Short Communication

CO-5: A promising bajra napier hybrid variety for coconut gardens and homesteads

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Abstract

Bajra napier hybrid is a highly accepted perennial fodder grass among the dairy farmers of Kerala, as it is very well suited for the climatic conditions of Kerala. Per capita land availability of Kerala is very low, making it essential to utilize the available land efficiently. Knowledge on shade tolerance of Bajra Napier grass varieties will help the farmers to select best variety for intercropping in coconut gardens as well as homesteads with different tree species. In this scenario, a study was conducted at College of Agriculture, Vellayani to identify the effect of varying shade levels on the yield and quality of promising varieties of Bajra Napier hybrid. The experiment was laid out in split plot design with 12 treatment combinations replicated three times.Main plot treatments were different shade levels, which included open, 25 per cent shade and 50 per cent shade and subplot treatments were major Bajra Napier hybrid varieties include *viz.*, Suguna, Susthira, CO-3 and CO-5. Shade had remarkable effect on yield and quality of the grass varieties. Green fodder yield and dry fodder yield decreased with increase in shade. Among quality characters, crude protein and oxalate content increased with increase in shade but crude fibre content decreased with increase in shade. CO-5 recorded maximum green fodder yield under open (173.63 t ha^{-1}) and 50 per cent shade level (116.93 t ha^{-1}) as well as dry fodder yield (38.20 t ha^{-1} and 25.72 t ha^{-1} respectively under open and 50 % shade level). Variety Suguna under 25 per cent shade recorded maximum green fodder (101.85 t ha^{-1}) and dry fodder yield (19.99 t ha^{-1}). Considering yield and quality of different BN hybrid varieties under varying shade levels, it can be inferred that CO-5 thrives optimally when cultivated in open areas and 50 per cent shade, while Suguna performs best in fields with 25 per cent shade.

Key words : Bajra napier hybrid, Fodder, Shade, Suguna.

Livestock, serving as a crucial means of additional income and sustenance, particularly for small-scale landholders and rural poor without land, holds significant importance in the country's rural economy. The total livestock population in the country was 535.82 million during 2018-19 and which was 4.6 per cent more than last livestock census held on 2012 (GOI, 2019). Even though there is increase in cattle population, productivity is very less. One of the primary challenges currently confronting the Indian livestock sector is guaranteeing a sufficient supply of feed and fodder of acceptable quality. In 2020, the total green fodder demand in our country was 851.34 mt and the supply was 590.4 mt. The projected green fodder requirement for 2050 is 1012.70 mt and availability is 826.05 mt, so demand and the deficit gap is 30.65 per cent and 18.43 per cent in 2020 and 2050 respectively (IGFRI, 2013). Considering the fodder crop production scenario in Kerala, the cultivated area under fodder crops in state of Kerala is only 5227 ha. The state's demand for fodder stands at 232.0 mt, whereas the current availability is just 94.5 mt, with a deficit of approximately 60 per cent (137.5 mt) (GOK, 2020). The above mentioned data indicates that there is a wide gap between demand and supply of fodder crops in the country as well as in Kerala. In Kerala the scope for using agricultural

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land for fodder production is limited as the percapita land availability is very less. Incorporating fodder crops in the existing cropping system is the best alternative to increase the area under fodder crops especially in coconut based cropping system. But the response of fodder crops to shade is a matter of concern when intercropped with coconut and tree crops. Considering the above mentioned factors the experiment was formulated to assess the effect of different shade levels on the yield and quality of promising varieties of Bajra Napier hybrid.

The research was carried out for the period from 2020 October to 2021July at Instructional Farm, College of Agriculture, Thiruvananthapuram, Kerala. The farm is located 8.5° North latitude and 76.9° East longitude and at an altitude of 29 m above mean sea level. The average maximum temperature ranged between 27.0°C and 33.8°C, while the average minimum temperature varied between 21.4°C and 25.4°C throughout the crop growing season. The relative humidity ranged from 66.4 per cent to 96.8 per cent. Total rain fall during the cropping period was 1291 mm.

