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Influence of fodder pearlmillet (*Pennisetum glaucum* L.) varieties and nitrogen levels on post-harvest soil fertility

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Abstract
This research was undertaken to determine the Influence of fodder pearlmillet (*Pennisetum glaucum* L.) varieties and nitrogen levels on post-harvest soil fertility. The experiment was conducted at the dry land farm of S.V. Agricultural College, Tirupati, Acharya N.G. Ranga Agricultural University during *kharif*, 2015 on sandy clay loam soils. Four Fodder pearlmillet varieties *viz.* Gaint bajra, BAIF bajra, Raj bajra chari-2 and APFB-09-1, Four Nitrogen levels *viz.* 75, 100, 125 and 150 kg N ha^{-1} were laid out in factorial randomized block design with three replications. Results revealed that soil nutrient status after harvest *i.e.*, available nitrogen, phosphorus and potassium were significantly affected by the varieties and nitrogen treatments. The highest post-harvest status of soil available nitrogen and phosphorus were recorded with the variety Raj bajra chari-2 followed by Gaint bajra, however for nitrogen, it was on par with that of APFB-09-1, while it was found to be the lowest with BAIF bajra. The post-harvest soil available potassium was the highest with Raj bajra chari-2 which was at par with Gaint bajra, while the lowest soil available potassium was observed with BAIF bajra. Application of 150 kg N ha^{-1} recorded the highest post-harvest soil available nitrogen, phosphorus and potassium status, while the lowest values were registered with application of 75 kg N ha^{-1}.

Keywords: Varieties, nitrogen levels, post-harvest soil fertility

Introduction
Pearlmillet (*Pennisetum glaucum* L.) is an important crop grown for food and fodder to meet the needs of both human and livestock population. It is one of the most important component crops of agriculture and animal husbandry and dominating the rural economy in dryland areas of India. It is a fast growing, short duration, drought tolerant crop having high biomass production potential, tillering and ratooning ability with high protein content of 10-12 per cent, free from anti-nutrient thus making it as an outstanding fodder crop for the rainfed situations and serves as an ideal crop under regions of low rainfall conditions (Patel *et al*., 2008) [7]. The green fodder of bajra is leafy, palatable and very nutritious feed stock for cattle ensuring good milk yield. Pearlmillet can be grazed or cut and fed at any growth stage, as it has no HCN content like sorghum. Tiwana and Puri (2008) opined that fodder pearlmillet is excellent for making silage, particularly in regions where long dry spells during the rainy season and it produces higher silage yields with higher protein content than sorghum.

The green fodder potential yield of fodder pearlmillet is low in India compared to the potentially achievable yield, because of inadequate and imbalance application of fertilizers, cultivation of low yielding varieties and lack of good management practices. Intensive agriculture demands full exploitation of the varieties with available resources, especially fertilizers while, being economic at the same time.

The soils in arid and semiarid regions are mainly deficient in nitrogen and inherently low in organic carbon because of rapid turnover rates of organic material due to higher soil temperature. The harsh climatic conditions and low soil fertility, effective nutrient management is of considerable importance to overcome the situations of limited yields in these areas (Meena and Jain, 2013) [14].

Among the nutrients, nitrogen is an essential primary nutrient for profuse vegetative growth and plays a pivotal role in productivity and also affects quality of forage like crude protein, crude fibre, total ash and ether extractable fat (Ayub *et al*., 2002) [2]. Application of nitrogen at varied growth stages is one of the ways to increase the forage productivity of crops and optimization of nitrogen level is an important aspect of cost effective management of fertilizers. Therefore, it is essential to find out the optimum dose of nitrogen for fetching good fodder yield of fodder pearlmillet.

Hence, the present investigation was undertaken to study the performance of different promising varieties of fodder pearlmillet at different nitrogen levels.

