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GROWTH AND YIELD OF WHITE GRAIN FINGER MILLET (*Eleusine coracana* (L). Gaertn) UNDER VARIED NITROGEN LEVELS AND TIME OF NITROGEN APPLICATION

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ABSTRACT

A field experiment was conducted during *rabi*, 2014-15 to study the effect of different nitrogen levels and time of nitrogen application on growth and yield of white grain finger millet. The experiment was laidout in split - plot design and replicated thrice. The four nitrogen levels *i.e*. 60, 80, 100 and 120 kg ha^{-1} were assigned to main plots time of nitrogen application *i.e*. 50% basal + 50% top dressing at 30 DAT, 50% basal + 25% top dressing at 30 DAT + 25% top dressing at 45 DAT and 25% basal + 50% top dressing at 30 DAT + 25% top dressing at 45 DAT were assigned to sub plots. The results revealed that the highest nitrogen level 120 kg ha^{-1} resulted in higher growth stature and yield, while these parameters were found to be at their lowest with 60 kg N ha^{-1}. Nitrogen applied as 25% basal + 50% top dressing at 30 DAT + 25% top dressing at 45 DAT markedly improved the crop growth , yield attributes and yield, while these were found to be at their lowest with two splits of nitrogen application as 50% basal + 50% top dressing at 30 DAT.

KEYWORDS: Growth parameters, Nitrogen, Time of nitrogen application, White grain finger millet and Yield.

INTRODUCTION

In India, finger millet (*Eleusine coracana* (L). Gaertn) accounts for 60 per cent area and 75 per cent of total small millets production, which is grown over an area of 1.3 million hectares with an annual production of 1.9 million tonnes and a productivity of 1480 kg ha^{-1}. In Andhra Pradesh, it is cultivated in 44,000 hectares with a production of 54,000 tonnes and a productivity of 1175 kg ha^{-1} (Ministry of Agriculture, 2012).

Finger millet is a versatile cereal crop which offers plausible health benefits with an ideal nutrient profile *i.e.* 100 grams of finger millet grain contains 6-8 g protein, 1.3 g fat, 70-76 g carbohydrates along with 370 mg of calcium and 3.9 mg iron. But the brown coloured grains have been reported to contain higher amounts of tannins (360 mg / 100g) and poly phenols, (Ramachandra *et al.*, 1977), which affects the in vitro protein digestability and the zinc as well as iron availability and adsorption. In contrast, white grain varieties have lower levels of tannins (0.05 mg/100g) and higher protein content (10-12%) with wider acceptability among the consumers. Nitrogen is an unique mobile nutrient in soil – plant system and the crop requires nitrogen throughout the crop growth period. Therefore, Split application of nitrogen in precise amounts synchronizing with peak demand periods of crop might be a promising agro-technique to enhance its use efficiency along with realization of maximum possible productivity. Keeping all the above points in view, it is pertinent to evolve the best nitrogen management practice for higher yield and quality of white grain finger millet.

MATERIAL AND METHODS

A field experiment was carriedout during *rabi*, 2014 - 15 at S.V. Agricultural College Farm, Tirupati. The experimental soil was sandy loam in texture, low in organic carbon (0.39%) and available nitrogen (132 kg/ ha), medium in available phosphorus (27.3 kg/ha) and medium in potassium (147.6 kg/ ha). The experiment was laid out in split - plot design and replicated thrice. The main plots comprised of four nitrogen levels 60, 80,100 and 120 kg N ha^{-1} and sub plots consisted of varied times of nitrogen application *i.e*. 50% basal + 50% top dressing at 30 DAT; 50% basal + 25% top dressing at 30 DAT + 25% top dressing at 45 DAT and 25% basal + 50% top dressing at 30 DAT + 25% top dressing at 45 DAT. Uniform dose of 45 kg ha^{-1} P_2O_5 through single super phosphate and 30 kg ha^{-1} K_2O through muriate of potash were applied basally at the time of transplanting. Nitrogen was applied through urea as per the prescribed treatments

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and accordingly to the time of nitrogen application. The variety of finger millet used in the experiment was Hima (VR 936). The other agronomic management practices were followed excluding nitrogen management as per the recommendation of the ANGRAU.

