Original Research Article

Effect of different varieties, nitrogen levels and cutting management on yield and ts attributes ~~growth and yield~~ of fodder bajra (*Pennisetum glaucum* L.)

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ABSTRACT

Aims: To identify an ideal pearl millet variety under ideal nitrogen level and cutting management for high green fodder yield and dry fodder yield.

Study design: ~~Randomized block design~~

Randomized Complete Block Design (RCBD)

with factorial concept.

Place and duration of study: AICRP on Forage Crops and Utilization, Agricultural Research Institute, between July 2021 and Nov. 2021.

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Methodology: Field experiment was conducted at AICRP on Forage Crops and Utilization, ARI, Rajendranagar, Hyderabad during *kharif* 2021. The treatments consisted of three varieties (TSFB 15-4, TSFB 15-8 and Moti bajra), three nitrogen levels (80, 100 and 120 kg N ha^{-1}) and two cutting management practices (C_1: Two cuts: 1st at 60 ~~DAS~~days after sowing(DAS), 2nd cut at 50% flowering) (C_2: Three cuts: 1st at 50 DAS, 2nd cut at 35 days after 1st cut and 3rd cut at 50% flowering) laid out in

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Randomized Complete Block Design

~~randomized block design~~ with factorial concept, with Factor (A) as varieties, Factor (B) as nitrogen levels and Factor (C) as cutting management with three replications. The soil was sandy loam in texture with pH of 7.0 low in available nitrogen, medium in available phosphorus and available potassium.

Results: Variety TSFB 15-8 recorded significantly higher plant height (67.2 cm) and leaf-stem ratio (0.4) green forage yield (821.1 q ha^{-1}), dry fodder yield (198.4 q ha^{-1}) respectively, but Moti bajra variety ~~the number of tillers m^{-2}~~ was recorded highest number of tillers m^{-2} ~~in Moti bajra~~ (4.5). Application of nitrogen at the rate of 120 kg ha^{-1} significantly recorded ~~higher~~ highest plant height (72.0 cm), number of tillers m^{-2} (4.7) and leaf-stem ratio (0.4), green forage yield (817.7 q ha^{-1}), dry fodder yield (201.0 q ha^{-1}). Three cuts for green fodder recorded significantly higher plant height (65.9 cm), number of tillers (5.1) and leaf-stem ratio (0.5) green fodder yield (910.0 q ha^{-1}), dry fodder yield (216.4 q ha^{-1}) compared to two cuts.

Conclusion: Variety TSFB 15-8 with nitrogen level of 120 kg N ha^{-1} at C_2 found suitable and economical for cultivation in southern Telangana zone.

Keywords: ***Pearl millet*** *Varieties, nitrogen levels and cutting management.*

1. INTRODUCTION

Pearl millet (*Pennisetum glaucum*. L) is an important minor millet being cultivated for high dietary fiber and nutrient source for human beings and also a good fodder crop for livestock and requires less irrigation water as compared to other cereal fodders; hence, it can be cultivated in command areas under rice fallows, where water is very scarce. 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 dual-purpose nature of the pearl millet has been recently identified due to its profuse tillering, withstanding capacity for repeated harvesting and absence of anti-nutritional factors like prussic acid, better performance under marginal and low fertile soils. Pearl millet is quick growing cereal as compared to maize and sorghum and it produces green fodder in short ~~relation~~ duration or time. Being tall vigorous with exceptional fodder yielding potential, it is an indispensable fodder for the animal inhabitants in arid and semi-arid regions of the world. In India, the requirement of green fodder was 611.99 Mt against the availability of only 224.08 Mt (Anonymous. 2006). It reflects a wide gap between demand and supply because the regional deficit are more important than the national deficit especially for forages which account only 3.4 m ha and 9.3 m ha area of total cultivable land is utilized for forage production in 1999 in Rajasthan and India, respectively (GOI, 2004). Therefore, the development of quality fodder cultivars and management to meet out the fodder requirements forever increasing livestock population is imperative, as the quality of fodder is very important issue with respect to livestock health status as well as to maximize the animal production.

2. MATERIAL AND METHODS

Field experiment was conducted during *kharif* season of 2021 at AICRP on Forage Crops and Utilization, ARI, PJTSAU, Rajendranagar, Hyderabad, India. The present research work is framed with an objective to identify an ideal pearl millet variety under ideal nitrogen level and cutting management for high green and dry fodder yield. The experiment was laid out in randomized complete block design with factorial ~~cocept~~concept. The soil was sandy loam in texture with pH of 7.0 low in available nitrogen, medium in available phosphorus and available potassium. The experiment consisted of 18 treatment combinations *viz.,* three varieties (TSFB 15-4, TSFB 15-8 and Moti bajra), three nitrogen levels (80, 100 and 120 kg N ha^{-1}) and two cutting management practices (C_1: Two cuts: 1st at 60 DAS, 2nd cut at 50% flowering) (C_2: Three cuts: 1st at 50 DAS, 2nd cut at 35 days after 1st cut and 3rd cut at 50% flowering) with three replications, phosphorus (40 kg P_2O_5 ha^{-1}) and potassium (20 kg K_2O ha^{-1}) were applied through Di-ammonium phosphate and Muriate of potash respectively. Nitrogen was given in split-doses, half as basal and other dose was given after 30 DAS and after each cut as top dressing. Crop was sown at a row distance of 30 cm. The crop was sown during 2nd week of July and harvested ~~when crop attained 50% flowering~~at certain cutting treatment. Five plants were randomly select in each net plot area for taking observations on growth and yield attributing parameters. The samples were first dried under shade and then in electric oven at temperature of 60^{0}C till attaining constant weight, on the basis of weight of these samples, the green fodder yield was converted into dry matter yield (q ha^{-1}). Data of ~~growth~~ yield and its attributes that is plant height (cm), number of tillers m^{-1}

