

## EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON YIELD AND NUTRIENTS UPTAKE BY SORGHUM (*SORGHUM BICOLOR L.*)

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### SUMMARY

Application of recommended dose of N and P increased the fodder yield of sorghum from 41.11 to 108.54 q ha<sup>-1</sup> significantly over absolute control and all other treatments. A decrease in RD of N and P at the tune of 25 % , 50 % and 75 % decreased the fodder yield significantly from 108.54 to 87.64., from 108.54 to 75.70. and from 108.54 to 66.32 respectively. Substitution of 100 % recommended dose of nitrogen through FYM increased the fodder yield of sorghum from 41.11 to 56.97q ha<sup>-1</sup> over absolute control. Application of recommended dose of N and P also increased the uptake of N, P and K by sorghum significantly from 62.25 to 148.70, 7.40 to 19.53 and 53.44 to 151.96 q ha<sup>-1</sup>, respectively over absolute control and all other treatments. Decrease in RDF N and P significantly decreased the uptake of N, P and K by sorghum. Application of 100 % recommended dose of nitrogen through FYM also increased the uptake of N, P and K by sorghum significantly from 62.25 to 77.48, 7.40 to 10.82 and 53.44 to 85.46 q ha<sup>-1</sup> respectively over absolute control.

**Key words :** Sorghum, fodder yield, Nitrogen, Phosphorus and potassium, uptake

Sorghum, besides being fifth most important cereal crop of the world, is also valued for its fodder and stover. Sorghum fodder is suitable for silage and hay making. In India, fodder sorghum is grown in 2.6 m ha mainly in western UP, Haryana, Punjab, Rajasthan and Delhi and fulfills over two third of the fodder demand during *Kharif* season. Sorghum is fast-growing, warm weather annual that can provide plenty of feed in midsummer during lean period. Judicious use of FYM with chemical fertilizers improves soil physical, chemical and biological properties and improves the crop productivity (Sharma *et al.* 2007). Among different sources of organic manures, FYM is most important source and used since long as a nutrients supplement to crop production. Very small information is available on the effect of organic and inorganic fertilizers on the growth and yield of sorghum fodder. Therefore, a field experiment was planned to study the effect of recommended dose of N and P through chemical fertilizers, different combination of chemical fertilizers with FYM and FYM alone on yield and nutrients uptake in sorghum.

Field experiment was conducted at research

farm, Department of Soil Science, CCSHAU, Hisar (29°05' N, 75°38' E, 222m elevation) to study the effect of sole application of recommended dose of N and P through chemical fertilizers and different levels of FYM, on yield and nutrients uptake in sorghum. Plot size was taken 100 m<sup>2</sup>. Soil of experimental site was sandy loam in texture, having pH 8.2, EC (1:2) 0.32 dSm<sup>-1</sup>, OC 0.28%, available N, P and K were 140.8, 16.0 and 285.0 kg ha<sup>-1</sup> respectively. In all six treatments were maintained as per given in Table 1. Randomized block design was followed by keeping four replications. All the P and N were applied through urea and SSP at the time of sowing. FYM was applied one day before sowing. All the field operations such as weeding, irrigation etc were done as and when required. Crop was harvested at full height. Fodder yield was recorded separately from each plot. Plant samples were analysed by following standard procedure in the laboratory. Total N in straw analysed by colorimetric (Nessler's reagent) method (Lindner, 1944) and total P analysed by vanadomolybdo phosphoric yellow color method (Koenig and Johnson, 1942). Total potassium in grain and straw was analysed by using flamephotometer.

