

Natta Takrattanasaran 2010: Response of Corn Grown on Calcareous Soils to Zinc Sources and Methods of Application and Efficiency of Some Extractants for Assessing Available Zinc in Calcareous Soils. Doctor of Philosophy (Soil Science), Major Field: Soil Science, Department of Soil Science. Thesis Advisor: Associate Professor Jongruk Chanchareonsook, D.Agr. 150 pages.

This investigation consisted of three parts. The first part was carried out in greenhouse to study the response of corn grown on calcareous soils, Lop Buri (Lb), Lum Narai (Ln), Chai Badan (Cd) and Takhli (Tk) series, low in available Zn content, to ZnSO₄, ZnEDTA and Zn citrate (application rate of 0.5, 1, 2 and 4 mg Zn kg⁻¹ soil). The results showed that corn grown on the four calcareous soils were deficient in Zn. Application of Zn fertilizers significantly increased the growth, dry matter yield and Zn uptake of corn as compared with the control (without Zn application). Maximum dry matter yield of corn was associated with fertilizer rates between 2 and 4 mg Zn kg⁻¹ soil. The effectiveness of ZnSO₄, ZnEDTA and Zn citrate in increasing growth, dry matter yield and Zn uptake of corn were similar. The second part was also conducted in the greenhouse to elucidate the effect of seed soaking with ZnSO₄ solution (at concentration of 0.4, 0.8 or 1.6% Zn, 16 hours) prior to planting and soil applied Zn (using ZnSO₄ at the rate of 2 mg Zn kg⁻¹) on growth and yield of corn grown on calcareous soils (Lb, Ln, Cd and Tk series). Results from four calcareous soils showed that seed soaking with ZnSO₄ solution and soil applied Zn increased Zn uptake, enhanced growth rate and increased corn yield (dry ear weight) significantly comparing with the control (unsoaked-seed). The effectiveness of seed soaking with ZnSO₄ solution and soil applied Zn in increasing growth and yield of corn were rather similar. These results suggested that seed soaked with ZnSO₄ solution prior to planting is effective and economical method for correcting Zn deficiency in corn grown on the calcareous soils of Thailand. In the third part, comparative study on the efficiency of four extractants including DTPA, ammonium bicarbonate-DTPA (AB-DTPA), Mehlich3 and EDTA-ammonium carbonate (EDTA-(NH₄)₂CO₃) for assessing available Zn in calcareous soils was investigated. The amount of Zn extracted from 7 calcareous soils by four extractants, was related to the amount of Zn taken up by corn grown in the greenhouse. The results showed that the amount of Zn extracted by DTPA, AB-DTPA, Mehlich3 and EDTA-(NH₄)₂CO₃ was significantly correlated with that absorbed by corn ($r = 0.919^{**}$, 0.924^{**} , 0.953^{**} and 0.806^* , respectively). The coefficient of determination (r^2) for the relationship between the amount of Zn taken up by corn and extracted by the four extractants was 0.845 (DTPA), 0.855 (AB-DTPA), 0.910 (Mehlich3) and 0.650 (EDTA-(NH₄)₂CO₃). This indicated that the efficiency of DTPA, AB-DTPA and Mehlich3 for estimating Zn availability in the calcareous soils were higher than that of EDTA-(NH₄)₂CO₃. Moreover, Mehlich3 was superior to AB-DTPA and DTPA.

Student's signature

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