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Assessment of P-Zn Interaction in Corn Grown on Calcareous Soil

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Abstract. Studies were carried out in the greenhouse and laboratory to elaborate the interaction between P-Zn in the nutrition of corn (*Zea mays* L.). The greenhouse experiments were conducted by using two highly calcareous soils differing in their texture (sandy and loamy). Their $CaCO_3$ contents were 23.8 and 36.9%; respectively. Treatments comprised wide combinations of phosphorus and zinc namely four levels of phosphorus as P_2O_5, $O(P_0)$, $75(P_1)$, $150(P_2)$, $300(P_3)$ kg ha^{-1} and three levels of zinc sulfate ($ZnSO_4$ $7H_2O$); 0 (Zn_1), 25 (Zn_2) and 50 (Zn_3) kg ha^{-1}. The laboratory experiment was initiated by using the heavier textured soil to conduct an incubation experiment. The treatments consisted of four levels of Zn; 0,2.5 and 10 mg Zn kg^{-1} and four levels of P; 0,10,15,25 mg P kg^{-1}. The incubation intervals were 24 hr., 3 days, 1,2,4 and 6 weeks.

Data obtained from the greenhouse experiments suggested that P applications enhanced Zn absorption by the plant and promoted its growth. Elevating the rate of applied P from P_0 to P_3 resulted in increasing Zn uptake from 159.1 to 229.1 ug/pot and dry matter yield from 2.52 to 5.36 g/pot. The results also demonstrated that Zn applications at the lower rates of applied P (P_1 and P_2) would decrease P uptake by the plant parts. Nonetheless, the incubation experiment indicated that irrespective of incubation intervals and applied Zn, increasing P levels caused a significant increase in the extractable P. Also, it caused non significant increase in the extractable Zn when it was associated with the lowest rate of applied P. However, higher applications of P caused a significant decrease in the extractable Zn. The data from this work indicate that plant capability to take up and assimilate Zn seems to be the limiting factor rather than P inducing Zn deficiency.

Introduction

Plants grown on calcareous soils, frequently suffer from zinc deficiency. Higher calcium carbonate content of soil and its subsequent effect on the soil pH greatly affect zinc availability [1-3]. Added phosphorus fertilizer may also induce zinc deficiency in plant [4]. However, the nature of such relationship is not fully understood and