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Performance of fodder pearl millet (*Pennisetum glaucum* L.) varieties under different nitrogen levels in southern agro-climatic zone of Andhra Pradesh

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Abstract
A field experiment was carried out during *kharif*, 2015 on sandy clay loam soils of dryland farm of S.V. Agricultural College, Tirupati, Acharya N.G. Ranga Agricultural University. The experiment was laid out in randomized block design with factorial concept and replicated thrice. The treatments consisted of four fodder pearlmillet varieties *viz.*, Gaint bajra, BAIF bajra, Raj bajra chari-2 and APFB-09-1 and four nitrogen levels *viz.*, 75, 100, 125 and 150 kg N ha^{-1}. The results indicated that among the four varieties evaluated, the tallest plants, maximum leaf area index, number of tillers $plant^{-1}$, leaf to stem ratio and dry matter production were produced by the variety BAIF bajra (V_2) followed by APFB-09-1 (V_4). The lowest values of these growth parameters were registered with Raj bajra chari-2 (V_3). Among the nitrogen levels tried, application of 150 kg N ha^{-1} (N_4) resulted in the taller plants, higher leaf area index, more number of tillers $plant^{-1}$ and higher leaf to stem ratio and higher dry matter production, while all these parameters were at their lowest with application of 75 kg N ha^{-1} (N_1).

Keywords: varieties, nitrogen levels, growth parameters

Introduction
Andhra Pradesh supports 59.8 million heads of livestock with a vast deficit of about 50 per cent of green fodder. In chittoor district more than 75 per cent of the farmers are depending upon dairying as a subsidiary source of income in which there is an acute shortage of green fodder to exploit the production potential of existing livestock. Further increasing area under fodder crops is not possible in the country due to lot of demand for food grain to meet the facing hardship for feeding the burgeoning human population. Increasing the fodder yield per unit area is with introduction of high yielding, better quality fodder varieties with suitable location specific agronomic practices. The only way to enhance the fodder production under the existing situation. Pearlmillet is an important crop grown for food and fodder for human and livestock population. It is an important component of agricultural and animal husbandry dominated rural economy of dryland areas of India. It is a fast growing short duration crop which has high biomass production potential. It is grown in arid and semi arid regions where moisture is a limiting factor for crop growth. It is an ideal crop with high tillering ability, high dry matter production, high protein content (10-12 %) with excellent growth habit, high palatability and better nutritive value. The green fodder of bajra is leafy, palatable and very nutritious feedstock for cattle ensuring good milk yield. It has no HCN content as compared to sorghum and can be fed to cattle at any stage of the crop. Now-a-days many new improved cultivars of fodder pearlmillet are coming up, therefore it is necessary to study the response of these cultivars to fertilizers especially for nitrogen to harvest potential yield. Nitrogen is one of the basic plant nutrients essential for profuse growth. It increases vegetative growth of plant and herbage quality which is highly desirable for the forage yield and dry matter accumulation. Keeping these points in view, the present study is proposed to find out a suitable fodder pearlmillet variety and optimum nitrogen level for higher green fodder yield.

Materials and Methods
A field experiment was carried out during *kharif*, 2015 on sandy clay loam soils of dryland farm of S.V. Agricultural College, Tirupati, Acharya N.G. Ranga Agricultural University. The experiment was laid out in a randomized block design with factorial concept and replicated thrice. The treatments consisted of four fodder pearlmillet varieties *viz.*, Gaint bajra, BAIF bajra, Raj bajra chari-2 and APFB-09-1 and four nitrogen levels *viz.*, 75, 100, 125 and 150 kg N ha^{-1}. Crop was harvested for green fodder purpose at 50% flowering in all the varieties

during both the cuts. The analysis of proximate principles in forage was done by the method recommended by Association of Official Analytical Chemists (AOAC, 1990) [1]. The data pertaining to growth parameters and yield was recorded at different intervals was statistically analysed following the analysis of variance for randomized block design with factorial concept as suggested by Panse and Sukhatme (1985) [6].

Table 1: Effect of different varieties and nitrogen levels on growth and yield of fodder pearlmillet.

Treatments	Plant height (cm)		Leaf area index		Number of tillers plant^{-1}		Leaf to stem ratio		Dry matter production (t ha^{-1})		Green forage yield (t ha^{-1})	
	1st Cut	2nd Cut	1st Cut	2nd Cut	1st Cut	2nd Cut	1st Cut	2nd Cut	1st Cut	2nd Cut	1st Cut	2nd Cut
Varieties												
V_1: Gaint bajra	196.9	167.4	14.20	6.24	4.00	4.00	0.29	0.34	7.31	3.23	36.54	16.62
V_2: BAIF bajra	202.1	175.1	18.80	8.30	4.50	4.33	0.47	0.36	8.27	4.18	45.95	23.02
V_3: Raj bajra chari-2	170.9	146.6	10.89	3.92	3.75	3.50	0.24	0.27	5.59	2.90	25.40	12.90
V_4: APFB-09-1	199.0	168.3	16.45	6.67	4.42	4.16	0.30	0.35	7.86	3.63	41.38	17.80
SEm±	4.44	2.54	0.51	0.19	0.14	0.18	0.01	0.01	0.14	0.09	1.09	0.44
CD (P=0.05)	12.8	7.4	1.5	0.6	0.4	0.5	0.03	0.03	0.4	0.3	3.2	1.3
Nitrogen levels (kg ha^{-1})												
N_1: 75	164.6	153.0	11.43	5.28	3.34	3.25	0.27	0.27	6.11	3.21	31.41	15.26
N_2: 100	192.7	162.1	13.94	6.05	3.75	3.42	0.31	0.29	6.99	3.21	35.87	16.49
N_3: 125	198.9	166.2	15.52	6.62	4.42	4.25	0.35	0.36	7.65	3.63	39.37	18.37
N_4: 150	212.8	176.1	19.45	7.19	5.17	4.92	0.37	0.40	8.28	3.99	42.62	20.22
SEm±	4.44	2.54	0.51	0.19	0.14	0.18	0.01	0.01	0.14	0.09	1.09	0.44
CD (P=0.05)	12.8	7.4	1.5	0.6	0.4	0.5	0.03	0.03	0.4	0.3	3.2	1.3
Interaction (V x N)												
SEm±	8.89	5.08	1.02	0.38	0.29	0.36	0.02	0.02	0.29	0.18	2.17	0.88
CD (P=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Results and Discussion

