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Critical levels of phosphorus for maize in alkaline soils of Anand and Kheda districts

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ABSTRACT

A pot experiment was conducted with 15 soils widely varying soil characters for determination of critical limit of P for maize. Average increase in dry matter yield with P application was 46 per cent over control. The extractants experiments found were in the order : P_5 (37.05) > P_6 (27.26) > P_4 (15.97) > P_2 (10.60) > P_3 (5.31) > P_1 (1.33). The critical limits extractable P for maize with 6.8 and 3.0 ppm P for P_2 of Olsen's *et al.* (19.54) and P_3 of Soltanpour and Schwab (1977) methods, respectively.

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Key words : Critical limit, Bray's per cent yield, Chemical extractant, Phosphorus, Maize

INTRODUCTION

Next to N the most critical element influencing plant growth and production is phosphorus, which has been the subject of study ever since its essentiality was established.

The availability of soil phosphorus has been estimated by different reagents which include use of water, CO_2 saturated mild organic and inorganic acid solution, alkalies buffered solutions or even chelating agents of the reagents proposed, 0.5 M $NaHCO_3$, pH 8.5 (Olsen *et al*., 1954) has become more popular. In recent years the method Mehlich-3 (Mehlich, 1984) and AB-DTPA (Soltanpour and Schwab, 1977) are gaining importance. The information regarding appropriate extractant for determining phosphorus in Anand and Kheda soils is lacking for sound fertilizer recommendation.

MATERIALS AND METHODS

Fifteen surface soil samples varied from low to high in Olsen extractable P were collected in bulk quantity from different locations of Anand and Kheda districts. The soils S_1, S_2, S_3 and S_4 have loamy sand S_6, S_7, S_8 and S_{10} have sandy loam and S_5, S_9, S_{11}, S_{12}, S_{13}, S_{14} and S_{15} have sandy clay loam texture. These soils are alkaline in reaction (7.40 - 8.77) but have no salt accumulation (0.08 - 0.52 dSm^{-1}). The organic carbon content ranged from 0.21 per cent in case of S_7 to 0.52 per cent in S_{15} while the total nitrogen percentage ranged between (0.018 and 0.045 per cent). The soils S_1, S_2, S_3 and S_4 have high amount of available P_2O_5 (113.21 - 131.26 kg ha^{-1}) and potash content (373.10 - 591.63 kg ha^{-1}). Available P_2O_5 was medium (31.03 - 41.75 kg ha^{-1}), in S_6, S_7, S_8 and S_{10} whereas S_{11}, S_{12}, S_{13}, S_{14} and S_{15} fall under low P_2O_5 content (10.51 - 18.97 kg ha^{-1}) except S_5 (68.32 kg ha^{-1}) soil.

A pot experiment was conducted by using 8.0 kg air dried soil in polythene lined earthen pots and treated with a calculated dose of P level (0 and 40 kg P_2O_5 ha^{-1}) of soil through urea and DAP with CRD in three replications. The pots were brought field capacity and eight presoaked seeds of maize (GM-4) were dibbled in each pot. After germination they were thinned to four. Irrigation and plant protection measures were taken as per need. They were allowed to grow upto 60 days, after which the above ground portion was harvested. Plant material was dried

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