COPPER AND ZINC FERTILIZATION IN WINTER WHEAT

B.L.S. Olson, D. Leikam, and M. Claassen
Kansas State University, Northwest Area Office, Colby, KS 67701
bolson@oznet.ksu.edu (785) 462-6281

ABSTRACT

Copper and zinc applications have recently been sited as a possible management practice to improve wheat production on the Great Plains. Copper deficiency has been observed on wheat planted into peat soils, whereas wheat sensitivity to zinc deficiency is rated as low. To determine whether winter wheat in Kansas may benefit from copper and zinc, a multi-site study was set-up to determine if a 1 lb/a application applied prior to jointing is beneficial to yield. Four locations were harvested and no difference was observed between the treatments and the untreated check. This research will be continued in the spring of 2008.

INTRODUCTION

Recent discussions in the popular press and at farmer conferences surrounding the need for copper and zinc fertilization to optimize winter wheat yields have been debated. Copper deficiency has not been documented in Kansas on other crops. However, copper deficiency has been observed on small grains such as wheat and barely in Minnesota when the small grains are grown on peat soils. (Rehm and Schmitt, 1997) Deficiency symptoms have also been documented in South Carolina when wheat is grown on high organic matter, poorly-drained soils. (Camberato et al., 2003) Copper deficiency is characterized by light green to yellow color leaf where the leaf tips die back and are twisted. (Rehm and Schmitt, 1997)

For zinc, deficiencies have been observed on corn, soybeans, grain sorghum, and forage sorghums in Kansas. Symptomology includes pale green to yellow interveinal chlorosis exerting from the whorl. However, sensitivity of wheat to zinc deficiency is characterized as low. (Ganoe et al., 2007)

Therefore, the objective of this research was to evaluate whether copper and zinc applications to winter wheat prior to jointing enhance production on Kansas wheat fields.

MATERIALS AND METHODS

Field research was initiated in the spring of 2007. One location was located at the Northwest Research and Extension Center in Colby, KS with three other locations located within 20 miles off-station of the research center site. A fifth site, located at the Harvey County Experiment Field outside of Hesston, KS, was abandoned due to a late spring freeze that severely damaged wheat growth.

Plot sites within fields were randomly chosen. Soil samples were taken to a depth of six inches, and wheat variety planted was recorded as indicated in Table 1. Soils at all sites were either a Keith or Ulysses silt loam soil. Each site was set-up as a randomized complete block with three replications with an untreated check. Plot size was 27 ft wide by 200 feet long. Copper and zinc application rates of 1 lb/A were applied prior to wheat jointing with a 4-wheeler propelled sprayer delivering 10 gpa. At harvest, plots were mechanically combined and plot sample weight was determined with a weigh wagon. Moisture and test weight was taken for each plot and bu/A was calculated. Data were subjected to ANOVA and treatments were compared using Fisher's protected least significant difference at α=0.05.

Table 1. Wheat and soil characteristics of the four sites.

	Site 1	Site 2	Site 3	Site 4
Variety	Danby	Jagalene	Wesley	Jagalene
Copper (ppm)	1	1	1	0.7
Zinc (ppm)	1.3	1	0.7	0.8
O.M.	3.1	1.8	2.2	2.2
pH	6.4	6.8	6.8	7.6

RESULTS AND DISCUSSION

Results in Table 2 indicate no difference observed between treatments when compared to the untreated check when copper and zinc soil tests ranged from 0.7 to 1.3 ppm. Possible reasons no benefit occurred could be the level of copper and zinc in the soil was sufficient to adequately fertilize the growing wheat crop. As for copper, none of the sites were located on a peat soil that is commonly associated with this deficiency.

This research will be continued in the spring of 2008 with multiple locations evaluated.

Table 2. Wheat yields at each site and across sites.

	Site 1	Site 2	Site 3	Site 4	Average
	------------------------------------bu/a-----------------------------------				
Copper	37.7	58.9	75.0	87.2	64.7
Zinc	35.6	58.5	73.1	85.5	63.4
Untreated	32.8	60.8	74.0	85.7	63.2
LSD (0.05)	NS	NS	NS	NS	NS

REFERENCES

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