Plants of the tallest stature were observed with BAIF bajra which was however, comparable with that of APFB-09-1, which was in turn at par with the variety Gaint bajra. The plants with shortest stature were observed with variety Raj bajra chari-2 during the second cut. The difference in plant height among the varieties might be due to the variation in their genetic character and inter nodal length. The above results were in conformity with the findings of Midha *et al.* (2015) [5]. During both cuts, plant height was found to be increased with increased levels of nitrogen and the tallest plants were produced with the application of 150 kg N ha^{-1}, while the plants were of the shortest stature with application of 75 kg N ha$^{-1.}$ It could be attributed to the fact that higher nitrogen levels might have accelerated the synthesis of more chlorophyll and amino acids and stimulated the cellular activity, which is useful for the process of cell division and meristematic growth. Similar results of increase in plant height with increasing nitrogen levels have been reported by Midha *et al.* (2015) [5] and Meena and Jain (2013) [4].

Leaf area represents a measure of photosynthetic efficiency. The LAI of fodder pearlmillet tended to increase progressively with advance in the age of the crop up to first cut and tended to decline during second cut. At all the stages of observation, BAIF bajra produced significantly higher LAI compared to rest of the varieties. This might be due to higher plant height, varietal difference in producing more number of leaves and total leaf area plant^{-1}. Application of 150 kg N ha^{-1} gave maximum LAI compared to rest of the nitrogen levels, at all the stages of the crop growth. Minimum LAI was recorded with application of 75 kg N ha^{-1}. Increase in LAI may be due to the fact that addition of nitrogen increased the number of leaves and total leaf area plant^{-1} and their effect on enlargement of cells of the leaf, which resulted in assimilation of photosynthates that would ultimately result in good performance of the crop in LAI. The present findings were in conformity with those of Midha *et al.* (2015) [5] and Raval *et al.* (2015) [7].

The number of tillers plant^{-1} was maximum in BAIF bajra compared with rest of the varieties. While the variety Raj bajra chari-2 produced minimum number of tillers plant^{-1}. Higher number of tillers plant^{-1} in BAIF bajra was might be due to its genetic potentiality under given set of climatic conditions. During both cuts of fodder pearlmillet with regard to nitrogen levels, the highest number of tillers plant^{-1} was recorded with 150 kg N ha^{-1} followed by application of 125 kg N ha^{-1} in producing the higher number of tillers plant^{-1}. Application of 75 kg N ha^{-1} has produced the lowest number of tillers plant^{-1} during the first cut and it was on par with 100 kg N ha^{-1} in producing lower number of tillers plant^{-1} during the second cut. The increase in number of tillers plant^{-1} with successive doses of nitrogen might be owing to the role of nitrogen in cytokinin synthesis, which increases cell division and elongation, thereby resulting in higher number of tillers plant^{-1}. These results were in agreement with the findings of Midha *et al.* (2015) [5] and Meena and Jain (2013) [4].

BAIF bajra produced higher leaf to stem ratio compared to rest of the varieties. This might be due to higher stem weight and lower leaf weight. Stem diameter has increased significantly with increase in the nitrogen levels. Application of 150 kg N ha^{-1} recorded significantly higher leaf to stem ratio. The increase in leaf to stem ratio due to the application of higher level of nitrogen can be explained by the fact that nitrogen promotes plant growth which inturn increases number of leaves plant^{-1} and stem diameter. These results were in agreement with the findings of Sheoran *et al.* (2008) [9] and Shekara and Lohithaswa (2009) [8].

At first and second cuts, BAIF bajra (V_2) recorded the highest green fodder and dry matter yield, while the lowest green forage and dry matter yield (Table-1) was obtained with Raj bajra chari-2 (V_3). This might be due to the superiority of the genotype to produce more values of growth characteristics like plant height, leaf area index, leaf to stem ratio and number of tillers plant^{-1}. Similar results were also reported by Midha *et al.* (2015) [5] and Damame *et al.* (2013) [2]. There was an increase in green forage and dry matter yield with increasing nitrogen levels from 75 to 150 kg N ha^{-1} and the maximum dry matter yield was noticed with the application of

150 kg N ha^{-1} (N_4) followed by 125 kg N ha^{-1} (N_3). The lowest dry matter yield was recorded with application of 75 kg N ha^{-1} (N_1). This might be due to the vegetative growth of the crop which was positively correlated for higher green fodder and dry matter yield. Similar results were also obtained by Devi and Padmaja (2007) [3] and Singh *et al.* (2012) [10].

Conclusion

The aforesaid results indicated that variety BAIF bajra recorded on application of 150 kg N ha^{-1} with highest growth parameters, dry matter production and green forage yields in Southern Agro-climatic zone of Andhra Pradesh.

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