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Soil test based fertilizer requirement for specific yield targets of castor in vertic ustocrepts

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ABSTRACT

Based on field experiment conducted on a *Vertic Ustocrepts* with castor (GCH-6), by dividing each of the four fertility strip into 12 subplots which received 9 selected treatment combinations out of 5 levels of N (0, 25, 50, 75, 100 kg ha^{-1}), 5 levels of P_2O_5 (0, 25, 50, 75, 100, kg ha^{-1}) and 4 levels of K_2O (0, 30, 60, 90 kg ha^{-1}) with 3 control treatments, fertilizer prescription equations were calculated. The results of field verification trials, conducted at different locations showed that yield targets were achieved below ± 10 per cent variation except 40 q ha^{-1}, but adjusted fertilizer prescription equations were fitted at yield targets of 20 and 25 q ha^{-1} seed yield of castor. The highest return was obtained in yield target 20 q ha^{-1} followed by 25 q ha^{-1}.

Key words : Target yield, Castor, Fertilizer prescription equation

Fertilizer is one of the most important agricultural inputs for increasing the crop production. Soil testing is now accepted as a procedure for the recommendation of fertilizer doses for various crops in India. But soil testing would become a useful tool only when it is based on intimate knowledge of soil-crop-variety-fertilizer-climate-management interaction for a given situation (Kanwar, 1971). In this regard targeted yield approach has been found to be beneficial which recommends balanced fertilization considering available nutrient status in the soil and the crop needs. Targeted yield approach was first developed by Truog (1960) and Ramamoorthy *et al.* (1967) established theoretical basis and experimental technique suit to Indian conditions. They showed linear relationship between yield and nutrient uptake. For obtaining a given yield, fertilizer needed can be estimated considering efficiency of soil and fertilizer nutrients. However, the cost of fertilizers has been increased by about three times during the last 10 years. Fertilizer use efficiency is also low. Similarly the soils of India are low in available N and P. Therefore, fertilizers should be used judiciously and efficiently. Castor is one of the most important oilseeds crops of Gujarat with an area of 3.04 lacks hectare and productivity of 1526.4 kg ha^{-1}. The nutrient requirement specifically depends on variety besides, types of soil and moisture availability. In general seed yield of one ton/ha removes 30 kg N, 12 kg P_2O_5 and 10 Kg K_2O ha^{-1}. So, nutrient imbalance and depletions is become common.

Within a normal range of applied fertilizer and available nutrient status of soil, a linear relationship between nutrient uptake and seed yield is an essential feature of targeted yield concept of crops. Research carried out on soil test crop response correlation has generated valuable information regarding nutrient requirement per unit weight of economic produce of harvested crop and about the efficiency of soil available and applied nutrients under various soil types and agro-climatic situation.

MATERIALS AND METHODS

A field experiment was conducted in *kharif* 2005 and 2006 with castor (Var. GCH-6) on a *Vertic Ustocrepts* using fertility gradient approach (Ramamoorthy *et al.*, 1967). A sorghum crop was raised as an exhausted crop in preceding season on these strips. After harvest of exhaust crop, the experiment with castor as a test crop was conducted in subsequent season (*kharif* 2005) by dividing each of the four fertility strip into 12 subplots which received 9 selected treatment combinations out of 5 levels of N (0, 25, 50, 75, 100 kg ha^{-1}), 5 levels of P_2O_5 (0, 25, 50, 75, 100, kg ha^{-1}) and 4 levels of K_2O (0, 30, 60, 90 kg ha^{-1}) with 3 control treatments. Full dose of P and K and half dose of N were applied at the time of sowing. The remaining half dose of N was top dressed at 30 days after sowing. Initial surface soil samples were drawn from each plot before fertilizer application to castor and analyzed for alkaline $KMnO_4$-N, Olsen-P and NH_4OAc-K (Jackson, 1973). Castor seed and stover yields were recorded at harvest and the samples analyzed for NPK concentration (Parkinson and Allen, 1975 and Jackson, 1973) and uptake was calculated. The data on yield, NPK uptake by castor, soil available NPK and fertilizer NPK applied were used for calculation of basic data (Sonar,