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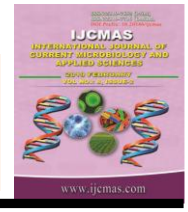

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Effect of Different Nitrogen Levels and Plant Geometry, in relation to Growth Characters and Yield of Brown Top Millet [*Brachiaria ramosa* (L.)] at Bastar Plateau Zone of Chhattisgarh

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A B S T R A C T

The experiment was conducted at New Upland Research Station cum Instructional Farm, Lamker under SG College of Agriculture and Research Station, Jagdalpur (CG) during *Kharif* season 2018. Experiment was laid out in split plot design with three replications. Main plot was three levels of fertilizer and sub plot consists of four planting geometry. One year experiment shows that plant growth characters, yield attributing characters, fodder yield and grain yield recorded significantly higher in treatment F_3 (125% RDF) than the F_1 (75% RDF) and F2 (100% RDF) during experimentation. In case of planting geometry, geometry S_1 (22.5 x 10 cm) recorded considerably taller plant, bundle weight and fodder yield. While, geometry S_4 (60 x 10 cm) recorded higher number of tillers, grain weight and economical yield among different planting geometry.

Introduction

Browntop millet (*Brachiaria ramosa* (L.) Stapf; *Panicum ramosum* L.) is an introduced annual grass that originated in South-East Asia. It is grown in Africa, Arabia, China and Australia, Clayton et al (2006). It was introduced to the United States from India in 1915 (Oelke *et al.,* 1990). In the US, it is mainly grown in the South-East for hay, pasture and game bird feed. The browntop millet, called korale in Kannada, is specially grown in rainfed tracts of Tumakuru, Chitradurga and Chikkaballapura districts of Karnataka state. The crop is popular in this region in terms of cultivation and consumption. This millet seed is grown in a variety of soils and climates. Like other millets, it is a hardy crop and well suited for dry land (Bhat et al 2018).

Brown top millet is an annual warm-season species that grows 1 to 3 ft tall. The smooth stems have pubescent nodes and may stand erect or ascend from a decumbent base. The leaves are 2.2 to 18cm long and 6-18mm wide; both surfaces are smooth. The inflorescence is indeterminate, open, spreading with simple axis and stalked flowers. It has 3-15 inflorescences and white flowers. Seeds are ellipsoid and tan in colour; they mature in approximately 60 days (Sheahan, 2014).

Brown top millet, which goes by the scientific name *Brachiaria ramosa* (L.) Stapf. or *Urochloa ramosa* (L.) R.D. Webster is known locally as pedda-sama and korne, and has a limited cultivation largely confined to southern India. Domestic and wild/weedy forms of brown top millet are found in agricultural systems, often within the same field. It is used as both a human food crop and fodder. Outside of India, it is grown in some parts of the USA as a fodder crop, largely to provide food for game birds, and was introduced from India around 1915. Although its distribution is highly relict today, restricted to parts remote parts of Andhra Pradesh, Karnataka, and Tamil Nadu states in southern India (Kimata *et al.,* 2000), it appears to have been a major staple crop in the late prehistory of the wider region of the Deccan (Fuller *et al.,* 2004).

The identification of brown top millet grain and spikelets can be difficult due to its similarity to *Setaria italica* (Fig. 1). Although the panicle is distinct from Setaria by being looser and non-bristly, the grains themselves are very similar. Grains are ovate to round and have a long embryo, roughly two thirds to three fourths of the length of the grain. They tend to be smaller than *Setaria italica* and squatter in cross section. The surface of well-preserved grains can be used for identification as these have a distinctive undulating pattern, although this again has similarities to *S. italica* (Fuller *et al.,* 2004). The husk has a fine beaded and rugose pattern, which again has some resemblance to that of *Setaria spp.*, but it is somewhat coarser than *S. italica* and finer than. *S. verticillata*. (https://www.researchgate.net/publication/286351352)

The productivity of brown top millet can be increased by applying of fertilizers. The presence of organic manure along with inorganic fertilizers helps in better availability of nutrients and moisture. Besides these, other advantages are reduction in seed rate, easy inter cultivation, better weed management and drip irrigation can also be adopted by providing wider spacing (60 x 60 cm) than the conventional method of planting (30 x 10 cm). Hence the present investigation was taken to develop a suitable nutrient management packages under guni (pit) method of finger millet.

