Soybean Foliar Feeding Trial
2020 Annual Summary

Emma G. Matcham, Shawn P. Conley, Laura E. Lindsey, and Rachel A. Vann

2019 and 2020 Participants

University of Arkansas System, Division of Agriculture	Jeremy Ross
University of Florida	David L. Wright
University of Kentucky	Carrie Knott
University of Kentucky	Chad D. Lee
Louisiana State University	David Moseley
Michigan State University	Maninder Singh
University of Minnesota	Seth Naeve
Mississippi State University	Trent Irby
University of Missouri	William Wiebold
North Carolina State University	Rachel Vann
North Dakota State University	Hans Kandel
The Ohio State University	Laura E. Lindsey
Oklahoma State University	Josh Lofton
Clemson University	Matthew Inman
South Dakota State University	Jonathan Kleinjan
Virginia Polytechnic Institute and State University	David Lee Holshouser
University of Wisconsin—Madison	Shawn P. Conley

Overview

Foliar nutrient products, selected with the input of industry professionals, were tested in 20 environments in 2019 and in 26 environments in 2020. The 2019 annual summary is available at https://coolbean.info/wp-content/uploads/sites/3/2020/08/2019_foliarfeed_shortreport_Final.pdf, and a full report on yield, grain, and tissue data from both growing seasons will be available later in 2021.

Trial yield averages for each 2020 site are available in Figure 1. Six products and one untreated control were applied to small plots in a randomized complete block design at all sites (Table 1). Products were applied at soybean growth stage R3 to align with commonly used fungicide and insecticide application timing. Nutrients applied in each product are listed in Table 2. Mixed-model analysis of variance (ANOVA) was performed using R 3.6.2 and the package lme4. All 2020 sites were analyzed together with treatment and site considered fixed variables, and replication nested within site being considered a random variable. Degrees of freedom were

estimated using Kenward-Rogers approximation to account for unequal replication among site years.

Average yield and variation of yield was similar for all treatments when averaged across sites (Figure 2). There was a significant difference in yield among sites, but no significant difference in yield among treatments or the treatment by site interaction (Table 3). Yield is presented using box plots for each site, and a summary of yield by treatment for each site is show in Table 4. Treatment median yield is represented by the horizontal line within each box.

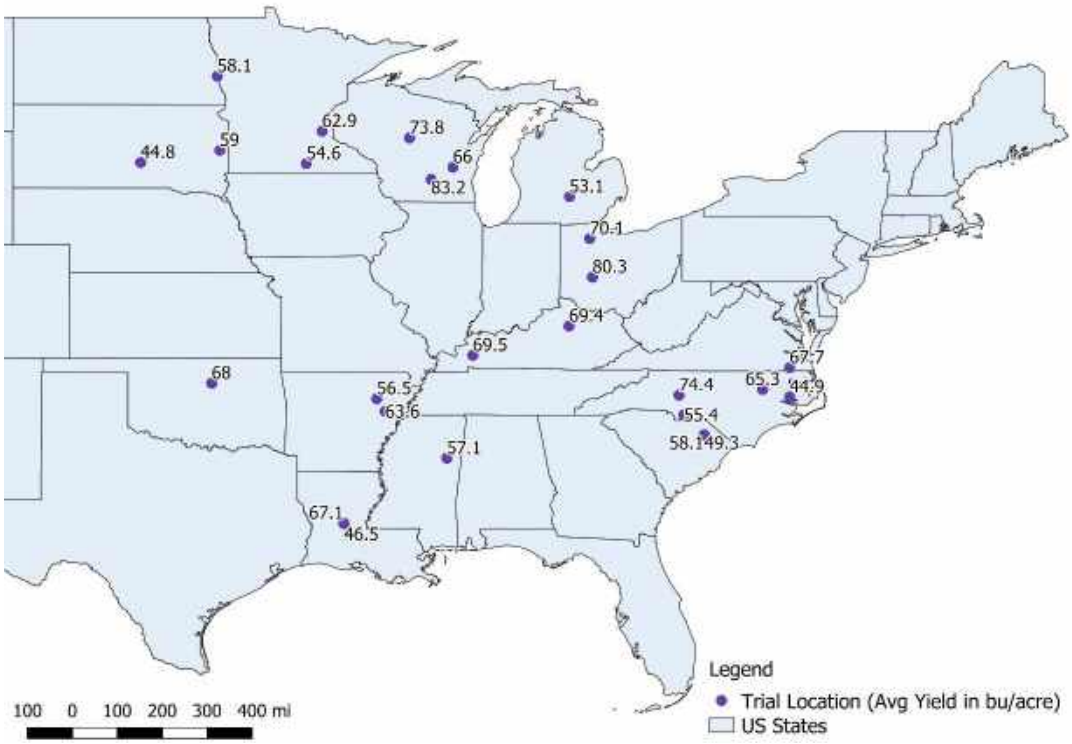


Figure 1. Map of 2020 sites with their average yield (bu/acre). Louisiana and South Carolina have two nearby sites each.

Table 1. List of foliar products names, brands, and application rate.

Treatment Name	Company	Application Rate
FertiRain	AgroLiquid	3 gal/A
SureK	AgroLiquid	3 gal/A
HarvestMoreUreamate	Stoller	2.5 lbs/A
Smart B-Mo	Brandt	1 pt/A
Smart Quarto Plus	Brandt	1 qt/A
Maximum NPact K	Nutrien	1.5 gal/A
Untreated Control	-	-

Table 2. Nutrients applied for each treatment in lbs/ A.

Treatment Name	N	P	K	S	Mn	Fe	Mo	Zn	B	Other
FertiRain	3.5	0.9	0.9	0.5	0.02	0.03	-	0.03	-	-
SureK	0.6	0.3	1.7	-	-	-	-	-	-	-
HarvestMoreUreamate	0.1	0.25	-	-	0.01	-	0.002	0.01	-	Ca, Mg, B, Co, Cu
Smart B-Mo	-	-	-	-	-	-	0.006	-	0.07	-
Smart Quarto Plus	-	-	-	0.04	0.08	-	0.003	0.08	0.06	-
Maximum NPact K	1.9	-	1.9	-	-	-	-	-	-	-
Untreated Control	-	-	-	-	-	-	-	-	-	-

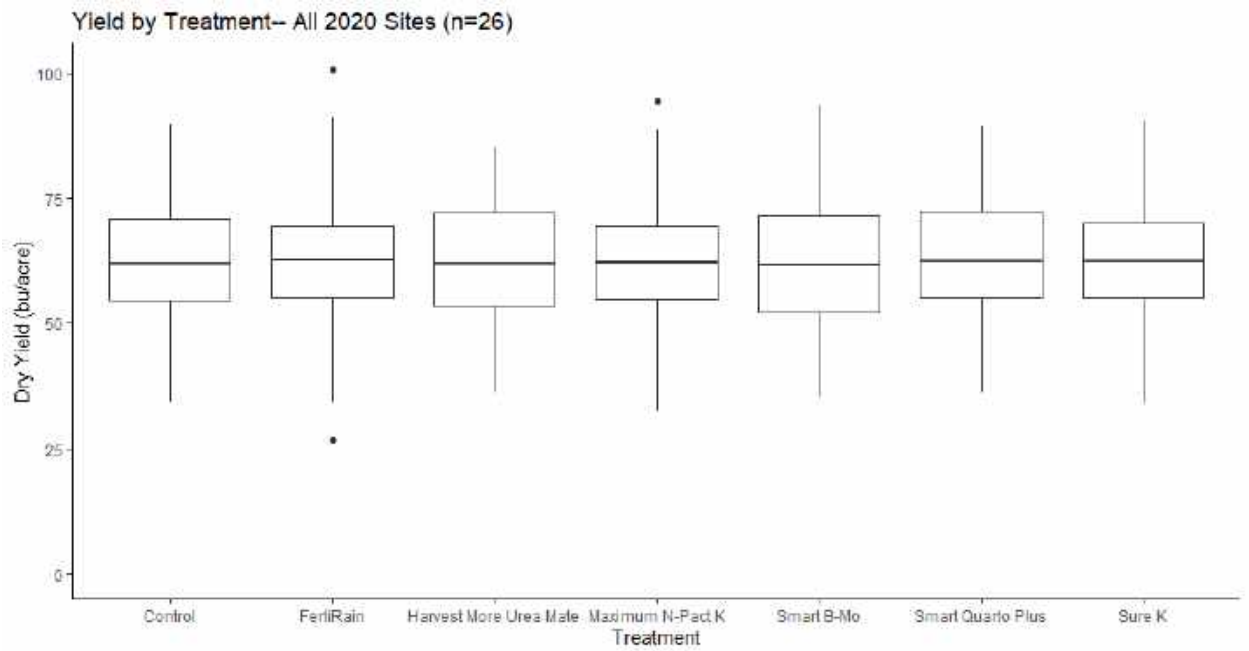


Figure 2: Boxplot of yield by treatment across all 2020 sites. Note that the median yield, represented by the horizontal line within each box, looks very similar across all treatments. Additionally, the size of each box is very similar, indicating that the variation in yield among plots does not differ among treatments.

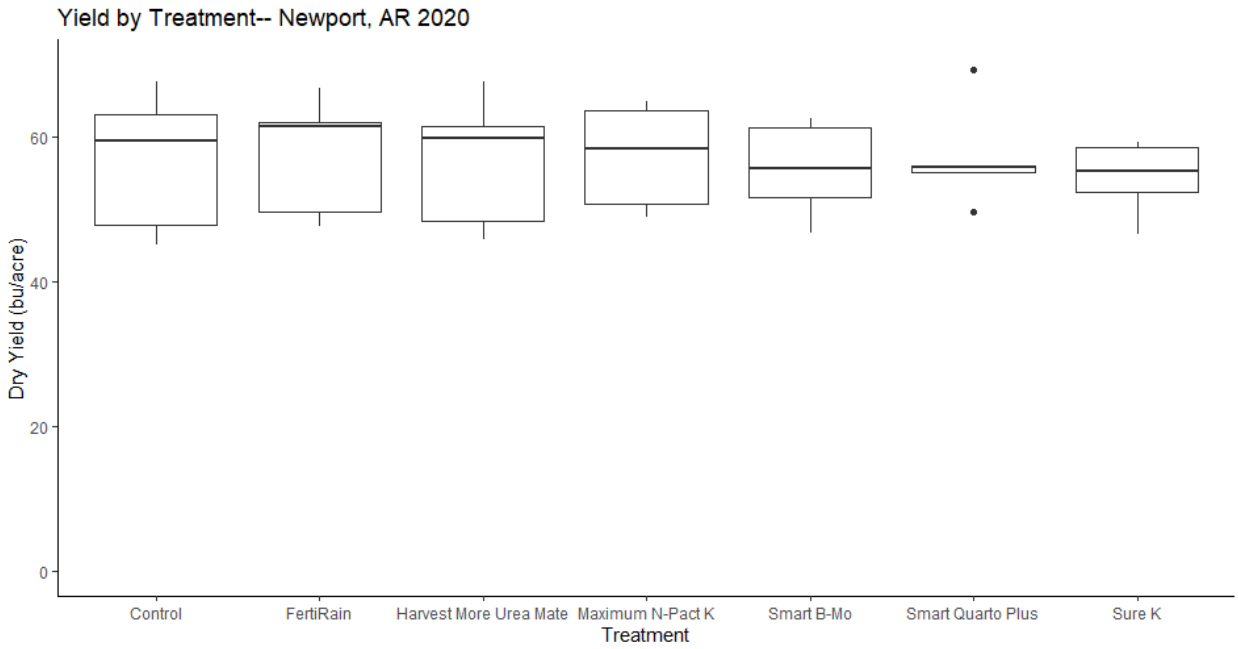
Table 3. ANOVA table for differences in yield among treatment across 26 sites (alpha = 0.05, Kenward-Rogers approximation for degrees of freedom). Significant differences in yield were observed among sites, but not among treatments. There was no significant interaction between treatment and site.