The experiment was designed using a split-plot design, replicated three times, with each plot occupying an area of 9 m^2. Main plot treatments include three shade levels (Open, 25%, 50%). Subplot treatments were four bajra napier hybrid varieties including Suguna and Susthira released from Kerala Agricultural University and CO-3 and CO-5 released from Tamil Nadu Agricultural University. Areas with varying shade levels were created by using shade nets with 25 per cent and 50 per cent shade. Three noded stem cuttings procured from AICRP on Forage Crops and Utilization, College of Agriculture, Vellayani. Cuttings were planted with a spacing of 60 cm x 60 cm and other intercultivation practices followed as per package of practices Kerala Agricultural University (KAU, 2016). First harvest was done 75 days after planting and successive harvest were done at 45 days interval. Five harvest were done during the study period.

Analysis of data indicated that shade has significant effect on yield and quality of different bajra napier hybrid varieties. Among the shade levels tested, open condition recorded a significantly higher green fodder yield (149.29 t ha^{-1}). Among different varieties, CO-5 showed significantly superior value of green fodder yield (124.21 t ha^{-1}). Among different treatment combinations, CO-5 under open condition recorded the significantly higher green fodder yield (173.63 t ha^{-1}) and the minimum green fodder yield was recorded by variety Suguna under 50 per cent shade level. Under 25 per cent shade level Suguna recorded significantly superior value of green fodder yield (101.85 t ha^{-1}) and under 50 per cent shade level CO-5 exhibited significantly higher green fodder yield (116.93 t ha^{-1}). Decreased solar radiation will reduce the photosynthetic productivity and carbohydrate assimilation (Senevirathna et al.,2003) which may cause the yield reduction under shaded situation. Yield of fodder crops are directly related to light availability. Similar results were reported by Antony and Thomas (2015) in different BN hybrid varieties.

Data of total dry fodder yield recorded during the study period revealed that, dry fodder yield follows the similar trend as that of green fodder yield. Open condition recorded the maximum dry fodder yield (32.84 t ha^{-1}) and minimum dry fodder yield was noted in 50 per cent shade level (18.49 t ha^{-1}). Considering variety performance, CO-5 recorded significantly superior value of dry fodder yield (27.25 t ha^{-1}). Under open and 50 per cent shade level, significantly superior value of dry fodder yield was recorded by CO-5. Under 25 per cent shade level Suguna recorded maximum dry fodder yield and was on par with Susthira and CO-3. Among all the treatment combinations, CO-5 under open condition recorded the maximum dry fodder yield (38.20 t ha^{-1}). This result is in agreement with the findings of Anita (2002) in guinea grass varieties.
Crude protein is a highly desirable character which decides the quality of a fodder crop. Crude protein in different BN hybrid varieties increased with increase in shade level. Significantly superior value

Table 1. Effect of shade levels on green fodder yield and dry fodder yield of different BN hybrid varieties.

Treatments	Green Fodder Yield (t ha^{-1})	Dry Fodder Yield (t ha^{-1})
Shade levels		
S_1	149.29	32.84
S_2	91.96	19.20
S_3	84.03	18.49
SEm (±)	0.95	0.21
CD (0.05)	3.736	0.830
Varieties		
V_1	94.77	20.04
V_2	107.19	23.08
V_3	107.53	23.66
V_4	124.21	27.25
SEm (±)	0.90	0.24
CD (0.05)	2.690	0.713
Interaction effect		
S_1V_1	122.00	26.84
S_1V_2	138.16	30.39
S_1V_3	163.38	35.94
S_1V_4	173.63	38.20
S_2V_1	101.85	19.99
S_2V_2	93.21	19.01
S_2V_3	90.67	19.95
S_2V_4	82.09	17.84
S_3V_1	60.46	13.30
S_3V_2	90.20	19.85
S_3V_3	68.54	15.08
S_3V_4	116.93	25.72
SEm (±)	1.56	0.41
CD (0.05)	4.659	1.235

NS: Non significant

Shade levels	Varieties	
S1 : Open condition	V1 : Suguna	V3 : CO-3
S2 : 25% Shade levels	V2 : Susthira	V4 : CO-5
S3 : 50% Shade levels		

of crude protein content was recorded under 50 per cent shade level (11.42 %) and among different varieties Suguna recorded maximum crude protein content (10.99 %) and was on par with CO-5 (10.96%). Considering all treatment combinations, Suguna under 50 per cent shade level recorded maximum crude protein content (12.82%) and was on par with CO-5 under 25 per cent shade level. Considering interaction of shade levels with different BN hybrid varieties, in conditions of both open exposure and 50 percent shade, Suguna exhibited notably elevated levels of crude protein content. Under 25 per cent shade level CO-5 recorded significantly higher crude protein content.Crude protein content is more affected by shade than other quality characters since nitrogen accumulation was higher in all green plants grown under shade(Kephart and Buxton ,1993). Parissi and Koukoura (2009) found that crude protein of fodder grass increased with increase in shade level.

