PEP-NBT: PRODUCT EVALUATION PROTOCOL AND THE NEXT BIG THING IN WHEAT PRODUCTION: 2014-2015 PRODUCTION SEASON

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INTRODUCTION/BACKGROUND

The primary goal of this research is to provide new product information to wheat producers. New product releases, which occur every year, are often accompanied by weak performance evaluation information – often testimonials based on invalid comparisons. Chemical soil compaction treatments, liquid carbon and foliar nutrition products are already in the marketplace, and a new group of 'biological/microbiological' products is now emerging. Are any of these new materials going to be the "next big thing" in wheat production? The objective was to evaluate nine products intended to raise Kentucky wheat yield. Six products were specified by the Kentucky Small Grain Growers Association.

PROCEDURES

The trial was established at the Princeton Research and Education Center on a Crider silt loam under a corn, wheat, double-crop soybean rotation. Initial soil fertility was good (pH 6.6; K 349; Zn 3), but soil test P (54) triggered a recommendation of 30 lb P_2O_5/acre. There were six replications of ten treatments (Table 1), in one of three classes: a) seed; b) soil; and c) foliar products. Pembroke 2014 seed was treated on 7 October and no-till planted on 8 October into corn residues. Treatments 2 and 3, DAP (diammonium phosphate, 18-46-0), and DAP treated with Avail, were applied after planting. Stand counts were done on 21 October on 10 foot of center row. Foliar treatments (Coron and BioForge) were applied during late vegetative growth to maximize foliar uptake. Flag leaf tissue were taken late in wheat flowering to determine treatment impact on plant nutrition. Wheat was harvested on 13 June.

TABLE 1. TREATMENT MATERIALS AND APPLICATION TIMING IN THE WHEAT PEP – NBT STUDY

Treatment Number	Treatment Material	Application Timing
1	Untreated Check	----------
2	30 lb P_2O_5/acre	Soil Applied Near Planting
3	30 lb P_2O_5/acre + Avail	Soil Applied Near Planting
4	BioForge	Foliar @ Feekes 8/9
5	Coron (28-0-0-0.5% B)	Foliar @ Feekes 8/9
6	TJ QuickRoots	Seed Treatment
7	SabrEx	Seed Treatment
8	Jumpstart Only	Seed Treatment
9	Jumpstart + LCO	Seed Treatment
10	LCO Only	Seed Treatment

RESULTS

Plants stands ranged from about 22 to 25 plants/ft^2, with an average of 23.5 plants/ft^2, and were not affected by treatments. No seed treatment resulted in a stand greater than the untreated check.

Evaluating wheat's macronutrient nutrition, leaf nitrogen (N) was a bit greater with phosphate, phosphate + Avail, Coron, and the TJ QuickRoots, SabrEx and Jumpstart + LCO seed treatments (Table 2). Leaf N tended to be lower in the untreated check, with BioForge, and with only Jumpstart or only LCO seed treatments. Leaf phosphorus (P) was greatest with phosphate or phosphate + Avail application, but was lowest in the untreated check, with BioForge, Coron, and the SabrEx, Jumpstart + LCO and LCO only seed treatments (Table 2). Avail addition did not improve leaf N or P levels over those found with phosphate alone (Table 2). Leaf potassium (K), magnesium (Mg), calcium (Ca) and sulfur (S) were not influenced by treatments and averaged 1.97, 0.144, 0.72 and 0.26 %, respectively.

Among the micro-nutrients, flag leaf boron (B) was positively affected by Coron application, as expected (Table 2), while all other leaf B levels were not different from the untreated check. The leaf manganese (Mn) response was complex, with the phosphate + Avail application resulting in the greatest leaf Mn concentration, though not significantly greater than those found with phosphate, BioForge, and the TJ Quickroots and Jumpstart + LCO seed treatments. Lowest leaf Mn was found with the untreated check, Coron, and the SabrEx and Jumpstart only seed treatments (Table 2). Leaf zinc (Zn), iron (Fe), and copper (Cu) were not influenced by treatments and averaged 18.5, 172 and 19.5 ppm, respectively.

At harvest, grain moisture and test weight were not affected by treatments, averaging 15.5 % and 63.6 lb/bu, respectively. Grain yield was significantly and influenced (+14.5% or +10.5 bu/acre) by phosphate addition, relative to the untreated check, but phosphate + Avail did not improve yield relative to phosphate alone (Table 2). No other treatment, either foliar or seed, resulted in a yield significantly better than the untreated check (Table 2). The BioForge treatment resulted in the lowest observed yield.

TABLE 2. WHEAT FLAG LEAF NURIENT COMPARISON, AND GRAIN YIELD, AS RELATED TO THE TREATMENTS

Treatment Number	Treatment Material	Leaf				Grain Yield
		N %	P %	B ppm	Mn ppm	Bu/acre
1	Untreated Check	3.37bc†	0.253bc	3.8b	77.0bcd	72.0bc
2	30 lb P_2O_5/acre	3.61a	0.283a	3.8b	81.5abc	83.0a
3	30 lb P_2O_5/acre + Avail	3.41abc	0.280a	3.8b	88.2a	81.9a
4	BioForge	3.28bc	0.253bc	3.8b	82.5abc	68.5c
5	Coron (28-0-0-0.5% B)	3.48ab	0.255bc	5.5a	70.7d	71.4bc
6	TJ QuickRoots	3.51ab	0.262b	3.7b	83.3ab	70.5bc
7	SabrEx	3.40abc	0.252bc	3.8b	73.7cd	73.8b
8	Jumpstart Only	3.35bc	0.260b	3.7b	75.8bcd	72.1bc
9	Jumpstart + LCO	3.45ab	0.245c	3.7b	79.0abcd	71.3bc
10	LCO Only	3.20c	0.245c	3.7b	78.2bcd	72.2bc

†Values followed by the same letter are not significantly different at the 90% level of confidence.

SUMMARY

In this study, there was a yield benefit to fertilizer phosphate, as recommended by the soil test P result. This benefit was not enhanced by Avail application to the phosphate fertilizer. The yield increase was due to improved wheat P nutrition. Of the two foliar treatments, there was no statistically significant benefit to BioForge application, relative to the untreated check, in any measured parameter, either leaf nutrient composition or grain yield. The Coron foliar application significantly increased wheat leaf B concentration, modestly increased leaf N concentration, and modestly decreased leaf Mn levels, but did not benefit wheat grain yield. Among the five seed treatments, none benefited plant stands or grain yield. Two of the seed treatments (QuickRoots, Jumpstart + LCO) tended to raise wheat leaf N, and two (Quickroots, Jumpstart only) tended to raise leaf P, but others (LCO only, Jumpstart only) tended to lower leaf N or (LCO only, Jumpstart + LCO) lower leaf P. Wheat grain yield responded positively to improved phosphorus nutrition, but was not benefitted by any of the other products.

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