

Effect of integrated use of fertilizer, nitrogen and green manures on sorghum yield, uptake of nitrogen and N balance on inceptisol

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SUMMARY

Field experiments were conducted during 2001-2002 and 2004-2005 on Inceptisols (Vertic Haplustept) to evaluate the influence of *in-situ* green manuring crops viz., balckgram, greengram sunhemp, cowpea and fallow in *kharif* and its residual effects with levels of N to *rabi* sorghum on grain and fodder yields, uptake of N and N balance in soil. The grain yield, fodder yield and uptake of N by *rabi* sorghum significantly increased due to the incorporation of all green manuring crops as compared with *kharif* fallow treatment. Among the green manuring crops cowpea was superior over all other green manure crops. The conjoint use of green manuring crop as cowpea with 25 kg N ha⁻¹ to *rabi* sorghum showed superiority over fallow and 0 kg N ha⁻¹ for increasing the grain yield of *rabi* sorghum.

Key words: Integrated nutrient management, Green manure, Uptake, N balance.

The N is the most unpredictable one and its higher demand coupled with various losses in the cropping system made this nutrient a highly significant one in the soil under dryland condition. Inceptisols are either low to medium range of organic matter and organic matter is the backbone for maintaining the sustainability of soil fertility and productivity. Therefore, use of chemical fertilizer alone may not keep place with time in maintenance of soil health for sustaining the productivity. The problem of micronutrients also generally observed by using high analysis fertilizer and it removed by the crops of high yielding genotypes. Indiscriminate use of high analysis chemical fertilizer also resulted in the deficiency of nutrients other than the applied and caused decline in organic carbon (Singh *et al.* 1999). There is wide gap between production and consumption of N fertilizers and greater emphasis necessarily have to be laid on supplementing the organic matter and N through green manure crops in dry farming areas for building the soil health in terms of physical, chemical and biological properties of soil in scarcity zone. However, when green manure was not applied in conjunction with chemical fertilizers for efficient growth of crop, decline in organic carbon was arrested and the gap between potential yield and the actual yield is bridged to a large extent. The release of N from green manuring crops varies with N content, C:N ratio and type of green manure crops. The beneficial effect of green manure /crop residues has been reported on rice by (Singh *et al.*, 1999, Duhan and Singh, 2002 and Surekha *et al.*, 2004); toria (Bahl and Pasricha, 2001) and sorghum (Duraisami *et al.*, 2001). The

incorporation of organic materials in the form of green manuring crops with fertilizer N will help in maintaining the fertility status of soil with improving the properties of soil and also stimulating the growth of sorghum ultimately helps in increasing the yield of *rabi* sorghum. There is a lack of information on integrated nutrient management for *rabi* sorghum under dryland condition. Therefore, the present study was undertaken to study the effect of integrated use of organic manure and fertilizer N on sorghum grain yield, uptake and N on sorghum grain yield, uptake and N balance on Inceptisol and to find out the suitability of green manure crop under dryland conditions.

MATERIALS AND METHODS

Field experiments were conducted on medium black clay soil (Vertic Haplustept) of 60 cm depth belonged to Mulegaon 4 series and was classified as fine montmorillonitic hyperthermic Vertic Haplustept. The soil of the experimental field had a pH of 7.20 and EC of 0.24 dS m⁻¹. The soil had bulk density 1.21 (Mg m⁻³), field capacity 304 mm, permanent wilting point 155 mm, organic carbon content 0.41 %, available nitrogen(KMnO₄-N) 205 kg ha⁻¹, available phosphorus (Olsen's P) 16 kg ha⁻¹ and available potassium (NH₄OAc) 744 kg ha⁻¹. The experiments were conducted in factorial randomized block design assigning green manuring crops in main plots and N levels in sub-plots. The main plot treatments included four green manure crops viz., blackgram, greengram, sunhemp, cowpea and two fallow treatments. The sub-plot treatments were levels of N viz., 0 (N₀) and 25 (N₂₅) kg ha⁻¹ to *rabi* sorghum. The 12.5

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