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RESPONSE OF PEARL MILLET (*PENNISETUM GLAUCUM* L.) VARIETIES TO NITROGEN LEVELS FOR HIGHER GREEN FORAGE YIELD AND QUALITY IN SOUTHERN DRY ZONE OF KARNATAKA

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SUMMARY

A field experiment was conducted at zonal agricultural research station, V. C Farm, Mandya (Karnataka) during *kharif* 2018 to know the response of pearl millet varieties to nitrogen levels and to identify optimum level of nitrogen for higher green forage yield and quality. The study revealed that, variety TSFB 15-4 significantly recorded higher green forage, dry matter and crude protein yield (284.0, 64.0 and 4.7 q/ha, respectively) and superior over national check Giant Bajra (262.8, 57.2 and 3.7 q/ha, respectively). The same variety recorded higher net monetary returns (Rs. 42074/ha). Application of 90 kg N/ha significantly recorded higher green forage, dry matter and crude protein yield (292. 8, 71.8 and 5.4 q/ha, respectively) and net monetary returns (Rs.43194/ha) over other levels.

Key words : Green forage, dry matter and crude protein yield and agronomic efficiency of nitrogen

India support about 20 per cent of the world's livestock and 16.8 per cent human population with only 2.3 per cent of the world geographical area (Kumar *et al.,* 2012). At the national level, there is a short supply of about 38 per cent green fodder and same situation was observed in Karnataka state also. The continuous supply of balanced nutritive forage is essential to the milch animal for enhancing milk productivity. (Meena *et al.,* 2012). There is a tremendous pressure of livestock on available feed and fodder, as land available for fodder production has been decreasing. The feed and fodder cost constitutes about 60-70% of cost of milk production, thus cultivated fodder has an important role in meeting the requirement of various nutrients and roughage in our country to produce milk and meat in cheaper cost and it is most economical as compared to concentrates. Pearl millet is one of the important dual purpose crop of hot and dry conditions of arid and semi-arid regions (Arya and Yadav, 2009) and gaining popularity in Karnataka state due to tolerance to drought situation, its quick growth, short duration, better palatability and digestibility and free from anti nutritional factor. Nitrogen is an essential primary nutrient for profuse plant growth and plays a pivotal role in productivity of forage. Now a day many new improved forage varieties of Pearl millet are being evolved and there is need to standardise the optimum dose of nitrogen for better forage yield and quality. keeping these things in view the present investigation was taken up to study the response of newly evolved forage Pearl millet varieties to different levels of nitrogen and to identify the optimum, cost effective level of nitrogen for higher yield and quality.

MATERIALS AND METHODS

The field experiment was conducted at Zonal Agricultural Research Station, V. C Farm, Mandya during *kharif* 2018 for identifying the optimum level of nitrogen for higher green forage yield and quality. The soil of the experimental site is red sandy loam in texture having low in available nitrogen (185 kg N ha^{-1}), medium in available phosphorous (21.2 kg/ha) and potassium (161 kg K_2O/ha) with neutral in reaction. The experiment consisted of four varieties (V_1: TSFB-15-8, V_2: TSFB-15-4, V_3: Giant bajra (National Check) and Moti bajra (South zone check)) and four nitrogen levels (0, 30, 60 and 90 N Kg/ha) was laid out in split plot design with three replications. The crop was sown during the month of July with recommended spacing of 30 cm between the rows, the cultural practices were followed as per recommended package of practices for establishment of crop. The nitrogen was applied as per the treatments. The crop was harvested at 50 per cent flowering and

immediately after harvest of the crop green fodder yield was recorded. The known quantity of sample was taken and oven dried for the estimation of dry matter as well as other quality parameters. The agronomic efficiency of Nitrogen (AEN) was worked out and economics was calculated with prevailing market price and input costs. The statistical analysis of data was done for interpretation of the results and draw conclusion.

$$\text{AEN (Kg GFY/Kg N)} = \frac{\text{Green forage yield in "Nitrogen" applied plot-green forage yield in "No Nitrogen" plot}}{\text{Amount of fertilizer Nitrogen applied}}$$

RESULTS AND DISCUSSION

Varieties

Varieties differed significantly with respect to green forage, dry matter, crude protein yield, crude protein content, leaf stem ratio and plant height recorded at harvest (Table 1). The variety TSFB 15-4 significantly recorded higher green forage, dry matter and crude protein yield (284.0 q, 64.0 q and 4.7 q/ha, respectively) and superior over national check Giant bajra (262.8, 57.2 and 3.7 q/ha, respectively). The increase in green forage yield is due to increased growth parameter like plant height (194.2 cm) and better leaf stem ratio (0.4). The increase in Dry matter yield is due to higher green forage yield and dry matter content (21.9 per cent). The higher crude protein yield due to higher dry matter yield and crude protein content (7.2 per cent). Similar results were reported by Sharma *et al.* (1999), Damame *et al.* (2013), Suresh Kumar *et al.* (2013) and Rana *et al.* (2013).

