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RESPONSE OF FORAGE PEARL MILLET (*PENNISETUM GLAUCUM* L.) GENOTYPES TO DIFFERENT NITROGEN LEVELS

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SUMMARY

A field experiment was conducted at CCS Haryana Agricultural University, Hisar (Haryana) during rainy season (**kharif**) of 2015 to study the effect of different nitrogen levels on the yield and quality of pearl millet (*Pennisetum glaucum* L.) genotypes. Four pearl millet genotypes viz., Raj Bajra Chari-2, AVKB-19, DFMH-30 and Giant Bajra were tested for their response at 0, 30, 60 and 90 kg N/ha. Among genotypes, Giant Bajra (Check) proved significantly superior than remaining genotypes for green fodder as well as dry matter yield. Genotype AVKB-19 recorded highest crude protein content (10.2%) followed by DFMH-30 (10.1%). The increasing levels of nitrogen from 0 to 90 kg/ha significantly increased the green fodder and dry matter yield over their lower levels. Application of 90 kg N/ha brought out an increase of 44.3, 29.7 and 7.0 per cent in green fodder and 54.0, 18.2 and 3.7 per cent in dry matter over 0, 30 and 60 kg N/ha, respectively. Among genotypes, maximum gross returns (Rs. 41986/ha), net returns (Rs. 27407/ha) and B : C ratio (2.88) were fetched in Giant Bajra closely followed by DFMH-30. Among different nitrogen levels, maximum gross returns (Rs. 36253/ha), net returns (Rs. 21,135/ha) and B : C ratio (2.40) were fetched with the application of 90 kg N/ha.

Key words : Green fodder yield, dry matter, nitrogen, pearl millet, crude protein

Pearl millet (*Pennisetum glaucum* L.), is commonly known as bajra, belongs to family Poaceae and is an important **kharif** season crop which is widely grown to meet the grain, green fodder as well as dry fodder requirement of the livestock in areas characterized by low rainfall, high temperature, drought and low soil fertility. As a feedstuff, it is mainly grown to produce green-chops, pasture and standover feed grazed directly, hay and silage. For higher green fodder yield, vegetative growth of this crop is very important. Although the vegetative growth of any crop is largely dependent upon the potential of the genotype, nutrient supply system, capacity of the soil to supply the nutrients to the crop and capacity of the plants to take and use the nutrients in unit time. Among all the primary nutrients, nitrogen plays a pivotal role in quantitative as well as qualitative improvement in the productivity of the crop. Nitrogen is an important constituent of protein and chlorophyll. It imparts dark green-colour to the plant, promotes vegetative growth and rapid early growth. It improves the quality by increasing the protein content of fodder crops and governs, to a considerable degree, the utilization of potassium, phosphorus and other essential nutrient elements (Patel *et al.*, 2007). Almost all the soils of Haryana are deficient in nitrogen and if the required amount of nitrogen of any crop is not supplied in sufficient amount. The deficiency of nitrogen is reflected in the straw and grain. Since nitrogen is a constituent of amino acid and deficiency of nitrogen in grain and straw of the cereals as well in the fodder crops may cause severe disorders in animals and human beings (Midha *et al.*, 2015). Therefore, it is essential to find out the optimum dose of nitrogen for fetching good fodder yield of pearl millet. Hence, the present investigation was undertaken to study the performance of different promising genotypes of pearl millet at different nitrogen levels.