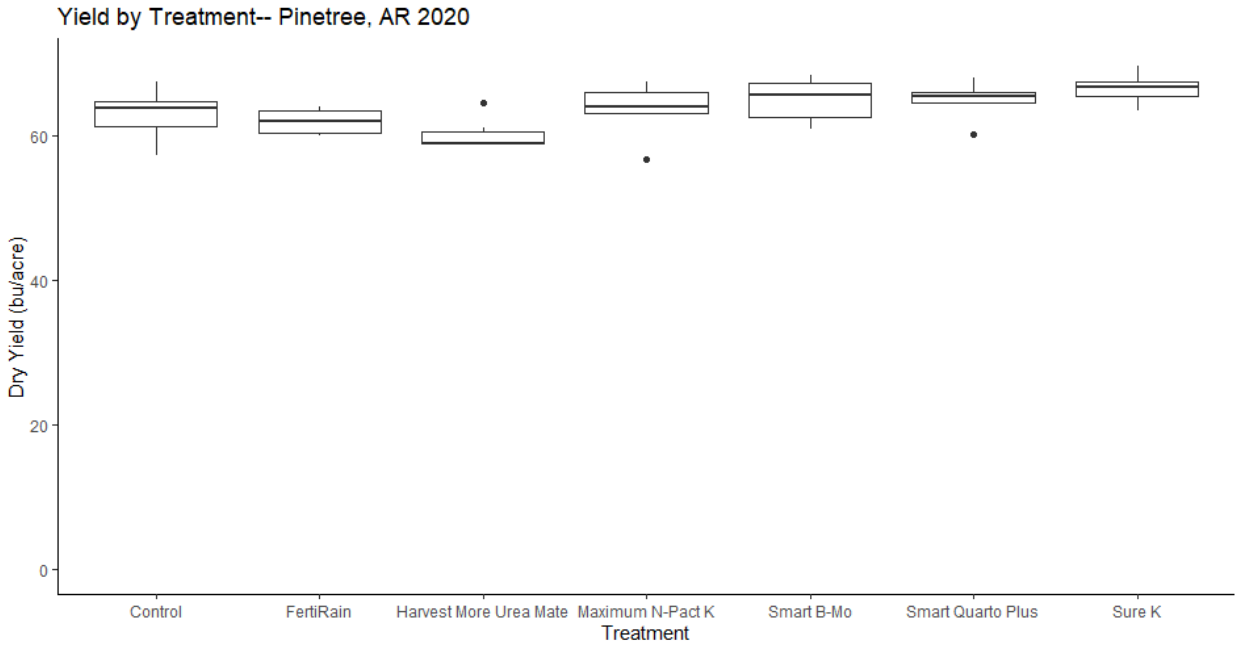
	Sums of Squares	Means Squared	DF (num.)	DF (den.)	F-value	p-value
Treatment	71.0	11.84	6	870.4	0.44	0.849
Site	23408.9	936.4	25	122.8	35.14	<2e-16
Treatment * Site	3349.8	22.6	748.7	0.85	0.85	0.891

Table 4. Treatment means (standard deviation) in bushels per acre and the number of replications (Reps) per treatment at each site in 2020. Smart Quatro Plus was not applied at the South Carolina sites.

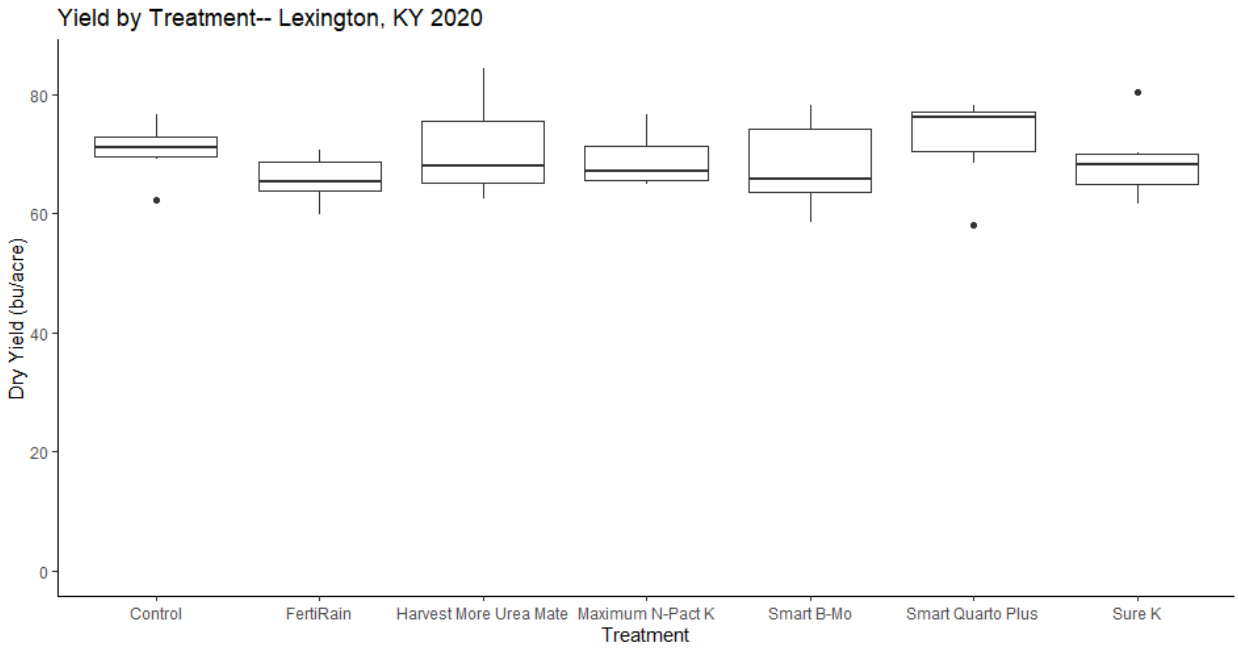
Site	Reps	Control	FertiRain	Harvest More Urea Mate	Max N-Pact K	Smart B-Mo	Smart Quatro Plus	Sure K
Newport, AR	6	56.7 (9.84)	57.5 (8.39)	56.7 (9.20)	57.3 (7.28)	55.6 (6.65)	57.2 (7.28)	54.5 (5.20)
Pinetree, AR	6	63.0 (3.56)	62.0 (1.77)	60.2 (2.32)	63.6 (3.81)	65.0 (3.08)	65.0 (2.58)	66.6 (2.18)
Lexington, KY	6	70.6 (4.86)	65.8 (3.97)	70.9 (8.47)	69.0 (4.72)	68.1 (7.81)	72.5 (7.86)	68.8 (6.48)
Princeton, KY	6	68.8 (5.28)	73.4 (8.44)	66.3 (12.0)	69.0 (6.16)	68.8 (5.94)	69.2 (7.30)	70.6 (8.63)
A3WA, LA	6	47.0 (4.41)	47.1 (4.32)	45.8 (3.13)	47.3 (4.05)	46.1 (0.87)	47.6 (4.74)	44.6 (2.15)]
TW, LA	6	60.5 (11.97)	65.3 (5.20)	69.2 (4.70)	69.6 (9.06)	67.3 (5.45)	68.5 (13.23)	69.6 (4.75)
Michigan	5	56.3 (14.45)	53.2 (12.32)	56.2 (14.55)	56.2 (9.44)	55.3 (16.02)	48.6 (8.30)	51.5 (10.46)
Minnesota Lake, MN	6	55.4 (5.60)	54.2 (4.07)	52.0 (9.01)	55.9 (3.32)	54.3 (5.18)	56.2 (5.56)	54.3 (6.03)
St. Paul, MN	6	66.1 (8.50)	62.8 (8.14)	60.7 (10.02)	64.2 (9.88)	65.2 (8.95)	60.0 (7.99)	62.0 (7.84)
Mississippi	6	57.1 (3.35)	56.4 (2.70)	57.4 (4.46)	58.2 (4.90)	54.0 (3.92)	58.0 (3.73)	58.7 (5.08)
Beaufort, NC	6	44.3 (4.46)	42.3 (8.07)	47.3 (3.71)	44.2 (1.35)	44.6 (3.99)	45.8 (3.41)	46.0 (2.93)
Salisbury, NC	6	75.2 (7.95)	74.1 (4.52)	75.2 (3.64)	72.8 (5.97)	75.0 (7.16)	75.9 (3.57)	72.5 (4.53)
Union, NC	6	54.4 (7.13)	55.8 (4.85)	56.7 (7.66)	56.2 (9.29)	54.3 (6.02)	55.4 (7.23)	54.6 (5.80)
Rocky Mount, NC	6	67.2 (7.22)	64.4 (8.85)	65.5 (7.96)	62.4 (7.58)	68.1 (10.15)	62.5 (8.44)	66.9 (13.50)
North Dakota	8	57.7 (3.42)	58.8 (3.25)	57.3 (5.68)	57.6 (2.52)	58.6 (3.84)	58.6 (3.06)	58.2 (1.68)
Hoytville, OH	6	68.5 (2.78)	67.9 (3.04)	72.0 (3.31)	68.9 (5.40)	70.3 (3.95)	71.2 (3.46)	71.5 (3.50)
South Charleston, OH	6	81.7 (2.63)	81.1 (3.77)	79.8 (2.61)	80.3 (4.13)	80.6 (2.80)	79.8 (4.21)	79.1 (3.74)
Oklahoma	7	66.8 (3.48)	65.3 (3.43)	69.8 (8.04)	64.9 (4.45)	72.8 (12.81)	72.2 (11.32)	63.9 (8.77)
Dargon Pond, SC	4	50.1 (4.36)	47.2 (9.59)	53.9 (4.30)	45.5 (10.35)	48.4 (6.32)	--	51.7 (12.32)
Rock Rd, SC	4	53.3 (6.83)	61.0 (1.82)	56.6 (12.3)	59.5 (7.24)	57.6 (4.96)	--	60.9 (0.76)
Reliance, SD	6	42.2 (5.60)	45.1 (3.77)	44.4 (5.98)	45.4 (5.38)	46.4 (2.83)	46.2 (4.86)	44.2 (3.61)
Brookings, SD	6	59.7 (6.92)	60.2 (4.74)	56.9 (3.32)	59.2 (2.24)	60.2 (3.84)	56.8 (2.09)	59.7 (4.49)
Arlington, WI	6	81.3 (4.08)	85.6 (8.15)	79.1 (3.76)	86.1 (6.46)	84.6 (5.76)	83.5 (4.99)	81.8 (7.24)
Fond du Lac, WI	6	66.0 (7.64)	69.2 (3.73)	68.2 (7.62)	61.9 (1.86)	63.2 (5.60)	68.5 (3.97)	64.6 (4.41)
Marshfield, WI	6	72.1 (4.28)	75.2 (7.92)	72.1 (3.13)	71.6 (6.86)	77.4 (3.21)	74.7 (4.07)	73.6 (3.87)
Virginia	6	66.1 (3.53)	69.9 (2.96)	70.5 (5.26)	67.5 (4.53)	67.8 (6.55)	67.3 (6.79)	64.6 (6.16)

