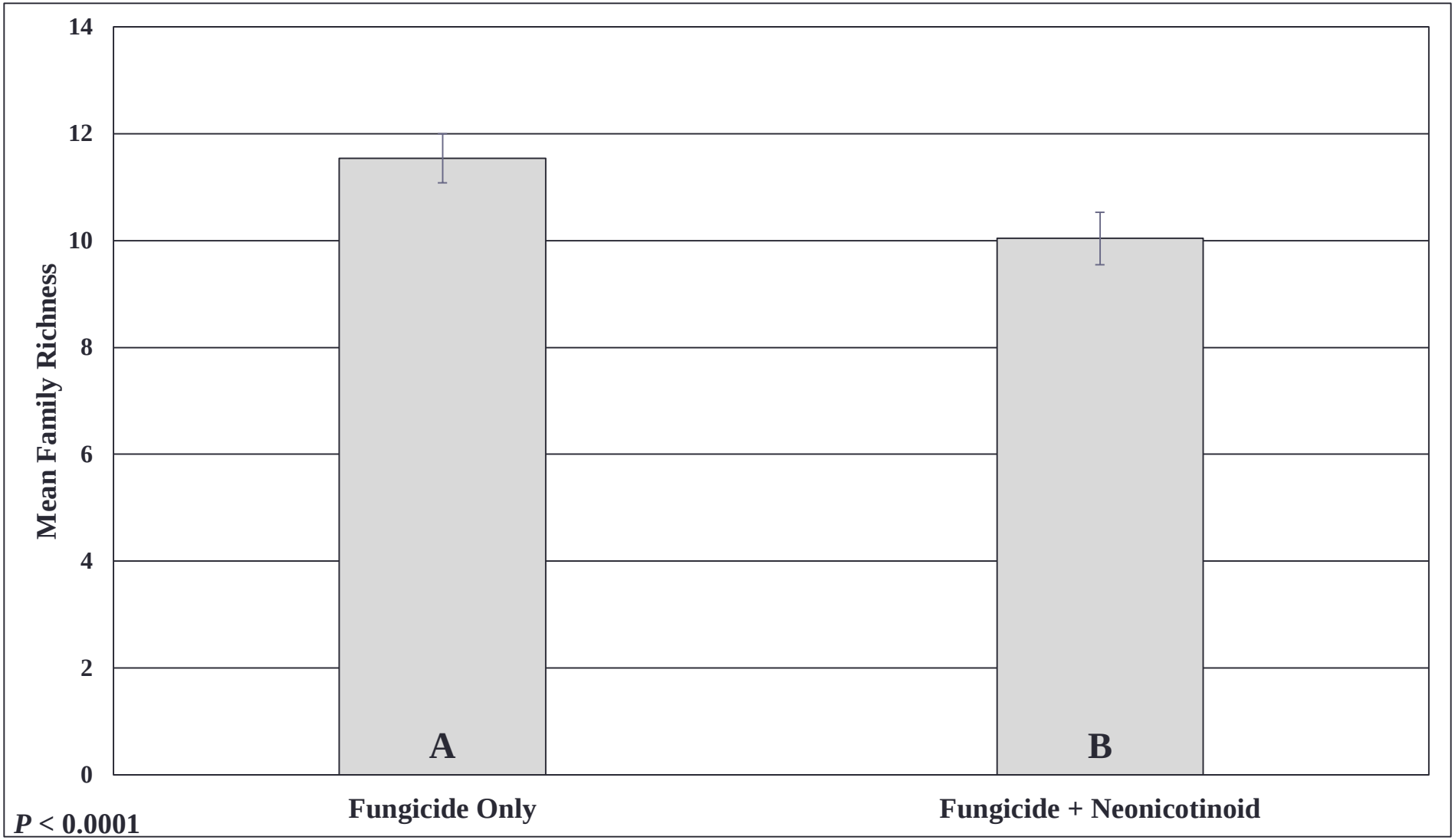
Insect Families	Number	% of Total Catch
Chrysopidae	3	0.04%
Pentatomidae	2	0.02%
Coreidae	2	0.02%
Coccinelidae	1	0.01%
Byrrhidae	1	0.01%
Miridae	1	0.01%
Anthocoridae	1	0.01%
Tridactylidae	1	0.01%
Dolichopodidae	1	0.01%
Tipulidae	1	0.01%
Ichneumonidae	1	0.01%