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 (A.O.A.C., 1990) [1]. The composite soil sample was drawn at random from 0-30 cm soil depth of the field before the experimentation and analysed for different physico-chemical properties by adopting the standard procedures and the results are presented in Table. 1. Perusal of the data indicated that the soil was sandy clay loam in texture, neutral in soil reaction, low in available nitrogen, medium in organic carbon and high in available phosphorus and available potassium. 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: Soil physico-chemical properties of the experimental field before sowing

Particulars	Value	Method adopted
I. Physical characteristics		
Sand (%)	66.20	Bouyoucos Hydrometer (Piper, 1950) [8]
Silt (%)	7.50	
Clay (%)	26.30	
Textural Class	Sandy clay loam	
II. Chemical characteristics		
Soil pH (1:2.5 Soil water suspension)	7.5	Glass electrode pH meter (Jackson, 1973) [3]
Electrical conductivity (dSm^{-1}) at 25°C	0.17	Conductivity bridge (Jackson, 1973) [3]
Organic carbon (%)	0.58	Wet digestion method (Walkley and Black, 1934) [11]
Available N (kg ha^{-1})	176.0	Alkaline potassium permanganate method (Subbiah and Asija, 1956) [9]
Available P_2O_5 (kg ha^{-1})	70.0	Olsen's method (Olsen *et al.*, 1954) [5]
Available K_2O (kg ha^{-1})	304.0	Flame photometry (Jackson, 1973) [3]

Table 2: Soil available nutrient status of fodder pearlmillet as influenced by varieties and nitrogen levels after harvest of crop

Treatments	Available N (kg ha^{-1})	Available P_2O_5 (kg ha^{-1})	Available K_2O (kg ha^{-1})
Varieties			
V_1: Gaint bajra	174.79	82.36	188.12
V_2: BAIF bajra	153.95	73.83	131.72
V_3: Raj bajra chari-2	183.96	86.92	196.41
V_4: APFB-09-1	170.60	78.77	150.57
SEm±	3.10	0.73	7.12
CD (P=0.05)	9.0	2.2	20.7
Nitrogen levels (kg ha^{-1})			
N_1: 75	149.13	88.08	210.10
N_2: 100	165.77	82.29	185.57
N_3: 125	176.56	79.18	150.72
N_4: 150	191.84	72.31	120.44
SEm±	3.10	0.73	7.12
CD (P=0.05)	9.0	2.2	20.7
Interaction (V × N)			
SEm±	6.21	1.46	14.24
CD (P=0.05)	NS	NS	NS

Results and Discussion

Different varieties and nitrogen levels have exerted significant influence on the soil nutrient status after harvest *i.e.*, available nitrogen, phosphorus and potassium, while the interaction effect was not found to be statistically traceable (Table 2.). The highest soil available nitrogen status after harvest was recorded with variety Raj bajra chari-2 which was significantly superior than other varieties. The variety, Gaint bajra was the next best in soil available nitrogen which was comparable with APFB-09-1. The lowest soil available nitrogen was recorded with BAIF bajra which was significantly lesser than other varieties. This might be due to better uptake efficiency of the variety BAIF bajra which has been reflected in low available nitrogen in the soil after harvest.

The variety Raj bajra chari-2 resulted in significantly higher soil available phosphorous status after harvest relative to the other varieties tested. The next best varieties were Gaint bajra followed by APFB-09-1. The lowest soil available phosphorous was recorded with BAIF bajra. This might be due to better development of tillers, plant height, leaf area and root system which led to more absorption of nutrients in BAIF bajra.

Similarly available potassium in the soil after harvest was significantly higher with the variety Raj bajra chari-2. Fodder pearlmillet variety, Gaint bajra registered as next best in obtaining soil available potassium after harvest which was at

par with APFB-09-1. The lowest soil available potassium was recorded with BAIF bajra.

Nitrogen availability in soil after harvest was found to be significantly superior with application of 150 kg N $ha^{-1.}$ There was a substantial increase in the available nitrogen status with 150 kg N ha^{-1} over other nitrogen levels tried. Due to increase in nitrogen application, there was an increase in the root exudates which act as a substrate for the micro-organisms and mineralise the organic nitrogen, thus, increasing the nitrogen status of the soil. However, more availability of phosphorous and potassium after harvest has been noticed with 75 kg N ha^{-1}. The availability of phosphorous and potassium content in the soil was found to be significantly lower with increasing dose of nitrogen when compared to the preceding dose. Application of higher doses of nitrogen has led to the better uptake of other nutrients from the soil leading to their lower availability in soil after harvest.

Conclusion

Based on the results of the present field experiment, it is concluded that, the highest post-harvest status of soil available nitrogen and phosphorus were recorded with the variety Raj bajra chari-2 and application of 150 kg N ha^{-1} recorded the highest post-harvest soil available nitrogen, phosphorus and potassium status and found to be effective in improving the post-harvest soil fertility.

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