

Wheat Response to Foliar Applications of Copper and Zinc

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Abstract

In recent years, questions have arisen as to whether copper and zinc deficiencies are depressing wheat yields in Kansas. A two year study was initiated in 2007. Multiple on-farm wheat production fields where chosen randomly and soil test levels were taken for copper and zinc. Treatments consisted of 1.12 kg/ha of copper or zinc applied prior to wheat jointing in the spring and an untreated check. No differences in wheat yield were observed when comparing the copper and zinc treatment to the untreated check. Therefore, wheat fields in northwest Kansas having copper levels from 0.6 to 1.2 ppm or zinc levels of 0.2 to 1.3 ppm will likely not have any increase in yield from supplemental applications of these nutrients during spring green-up.

Introduction

In recent years, speculation in the farm press and from crop consultants and farmers has increased that copper and zinc deficiency is widespread in the wheat fields of the High Plains. This undocumented deficiency is supposedly causing significant yield loss to area farmers with many farmers buying fertility products with these components to "play it safe" in case there is a deficiency. Current research evaluating copper and zinc applications to wheat in Kansas was lacking. Therefore, research was initiated to evaluate copper and zinc applications to wheat prior to jointing.

Objective

Determine whether a foliar application of copper or zinc applied to wheat prior to jointing can increase wheat yield.

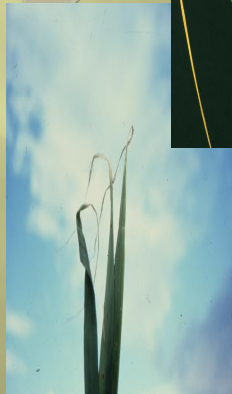
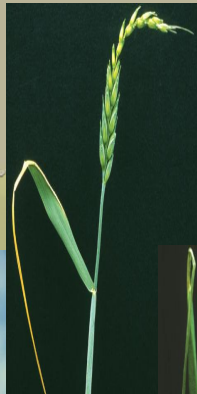
Materials and Methods

- ◆ Eight locations in Kansas
 - 2007
 - Four locations in Thomas county
 - One location by Hutchinson (abandoned)
 - 2008
 - Two locations in Thomas county
 - One location in Decatur county
- ◆ Soil test taken at each location (Table 1)
- ◆ 1.12 kg/ha of either copper or zinc was applied prior to jointing in the spring
 - Copper form - chelated copper
 - Zinc form - chelated zinc
- ◆ Randomized complete block with 4 replications
- ◆ Plots were mechanically harvested with a small plot combine

Factors Affecting Copper Availability

- ◆ Availability is reduced in fields with high levels of organic matter (Rehm and Schmitt, 1997).
- ◆ High pH levels decrease copper availability (Rehm and Schmitt, 1997).
- ◆ Light loamy or sandy soils may be low in copper (Solberg et al. 1999).
- ◆ High soil test levels of nitrogen and phosphorus may induce copper deficiency (Solberg et al. 1999).

Copper Deficiency Symptoms on Wheat



Factors Affecting Zinc Deficiency

- (Rehm and Schmitt, 2002)
- ◆ High yields on sandy soils with low organic matter.
- ◆ Where top soil has been removed increases the probability of having zinc deficiency as the percentage of free calcium carbonate increases
- ◆ Excessive phosphorus applications may enhance Zn deficiency on fields where the Zn soil levels are already low.

Zinc Deficiency Symptoms on Wheat



Table 1. On-farm site information

Year	County	Sites	Variety	Copper (ppm)	Zinc (ppm)	pH	OM%
2007	Thomas	1	Danby	1.0	1.3	6.4	3.1
		2	Jagalene	1.0	0.5	6.8	1.8
		3	Wesley	1.0	0.7	6.8	2.2
		4	Jagalene	0.7	0.8	7.6	2.2
2008	Thomas	1	Jagalene	0.6	0.2	7.3	2.1
	Thomas	2	Ike	1.0	1.2	6.5	2.7
	Decatur	TAM111	1.2	0.6	6.3	1.6	

Results

Wheat fields in northwest Kansas having copper levels from 0.6 to 1.2 ppm or zinc levels of 0.2 to 1.3 ppm will likely not have any increase in yield from supplemental applications of these nutrients during spring green-up (Table 2).

Table 2. Wheat yield combined across sites within a year

	2007	2008
	-----kg/ha-----	
Copper	4351	2710
Zinc	4264	2845
Untreated	4250	2825
LSD (0.05)	NS	NS

Citations

Copper deficiency pictures. 2009. CIMMYT. Available at http://wheatdoctor.cimmyt.org/index.php?option=com_content&task=view&id=162&Itemid=45 (accessed 23 Sept. 2009; verified 23 Sept. 2009).

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