For that reason this research was undertaken to find out an optimum level of chemical fertilizer Di-Ammonium Phosphate (DAP) that can maximize growth, production and much more importantly, yields of brown top millet under climatic and soil conditions of Bastar Plateau Zone of Chhattisgarh, India.

Materials and Methods

Experiment was conducted during Kharif season 2018 at New Upland Research Station cum Instructional Farm, Lamker under SG college of Agriculture and Research Station, Jagdalpur, Bastar, CG.

The experiment was laid out in split plot design with three replications. Main plot was three levels of fertilizer i.e. F1 (75% RDF), F2 (100% RDF) and F3 (125% RDF), and sub plot was four different spacing viz. S1 (22.5 x 10 cm), S2 (30 x 10 cm), S3 (45 x 10 cm) and S4 (60 x 10 cm). Recommended dose of fertilizer was 40:20:00 kg N: P: K kg ha^{-1}.

The soil was stony and calcareous in texture, low in organic carbon (0.48%). available N (213.4 kg ha^{-1}), available phosphorus (12.50 kg ha^{-1}) and medium in available potassium (228.6kg h^{-1}) with soil reaction (pH 5.5). Olsen's method (Watanabe and Olsen, 1965), Neutral normal Ammonium Acetate extract using flame photometer (Hanway and Heidel, 1952) and Walkely and Black method (Jackson,1967) for the determination of available nitrogen (N), phosphorus (P_2O_5) potassium (K_2O) and organic carbon, respectively. The pH of experimental site was determined through 1:2.5 soil and water suspension method (Jackson, 1967).Weather during *kharif* 2018 weekly pattern of different meteorological parameters are shown in figure 2 during *kharif* 2018.

Results and Discussion

Total 1386.50 mm rainfall was recorded against the normal rain fall of 1414.92 mm.

Monsoon was active during 24^{th} SMW and received 26.04 mm water with two rainy days. Maximum rainfall was received during 29^{th} SMW (130.7mm with 4 rainy days), 32^{th} SMW (109.9mm with 5 rainy days), 33^{th} SMW (152.7mm with 5 rainy days) and 38^{th} SMW (175.7 mm with 6 rainy days). During cropping season maximum temperature was 34.5°C on 22^{nd} SMW and minimum temperature was recorded 20.40°C on 38^{th} SMW.

Table.1 Effect of different treatment on plant height, tillers, bundle and grain weight, fodder yield and test weight of brown top millet

Treatment	Plant Height (cm)	No. of Tillers $plant^{-1}$	No. of Grains $Panical^{-1}$	Bundle wt kg $plot^{-1}$
F1	68.02	5.67	445.82	5.17
F2	69.76	6.73	493.32	5.37
F3	75.25	7.15	408.68	5.92
SEm±	1.21	0.11	16.06	0.09
CD at 5%	4.88	0.46	64.73	0.38
CV%	5.91	6.04	12.38	5.88
S1	74.04	5.98	447.18	6.01
S2	71.58	6.43	493.40	5.53
S3	69.54	6.64	426.09	5.50
S4	68.88	7.00	430.42	4.89
SEm±	*0.87*	*0.12*	*20.54*	*0.23*
CD at 5%	*2.59*	*0.35*	*NS*	*0.68*
CV%	*3.65*	*13.57*	*13.71*	*12.49*

