Evaluation of Foliar Fertilizers in Cotton

Seth Byrd[1], Katie Lewis[2], Julie Howe[3], and Gaylon Morgan[4]

[1]Oklahoma State University, Ag Center, Stillwater, OK; [2]Texas A&M AgriLife Research, Lubbock, TX; [3]Texas A&M University, College Station, TX; [4]Texas A&M AgriLife Extension, College Station, TX

Background

Farmer interest and questions on foliar fertilizers

University data is limited for cotton

Objectives

1. **Determine if foliar applications of macro- and micronutrients have the potential to increase yield and fiber components of cotton**

2. Quantify the return on investment from the utilization of various fertility programs and application costs and the resulting cotton yield and fiber quality

Texas A&M AgriLife Research

Lubbock, TX

Fort Cobb, OK

College Station, TX

Methods

Lubbock, TX

- Irrigation: furrow
- Base fertility: 120-0-0
- Variety: NG 3406 B2XF
- Planted/harvested: 5/24 and 11/16
- Foliar treatments:
  1. 1st bloom
  2. 15 days after the 1st application
  3. 27 days after 1st application
- Destructive sampling for partitioning (5 plants per plot):
  - 9 days after 1st application
  - 60% open boll

Fort Cobb, OK

- Relocated from original location due to 2,4-D damage
- Fertility: 170-50-40
- Irrigation: center pivot
- Variety: PHY 300
- Planted/harvested: 5/22 and 11/16
- Foliar treatment: peak bloom
- Destructive plant sampling for partitioning (5 plants per plot):
  - 10 days after application
  - 60% open boll

Treatments

Lubbock, TX

- 100% recommended levels of soil applied nutrients (0-70-0)
- 125% recommended levels of soil applied nutrients (0-88-0)
- K-Fuel @ 5 qts/acre
- OneUp @ 2 qts/acre
- NDemand Polish @ 4 qts/acre
- NDemand 88 @ 4 qts/acre
- Pro Tetra @ 4 qts/acre

Fort Cobb, OK

- 100% recommended levels of soil applied nutrients (170-50-40)
- ~~125% recommended levels of soil applied nutrients (based on soil test)~~
- K-Fuel @ 5 qts/acre
- OneUp @ 2 qts/acre
- NDemand Polish @ 4 qts/acre
- NDemand 88 @ 4 qts/acre

All applications made with CO_2 pressurized backpack sprayer calibrated to deliver 10 GPA

Foliar Fertilizers

- K-Fuel @ 5 qts/acre, (0 - 0 - 24)
- NDemand Polish @ 4 qts/acre,
  (10 - 0 - 0 - 4Ca - 0.8Mg - 1.2Zn)
- NDemand 88 @ 4 qts/acre,
  (10 - 8 - 8 - 2S - 0.25B - 0.06Cu - 0.25Mn - 0.25Zn)
- OneUp @ 2 qts/acre,
  (4 - 14 - 5 - 0.05Cu - 0.7Zn)
- Pro Tetra @ 4 qts/acre,
  (4 - 0 - 0 - 1S - 0.8B - 1.2Cu - 2Mn - 3Zn)