Nitrogen levels

Plant height, Leaf stem ratio, crude protein and Dry matter content, Green forage, Dry matter and Crude protein yield, were significantly influenced by nitrogen levels (Table 1). Application of 90 kg N/ha significantly recorded higher green forage, dry matter and crude protein yield (292. 8, 71.8 and 5.4 q/ha, respectively) over other levels. The crude protein content (7.5%) and dry matter content (24.4%) were also higher with nitrogen level of 90 kg/ha which were on par with 60 kg N/ha (7.1 and 23.0%, respectively). The increase in green forage yield with higher level of nitrogen is due to better growth, which is indicated by higher leaf stem ratio (0.6) and plant height (241.2 cm). The increase in dry matter yield is due to increase in matter content and green forage yield and increase in crude protein yield due to increased dry matter yield and crude protein content with higher dose of nitrogen. This assumption is well justified that higher nutrient status of plants under fertilizer application is due to their greater availability in soil and better uptake by

TABLE 1
Growth, yield & quality parameters of Pearl millet varieties as influenced by nitrogen levels

Varieties	Plant height (cm)	Leaf Stem ratio	GFY (q/ha)	DMY (q/ha)	Dry Matter (%)	Crude Protein (%)	CPY (q/ha)
TSFB-15-8	173.5	0.4	209.8	45.5	21.3	7.4	3.4
TSFB-15-4	194.2	0.4	284.0	64.0	21.9	7.2	4.7
Giant bajra	191.2	0.5	262.8	57.2	21.3	6.4	3.7
Moti bajra	192.7	0.4	178.2	39.6	21.9	6.2	2.6
S. Em±	3.5	0.01	6.2	1.5	0.7	0.1	0.1
C. D. (P=0.05)	12.2	0.04	21.4	5.2	NS	0.4	0.2
Nitrogen Levels (Kg/ha)							
0	127.4	0.3	163.6	29.9	18.3	6.0	1.8
30	171.6	0.4	225.9	46.8	20.8	6.6	3.1
60	211.4	0.5	252.4	58.0	23.0	7.1	4.1
90	241.2	0.6	292.8	71.8	24.4	7.5	5.4
S. Em±	4.6	0.0	6.0	2.1	0.5	0.2	0.2
C. D. (P=0.05)	13.5	0.0	17.6	6.2	1.5	0.6	0.5
Interaction							
S. Em±	0.0	0.0	12.1	4.3	1.1	0.4	0.3
C. D. (P=0.05)	0.04	0.04	NS	NS	NS	NS	NS

GFY= green forage yield, DMY= dry matter yield, CPY=crude protein yield.

TABLE 2
Agronomic efficiency of nitrogen (Kg GFY/Kg N) and economics as influence by varieties and nitrogen levels

Treatment	Agronomic efficiency of nitrogen (Kg GFY/ Kg N)	Gross returns (Rs/ha)	Net returns (Rs/ha)	B : C ratio
Varieties				
TSFB 15-88	116	41960	27234	2.84
TSFB 15-4	192	56800	42074	3.86
Giant bajra	239	52560	37834	3.57
Moti barja	115	35642	20916	2.42
Nitrogen levels (kg/ha)				
0	-	32270	18660	2.33
30	207	45180	30668	3.11
60	148	50480	35516	3.37
90	144	58560	43194	3.81

GFY=green forage yield.

plants and therefore, translocation within the plant system. Superiority of fertility levels appears to have resulted on account of improved crop growth and better productivity favoured by improved nitrogen. This is in accordance with the findings of Bhatt *et al.* (2012).

Nitrogen use efficiency

Application of 30 Kg N/ha recorded higher nitrogen use efficiency (207 Kg green forage yield/ Kg Nitrogen). The Nitrogen use efficiency was higher at lower levels of nitrogen and decreased with incremental nitrogen levels. This might be due to higher amount of N loss through leaching with higher N levels might have led to lower utilization of applied nitrogen and there by decrease N use efficiency. Similar results were reported by Sharma *et al.* (1999).

Economic analysis

Varieties and Nitrogen levels had influence on gross returns, net returns and benefit cost ratio (Table 2). Variety TSFB-15-4 recorded higher net monetary returns (Rs. 42074/ha) and benefit cost ratio (3.86) over south zone check variety Moti bajra (Rs.20916/ha and 2.42, respectively). Application of 90 kg N/ha recorded higher gross returns (Rs. 58560/ha), net returns (Rs. 43194/ha) and benefit cost ratio (3.81). This might be due better growth and yield attributes like plant height and leaf stem ratio, which led to higher green forage yield and resulted in higher economics. The interaction between varieties and nitrogen levels found non-significant with respect to green forage, dry matter and crude protein yield and content.

Based on results it can be inferred that variety TSFB 15-4 with nitrogen levels of 90 kg/ha found optimum and economical, which recorded higher green forage, dry matter and crude protein yield and content and higher net monetary returns in southern dry zone of Karnataka.

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