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

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Kernza nitrogen synthesis

- Collaborators compiled database from multisite 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
- Response ratio = $\ln \frac{High \ N \ Rate}{Standard \ N \ Rate}$
- Above zero = increased effect of high N rate
- Below zero = decreased effect of high N rate



Fertilizer effect on kernza yield



Year 1: Fertilizer effect on kernza yield



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

	-	
Colorado_Y1, 2015	⊢_ ∎1	0.06 [-0.08, 0.20]
Colorado_Y2, 2016	├──■ ──1	0.24 [0.03, 0.45]
Colorado_Y3, 2017	⊢ I	-0.15 [-0.46, 0.15]
Kansas_Y1, 2015	⊢ ∎ <u>+</u> I	-0.16 [-0.36, 0.04]
Kansas_Y2, 2016	⊢	-0.02 [-0.28, 0.24]
Kansas_Y3, 2017	HH	0.28 [-0.04, 0.59]
New York_Y1, 2015	⊢	0.03 [-0.24, 0.30]
New York_Y2, 2016	⊢	0.13 [-0.19, 0.46]
New York_Y3, 2017	⊢	-0.01 [-0.22, 0.20]
Ohio2_Y1, 2015	⊦ ∎ -[-0.09 [-0.18, -0.00]
Ohio2_Y2, 2016	⊢ ∎_{	-0.14 [-0.27, -0.00]
Ohio2_Y3, 2017	⊦∔∎−−1	0.05 [-0.08, 0.18]
Wisconsin_Y1, 2016	-∎-1	0.15 [0.06, 0.25]
Wisconsin_Y2, 2017	⊢ ∎	0.12 [-0.07, 0.30]
FE Model	•	0.02 [-0.02, 0.06]
	-0.6 -0.2 0 0.2 0.4 0.6	
	Log Ratio of Means	

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! abasche2@unl.edu nchatterjee2@unl.edu



Institute of Agriculture and Natural Resources



Airedale Terriers for Kernza!