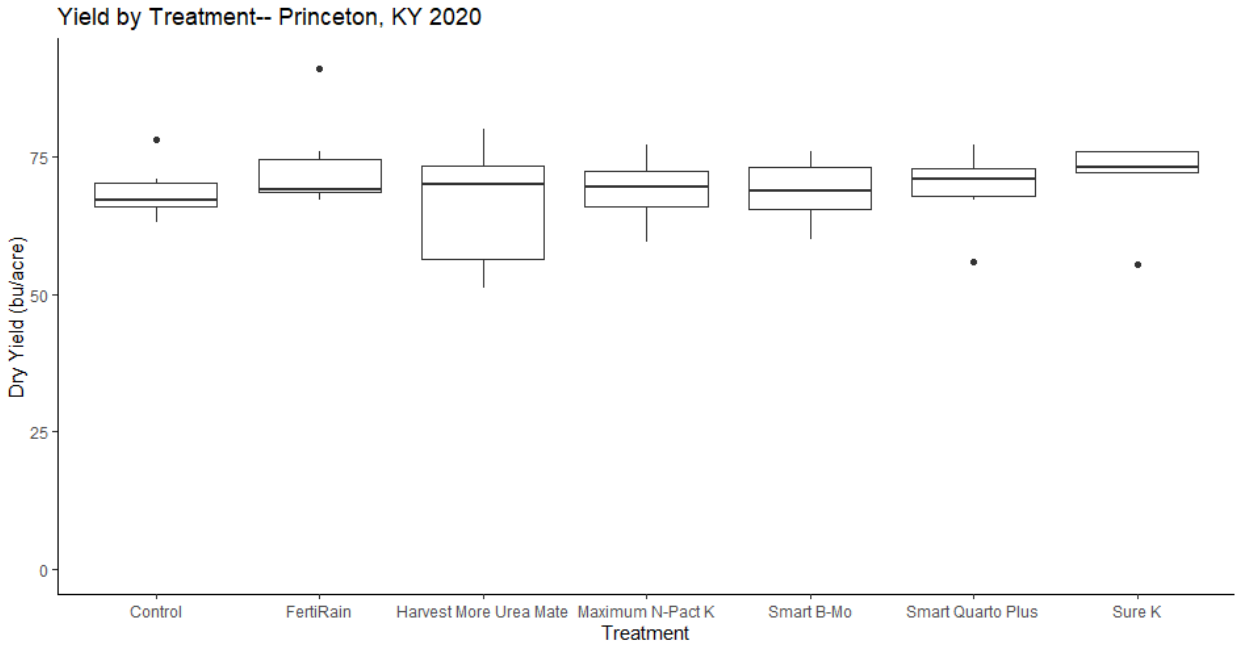
Arkansas


Yield by Treatment-- Newport, AR 2020
Dry Yield (bu/acre)
0
20
40
60
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment

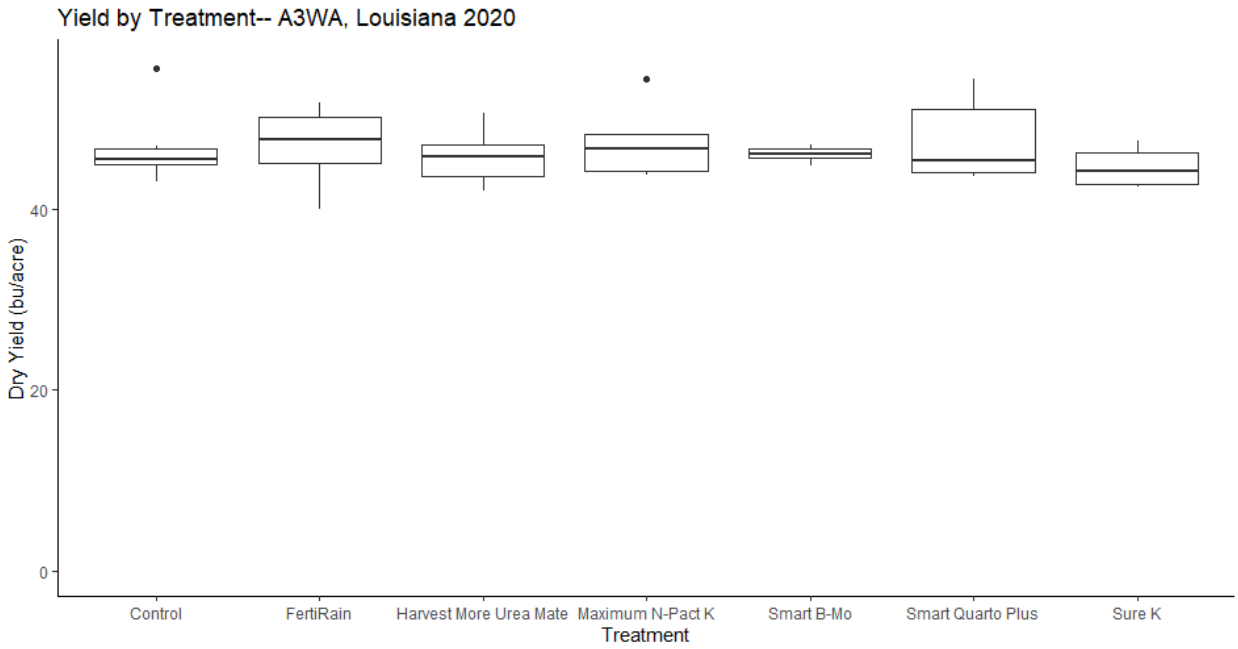

Yield by Treatment-- Pinetree, AR 2020
Dry Yield (bu/acre)
0
20
40
60
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment

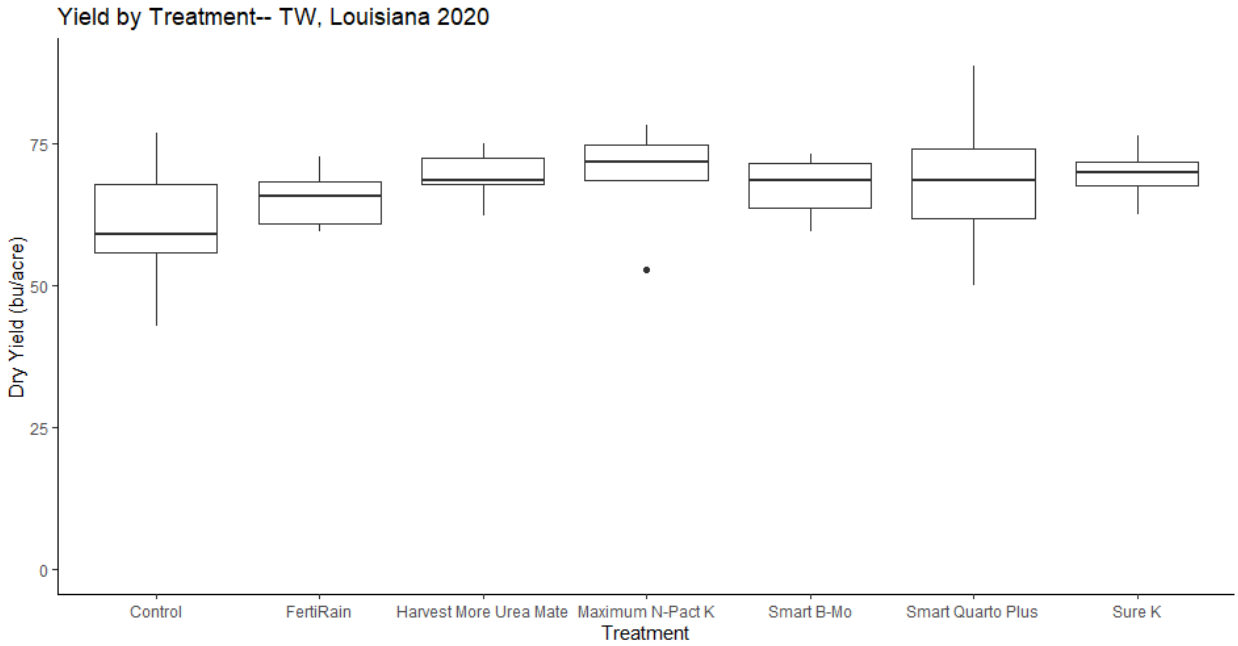
Kentucky


Yield by Treatment-- Lexington, KY 2020
Dry Yield (bu/acre)
0
20
40
60
80
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment

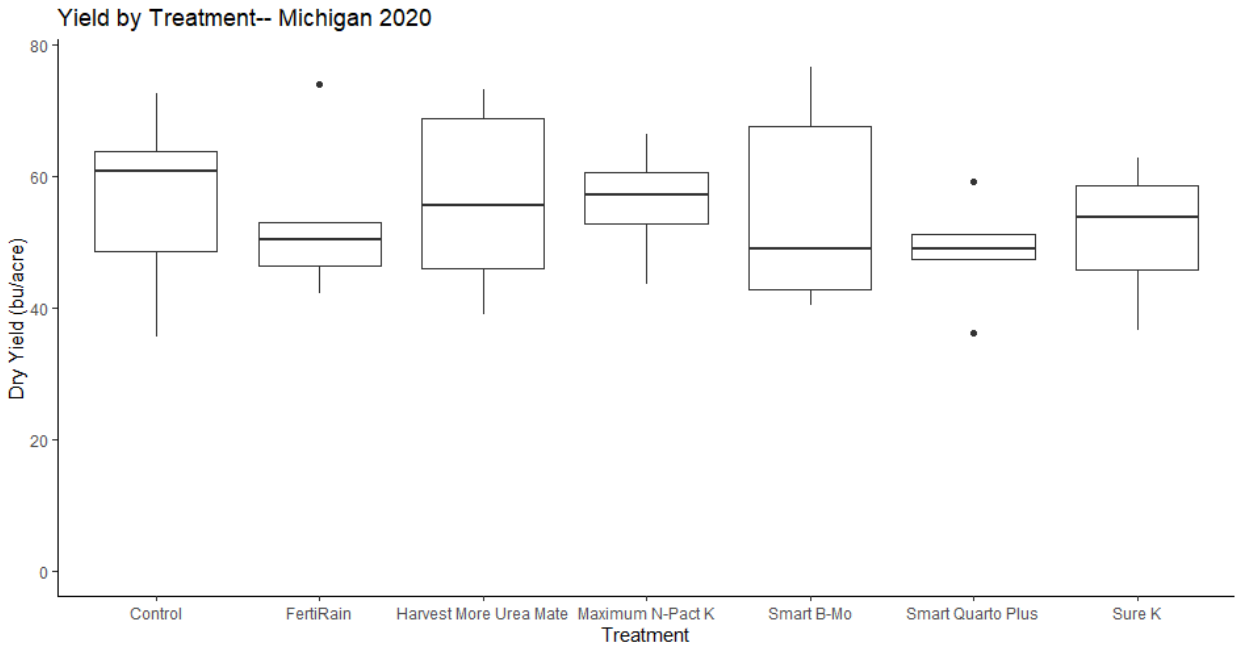

Yield by Treatment-- Princeton, KY 2020
Dry Yield (bu/acre)
0
25
50
75
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment

Louisiana

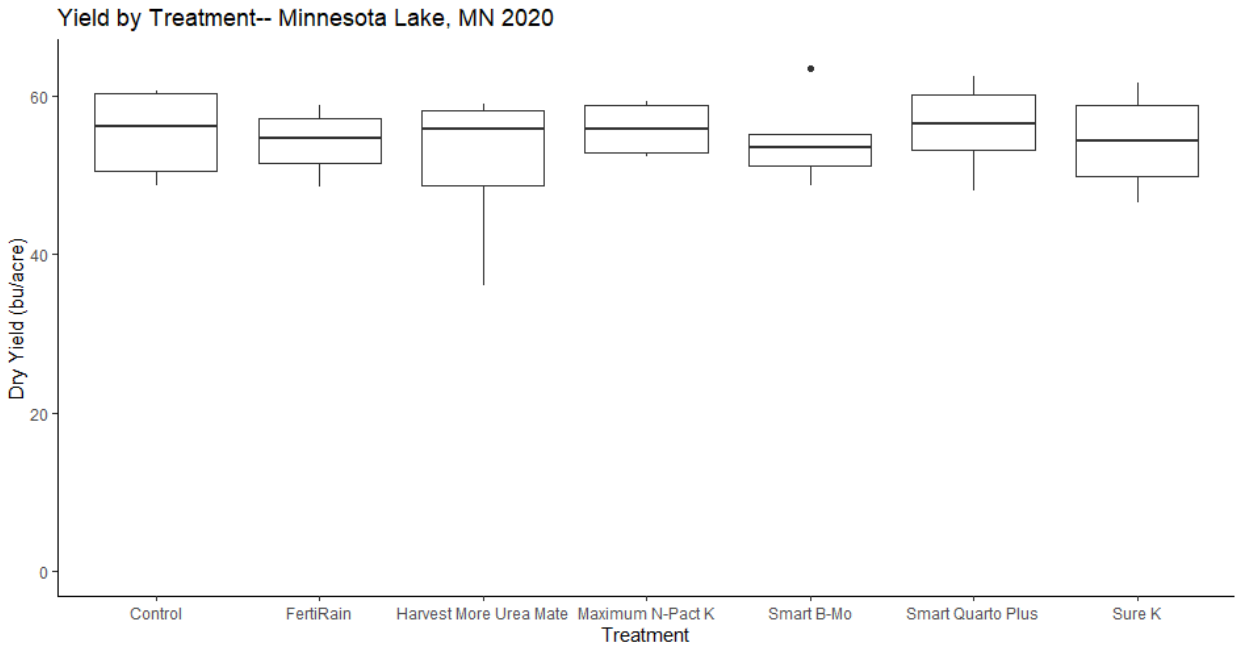

Yield by Treatment-- A3WA, Louisiana 2020
Dry Yield (bu/acre)
0
20
40
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment

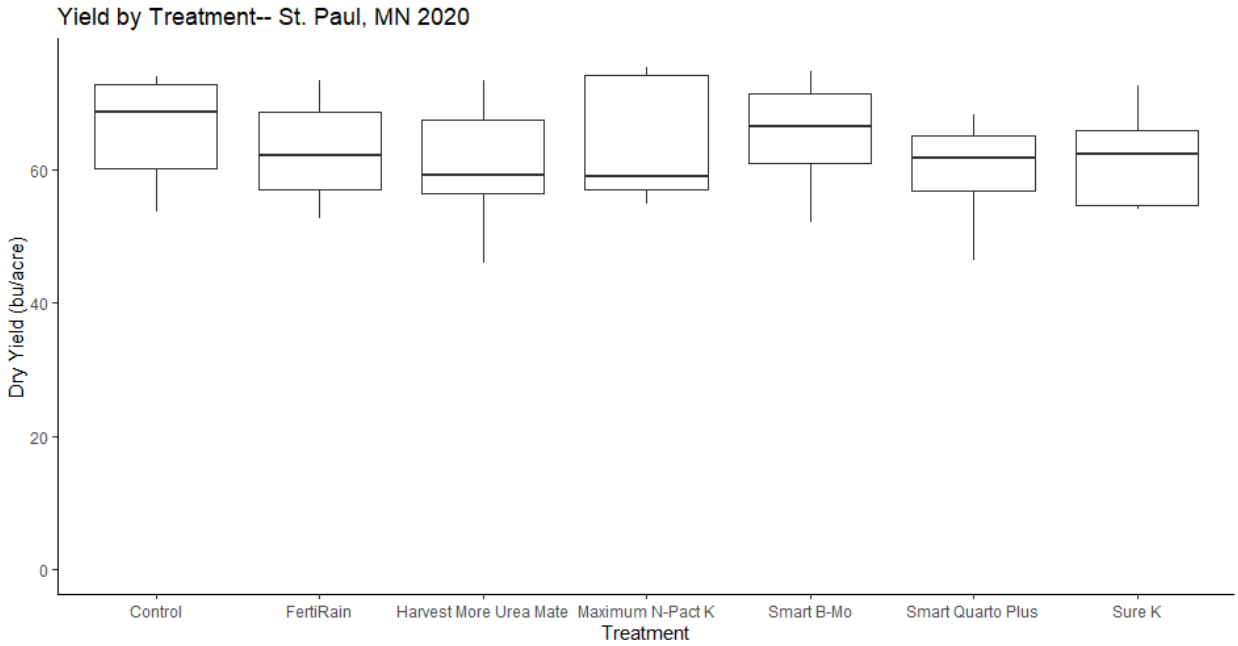

Yield by Treatment-- TW, Louisiana 2020
Dry Yield (bu/acre)
0
25
50
75
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment

Michigan

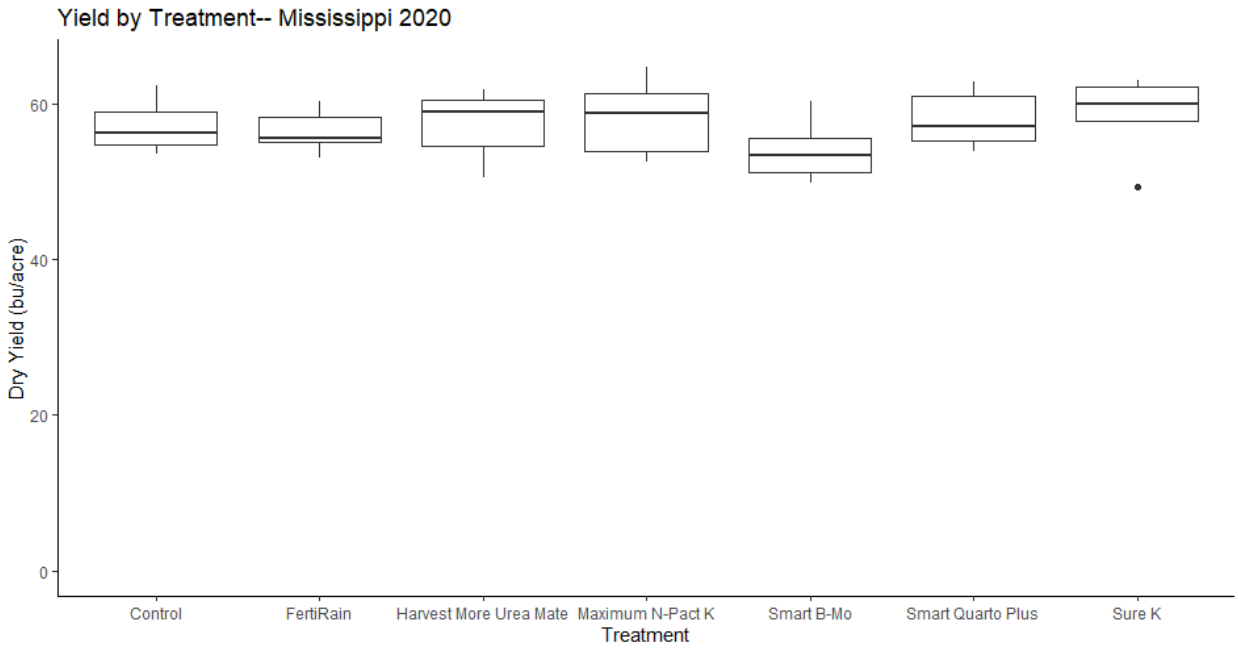

Yield by Treatment-- Michigan 2020
Dry Yield (bu/acre)
80
60
40
20
0
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment

