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Effect of Integrated Use of Nitrogen with Farmyard Manure on Yield and Yield Attributes of Ragi [Eleusine coracana (L.) Gaertn] in Alfisols of HAT-Zone of Andhra Pradesh

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ABSTRACT

Field experiment conducted on red sandy loam soil at ARS, Seethampeta of Srikakulam District of High Altitude (450 m) and Tribal Zone, revealed that more plant height, more panicle length and more number of fingers per car and also higher grain and straw yields were obtained with the treatment received nitrogen @ 40 kg N ha^{-1} along with FYM @ t ha^{-1}. The tribal farmers were advised to apply nitrogen fertilizers along with organic manures to ragi crop to maintain both the fertility and productivity of the soil and to improve the economic stability of the tribal farmers with high net returns.

Key words : HAT-zone, Integrated Nitrogen Management, Ragi.

Finger millet is one of the important staple food crops of India, which accounts for nearly 40 per cent of area and 60 per cent of production under small millets. It is one of the food crops for tribal farmers and which is grown in larger extent in High Altitude and Tribal Zone of Andhra Pradesh. The productivity in this zone is very low compared to the other zones due to non adoption of improved agro - techniques. Newly developed finger millet varieties respond to considerable amounts of nitrogen and application of nitrogen was found to be economically advantageous (Reddy *et al.,* 1980 and 1984) for obtaining higher productivity. Continuous use of inorganic fertilizers alone deteriorates soil health and lowers its productivity. Escalating energy crisis and high prices of chemical fertilizers. The tribal farmers can not afford to apply recommended dose of fertilizers due to high prices of chemical fertilizers and so they apply sub-optimal dose of fertilizers and get lower yields. In recent days, integrated use of inorganic fertilizers with manures has become an estiablished agro-technique for sustaining yield levels, enhancing nutrient use efficiency and restoring soil physical, chemical and biological properties. Among various organic manures, FYM proved to be important renewable source of plant nutrients to substitute the inorganci nitrogen to a reasonable extent. Therefore, it is proposed to study application of farm yard manure in combination with nitrogen at lower dose so that it can be recommended to tribal farmers.

MATERIAL AND METHODS

A field experiment was conducted on sandy loam soil, medium in abailable nitrogen and phosphorus and high in potassium content at Agricultural Research Station, Seethampeta for three years during 1996 to 1998 with ten treatments *viz.,* control (T_1); FYM 5t ha^{-1} (T_2); 10 kg N ha^{-1} (T_3);10kg N + FYM 5t ha^{-1} (T_4); 20 kg N ha^{-1} (T_5); 20 kg N + FYM 5t ha^{-1} (T_6); 30 kg N ha^{-1} (T_7); 30 kg N + FYM 5t ha^{-1} (T_8); 40 kg N ha^{-1} (T_9); 40 kg N + FYM 5t ha^{-1} (T_{10}). Twenty five days old seedlings of ragi variety, Godavari were transplanted at a spacing of 25 x 10 cm. The plot size of each treatment was 5 x 3 m. The crop was maintaines by adopting the recommended package of practices. Need based plant protection measures were taken up during crop growth period. The data on plant height, panicle length, number of fingers $panicle^{-1}$, test weight, grain and straw yield were recorded in two years trial and the data analyzed as per the standard statistical procedures described by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

The results on yield and yield attributes are presented in Table 1 and 2. Maximum plant height (86.6 cm) was noticed with 40 kg N along with farm yard manure @ 5 t ha^{-1} followed by only application of 40 kg N ha^{-1} (83.1 cm). These treatments recorded the highest plant height in both the years with the application of 40 kg N + FYM @ 5 t ha^{-1}. The shortest plant height was noticed in T_1 (Control). Panicle length was found to be significantly influenced in various combinations of nitrogen managment practices.

Table 1. Influence of nitrogen management practices on yield attributes in ragi

Treatment	Plant Height (cm)			Panicle length (cm)			No.of fingers panicle^{-1}			Test weight (g)		
	1997	1998	Mean	1997	1998	Mean	1997	1998	Mean	1997	1998	Mean
T_1-Control	55.4	57.6	56.5	4.23	5.10	4.67	4.0	4.0	4.0	2.50	2.50	2.50
T_2-Fym 5tha^{-1}	64.3	62.6	63.5	5.37	6.13	5.75	4.3	4.5	4.4	2.56	2.55	2.55
T_3-10kg Nha^{-1}	71.3	71.8	71.6	5.91	6.32	6.12	5.1	5.5	5.3	2.55	2.56	2.55
T_4-10kg N+FYM 5tha^{-1}	73.8	71.6	72.4	5.78	6.41	6.10	5.2	5.4	5.3	2.61	2.61	2.61
T_5-20kg Nha^{-1}	73.0	76.3	74.7	6.35	6.83	6.59	5.4	5.5	5.5	2.55	12.59	2.57
T_6-20kg N+FYM 5tha^{-1}	78.8	80.2	79.5	6.83	7.53	7.18	5.6	5.2	5.4	2.62	2.55	2.59
T_7-30kg Nha^{-1}	76.2	79.9	78.1	6.97	7.15	7.06	5.7	5.7	5.7	2.53	2.62	2.58
T_8-30kg N+FYM 5tha^{-1}	79.6	82.5	81.1	7.03	7.18	7.11	6.3	5.8	6.1	2.62	2.63	2.63
T_9-40kg Nha^{-1}	81.0	85.2	83.1	7.15	7.40	7.28	6.7	6.4	6.6	2.57	2.65	2.61
T_{10}-40kg N+FYM 5tha^{-1}	85.6	87.6	86.6	7.53	7.82	7.68	6.9	6.4	6.7	2.65	2.65	2.65
C D (P=0.05)	5.0	5.1	-	0.51	0.72	-	0.5	0.5	-	NS	NS	-