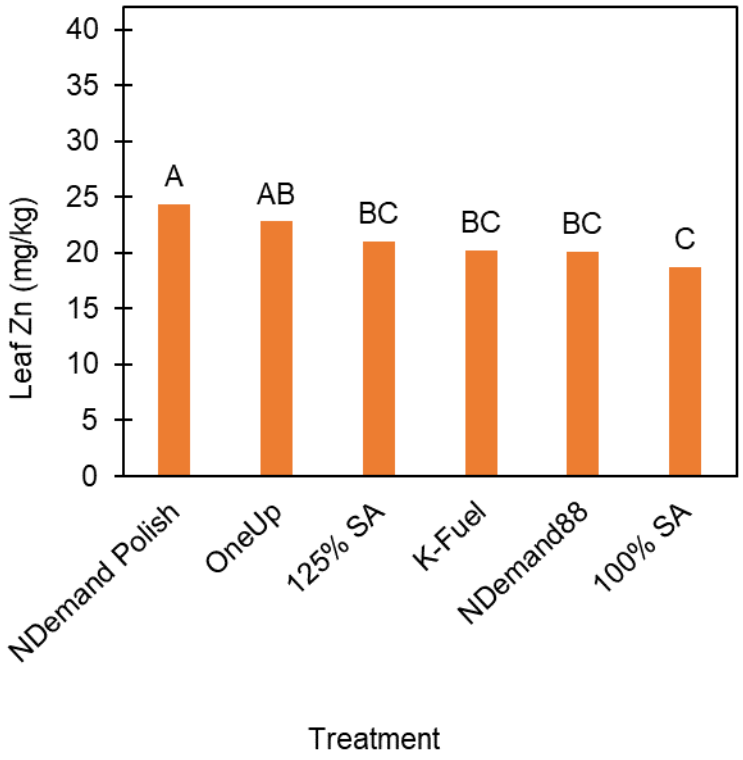
Soil Characterization

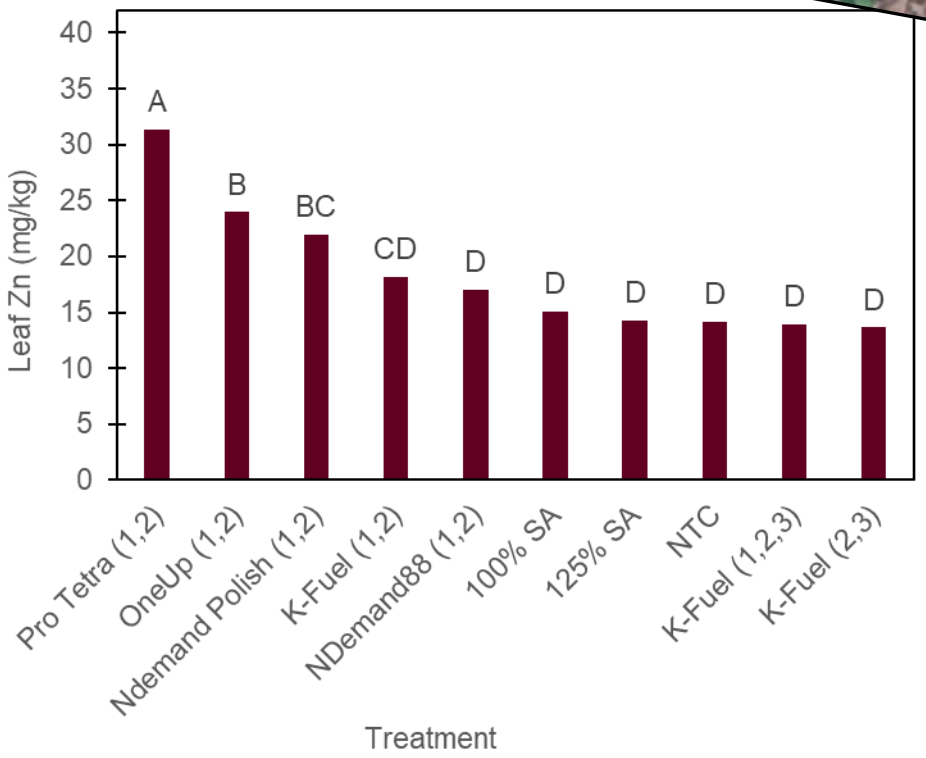
Location	pH	NO_3-N	P	K	Ca	Mg	S	Na	Fe	Zn	Mn	Cu
	--						mg/kg					
Fort Cobb, OK	7.4	6	6	101	1139	114	2.5	--	9.5	0.4	--	0.4
Lubbock, TX	8.0	8	8	270	5501	732	21	54	4.8	0.1	7.7	0.8

