Evaluation of some techniquesof fertilization with phosphorus fertilizer and some traceelement fertilizers

Taha Abdel-Khalik Mohamed El-Maghraby

he objective of this study was to evaluate four techniques of fertilization with phosphorus fertilizers as well as with some Zn and Cu fertilizers. Studies involved 3 greenhouse pot experiments involving different techniques , sources, forms and rates; crop grown was wheat (Triticum aestivum).Experiment 1: It involved evaluation of mixing thesuperphosphate fertilizer with seeds (Md), broadcast on soil surface without mixing (BR), broadcast on soil with mixing (Mx) and localized in bands 5 cm below soil surface, and 3 cm below seeds. Fertilizer sources were ordinary superphosphate (OSP:7.7%P i.e. 17.6% P2O5) and triple superphosphate (TSP:24%P i.e. 54.9% P2O5). The forms were granulated material (pelleted) and powdered (pulverized) and the rates were (10, 20, and 40 mgP/kg soil. (i.e. low, medium, and high). The soil was a sandy clay loam. Parameters measured were: plant dry weight and P-uptake/plant at 40 and 60 days of growth, dry matter straw and grains/pot, and P-uptake by plant at harvest (120 days of growth). Available P in soil and soil pH were also measured.Experiment 2: It involved the evaluation of Zn fertilizer by foliar spray of plant (SP), soaking of seeds in Zn solution (SK), mixing fertilizer with soil (Mx), and coating of seeds with zinc fertilizer (CT) using chelated zinc (Zn-chelate Zn-EDTA, 12.8%Zn) and ZnSO4.7H20 (22.1% Zn), at rates of 1.5, 3.0,4.5 mgZn/kg soil. The soil was a clay loam.Experiment 3: It involved the same factors as experiment 2, but using Cu instead of Zn, rates were 4, 8, and 12 mg / kg soil.Results may be summarized as follows;A. Experiment 1 (P- Fertilizers) :1-The Md technique was the most efficient for plant growth, yield, P-uptake, available P and pH in soil after wheat growth and the BR technique was the least efficient. Efficiency rating was as follows: Md > Lc > Mx > BR. Superiority of Md was most marked with OSP than with TSP at the low to medium P-rates than at the high rate where Lc was superior to it, indicating a possible slight decrease due to seed contact with high concentration of fertilizer phosphate; but both techniques remained superior to Mx and BR.2-The non-fertilized (no-P) gave plant weight at 40 & 60 days growth of 2.94 & 10.30 (g/pot), but P-fertilized gave increases of 23.1 & 78.9% (for Md); 25.9% & 60.9% (Lc); 25.5% & 57.9% (Mx); 24.1% 43.6% (BR). Straw & grain yields by no-P (g/pot) were 21.25 & 1.76 increasing upon adding P by 38.9% & 291% (Md); 34.0% & 289% (Lc); 30.8% &. 207% (Mx); 23.6% & 174% (BR).3-P-uptake (mg/pot) was 6.33 in grains, increased upon P addition by 429% (Md), 404% (Lc), 226% (Mx) and 194% (BR). It was 8.92 in straw increased by 186% (Md), 158% (Lc), 103% (Mx), and 86% (BR).4-Available P values after harvest (mg/kg) within top, middle, and bottom layers of soil pot (10-cm thick each) were 3.99, 2.56, and 2.39 for the no-P treatments in the same respective layers compared with 9.71, 5.32, and 3.78 (Md); 9.45, 4.96, and 3.73 (Lc); 5.49, 4.23 and 3.80 (Mx); 6.47,3.91, and 3.39 (BR).5-Soil pH decreased with increasing yield and plant growth, apparently a consequence of increased root network.B: Experiment 2 (Zn-fertilizers).1-The SP technique was the most efficient and the Mx technique was the least efficient, and the rating was SP > CT > SK > Mx regarding plant growth, Zn uptake and soil pH.2-Plant weight (g/pot) for no-Zn was 12.39, increased upon Zn-addition by 29.0, 24.7, 11.4 and 2.8% for SP, CT, SK, and Mx, respectively.3-Zn-uptake for no-Zn was 863 ug/pot increased upon Zn addition by 110.1, 63.8, 34.1, and 13.6% for SP, CT, SK , and Mx, respectively.4-Available Zn for no-Zn at end of experiment was 5.47 mg/kg but 12.46, 9.72,

7.44, and 5.85 mg/kg for CT, Mx, SP, and SK, respectively, reflecting the nature of eachtechnique.5-The SK technique was the most economic in terms of actual amounts consumed; since Zn-solution was not spent on the soil but used for seed-soaking with little portion of it consumed by seeds (absorbed by seeds).138C. Experiment 3 (Cu-fertilizers).1-Results resembled those of the Zn-experiment with plant growth increasing by 29.5, 27.0, 22.6, and 18.1% by SP, CT, SK, and Mx techniques, respectively.2-The CT was more efficient than Mx using the sulphate form and using the low rate.3-Cu-uptake was 221 ug/pot with no-Cu applied and increased upon Cu-addition by 71.0, 55.2, 39.8 and 24.4% with SP, CT, SK, and Mx techniques, respectively.4-Available Cu, was 11.16 mg/kg with no-Cu applied but 21.32, 18.41, 14.53, and 13.40 for means of CT, Mx, SP, and SK techniques, respectively.5-The SK treatment was the most economic as occurred with the Zn experiment.