Fodder Productivity of Different Genotypes of *Cenchrus ciliaris* under Hot Arid Climate of Thar Desert

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Introduction

Indian arid zone occupies about 31.7 million ha of land, of which 62% lies in western Rajasthan. The climate of the area is typically arid, characterized by hot dry summers, sub-humid monsoon and cold dry winters. The soils are coarse loamy sand with low level of nutrients. These factors render cropping an undependable proposition, while animal husbandry remains the main stake of the local people. *Lasiurus sindicus*, *Cenchrus ciliaris*, *C. setigerus*, *Panicum antidotale*, *P. turgidum* and *Cymbopogon* spp., are the main perennial grasses grow in this area. These grasses had three folds advantages in the arid agricultural economy, *i.e.*, the cheapest livestock feed, soil builders and aid in soil conservation. Due to frequent droughts and overgrazing the productivity of the natural grasslands in the region has declined to < 300 kg/ha per year. The ever existing gap between demand and supply of the fodder can be bridged by improving the rangelands by adopting improved grassland management techniques including genetically improved genotypes for their productivity and quality. Buffel grass (*C. ciliaris* L.) is one of the dominant grasses of *Dichanthium-Cenchrus-Lasiurus* grass cover of India (Dabadghao and Shankarnarayan, 1973). It is well distributed in hotter and drier parts of India, Mediterranean region, tropical and southern Africa. It is adapted to a wide range of soils and climatic conditions and can be cultivated in areas receiving rainfall from 150 to 1250 mm annually. It grows well on sandy to sandy-loam soils in semiarid and arid regions, forming mats or tussocks (Mansoor *et al.*, 2002). The forage of this grass is highly palatable and rich in protein (Sawal *et al.*, 2009). It has 6 to 10% crude protein, 34% crude fibre, 13% ash, 1.5% ether extract and 44% nitrogen free extract of dry matter at flowering. In earlier efforts at CAZRI, Jodhpur, germplasm was collected from different areas of arid zone and some accessions were identified for their fodder productivity and quality. Five genotypes were selected to assess their response for fodder production over the years under hot dry conditions.

Materials and Methods

To study the response for fodder production under dry hot conditions, five genotypes, *viz.*, CAZRI 75, CAZRI 358, CAZRI 585, CAZRI 2178 and CAZRI 2221 of *C. ciliaris* were grown under rainfed condition in randomized complete block design with four replications in the second fortnight of July 2011, after first effective showers of summer monsoon at the Central Research Farm of the Institute. The experimental site represents alluvial plains of the Thar Desert. The soil of the site is coarse loamy sand with low in organic carbon, available N and phosphorus. The plot size was 4 m x 5 m, having 8 rows each of 5 m with spacing of 50 cm between rows. Data was recorded on green fodder yield, dry matter yield and its components from each plot with a net size of 3 m x 4 m during *Kharif* season of monsoonal growth of years 2011 to 2014. Rainy days ranged from 20 in 2011 to 25 in 2013. The annual rainfall was 320.3 mm in 2011, 484.6 mm in 2012, 493.1 mm in 2013 and 366.6 mm in 2014.

Results and Discussion

To evaluate the genotypes for green fodder yield, dry matter yield and its component traits during 2011-2014, crop was harvested three times in 2011 and 2012 four times in 2013 and two times in 2014 at 50% flowering. Growth of different genotypes was not uniform in the third and fourth cuts in different years and data was recorded as per availability. Maximum cuts were taken in the year 2013 when the rainfall received was maximum, *i.e.*, 493.1 mm. Analysis of variance showed significant differences ($p < 0.05$) among the genotypes for total green fodder yield and dry matter yield in 2011 and 2013 (Table 1). The analysis of data showed that genotype CAZRI 2221 yielded maximum green fodder in the first two years (11294.8 and 10356.3 kg/ha), whereas CAZRI 358 produced maximum green fodder during third and fourth years (9908.3 and 6726.7 kg/ha). Dry matter production was maximum from CAZRI 2221 during 2011 (2566.9 kg/ha), CAZRI 585 during 2012 (2552.9 kg/ha), CAZRI 75 during 2013 (3106.5 kg/ha) and 2014 (1582.7 kg/ha). The mean data of the four years showed that the highest yielder was CAZRI 358 for green fodder (9219.4 kg/ha) and dry matter (2214.2 kg/ha), followed by CAZRI 2221 (8731.5 kg/ha green fodder and 2113.7 kg/ha dry matter yield). High green fodder yielding genotypes are suitable for grazing system. Average tiller production at the first cut was maximum during 2012 (144.9 per meter row length) and the number was highest with CAZRI 2178 (176.3 per meter row length) for

the cut in year 2012, thereafter it declined in the years 2013 and 2014. Though the differences among the genotypes for fodder yields were non-significant during two years, but the yield of the highest yielder was 1.2 times more than the lowest yielder for both green and dry fodder. So, collecting the material from different areas, its evaluation and followed by simple selection, productivity of the grasslands can be enhanced. In the prevailing climate under arid zone CAZRI 358 and CAZRI 2221 proved to be more resilient genotypes.

Table 1. Fodder yield in *Cenchrus ciliaris* over the years under arid climate

Genotypes	Green Fodder Yield (kg/ha)					Dry Matter Yield (kg/ha)				
	Yr-2011 (3)	Yr-2012 (3)	Yr-2013 (4)	Yr-2014 (2)	Mean	Yr-2011 (3)	Yr-2012 (3)	Yr-2013 (4)	Yr-2014 (2)	Mean
CAZRI 75	6364.6	6312.5	9704.2	5445.8	6956.8	1407.8	1747.1	3106.5	1582.7	1961.0
CAZRI 358	10129.4	10113.3	9908.3	6726.7	9219.4	2237.0	2541.9	2690.9	1386.8	2214.2
CAZRI 585	3808.1	10143.5	5827.1	5709.4	6372.0	985.3	2552.9	1530.4	1232.0	1575.2
CAZRI 2178	6410.0	9410.4	6206.3	5583.3	6902.5	1447.6	2188.7	1793.6	1380.9	1702.7
CAZRI 2221	11294.8	10356.3	7722.9	5552.1	8731.5	2566.9	2410.5	2190.7	1286.8	2113.7
Mean	7601.4	9267.2	7873.8	5803.5	7636.5	1728.9	2288.2	2262.4	1373.8	1913.3
CD 5%	2221.3	NS	2323.9	NS	-	581.2	NS	601.7	NS	-
CV %	19.0	20.8	19.2	15.1	-	21.8	23.5	17.3	15.3	-

Note: Figures in parentheses represent number of cuts during *Kharif* season in a year

Conclusion

Productivity of the grasslands can be enhanced by using the seeds of high fodder yielding genotypes which can be selected by exploring different areas, evaluation at the site for which material is to be used and making simple selections. In the prevailing climate under arid zone CAZRI 358 and CAZRI 2221 proved to be the best genotypes for fodder production.

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