Araneae Families	Number	% of Total Catch
Theridiidae	5	0.06%

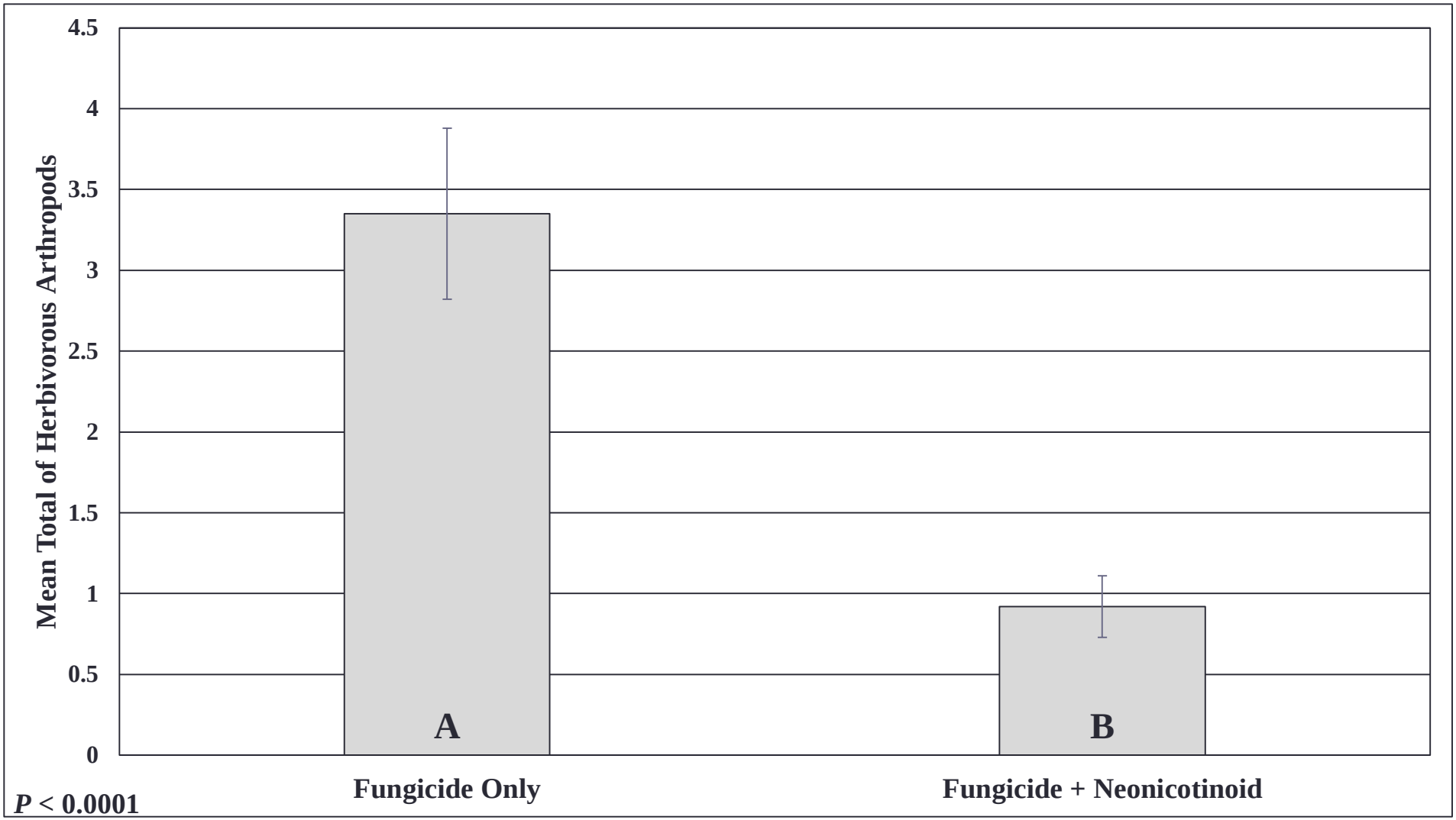
Mean ENS for the Epigeal Community of Soybean Treated with each Seed Treatment in the Second Field Trial