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row length, leaf-stem ratio and forage yield as green and dry (q ha^{-1}). Data obtained were statistically analyzed as mentioned by Gomez and Gomez,(1984).

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3. RESULTS AND DISCUSSION

3.1 ~~Growth parameters~~yield attributes

3.1.1 Varieties

The ~~growth~~ yeld attributes and fodder yield of pearl millet significantly varied among studied varieties (Table 1). The pearl millet variety TSFB 15-8 recorded significantly higher plant height (67.2 cm) and leaf-stem ratio (0.4) as over other ~~varieties~~varieties, but the maximum number of tillers was found in Moti bajra variety (4.5) and was at par with TSFB 15-8. The TSFB 15-8 variety recorded highest green fodder yield of 821.2 q ha^{-1} which was followed by TSFB 15-4 (757.6 q ha^{-1}) and the same variety recorded ~~higher~~ highest dry matter yield of 198.4 q ha^{-1} followed by variety Moti bajra (181.7 q ha^{-1}). This was due to the superiority of the genotype to produce more mean values of ~~growth characters~~yield attributes like plant height, ~~leaf stem ratio~~, number of tillers.

3.1.2 Nitrogen levels

Application of nitrogen at the rate of 120 kg N ha^{-1} recorded significantly higher green fodder yield (817.7 q ha^{-1}) and was at par with 100 kg N ha^{-1} (787.9 q ha^{-1}) and dry matter yield (201.0 q ha^{-1}) over other studied nitrogen levels. Increase in green bio-mass yield was due to improved ~~growth~~ yield attributes parameters *viz.,* plant height (72.0 cm~~),~~)and number of tillers m^{-2} (4.7)~~ and leaf stem ratio (0.4~~). Nitrogen is directly involved in cell division, cell elongation, formation of nucleotides and co-enzymes that increased meristematic activity, since nitrogen is an integral part of chlorophyll, plays an important role in photosynthesis and produce more of photosynthates, which helped in accumulation more dry matter yield. This is in conformity with the findings of Golada et al. [6] and Damame et al. [4].

3.1.3 Cutting management

Results with cutting management indicated that the maximum average means of plant height (65.9 cm), number of tillers m^{-2} (5.9) were recorded with three cuts for green fodder and recorded significantly higher green fodder yield (910.0 q ha^{-1}) and dry matter yield (216.4 q ha^{-1}) as compared to two cuts of green fodder yield (641.1 q ha^{-1}) and dry matter yield (151.4 q ha^{-1}). This might be due to high production potential of all the varieties and higher number of tillers m^{-2} as evident from data (Table 1).

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3.1.4 Interaction effect

The interaction between different varieties and nitrogen levels was found to be significant and revealed that variety TSFB 15-8 recorded maximum green fodder yield at 100 kg N ha^{-1} (860.1 q ha^{-1}) but significantly on par with Moti bajra at 80 kg N ha^{-1} and 120 kg N ha^{-1}. Contrary to this, at 100 kg N ha^{-1} TSFB 15-8 was significantly on par with TSFB 15-4 (Table 2).

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The interaction between different varieties and nitrogen levels on dry fodder yield was found to be significant and it was observed that TSFB 15-8 recorded maximum dry fodder yield at 100 kg N ha^{-1} (202.9 q ha^{-1}) and 120 kg N ha^{-1} (216.2 q ha^{-1}) but significantly on par with TSFB 15-4 at 100 kg N ha^{-1} and with Moti bajra at 120 kg N ha^{-1}. Contrary to this, at 80 kg N

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ha^{-1} Moti bajra (176.4 q ha^{-1}) was found to be superior and was on par with TSFB 15-8 (Table 3).

Table 1: Effect of different varieties, nitrogen levels and cutting management on growth parameters and fodder yield of pearl millet.