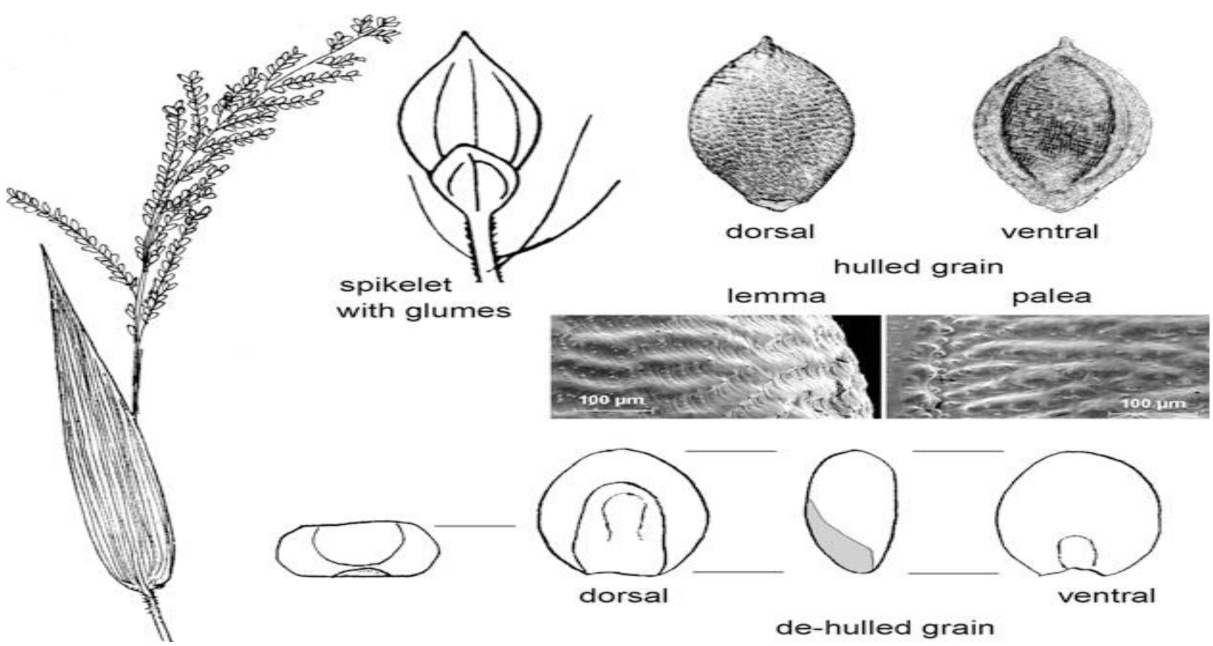
F_1-75% RDF, F_2-100% RDF, F_3-125% RDF, S_1-22.5 x 10 cm, S_2-30x10, S_3-45 x 10 cm and S_4-60 x 10 cm

Table.2 Effect of different grain and straw yield of brown top millet

Treatment	Grain weight plot^{-1} (kg)	Fodder yield plot^{-1} (kg)	Test weight (g)	Grain Yield (q ha^{-1})	Straw yield (q ha^{-1})
F1	1.63	3.53	2.88	7.10	15.58
F2	1.69	3.68	2.81	7.45	16.21
F3	1.76	4.16	2.97	8.17	18.32
SEm±	0.02	0.01	0.09	*0.10*	*0.44*
CD at 5%	0.10	0.40	NS	*0.42*	*1.77*
CV%	4.94	9.03	10.72	*4.86*	*9.12*
S1	1.58	4.43	2.70	6.97	19.53
S2	1.70	3.83	2.98	7.51	16.88
S3	1.73	3.77	3.00	7.61	16.64
S4	1.77	3.12	2.88	7.79	13.77
SEm±	*0.04*	*0.24*	*0.1*	*0.16*	*1.06*
CD at 5%	*0.11*	*0.72*	*NS*	*0.48*	*3.18*
CV%	*6.46*	*19.09*	*9.85*	*9.95*	*19.09*

F_1-75% RDF, F_2-100% RDF, F_3-125% RDF, S_1-22.5 x 10 cm, S_2-30x10, S_3-45 x 10 cm and S_4-60 x 10 cm