Crude fibre content should be minimum for an ideal fodder crop. Shade levels had a significant effect on the crude fibre content of different BN hybrid varieties, and it was noticed that crude fibre content decreased with an increase in shade level. Lowest value of crude fibre was recorded under 50 per cent shade level (27.70 %). Significantly higher crude

Table 2. Effect of shade levels on quality parameters of different BN hybrid varieties

Treatments	Crude protein (%)	Crude fibre (%)	Oxalate (%)
Shade levels			
S_1	9.38	29.85	2.40
S_2	11.05	28.25	2.53
S_3	11.42	27.70	2.51
SEm (±)	0.04	0.14	0.01
CD (0.05)	0.161	0.569	0.060
Varieties			
V_1	10.99	28.55	2.51
V_2	10.44	28.64	2.47
V_3	10.07	28.50	2.46
V_4	10.96	28.71	2.48
SEm (±)	0.07	0.19	0.01
CD (0.05)	0.212	NS	NS
Interaction effect			
S_1V_1	9.86	28.84	2.37
S_1V_2	9.27	30.85	2.33
S_1V_3	9.37	29.50	2.40
S_1V_4	9.01	30.23	2.50
S_2V_1	10.30	28.76	2.63
S_2V_2	10.75	28.20	2.59
S_2V_3	10.70	28.26	2.45
S_2V_4	12.46	27.80	2.47
S_3V_1	12.82	28.07	2.54
S_3V_2	11.30	26.87	2.51
S_3V_3	10.16	27.75	2.53
S_3V_4	11.41	28.10	2.48
SEm (±)	0.12	0.33	0.02
CD (0.05)	0.367	0.995	0.078

NS: Non significant

Shade levels	Varieties	
S1 : Open condition	V1 : Suguna	V3 : CO-3
S2 : 25% Shade levels	V2 : Susthira	V4 : CO-5
S3 : 50% Shade levels		

fibre content was recorded under open condition and variety effect was observed non significant. Among different treatment combinations, Susthira under 50 per cent shade level recorded lowest value of crude fibre content (26.87%). Interaction effect was also observed significant and under open condition, Suguna recorded lower crude fibre content and was on par with CO-3. Under 25 per cent shade level CO-5 recorded lowest value of crude fibre content and it was on par with other three varieties. Under 50 per cent shade level Susthira recorded lowest crude fibre content and was on par with CO-3.The reduced photosynthetic active radiations will delay the ontogenic development of fodder grasses and it will delay the plant maturity which will lead to the reduction in crude fibre content(Bos and Neuteboom, 1998) .

Shade had significant effect on oxalate content of BN hybrid varieties. Significantly lowest oxalate content was recorded under open condition. Varieties had no significant effect on oxalate content of different BN hybrid varieties. Among different treatment combinations, Susthira under open condition recorded lowest oxalate content (2.33%) and was on par with Suguna under same shade. Suguna under 25 per cent shade level recorded maximum oxalate content (2.63%) and was on par with Susthira under same shade level. Considering interaction effect, under open condition Susthira recorded minimum oxalate and was on par with that of Suguna. Under 25 per cent shade level, CO-3 recorded lowest value of oxalate content and was on par with CO-5. Under 50 per cent shade level, significantly lowest oxalate content was recorded by CO-5. Oxalate synthesis is closely associated with light and photosynthesis; which will contribute to increased production of oxalates under shade (Moreau and Savage, 2009). Similar results were reported by Antony (2016).

Conclusion

Considering yield and quality of different BN hybrid varieties under varying shade levels, it can be concluded that BN hybrid variety CO-5 is very well suited for more shaded area as well as open condition *ie.*, 50 per cent shade and open.

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