Kernza & nitrogen: What can we learn from prior experiments?

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Kernza nitrogen synthesis

- Collaborators compiled database from multi-site trials that included at least two nitrogen rates
  - Standard: 75-90 kg/ha (80 kg/ha most frequent)
  - High: 108-160 kg/ha (120 kg/ha most frequent)

- Understanding site-year effects of N rate on Kernza performance
  - Multiple sites and years of data with two N rates can help us make broader recommendations for Kernza nutrient management

- This should compliment ongoing manuscripts of yield and forage performance from the multi-site trial
Preliminary analysis

• Developed response ratios to evaluate effects of different N rates on kernza yield, forage biomass and plant height
• Response ratio is the ratio of the response variable of higher to standard N rate
• \[ \text{Response ratio} = \ln \frac{\text{High N Rate}}{\text{Standard N Rate}} \]
• Above zero = increased effect of high N rate
• Below zero = decreased effect of high N rate
Fertilizer effect on kernza yield

Multi-location trial
Culman et al. In Prep

Jungers et al. 2017

Culman et al. 2013
Year 1: Fertilizer effect on kernza yield

Negative effect of higher N rate

FE Model: $-0.05 [-0.16, -0.02]$
Year 2: Fertilizer effect on kernza yield

No effect of higher N rate
Year 3: Fertilizer effect on kernza yield

Positive effect of higher N rate
Fertilizer effect on plant height
Fertilizer effect on forage biomass
Expanding a synthesis project

• Preliminary search (in June 2019) of the literature for additional work
  • Intermediate wheatgrass + nitrogen keywords = 35 articles on Web of Science
  • Search returns the papers previously discussed & included
  • Additional varieties of intermediate wheatgrass and possible intercropping comparisons

• Additional studies for grain/forage yield
  • Lee et al. 2009 – South Dakota
  • McCartney et al. 2004 – northeastern Saskatchewan
  • Loeppky et al. 1999 – northeastern Saskatchewan
  • Lawrence et al. 1970 – western Canada
  • Lawrence and Ashford 1968 – western Canada

• Legume intercropping comparisons
  • Franco et al. 2018 – North Dakota
  • Tautges et al. 2018 – Minnesota
  • Weik et al. 2002 – southwest Germany
Other ideas for the synthesis

• Potentially adding additional sites or literature search

• Adding growing degree days and precipitation to more thoroughly evaluate year and site effects
  • Ideally the collaborators could share with us the site latitude and longitude, planting and harvest dates

• Can we get together this week to discuss?
Thank you!

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Airedale Terriers for Kernza!