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Evaluation of quality traits of nitrogen treated Napier Bajra hybrid plants in different cuts using different nitrogen sources

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Introduction:

Napier Bajra Hybrid, *cv* PBN-233 is a inter-specific hybrid between *Pennisetum glaucum* × *Pennisetum purpureum*. It is an important fast growing multi-cut fodder crop and provides fodder from April to November. It is widely distributed in sub-tropical regions of Asia, Africa, southern Europe and America. Nitrogen (N) is a fundamental regulator of plant growth and its supply strongly influence plant growth. In general, the availability of the nutrients influences the quality of various crops. Due to this reason, nitrogen fertilizers were increasingly used in agricultural sectors around the world. Some researchers reported that forage quality increased with nitrogen fertilization but nitrogen use efficiency declined. The increase in nitrogen fertilization improved considerably nitrogen uptake and would contributed to large photosynthetic activity and synthesis of higher protein content. Forages with high concentrations of crude protein (CP) considered of high quality because feeding high protein forage cut down the need of supplementary protein. Generally, high protein forages are more digestible and provide more energy than low protein forages. CP content generally decreased with the advancement of the plant growth due to synthesis of structural carbohydrates with advancing plant age. The declined protein content concentration was also attributed to reduction in leaf to stem ratio with advancing age. Neutral detergent fibre (NDF) and acid detergent fibre (ADF) are regarded as good indicators of forage quality because of their negative relation to digestibility in animals. Low NDF containing forage preferred by animals than high NDF ones. High NDF content in forages not only decreased intake, but also reduces the availability of energy for higher milk production. Increased supply of nitrogen and other nutrients increased the protein content whereas decreased the NDF and ADF content. Therefore, an attempt was made to evaluate the effect of different nitrogen levels and sources on quality traits of Napier Bajra hybrid in different cuts.

Materials and Methods

Field experiment was conducted at Forage Research Farm, Department of Plant Breeding and Genetics, Punjab Agricultural University, Ludhiana in randomized block design using three nitrogen levels (50, 75 and 100 kg N/ha) with three replications. Stem cuttings with two or three nodes were used for planting. Three nitrogen fertilizers, potassium nitrate (KNO_3), urea and ammonium sulphate [$(NH_4)_2SO_4$] were used in divided doses. First cut was taken after 60 days of sowing (DOS) and second cut was taken after an interval of 35-40 days. Plant samples were collected after every harvest, sun dried and then completely dried in hot air oven till a constant weight was obtained. This dried plant material was ground using Willy grinder to a uniform mesh size and used for the estimation of quality traits. Standard methods were used for the estimation of crude protein (AOAC, 1970), neutral detergent fibre and acid detergent fibre (Goering and Van Soest, 1970).

Results and Discussion

Crude protein (CP) content increased with increasing levels of nitrogen fertilization (Table 1). The improvement in quality might be due to the fact that nitrogen is an essential constituent of chlorophyll, protein and nucleic acids. This might be due to more rapid conversion of carbohydrates to proteins under higher nitrogen supply. Thus, carbohydrates and nitrogen provided skeleton for protein synthesis. In the present study, CP content was recorded higher in $(NH_4)_2SO_4$ treated plants followed by KNO_3 and urea treated plants in both cuts. Similarly lower CP content was observed in urea treated fodder maize plants than ammonium sulphate treated plants (Hassan Amin, 2011). CP content was also found higher in ammonium treated lucerne plants as compared to nitrate treated plants (Vasileva and Ilieva, 2011). Oat fodder also showed increased CP content with increasing N levels in two different cuts but the content was observed higher in first cut than second cut (Kumari *et al.*, 2014) which supported our present results.

Neutral detergent fibre (NDF) represents total fibre fraction (cellulose, hemicellulose, lignin and silica) that make up cell walls of the forage tissue. NDF decreased with nitrogen fertilization (Table 1). Similar types of findings were also

observed in hybrid napier by Sharma *et al.* (2012). Decreased NDF content with increasing the level of nitrogen in two different harvests of fodder oats was observed by Kumari *et al.* (2014). The higher NDF content was observed in urea treated plants followed by KNO_3 and $(NH_4)_2SO_4$ treated plants in both cuts and higher values were recorded in second cut. The increase in concentration of NDF with increasing plant age might be due to decreased leaf to stem ratio, synthesis of more cell wall contents and declined cell contents.

Acid detergent fibre (ADF) represents cellulose, lignin and silica. It was a major indicator of digestibility and negatively affected feed quality. ADF decreased with increased fertility level of nitrogen fertilization in both cuts (Table 1). The decreased ADF content with N application in different cuts of hybrid Napier was also recorded by Sharma *et al.* (2012) and Kumari *et al*. (2014) in oats. The higher ADF content was recorded in second cut and obtained higher values in urea (42.2%) treated plants than KNO_3 (40.5%) and $(NH_4)_2SO_4$ (40.2%) treated plants. The increase in ADF content with advancing plant age was also attributed to decreased leaf to stem ratio with advancing plant age.

Table 1: Effect of nitrogen levels and sources on quality traits of Napier Bajra hybrid in different cuts.

Treatments	Crude protein (%)			Neutral detergent fibre (%)			Acid detergent fibre (%)		
	I Cut	II Cut	**Mean**	I Cut	II Cut	**Mean**	I Cut	II Cut	**Mean**
Control	7.5	6.0	**6.8**	45.3	66.1	**55.7**	35.9	40.3	**38.1**
KNO_3-50	8.3	7.4	**7.9**	58.9	67.3	**63.1**	38.1	43.9	**40.1**
KNO_3-75	9.8	7.8	**8.8**	51.0	65.9	**58.5**	35.0	39.5	**37.3**
KNO_3-100	10.6	8.7	**9.7**	47.2	64.9	**56.1**	33.7	38.1	**35.9**
Mean	**9.6**	**8.0**	**8.8**	**52.3**	**66.1**	**59.2**	**35.6**	**40.5**	**38.1**
Urea-50	9.3	6.1	**7.7**	60.6	70.9	**65.7**	39.0	43.3	**41.2**
Urea-75	9.6	6.3	**7.9**	59.7	69.7	**64.7**	37.8	42.5	**40.1**
Urea-100	9.8	8.6	**9.2**	45.7	68.7	**57.2**	35.5	40.9	**38.2**
Mean	**9.5**	**7.0**	**8.3**	**55.3**	**69.7**	**62.5**	**37.4**	**42.2**	**39.8**
$(NH_4)_2SO_4$-50	9.2	7.3	**8.2**	50.2	65.0	**57.6**	36.1	41.7	**38.9**
$(NH_4)_2SO_4$-75	9.7	8.9	**9.3**	44.5	63.4	**54.0**	33.6	41.6	**37.6**
$(NH_4)_2SO_4$-100	10.8	9.3	**10.1**	42.8	62.3	**52.6**	32.6	37.4	**36.7**
Mean	**9.9**	**8.5**	**9.2**	**45.8**	**63.6**	**54.7**	**34.1**	**40.2**	**37.2**
CD (P<0.05)	1.22	0.67		3.63	3.61		2.91	2. 57	

Conclusion

The results revealed that nitrogen sources affected quality traits in both cuts. CP content increased while NDF and ADF content decreased with increased fertility level of nitrogen. Crude Protein content was affected by nitrogen sources (Potassium nitrate, urea and ammonium sulphate). Ammonium sulphate gave highest CP content as compared to other nitrogen sources. On the other hand, higher NDF and ADF content was recorded in urea treated plants.

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