### Fodder yield

Application of recommended dose of N and P significantly increased the fodder yield of sorghum from 41.11 to 108.54 q ha<sup>-1</sup> over absolute control (Table 1). Application of recommended dose of N and P also recorded significant and highest fodder yield over all other treatments. Similar results were reported by Ali (2000) who also reported significant effect of nitrogen application on green fodder yield of sorghum. Ahmad et al (2007) also reported the maximum green fodder yield where inorganic fertilizer (NP) was applied. Roy and Khandakar (2010) also reported the increase in fodder yield with the application of phosphorus. Afzal et al (2013) also reported the increase in growth of fodder sorghum with the increase in nitrogen levels. A substitution of 100 % recommended dose of nitrogen through FYM increased the fodder yield of sorghum from 41.11 to 56.97q ha<sup>-1</sup> over absolute control. Kumar et al. (2004) also reported the increase in sorghum fodder yield with the application of FYM. However, treatment 100 % recommended dose of nitrogen through FYM was inferior to all other combinations of RDF N & P with FYM. This may be due to lower concentration and slow release of nutrients from the FYM as compared the chemical fertilizers. Data further indicated that we cannot achieve required yield only with the application of FYM alone. A decrease in RD of N and P at the tune of 25% 50% and 75% decreased the fodder yield significantly from 108.54 to 87.64., from 108.54 to 75.70 and from 108.54 to 66.32 97 q/ha, respectively and the extent of decrease were 18.43, 30.26 and 40.74 per cent respectively. Difference between 25 % RDF N and P through fertilizers+25% RDF N and P through fertilizers+75 N % through FYM and 100 N% through FYM was found non-significant with respect to fodder yield of sorghum.

### Nutrients uptake

Application of recommended dose of N and P significantly increased the N uptake by sorghum stover from 62.25 to 148.70 kg ha<sup>-1</sup> over absolute control and all other treatments. Ketterings *et al.* (2006) also reported the similar results. Application of 75 % N and P + 25 % N through FYM recorded the significantly higher N uptake by sorghum stover (120.07 kg ha<sup>-1</sup>) over all other FYM combinations and control. Further reduction in RDF of N and P through chemical fertilizers 50 and 25 % further decreased the N uptake by sorghum stover from 120.07 to 103.71 and 90.86 kg ha<sup>-1</sup> respectively. Treatment 100 % N through FYM recorded the significantly higher N uptake by sorghum stover (77.48 kg ha<sup>-1</sup>) over absolute control (62.25 kg ha<sup>-1</sup>).

Application of recommended dose of N and P significantly increased the N uptake by sorghum stover from 7.40 to 19.53 kg ha<sup>-1</sup> over absolute control and all other treatments except 75 % RDF N and P through fertilizers + 25 % N through FYM (table 2). Differences between N and FYM combinations (T<sub>4</sub> and T<sub>5</sub>) were found non significant with respect to P uptake by sorghum stover. Data further indicated that differences between N and FYM combinations (T<sub>5</sub> and T<sub>6</sub>) were found non significant with respect to P uptake by sorghum stover. Treatment 100 % N through FYM recorded the lowest P uptake by sorghum stover as compared to other treatments but significantly higher (10.82 kg ha<sup>-1</sup>) over absolute control (7.40 kg ha<sup>-1</sup>). Ketterings et al (2006) also reported the similar results.

Application of recommended dose of N and P significantly increased the P uptake by sorghum stover from 53.44 to 151.96 kg ha<sup>-1</sup> over absolute control and all other treatments. Ketterings et al (2006) reported increase in K uptake by sorghum with the application of phosphorus. Treatment 75% N and P+25% N through

TABLE 1  
Effect of IN M on yield (q/ha) and nutrient uptake (kg/ha) by sorghum stover

Treatments	Fodder yield (q/ha)	N uptake (q/ha)	P uptake (q/ha)	K uptake (q/ha)
T <sub>1</sub> -Control (no fertilizers and Manure)	41.11	62.25	7.40	53.44
T <sub>2</sub> -Recommended dose of N and P through fertilizers (RDF)	108.54	148.70	19.53	151.96
T <sub>3</sub> -75% RDF N and P through fertilizers+25% N through FYM	87.64	120.07	16.65	122.70
T <sub>4</sub> -50% RDF N and P through fertilizers+50 N% through FYM	75.70	103.71	14.38	98.41
T <sub>5</sub> -25% RDF N and P through fertilizers+75 N% through FYM	66.32	90.86	13.26	92.65
T <sub>6</sub> -100% N through FYM	56.97	77.48	10.82	85.46
C. D. (P=0.05)	9.33	12.56	3.16	13.47

FYM recorded the significantly higher K uptake by sorghum stover ( $120.07 \text{ kg ha}^{-1}$ ) over all other FYM combinations and control. As in case of P uptake, differences between N and FYM combinations ( $T_5$  and  $T_6$ ) were found non significant with respect to K uptake by sorghum stover. Treatment 100 % N through FYM recorded the lowest K uptake by sorghum stover as compared to other treatments but significantly higher ( $85.46 \text{ kg/ha}$ ) over absolute control ( $53.44 \text{ kg/ha}$ ).

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