Treatments	Plant height (cm)	~~No.~~Number of tillers m^{-2}	~~L:S ratio~~leaf - stem ratio	Green ~~F~~Fodder Yeld (q ha^{-1})	Dry ~~F~~Fodder Yield (q ha^{-1})
Varieties					
TSFB 15-4	63.6	3.7	0.3	757.6	171.6
TSFB 15-8	67.2	4.4	0.4	821.2	198.4
Moti bajra	60.2	4.5	0.4	747.7	181.7
S Em±	0.9	0.09	0.01	14.9	4.4
CD (P=0.05)	2.7	0.2	0.04	42.7	12.6
Nitrogen levels (kg ha^{-1})					
80	56.6	3.9	0.4	720.9	167.5
100	62.4	3.9	0.3	787.9	183.2
120	72.0	4.7	0.4	817.7	201.0
S Em±	0.9	0.09	0.01	14.9	4.4
CD (P=0.05)	2.7	0.2	0.04	42.7	12.6
Cutting management					
C_1 (Two cuts)	61.5	3.3	0.3	641.1	151.4
C_2 (Three cuts)	65.9	5.1	0.5	910.0	216.4
S Em±	0.8	0.07	0.01	12.1	3.6
CD (P=0.05)	2.2	0.2	0.03	34.9	10.3

~~**NOTE:** L:S- Leaf-stem ratio, GFY- Green fodder yield, DFY- Dry fodder yield.~~

Table 2~~.~~: Interaction effect of different varieties and nitrogen levels on green fodder yield of fodder pearl millet.

Treatments	Nitrogen levels (kg ha^{-1})		
	80	100	120
Varieties			
TSFB 15-4	674.2	807.6	791.1
TSFB 15-8	767.9	860.1	835.8
Moti Bajra	720.7	696.1	826.2

Table 3~~.~~: Interaction effect of different varieties and nitrogen levels on dry fodder yield of fodder pearl millet

Treatments	Nitrogen levels (kg ha^{-1})		
	80	100	120
Varieties			
TSFB 15-4	150.2	181.6	183.1
TSFB 15-8	176.0	202.9	216.2
Moti Bajra	176.4	165.1	203.7

Table 4. : Effect of different varieties, nitrogen levels and cutting management on economics of fodder pearl millet

Treatments	Gross returns (Rs. ha^{-1})	Net returns (Rs. ha^{-1})	B-C ratio
Varieties			
TSFB 15-4	132584	92640	2.3
TSFB 15-8	143713	103768	2.5
Moti bajra	130842	90897	2.2
Nitrogen levels (kg ha^{-1})			
80	126162	90897	2.1
100	137882	97938	2.4
120	143095	103024	2.5
Cutting management			
C1 (Two cuts)	112186	73574	1.9
C2 (Three cuts)	159240	117963	2.8

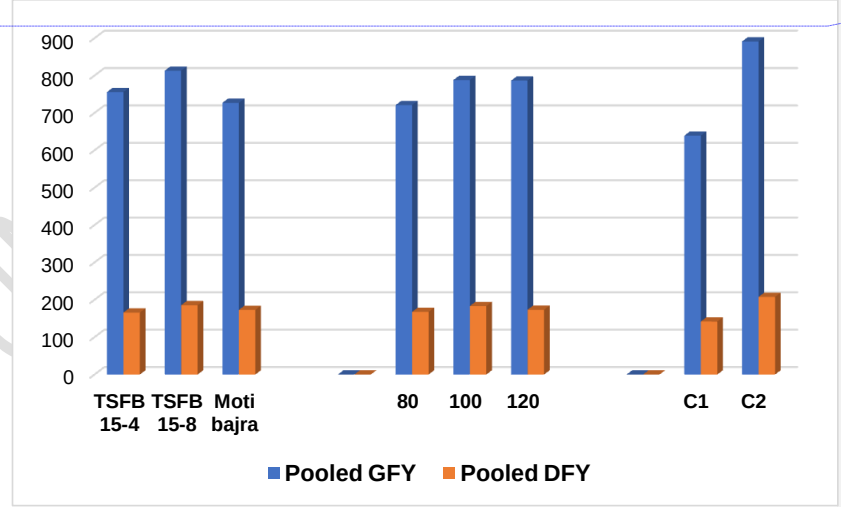

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Fig.1. Variation in GFY and DFY (q ha-1) among varieties, nitrogen levels and cutting management.

~~**NOTE:** Varieties (TSFB 15-4, TSFB 15-8, Moti bajra)~~

~~Nitrogen levels (80, 100, 120 kg ha^{-1})~~

~~Cutting management (C_1 and C_2)~~

~~GFY- Green fodder yield, DFY- Dry fodder yield.~~

Among varieties tested TSFB 15-8 registered higher net returns (103768 Rs. ha^{-1}) and benefit-cost ratio (2.5). Application of nitrogen 120 kg N ha^{-1} recorded higher net returns (103024 Rs. ha^{-1}) and benefit-cost ratio (2.5) and among cutting management practices C_2 (Three cuts) recorded higher net returns (Rs. 117963 ha^{-1}) and benefit-cost ratio (2.8). This might be due to better growth attributes which resulted higher green forage yield with higher level of nitrogen.

4. CONCLUSION

Based on the research results it can be inferred that forage pearl millet variety TSFB 15-8 with nitrogen level of 120 kg N ha^{-1} at C_2 (Three cuts) found suitable and economical for cultivation in Southern Telangana Zone. These results are in conformity with findings of Shekara et al. [16] and Shekara et al. [17].

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