RESULTS AND DISCUSSION

Effect of nitrogen

Varied nitrogen levels exerted significant effect on growth and yield of white grain finger millet. The application of nitrogen @ 120 kg ha^{-1} produced elevated stature of growth parameters, *viz.,* LAI, plant height and dry matter production. The application of 100 kg N ha^{-1} was the next best level of nitrogen to white grain finger millet. The lowest values of growth parameters were obtained with 60 kg ha^{-1}. The increase in number of tillers m^{-2} with each successive level of nitrogen might be owing to its role in cytokinin synthesis, which promoted the growth and development of tiller buds, present at each node of the shoot. Nitrogen regulates the synthesis of photosynthetic carboxylating enzymes, which results in greater light interception, enhancing canopy photosynthesis and eventually higher dry matter accumulation. Therefore, increase in growth attributes with higher levels of nitrogen application might be due to adequate supply of nitrogen associated with higher photosynthetic activity and vigorous shoot growth. These results are in conformity with the findings of Chavan *et al.* (1995), Roy *et al.* (2002).

The highest grain yield of white grain finger millet was obtained with the application of nitrogen @ 120 kg ha^{-1}, which was significantly higher than with rest of the N levels tried. The lowest grain yield of white grain finger millet was obtained with application of 60 kg N ha^{-1} which was significantly lesser than rest of the nitrogen levels tried The better availability of nitrogen with 120 kg ha^{-1} might have fullfilled the plant requirement, enhanced the total biomass accrual and its efficient translocation from source to sink for the production of elevated yield stature i.e. number of productive tillers /m^2, grain weight ear^{-1} and consequently increased the grain yield of white grain finger millet. The linear increase in grain yield with increased supply of nitrogen was also reported by Rao *et al.* (1986) and Ramesh Singh and Singh (2005).

Effect of time of nitrogen application

Application of nitrogen in three splits as 25% basal + 50% top dressing at 30 DAT + 25% top dressing at 45 DAT registered the highest growth parameter continuous and adequate supply of nitrogen in commensurate with the growth stages *viz.,* early vegetative, active tillering, panicle initiation, flowering and grain filling of the crop and maintained the photosynthetic capacity for longer period, resulting in higher dry matter accrual. Application of nitrogen in two splits of nitrogen *i.e.* 50% basal + 50% top dressing at 30 DAT resulted in reduced growth attributes.

The yield attributes *viz.,* productive tillers m^{-2}, grain weight ear $^{-1}$ and grain yield were recorded to be the highest with the application of nitrogen as 25% basal + 50% top dressing at 30 DAT + 25 % top dressing at 45 DAT, which might be ascribed due to continuous adequate availability of nitrogen synchronizing with its peak crop requirements of critical stages of the crop growth, This is crucial in determination of sink capacity as well as the maintenance of functional sink throughout the seed development. Another positive effect of nitrogen as top dressing at 45 DAT might have enhanced the LAD of older leaves with increased photosynthetic activity particularly from flag leaf during reproductive and ripening periods. The larger proportion of nitrogen have applied in two splits with application of N as 50% basal + 50% top dressing at 30 DAT might have not been efficiently utilized at the early stages of crop growth and lost from the soil in various forms, and leading to nitrogen starvation at later critical stages of crop growth for nitrogen nutrition *i.e* post flowering period . The results of the present investigation are in agreement with the findings of Tahir *et al.* (2008) and Jakhar *et al.* (2011).

In conclusion, the present study has revealed that application of nitrogen @120 kg ha^{-1} in three splits as 25% basal + 50% top dressing at 30 DAT + 50% top dressing at 45 DAT was the best nitrogen management practice for obtaining higher productivity of white grain finger millet.

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Table 1. Growth parameters at harvest, yield attributes and yield of white grain finger millet as influenced by nitrogen levels and time of nitrogen application

Treatments	Leaf area index	Number of tillers m^{-2}	Dry matter production (kg ha^{-1})	Productive tillers m^{-2}	Grain weight ear^{-1} (g)	Grain yield (kg ha^{-1})	B:C ratio
Nitrogen levels (kg ha^{-1})							
60	2.13	69.3	3958	60	2.13	1560	1.14
80	3.05	80.2	4540	74	3.37	1908	1.37
100	3.53	87.2	5395	83	4.38	2123	1.53
120	4.05	99.2	7157	89	5.20	2604	1.87
SEm±	0.072	1.49	110	1.44	0.08	60.1	0.041
CD (P=0.05)	0.24	5.1	381	5	0.29	207	0.14
Time of nitrogen application							
T_1 : 50 % basal + 50 % top dressing at 30 DAT	2.91	81.1	4929	72	3.48	1908	1.39
T_2 : 50 % basal + 25 % top dressing at 30 DAT + 25% top dressing at 45 DAT	3.35	91.1	5331	75	3.88	2104	1.52
T_3 : 25 % basal + 50 % top dressing at 30 DAT + 25% top dressing at 45 DAT	3.4	92.8	5528	76	3.96	2135	1.54
SEm±	0.050	0.93	90.1	0.56	0.09	55.2	0.031
CD (P=0.05)	0.15	2.8	270	2	0.28	165	0.11

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