Fig.1 Drawing of *Brachiaria ramose* panicles, spikelet, hulled and de-hulled grains, showing the rugose husk patterns of the lemma and palea. SEM images of lemma and palea patterns inset



(Courtesy: Eleanor Kingwell-Banham and Dorian Q. Fuller, Institute of Archaeology, University College London, London, UK)
(Source:https://www.researchgate.net/publication/286351352_Brown_Top_Millet_Origins_and_Development)

Fig.2 Weekly weather data 2018

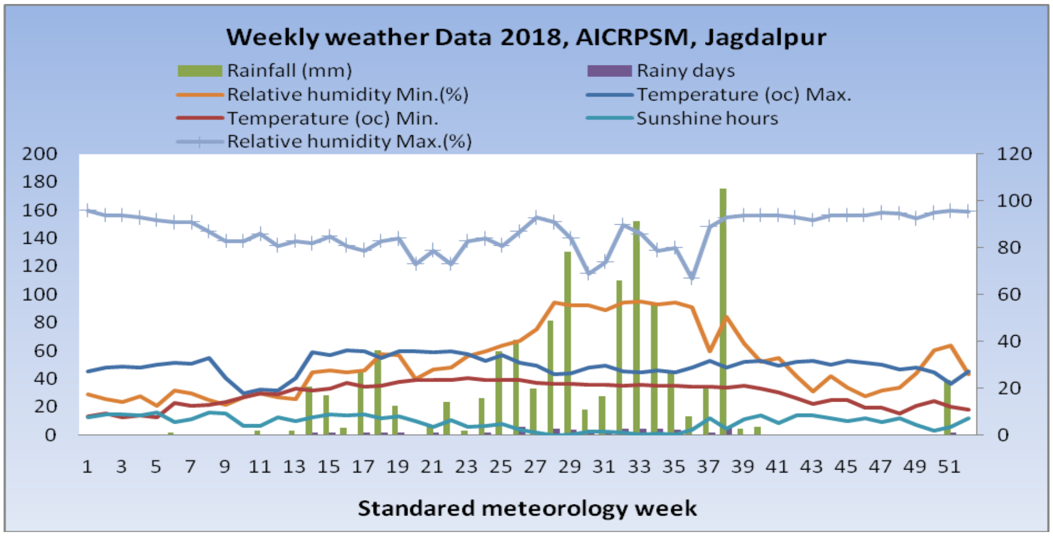


Table1 shows that, in brown top millet plant height, number of tillers, bundle weight, grain and fodder weight was recorded significantly higher treatment F3 (125%RDF) but it was at par with F2 in number of tillers and grain weight plot^{-1}. While, number of grains panical^{-1} was recorded significantly higher in treatment F2 which was on par with F1.In case of different planting geometry, treatment S1 was found significantly taller plant, bundle weight and fodder yield but S4 recorded statistically more number of tillers and grain weight which was at par with S3 and S2 in grain weight and S1 and S2 in fodder weight. Increased plant height and number of leaves plant height, number of tillers, bundle weight, grain and fodder weight might be due to wider spacing with higher fertilizer levels resulted in less competition between plants for solar radiation, space and increased supply of nutrients and efficient utilization helps in better growth compared other fertilizer levels and spacing. These results agree with the findings of Chittapur *et al.,* (1994), Muthukrishnan and Subramanian (1980) and Hanumantha Rao *et al.*, (1982).

Data recorded on different parameters Table 2. Data revealed that grain yield, fodder yield, was recorded significantly highest in F2 among fertility levels. In case of different planting geometry, S4 recorded significantly higher grain yield but it was at par with S3 and S2. Fodder yield recorded significantly maximum in treatment S1 which was on par with S2 and S3. The higher number of tillers at wider spacing intercepted more of solar radiation, water and increased nutrient availability helped to produce significantly higher number of tillers. Again less competition between plants due to wider space allowed the individual plants to develop massive root system. Better aeration at wider spacing resulted in healthy plant growth with more tillers. These results are in conformity with the findings of Narasimhamurthy and Hedge, (1981).

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