MATERIALS AND METHODS

A field experiment was conducted during **kharif** 2015 at Research Farm of Forage Section, CCS Haryana Agricultural University, Hisar, (Haryana, India) (29° 10' N or 75° 46' E, at an average elevation of 215.2 m above mean sea level). The site has semi-arid and sub-tropical climate with hot dry summers and severe cold winters. Average annual rainfall is about 450 mm and 75 per cent of which is received during three months i. e. from July to September during south-west monsoon. The crop received 153.0 mm rainfall during crop season. The soil of the experimental field was sandy loam in texture, slightly alkaline in reaction (pH 7.3), low in available nitrogen (215.2 kg/ha), medium in available phosphorus (13.0 kg/ha) and potassium (144.0 kg/ha). The experiment consisted of 16 treatment combinations comprising four pearl millet genotypes (Raj Bajra Chari-2, AVKB-19, DFMH-30 and Giant Bajra) and four nitrogen levels (0, 30, 60 and 90 kg N/ha). These treatments were tested in factorial randomized block design with three replications. The pearl millet genotypes as per treatment were sown manually on 16th July 2015 in opened furrows at 30 cm apart by using the seed rate of 10 kg/ha. All the other standard agronomic practices for the cultivation of pearl millet were followed uniformly among all the treatments. All the genotypes were harvested at 50 per cent flowering stage. The harvested green fodder from each plot was weighed *in situ* in kg/plot and then converted into q/ha. A random sample of 500 g was taken from each plot at the time of green fodder harvest, chopped well and put into paper bag. These bags were aerated by making small holes all over. The samples were first dried in the sun for 15 days and then transferred in an electric hot air oven for drying at a temperature of 60±5°C till constant weight was achieved. On the basis of these samples, the green fodder yield was converted into dry matter yield (q/ha). Crude protein content (%) was estimated in dried and grinded samples (2 mm sieve size), collected at 50 per cent flowering stage. The crude protein content was calculated by multiplying the nitrogen percentage with 6.25 by conventional Micro-Kjeldal method (AOAC, 1995). Crude protein yield was calculated by the multiplication of crude protein content (%) with dry matter yield (q/ha). *In vitro* dry matter digestibility (IVDMD) was determined by the method of Tilley and Terry (1963) as modified by Barnes *et al*. (1971). Digestible dry matter (DDM) was calculated by multiplication of IVDMD and dry matter yield and divided by one hundred. Economics of different treatments was worked out on the basis of prevailing market prices of inputs and output in the local market. The experimental data were analyzed by using OPSTAT software available on CCS Haryana Agricultural University home page. The results are presented at 5 per cent level of significance (P=0.05) for making comparison between treatments.

RESULTS AND DISCUSSION

Effect of Genotypes

The data presented in Table 1 reveal that highest number of tillers/m row length (30.8) were recorded in Giant Bajra which was significantly superior to rest of the genotypes. Highest plant height was recorded in AVKB-19 (276.4 cm) which was found significantly superior over rest of the genotypes. The highest green fodder yield (599.8 q/ha) and dry matter yield (135.2 q/ha) were recorded with Giant Bajra, which were significantly superior to rest of the genotypes. This was due to the superiority of this genotype to produce more values of growth characters like plant height and number of tillers. The highest green fodder and dry matter yield by Giant Bajra in Punjab were also reported by Tiwana and Puri (2005). The highest crude protein (10.23 %) was estimated in AVKB-19 which was at par with DFMH-30 (10.12 %) but significantly superior to rest of the genotypes. The maximum crude protein yield (13.1 q/ha) was recorded in Giant Bajra followed by DFMH-30 (12.3 q/ha). Highest IVDMD (*In vitro* dry matter digestibility) (59.15%) was estimated with the genotype Raj Bajra Chari-2 which was significantly superior to rest of the genotypes. The maximum digestible dry matter yield (77.74 q/ha) was recorded with Giant Bajra followed by DFMH-30 (69.32 q/ha). Data presented in Table 2 revealed that among genotypes, the maximum gross returns (Rs. 41986/ha), net returns (Rs. 27407/ha) and B:C ratio (2.88) was realized with Giant Bajra closely followed with DFMH-30. The minimum gross returns (Rs. 20552/ha), net returns (Rs. 5973/ha) and B: C ratio (1.41) were recorded in Raj Bajra Chari-2.

Effect of Nitrogen Levels

The perusal of the data presented in Table 1 reveal that maximum tillers (28.8/m row length) recorded with the application of 90 kg N/ha were significantly superior over the application of 0 and 30 kg N/ha, respectively. The plant height (263.6 cm) was also observed highest at 90 kg N/ha which was at par with rest of the treatments except control. The highest green fodder yield (517.9 q/ha) was recorded with the

TABLE 1

Growth attributes, yield and quality of pearl millet genotypes as influenced by different nitrogen levels