Table 2. Influence of nitrogen management practices on yield of grain and straw and benefit cost ratio in ragi

Treatment	Straw yield Qha^{-1}			Grain yield Qha^{-1}			Per cent yield increase over control	Benefit cost ratio
	1997	1998	Mean	1997	1998	Mean		
T_1-Control	10.00	9.27	9.64	5.55	5.56	5.56	-	1.10
T_2-Fym 5tha^{-1}	13.67	11.20	12.44	7.58	7.22	7.40	24.9	1.11
T_3-10kg Nha^{-1}	13.16	12.01	12.59	7.93	8.00	7.97	30.2	1.32
T_4-10kg N+FYM 5tha^{-1}	15.33	12.71	14.02	8.09	9.33	8.71	36.2	1.14
T_5-20kg Nha^{-1}	14.67	12.87	13.77	8.44	9.67	9.06	38.6	1.46
T_6-20kg N+FYM 5tha^{-1}	15.67	14.14	14.91	9.33	10.22	9.78	43.2	1.24
T_7-30kg Nha^{-1}	16.33	16.25	16.29	9.96	10.50	10.23	45.7	1.61
T_8-30kg N+FYM 5tha^{-1}	18.00	16.39	17.20	10.67	12.60	11.64	52.2	1.46
T_9-40kg Nha^{-1}	18.33	16.83	17.58	12.78	13.01	13.08	57.3	1.88
T_{10}-40kg N+FYM 5tha^{-1}	22.00	19.87	20.94	15.71	15.12	15.42	63.9	1.90
C D (P=0.05)	3.59	1.82	-	1.30	1.30	0.84	-	-

Maximum panicle length (7.68 cm) was produced with the application of 40 kg N along with FYM @ 5 t ha^{-1} and the least was control plot (4.67 cm) followed by the application of 40 kg N ha^{-1} alone (T_9).

The mean value for number of fingers panicle^{-1} ranged from 4.0 (control) to 6.7 (40 kg N + FYM @ 5 t ha^{-1}). Application of 40 kg N along with FYM @ 5 t ha^{-1} had direct effect on the production of more number of fingers panicle^{-1} in both the years. This was added advantage due to organic source added to the soil compared to control. No treatmental differences were observed for test weight. The mean value for test weight ranged from 2.50 g (control) to 2.63 g (30 kg N + FYM @ 5 t ha^{-1}). It showed that treatments had no influence to increase grain size in ragi. Highest straw yield was obtained with the application of 40 kg N along with FYM @ 5 t ha^{-1} (T_{10}). These treatments had registered maximum straw yield in both the years followed by T_9 (40 kg N ha^{-1}). This was due to more plant height which achieved through the application of 40 kg N + Farm Yard manure @ 5 t ha^{-1}. Similar results were

reported by Parasuraman *et al.,* (1998) for straw yield in finger millet.

The highest grain yield (15.42 q ha^{-1}) was recorded with 40 kg N along with farm yard manure @ 5 t ha^{-1} followed by T_9 (13.08 q ha^{-1}) with 40 kg N application alone. These treatments significantly influenced in increasing the grain yield over the other treatments. The increase in grain yield was due to the cumulative effect of elevated growth stature more panicle length and more number of fingers ear^{-1}. These results are in conformity with the findings of Basavaraju and Gururaja Rao (1997) and Arunachalam *et al.,* (1995) who reported that increased grain yield was influenced due to conjuctive use of organic and in organic nitrogen in ragi. The maimum benefit cost ratio (1.90) was achieved through the application of 40 kg by N along with farm yard manure @ 5 t ha^{-1} followed by 40 kg N alone. Higher grain yield were associated with the T_{10} treatment which resulted in enhanced economic returns.

From the above findings it is concluded that supply of 40 kg N along with farm yard manure @ 5 t ha^{-1} had greatly influenced in increasing more plant height, more panicle length and more number of fingers ear^{-1} which could have resulted in higher grain and straw yields and to get high benefit cost ratio. It is also evident that application of inorganic source could not maintain soil productivity status to desirable level, where as conjunctive use of inorganic and organic sources resulted in maintaining higher nutrient status of the soil.Supply of 40 kg N along with FYM @ 5 t ha-1 have resulted in better performance of finger millet crop in terms of grain yield, straw yield and profitable to the tribal farmers of high altitude areas.

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