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Effect of potassium application and continuous cropping on K dynamics in calcareous soils

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ABSTRACT

A pot experiment was conducted at Junagadh during 91-92. Four soils varying in their native lime content 4.3 (L_1), 17.8 (L_2), 30.8 (L_3) and 40.5 (L_4) per cent, clay loam in their texture having available K contents 93.8, 105, 96.5 and 87.1 ppm, respectively were collected. Four levels of potassium were applied 0 ((K_0), 25 (K_1), 50 (K_2) and 100 (K_3) ppm. Three crops groundnut, wheat and maize were grown in a sequence. Soil samples collected periodically and at harvest of each crop were analyzed for different forms of potassium. With the application of potassium, the WSK (Water soluble-K) content increased almost linearly. Similarly the EK (exchangeable K) content also increased with the K applications. In case of NEK (non exchangeable K) content, the reduction was noted under K_1 and K_2 treatments and fixation occurred in K_3. The EK content and NEK contents were decreased with the increase in lime content of the soils. The WSK content increased with the lime content up to 30.5 per cent (L_3). Due to continuous cropping the WSK, EK and NEK content reduced drastically, specifically in the treatments where the depletions were higher.

Key words : K dynamics, Depletion pattern, Continuous cropping, Calcareous soil.

The free lime content of medium black calcareous soils of Junagadh district varies from 3 to 50 per cent. The presence of lime has been found to have a great impact on nutrient availability in these soils. The present study was planned to note the changes in K-dynamics taking place as a result of K application and continuous cropping on calcareous soils of varying lime contents.

MATERIALS AND METHODS

Four soils having different native lime contents were collected from college farms, Junagadh. The soils were clay loam in texture, with pH ranging from 8.0 to 8.2, EC from 0.32 to 0.55 dSm^{-1}, and CEC from 32.4 to 48.3 Cmol (P^+) kg^{-1}. Native lime contents of these soils were 4.3(L_1), 17.8(L_2), 30.5(L_3) and 40.5(L_4) per cent. The initial water soluble K contents of these four soils L_1, L_2, L_3 and L_4 were 8.9, 6.9, 8.0 and 7.8 ppm the exchangeable-K contents of these soils were 84.9, 98.1, 88.8 and 79.3 ppm and non-exchangeable-K contents were 307, 293, 268 and 178 ppm, respectively.

The pots were filled with 12 kg of soil and crops of groundnut, wheat and maize were grown in a sequence, with different levels of potassium application viz., 0(K_0), 25(K_1), 50(K_2) and 100(K_3) PPM K added through muriate of potash. Recommended doses of N and P were given through DAP and Urea. Irrigations were given using distilled water. The groundnut, wheat were harvested at maturity and maize after 60 days. The soil samples were collected periodically and after harvest of each crop for chemical analysis. For determination of water soluble-K (WSK), exchangeable-K (EK) and non-exchangeable-K (NEK), procedures given by McLean (1960), Hanway and Heidel (1952) and Wood and Deturk (1941) were followed, respectively. The potassium content of the extract was determined using flame photometer.

RESULTS AND DISCUSSION

Water soluble K:

Data regarding effect of native lime, potassium application and continuous cropping on WSK content of soil at different growth stages are presented in Table 1. The water soluble-K content was found to be significantly affected by native lime content and potassium application. The WSK content varied from 1.43 to 41.32 ppm. It was observed that with the increase in lime levels the WSK contents also increased significantly. However, in most of the L_3 treatment combinations the WSK contents were noticeably high. The potassium application increased the WSK content significantly over control in all the treatment combinations.

While studying the effect of continuous cropping, it was observed that the highest values of WSK contents under control in all the four soils viz., L_1K_0, L_2K_0, L_3K_0 and L_4K_0 were noted 10.35, 8.93, 13.73 and 10.05 ppm, respectively at harvest of 1st crop.