1st Plant Harvest

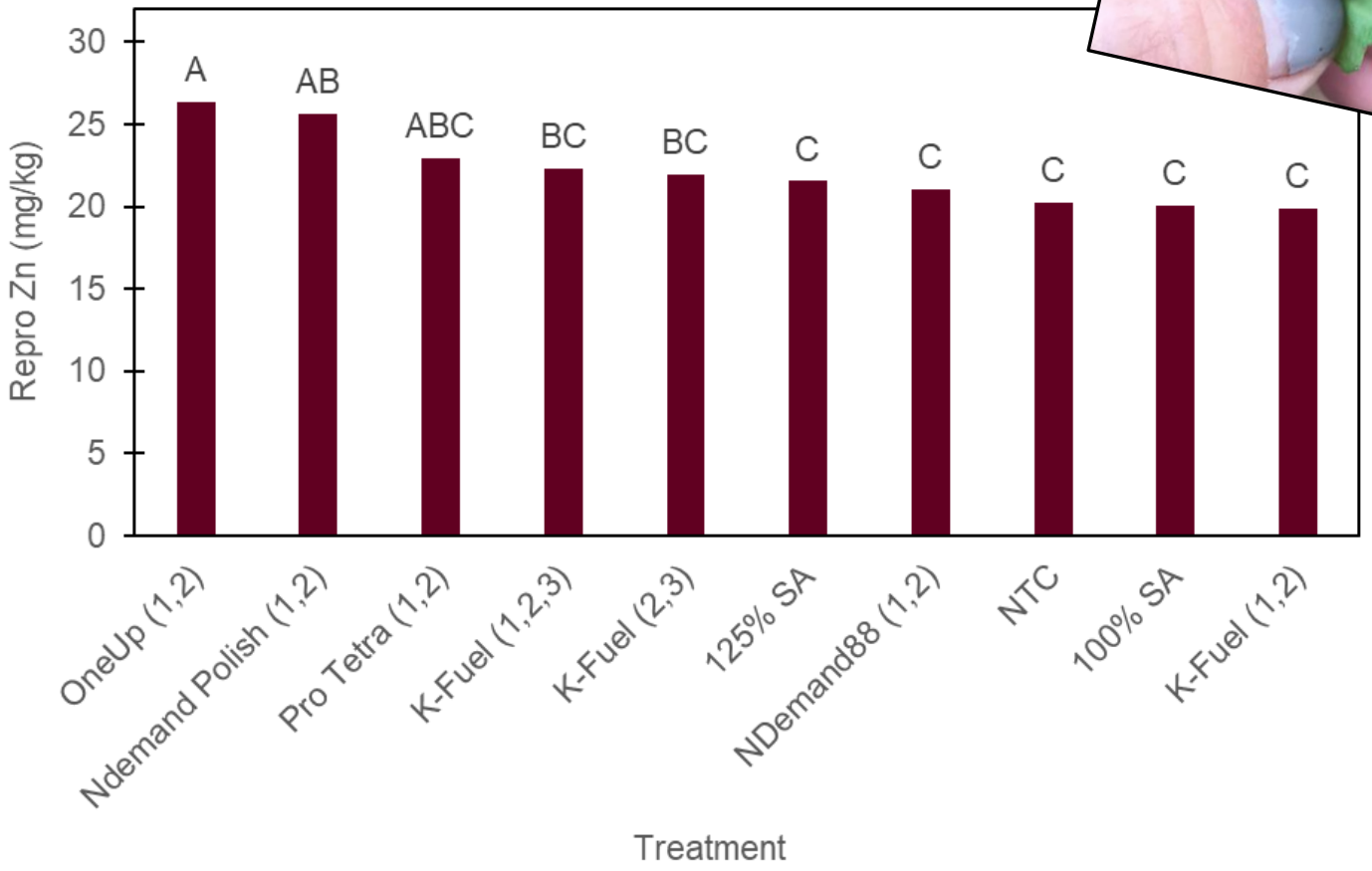
	Fort Cobb, Ok			Lubbock, TX		
	Leaf	Stem	Repro	Leaf	Stem	Repro
	P-values					
Dry Weight	0.329	0.537	0.701	0.194	0.107	0.637
N	0.703	0.729	0.057	0.428	0.399	0.839
P	0.816	0.507	0.347	0.893	0.299	0.761
K	0.562	0.525	0.997	0.764	0.564	0.932
Ca	0.724	0.182	0.124	0.769	0.220	0.806
Mg	0.862	**0.021**	0.111	0.129	0.446	0.901
S	0.289	0.358	0.221	0.091	0.542	0.874
B	0.093	**0.003**	0.310	0.181	0.802	0.918
Zn	**0.014**	0.120	0.729	**<.0001**	0.251	**0.010**
Mn	0.501	0.798	0.566	0.181	0.381	0.320
Fe	0.610	0.291	0.100	0.895	0.776	0.392
Cu	0.865	0.290	0.763	0.310	0.689	0.354

1st Plant Harvest





1st Plant Harvest



2nd Plant Harvest

	Fort Cobb, Ok		Lubbock, TX	
	Leaf	Stem	Leaf	Stem
	P-values			
Dry Weight	**0.032**	0.467	0.976	0.904
N	0.744	0.294	0.694	0.503
P	0.067	0.239	0.487	0.753
K	0.232	0.209	0.344	0.113
Ca	0.741	0.328	0.253	0.951
Mg	0.312	0.142	0.822	0.990
S	0.290	0.195	0.564	0.926
B	0.634	0.082	0.890	0.899
Zn	0.467	0.555	0.864	0.403
Mn	0.582	0.655	0.538	0.218
Fe	0.852	0.821	0.217	**0.040**
Cu	0.929	0.160	0.623	0.344

Lint Yield

Treatment	Lint Yield (lb/A)
100% SA	1892
125% SA	1874
K-Fuel	1885
Ndemand Polish	1860
NDemand88	1841
OneUp	1894
Average	1874
P-value	0.811

Treatment	Lint Yield (lb/A)
NTC	623
100% SA	708
125% SA	687
K-Fuel (1,2)	666
K-Fuel (1,2,3)	666
K-Fuel (2,3)	726
Ndemand Polish (1,2)	753 ★
NDemand88 (1,2)	523
OneUp (1,2)	721 ★
Pro Tetra (1,2)	603
Average	672
P-value	0.175

Summary

- Treatments did influence mineral concentrations in plant parts
  - Leaf Zn at 1st sampling (OK and TX)
  - Stem B and Ca at 1st sampling (OK)
  - Repro Zn at 1st sampling (TX)
  - Stem Fe at 2nd sampling (TX)
- Under low yield potential, treatments did not affect lint yield
  - Greater yield potential sites have been identified for 2019

Next Steps

- Additional data
  - Mineral concentrations of burrs, seed and lint at 2nd sampling
  - Total uptake at 2nd plant sampling
  - Fiber quality and lint loan value
  - Return on investment
  - Analysis using paired t-tests
- Plans for next year:
  - Lubbock - higher yield potential site with subsurface drip irrigation or pivot
  - Maintain same foliar treatments
  - Suggestions?

Thank you

Texas A&M AgriLife Research

Katie L. Lewis, PhD
Assistant Professor
Soil Chemistry & Fertility

Texas A&M AgriLife Research
1102 E. FM 1294, Lubbock

361-815-3836
katie.lewis@ag.tamu.edu

Texas Tech University
Department of Plant and Soil Science