Minnesota

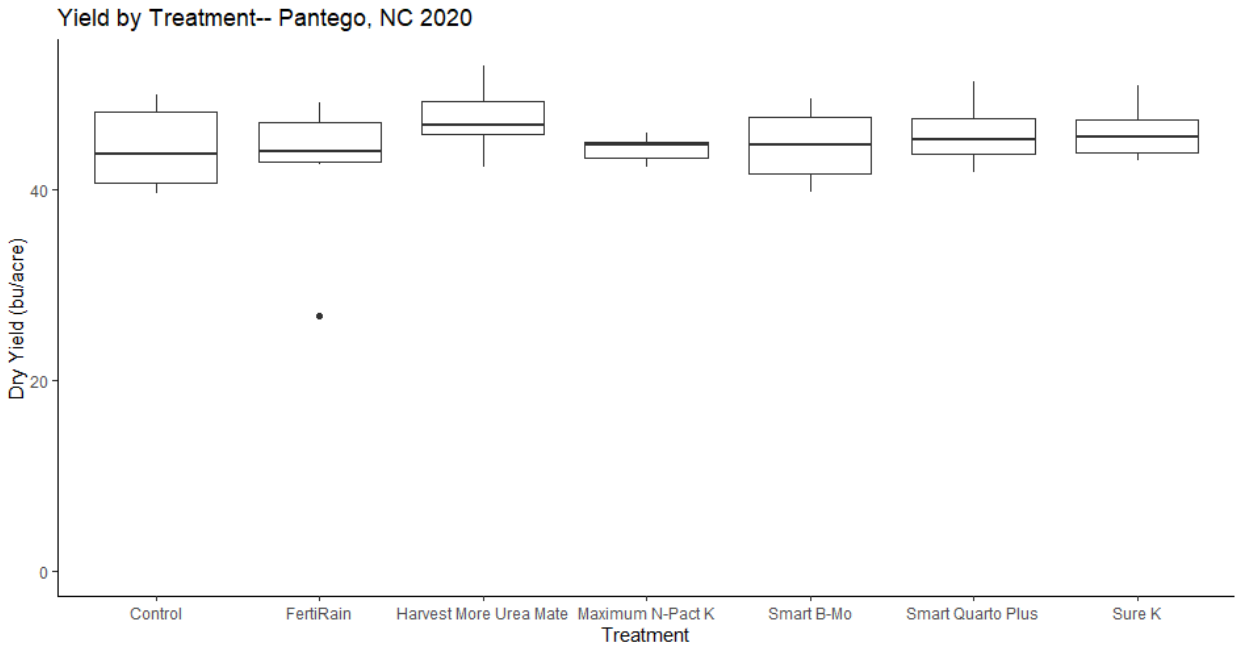

Yield by Treatment-- Minnesota Lake, MN 2020
Dry Yield (bu/acre)
0
20
40
60
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment

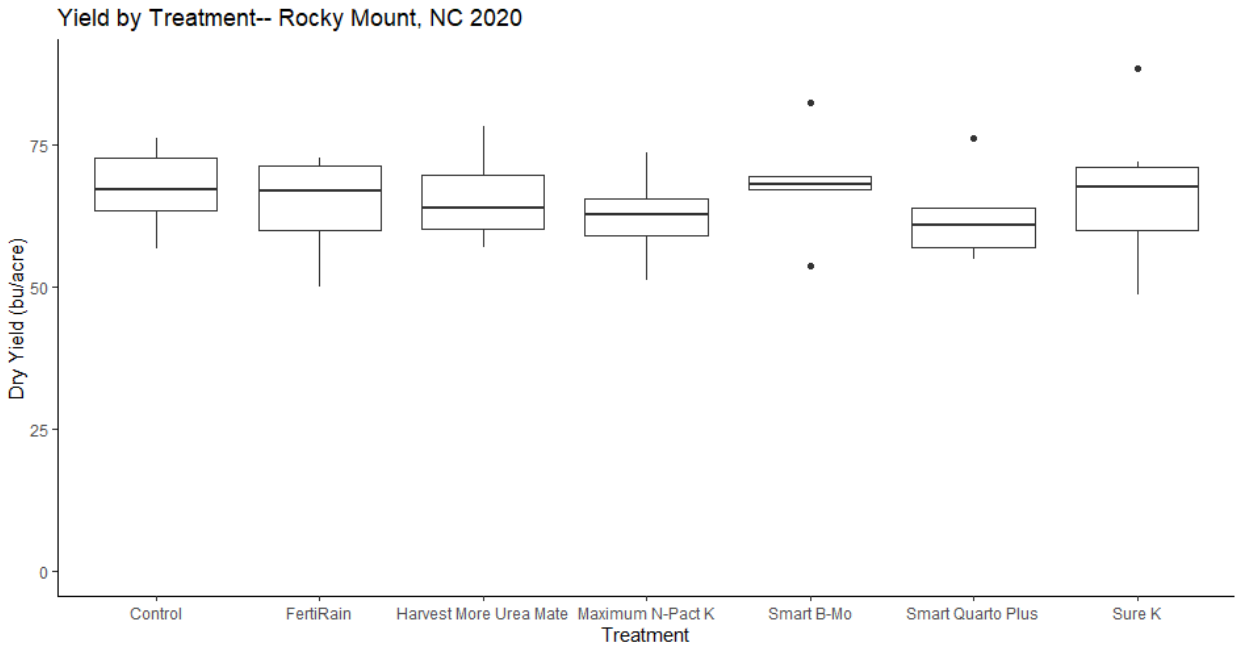

Yield by Treatment-- St. Paul, MN 2020
Dry Yield (bu/acre)
0
20
40
60
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment

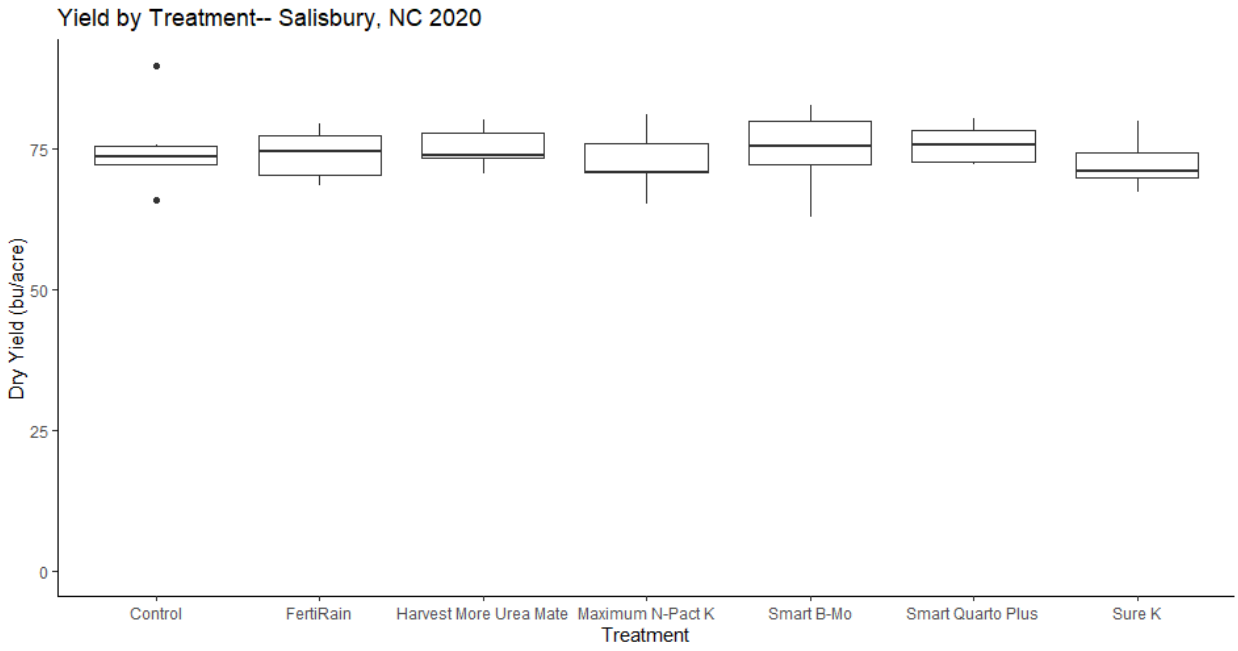
Mississippi

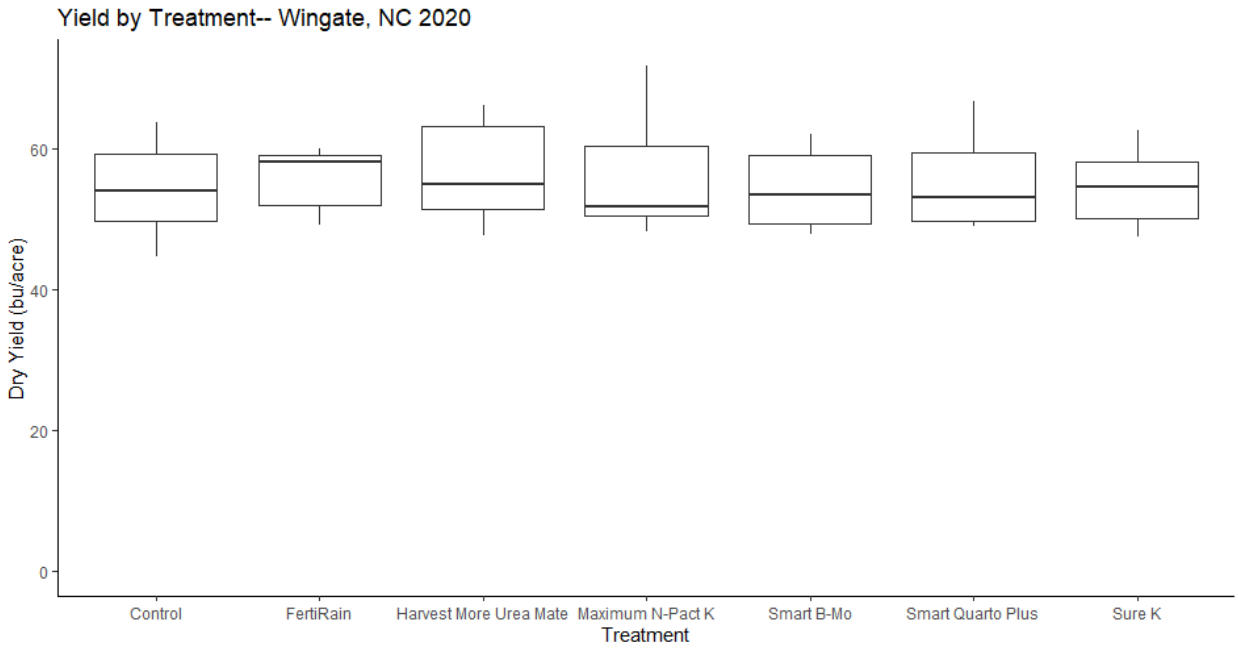


North Carolina

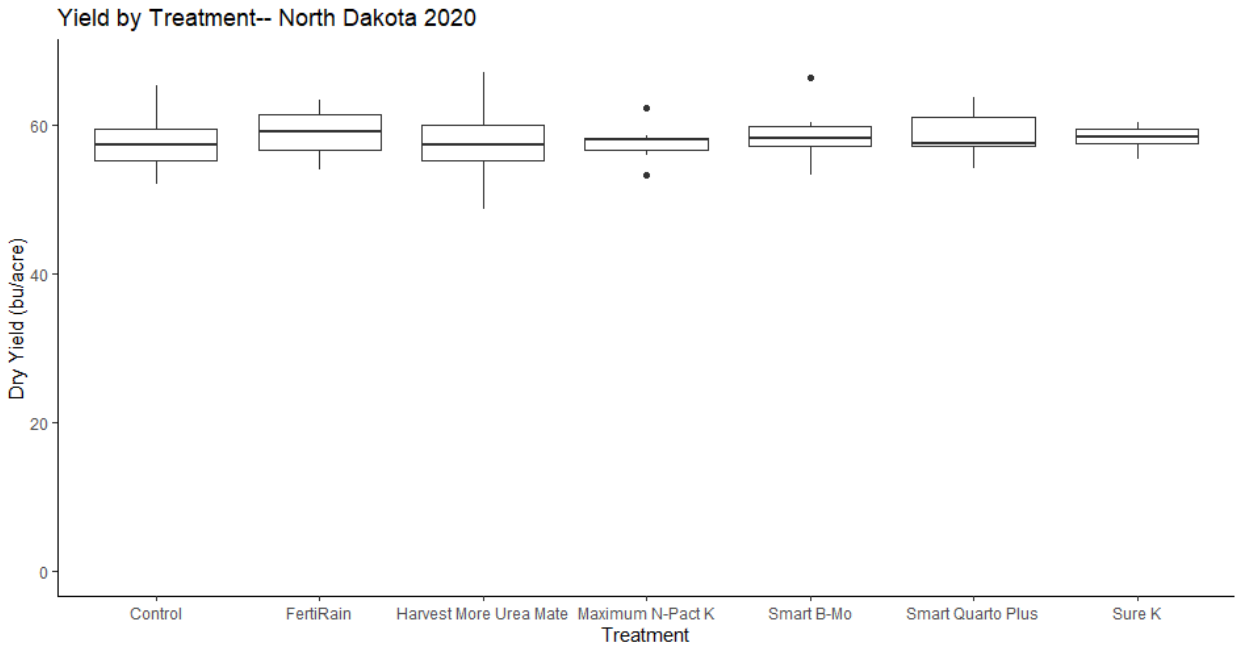




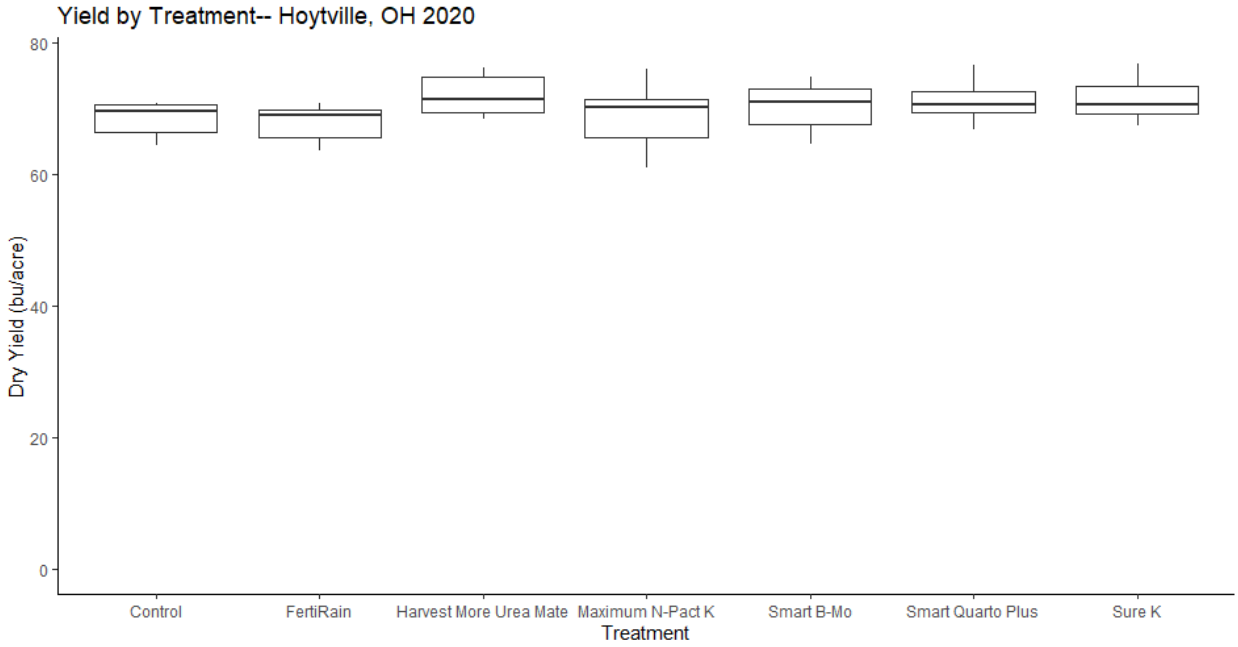

Yield by Treatment-- Salisbury, NC 2020
Dry Yield (bu/acre)
0
25
50
75
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment

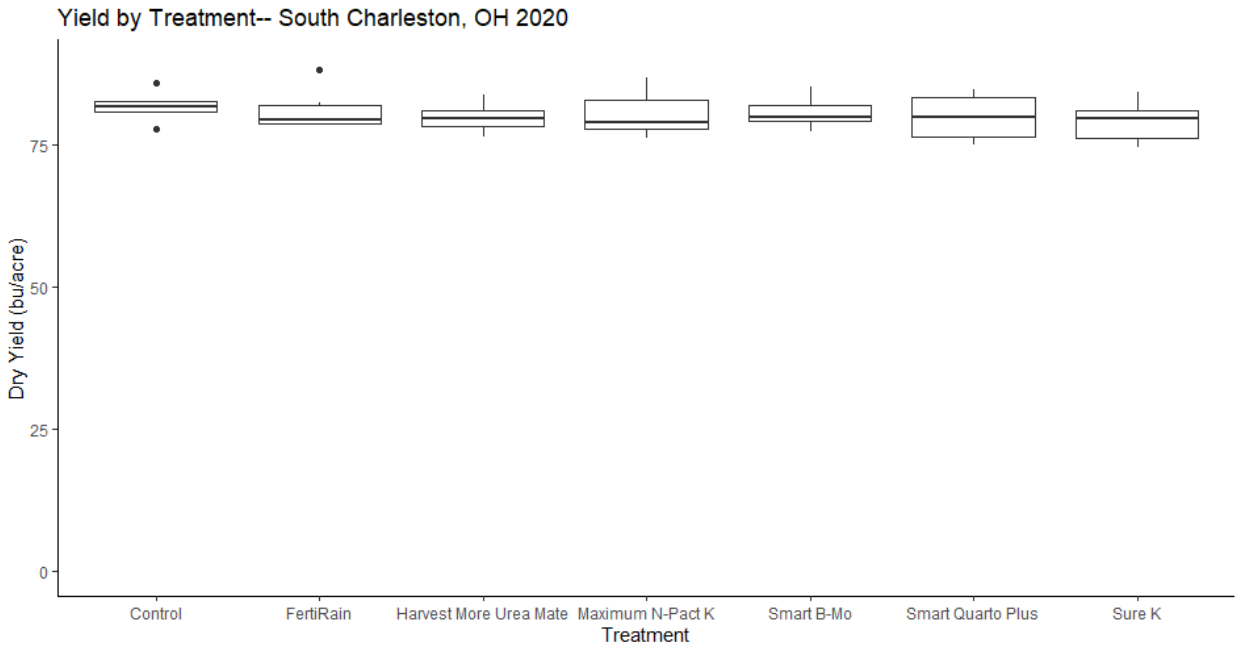

Yield by Treatment-- Wingate, NC 2020
Dry Yield (bu/acre)
0
20
40
60
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment

North Dakota

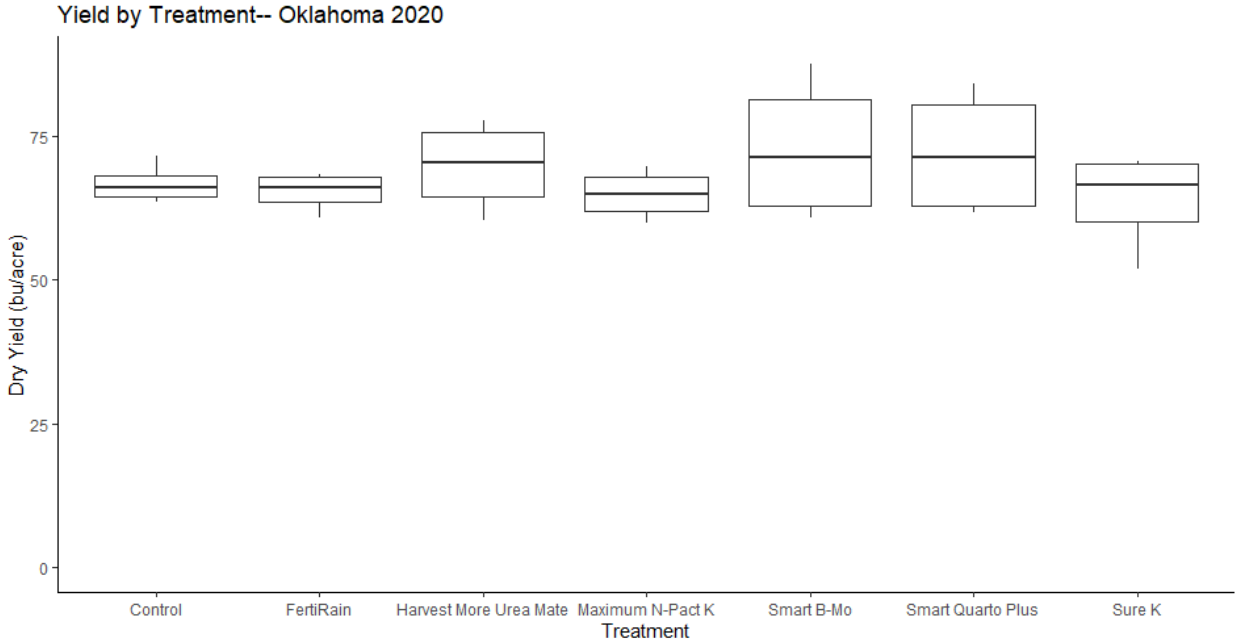


Ohio

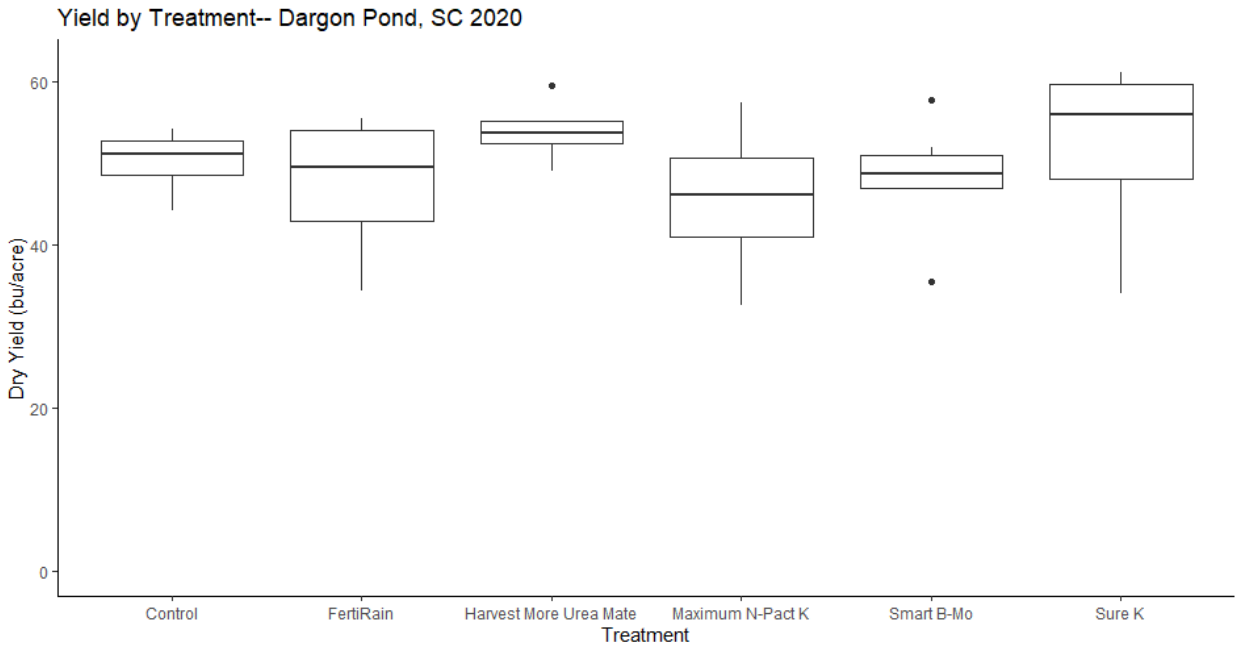


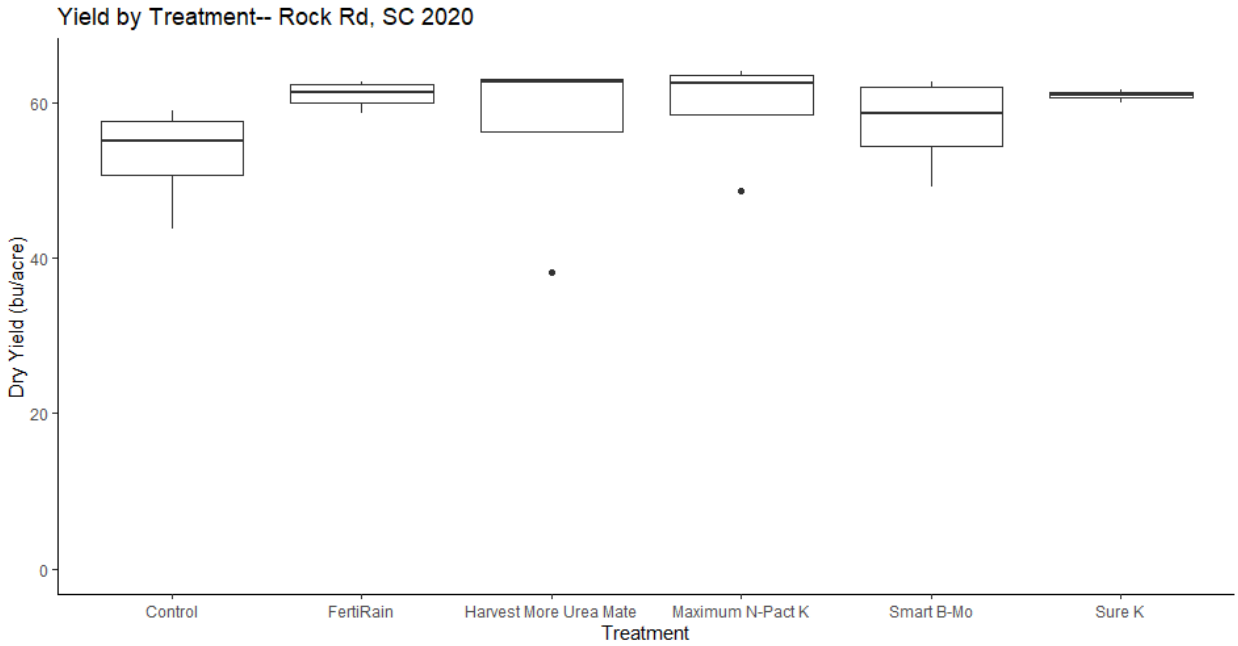

Yield by Treatment-- South Charleston, OH 2020
Dry Yield (bu/acre)
0
25
50
75
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment

Oklahoma

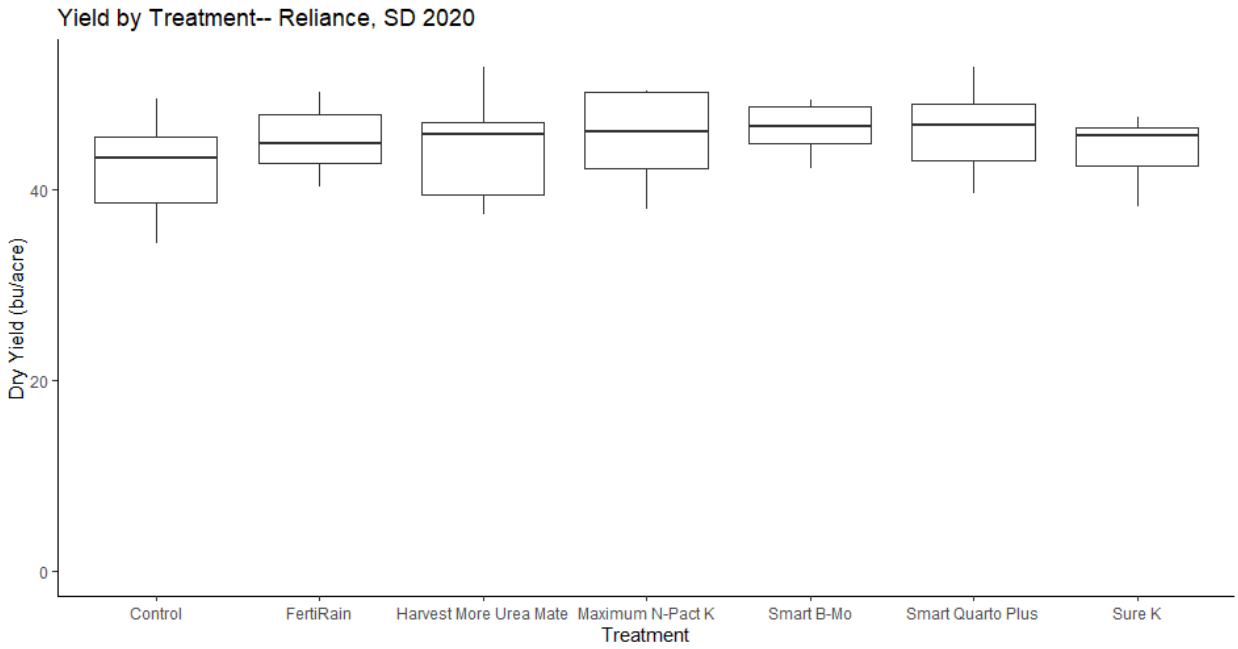

Yield by Treatment-- Oklahoma 2020
Dry Yield (bu/acre)
0
25
50
75
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment

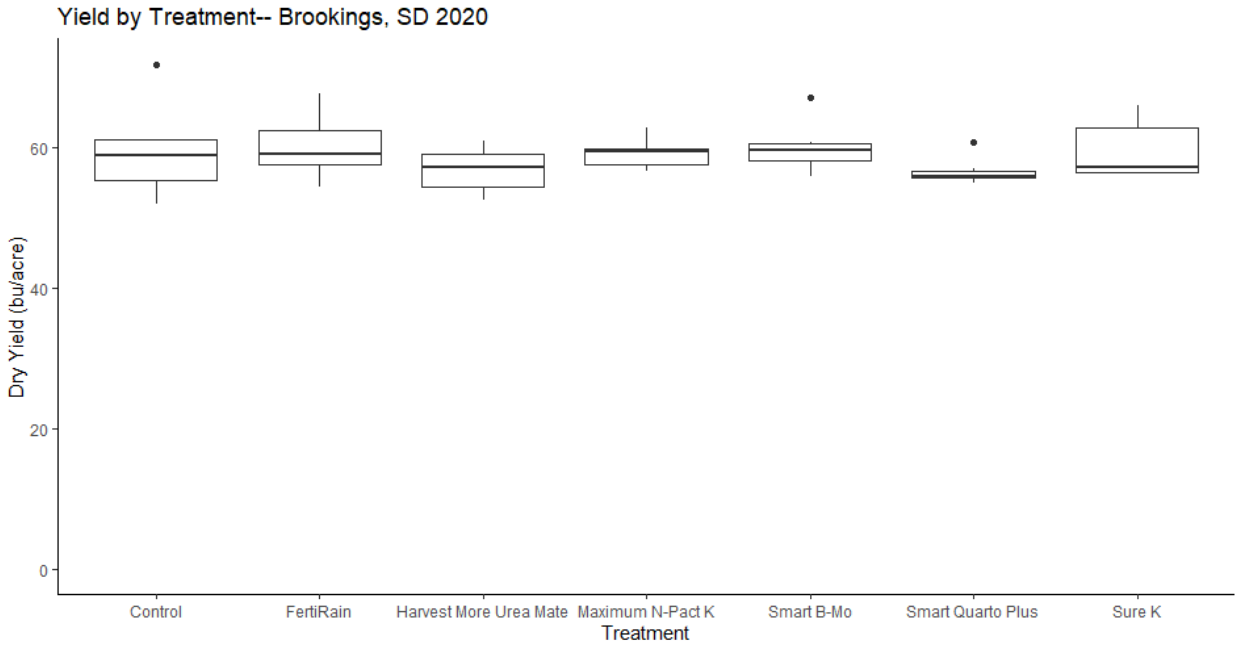
South Carolina



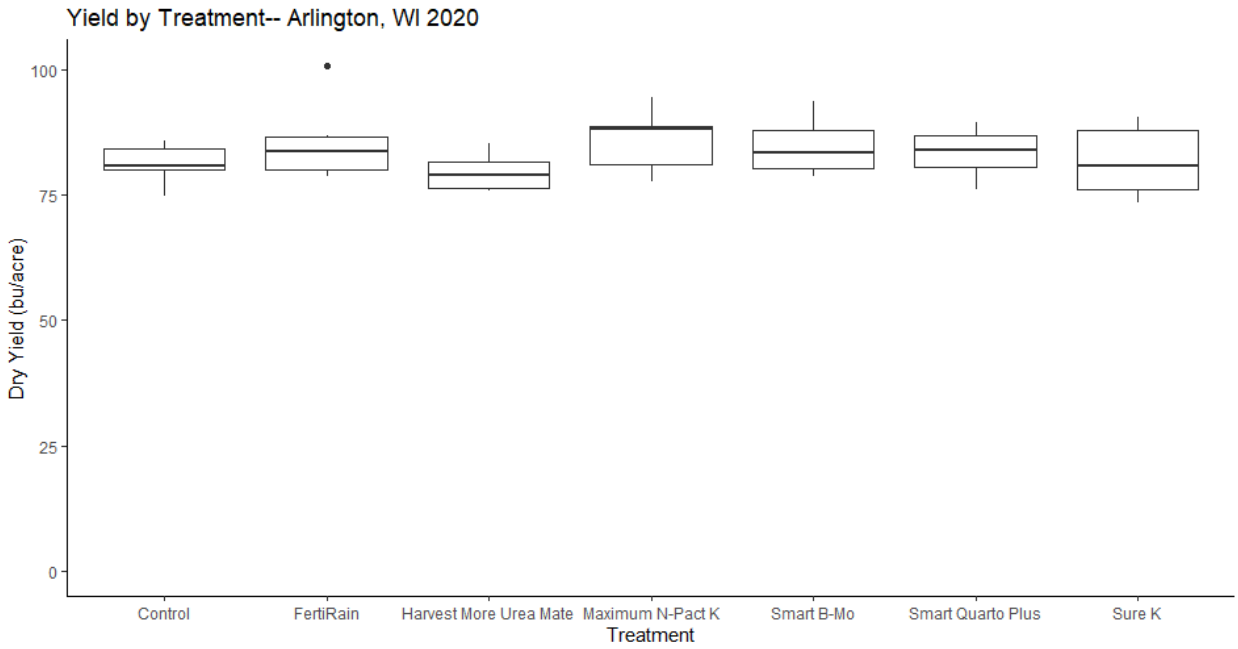


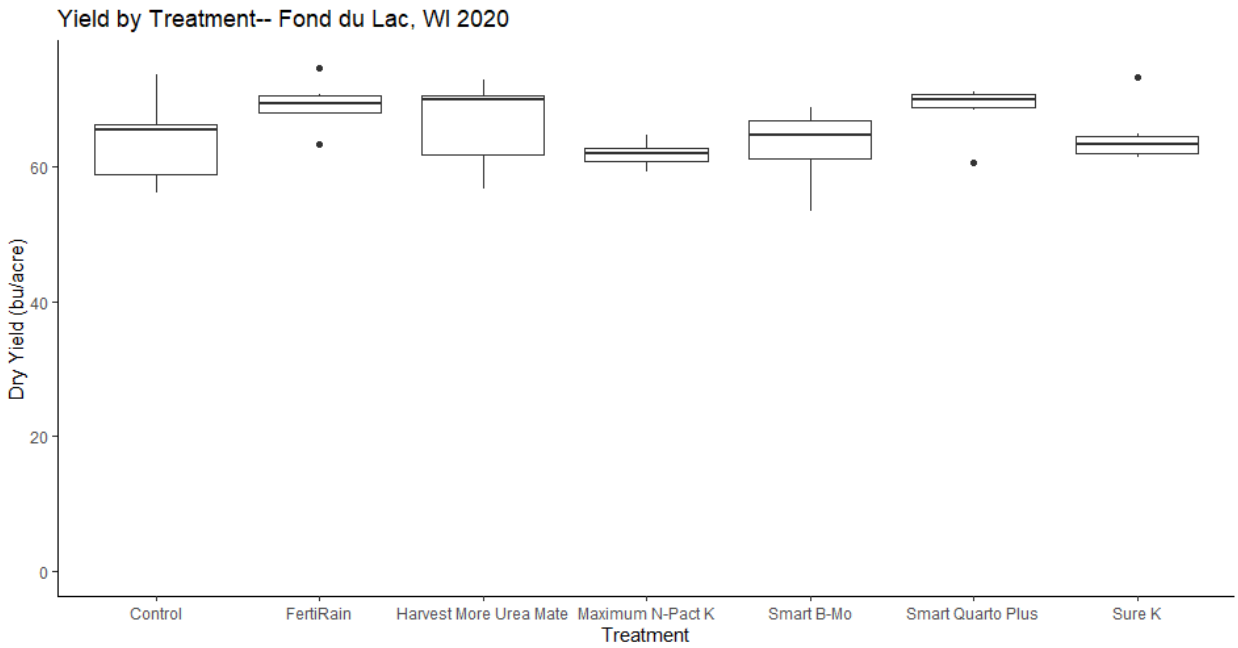
South Dakota

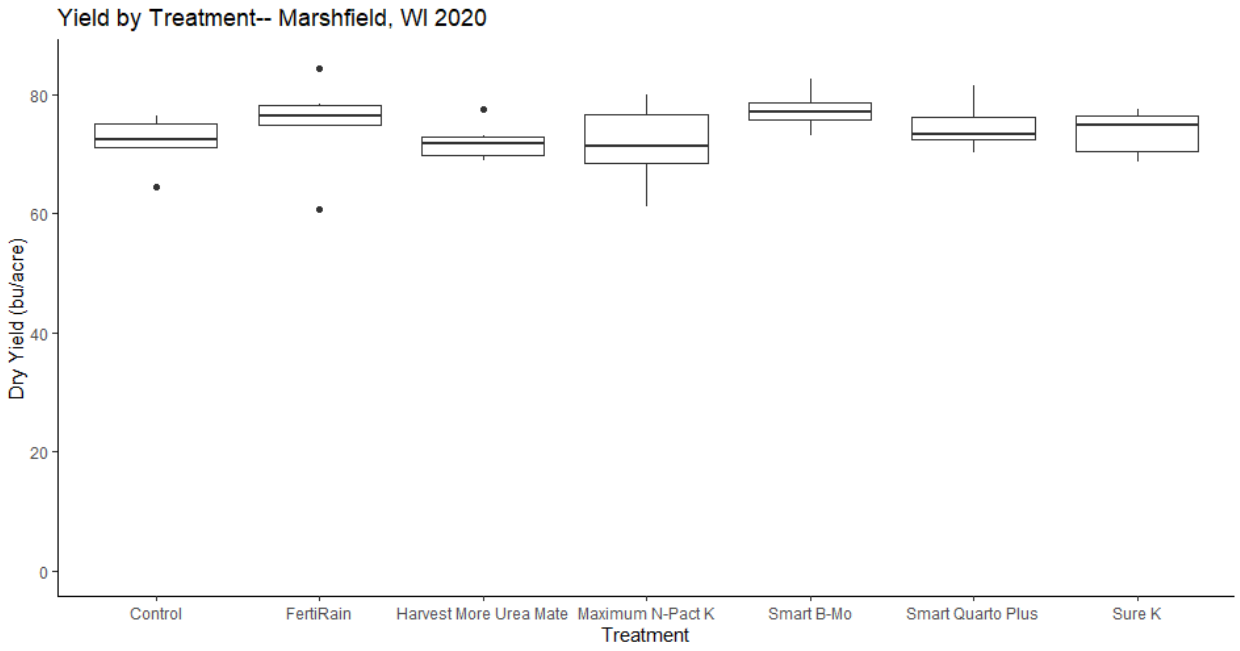




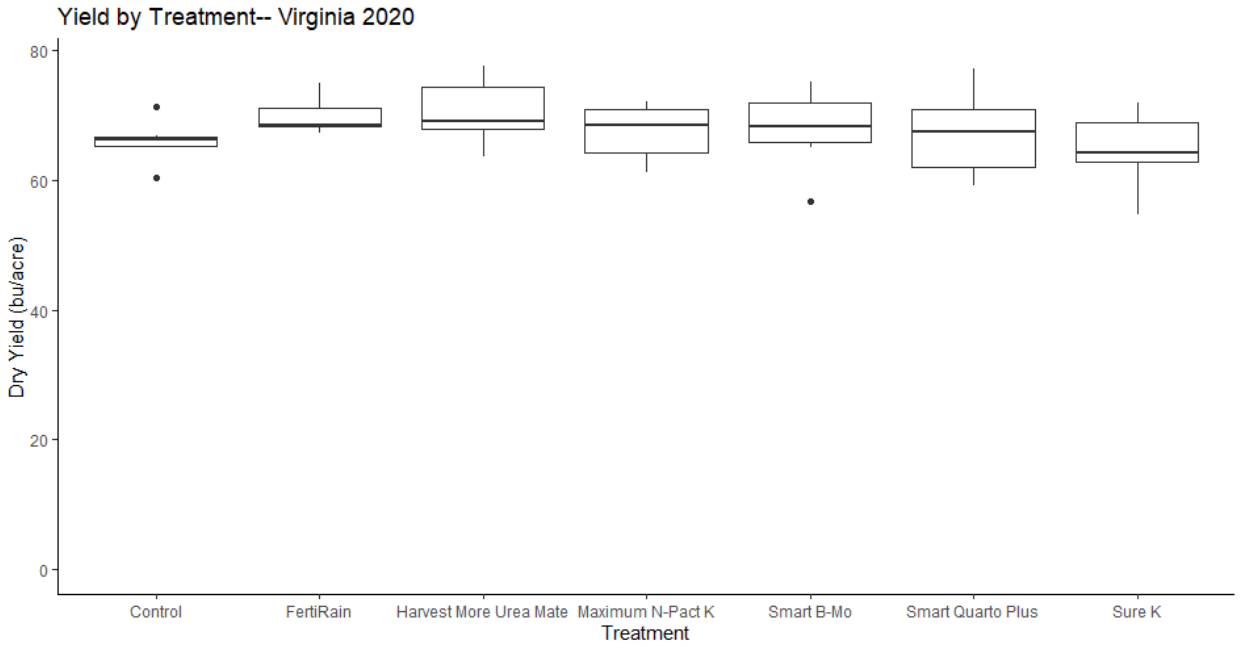
Wisconsin


Yield by Treatment-- Arlington, WI 2020
Dry Yield (bu/acre)
100
75
50
25
0
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment


Yield by Treatment-- Fond du Lac, WI 2020
Dry Yield (bu/acre)
60
40
20
0
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment


Yield by Treatment-- Marshfield, WI 2020
Dry Yield (bu/acre)
0
20
40
60
80
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment

Virginia


Yield by Treatment-- Virginia 2020
Dry Yield (bu/acre)
0
20
40
60
80
Control
FertiRain
Harvest More Urea Mate
Maximum N-Pact K
Smart B-Mo
Smart Quarto Plus
Sure K
Treatment