Copper Deficiency in Wheat

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A winter wheat field exhibiting classic visual copper deficiency symptoms on soil likely low in copper:

- twisted leaf tips (Figures 1-2)
- sandy, low OM , high pH soil with known low copper levels (0.36 ppm DTPA-Cu).

Figure 1 and 2: Copper deficiency symptoms in winter wheat (courtesy A. Knaggs)

Or could it just be environmental stress due to frost injury, lack of moisture and drying winds?

A tissue test confirmed copper deficiency as the culprit – testing at 3 ppm (Low) versus sufficiency levels of 5-25 ppm Cu. At this point, a foliar copper spray is needed.

Studies in Manitoba compared three timings of foliar copper sprays on deficient spring wheat. Timings were tillering (Feekes 2), stem elongation (detection of first node or Feekes 6) and flagleaf emergence (sheath of flagleaf visible or Feekes 10). The wheat yield response is shown in Table 1.

Table 1. Wheat yield response to foliar copper applications on deficient soils (Karamanos et al, 2004.)

Site	Check	Tillering (Feekes 2)	Stem elongation (Feekes 6)	Flag leaf emerged (Feekes 10)	Feekes 2 & 10
Elm Creek 2002	3.6	4.5	14.1	10.3	12.7
Miami 2001	19.4	21.2	23.9	22.6	24.6
Miami 2002	54.8	56.5	58.7	53.4	57.9
Mean	26.0	27.4	32.2	28.8	31.7

Note: in separate studies at these same sites, broadcast and incorporation of 5 lb Cu/ac as copper sulphate increased yields above checks by 17, 6 and 6 bu/ac at Elm Creek and Miami in 2001 and 2002, respectively.

From the yields, it is apparent that copper deficiencies can be severe or slight and can vary from year to year.

Plants at tillering generally do not have enough leaf area exposed for effective foliar uptake. If applying foliar copper only once, the best time was at stem elongation. However, it was suggested that two applications at both stem elongation and at flagleaf emergence might be warranted in severe deficiencies. Full yield potential was not achieved in all cases and the preferred treatment method remains broadcast and incorporation of 3.5+ lb copper /ac as copper sulphate.

Reference:

Karamanos, R.E., Q. Pomarenski, T.B. Goh and N. Flore. 2004. The effect of foliar copper application on grain yield and quality of wheat. Can. J. Plant sci. 84:47-56.