Treatment	No. of tillers/ mrl	Plant height (cm)	Green fodder yield (q/ha)	Dry matter yield (q/ha)	Crude protein (%)	Crude protein yield (q/ha)	IVDMD (%)	DDM (q/ha)
A. Genotypes								
Raj Bajra Chari-2	21.2	258.4	293.6	70.0	9.52	6.7	59.15	41.41
AVKB-19	23.3	276.4	350.6	86.3	10.23	8.8	58.60	50.57
DFMH-30	28.4	240.4	546.3	121.4	10.12	12.3	57.10	69.32
Giant Bajra	30.8	252.6	599.8	135.2	9.70	13.1	57.50	77.74
S. Em±	0.6	2.2	10.3	3.4	0.09	-	0.16	-
C. D. (P=0.05)	1.8	6.4	29.8	9.8	0.27	-	0.48	-
B. Nitrogen levels (kg/ha)								
0	20.6	244.8	358.9	77.5	9.21	7.1	55.30	42.86
30	25.9	257.5	429.7	101.0	9.62	9.7	57.00	57.57
60	28.4	262.1	483.8	115.1	10.66	12.3	58.40	67.22
90	28.8	263.6	517.9	119.4	10.08	12.0	60.80	72.60
S. Em±	0.6	2.2	10.3	3.4	0.09	-	0.16	-
C. D. (P=0.05)	1.8	6.4	29.8	9.8	0.27	-	0.48	-
A x B Interaction								
S. Em±	1.2	4.4	20.6	6.7	-	-	-	-
C. D. (P=0.05)	NS	NS	NS	NS	-	-	-	-
C. V. (%)	8.3	19.1	7.9	11.2	-	-	-	-

IVDMD–*In vitro* dry matter digestibility and DDM–Digestible dry matter. NS–Not Significant.

TABLE 2

Economics of different pearlmillet genotypes as influenced by various levels of nitrogen

Treatment	Gross returns (Rs./ha)	Cost of cultivation (Rs./ha)	Net returns (Rs./ha)	B : C ratio
Genotypes				
Raj Bajra Chari-2	20552	14579	5973	1.41
AVKB-19	24542	14579	9963	1.68
DFMH-30	38241	14579	23662	2.62
Giant Bajra	41986	14579	27407	2.88
Nitrogen levels (kg/ha)				
0	25123	14039	11084	1.79
30	30079	14399	15680	2.09
60	33866	14758	19108	2.29
90	36253	15118	21135	2.40

application of 90 kg N/ha which was found significantly superior to rest of the treatments. Similar results were also reported by Singh *et al*. 2012. Maximum dry matter yield (119.4 q/ha) was also recorded with the application of 90 kg N/ha which was at par with 60 kg N/ha. The probable reason for such a positive effect of nitrogen application might be due to the poor nitrogen status of the experimental field and response of forage pearl millet to nitrogen application, which with applied nitrogen tended to put more vegetative growth, better root development and efficient photosynthesis and finally produced more forage yield. Moreover, this was mainly due to the cumulative effect of increasing trend observed in major yield attributing characters *viz*. number of tillers/ m row length and plant height (Golada *et al*., 2010). Highest crude protein (10.7%) and crude protein yield (12.3 q/ha) were estimated at 60 kg N/ha and it was followed by 90 kg N/ha. Application of nitrogen increased the protein content in pearl millet and this might be due to the fact that nitrogen helps in the synthesis of amino acid and protein in plant. Higher crude protein at 60 kg N/ha was mainly attributed to more uptake of nitrogen which is constituent of amino acids and protein. Rana *et* al. (2009), Devi *et* al. (2010) and Midha *et* al. (2015) also reported similar results in oats. The increase in crude protein yield was due to the increase in crude protein content and dry matter yield of pearlmillet crop. Highest IVDMD (60.8 %) was estimated with the application of 90 kg N/ha which was found significantly superior than rest of the treatments. The data presented in Table 2 revealed that among different nitrogen levels, the maximum gross returns (Rs. 36253/ha), net returns (Rs. 21135/ha) and B:C ratio (2.40) were realized with the application of 90 kg N/ha and it was followed by 60 kg/ha (gross returns Rs. 33866/ha, net returns Rs. 19108/ha and B:C ratio 2.29).

CONCLUSION

The genotype Giant Bajra gave significantly higher fodder yield as compared to other genotypes and the forage pearl millet genotypes responded up to 90 kg nitrogen/ha.

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