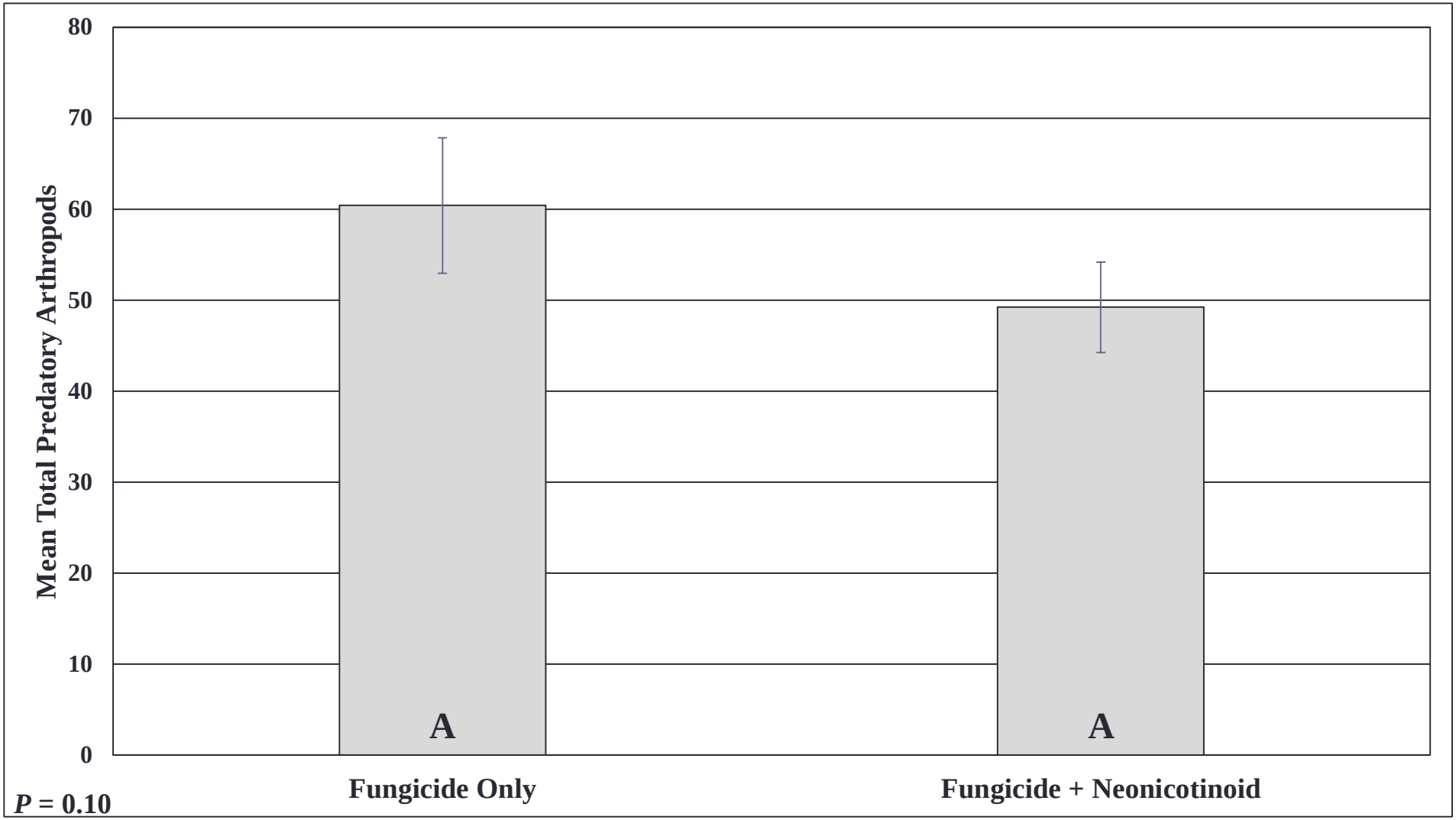
Mean Family Richness for the Epigeal Community of Soybean Treated with each Seed Treatment in the Second Field Trial



Mean Total of Herbivorous Arthropods within the Epigeal Community of Soybean Treated with each Seed Treatment in the Second Field Trial



Mean Total of Predatory Arthropods within the Epigeal Community of Soybean Treated with each Seed Treatment in the Second Field Trial



Conclusions

- **The epigeal communities of soybean treated with neonicotinoid seed treatments were less diverse at than soybean treated with only a fungicide seed treatment.**

- **While herbivorous arthropods were significantly less abundant in neonicotinoid treated soybean, predatory arthropod abundance was not affected by the seed treatment.**

Acknowledgements

- Angus Catchot
- Jeff Gore
- Don Cook
- Trent Irby
- Richard Brown
- Brandon Barton
- Dung Bao and Boise Stokes
- Fellow graduate students
- Student Workers