

COMPARATIVE PERFORMANCE OF *CENCHRUS CILIARIS* ECOTYPES UNDER BARANI CONDITIONS AT PESHAWAR

Mohammad Noor, Assistant Silviculturist, Pakistan Forest Institute, Peshawar.

ABSTRACT

Ten ecotypes of *Cenchrus ciliaris* were sown at Range Research Station, Peshawar in June 1977 under barani (rainfed) conditions, using randomised complete block design with five replications. By October 1981, Indian ecotype (269) had produced significantly more air-dried forage (4726 kg/ha) and was one of the best among all ecotypes. The ecotypes from Australia (426), USA (235) and Pakistan (229) produced higher ($P < 0.05$) quantity of air-dried forage compared with other ecotypes except No. 269, but did not differ significantly among themselves.

The average number of established plants of the ecotypes from India (269), Australia (426), USA (235), and Pakistan (229) was significantly higher than those of other ecotypes. The ecotype from Pakistan (390) produced minimum air-dried

forage and had minimum number of established plants.

INTRODUCTION

Cenchrus ciliaris (Dhman), a warm season grass, is distributed in the arid and semi-arid parts of the world. It occurs naturally in drier parts of Africa, Arabia, Australia, USA, India and Pakistan (Bor, 1960; Patil and Sing 1963; Coupland, 1979; Hughes, *et al.* 1963; Gould, 1951; Khan, 1966 & 1971 and Mohammad, 1989). Livestock and wildlife relish it throughout the year. Average protein content is 7.3 percent but varies with growth stage, higher in vegetative stage compared to maturity stage (Mohammad, 1989). This species is one of the best grasses for range reseeding due to its palatability and adaptation to dry environment (Gould, 1951, Khan, 1966 and 1971).

Currently the arid and semi-arid rangelands of Pakistan are producing only a fraction of their productive potential due to their overgrazing and misuse in the past. The dominance of *Eleusine flagellifera*, *cymbopogon*, *jwarancusa*, *Asistida depressa* and *Pennisetum divisum* indicates that these rangelands are in highly depleted condition. The depleted rangeland of Thal, D.G.Khan, Pothowar and Tharparker are being reseeded with *Cenchrus ciliaris* for the last 25 years to provide nutritious feed to livestock and wildlife, enhance their productivity and prolong the grazing season (Khan, 1966 and 1971; GOP, 1973; FAO, 1975; and Mohammad, 1989). In June 1977, ten ecotypes of *Cenchrus ciliaris* were sown under

barani (rainfed) conditions at Peshawar to find out the best ecotype for reseeding arid and semi-arid rangelands of the country.

MATERIAL AND METHODS

This study was laid out at Range Research Station, Peshawar. The climate of Peshawar is subtropical semi-arid. The average annual rainfall is 350 mm, and maximum and minimum temperature is 40.4°C and 4.4°C in June and January, respectively. The soil is clayey loam in texture. The monthly rainfall recorded at meteorological station of Pakistan Forest Institute during the study period is given in Table 1.

Table 1. Monthly Rainfall(mm)at Meteorological Station, Pakistan Forest Institute, Peshawar from 1977 to 1981.

Month	1977	1978	1979	1980	1981	Average
January	51.05	9.14	54.10	40.89	46.34	40.30
February	9.91	14.73	21.08	91.19	32.00	33.78
March	55.63	207.50	52.50	94.49	111.50	104.33
April	61.98	20.06	14.73	7.62	30.99	27.08
May	24.64	0.0	33.01	8.89	46.22	22.55
June	37.59	9.65	13.14	41.14	0.0	20.47
July	193.04	106.17	59.43	60.45	19.81	87.78
August	6.85	93.98	54.86	12.88	90.94	51.90
September	45.97	7.62	0.0	0.0	50.80	20.88
October	4.31	0.0	0.0	6.60	15.75	5.33
November	22.35	37.85	25.40	7.84	0.0	18.69
December	5.33	1.02	0.0	2.54	39.0	9.58
Total	518.65	507.74	329.08	374.53	483.35	442.67

METHODS

Seed of twenty two ecotypes of *Cenchrus ciliaris* received from different sources since 1967 was sown in Range Research Station to study their performance under irrigated conditions. Ten ecotypes performed better than others in initial screening trials and were selected to evaluate their performance under barani conditions. Randomised complete block design with five replications was used in this study. Fifty gram seed of each ecotype was sown in lines in a 10x5 meter well prepared plots on June 25, 1977. The distance between lines was 50 cm with one meter border between the plots. Seed was sown at a depth of 2 cm. The ecotypes of *Cenchrus ciliaris* sown were:

<u>R.M.No.</u>	<u>Source</u>
229	Pakistan (Bhakkar)
390	Pakistan(Nizampur)
235	USA(FAO,4112,4112-60)
267	India(FAO,220)
268	India(FAO,357)
269	India(FAO,214)
270	India(FAO,326)
424	Australia(FAO)
425	Australia(FAO,Numbank)
426	Australia(FAO,Molopo)

Seed of all the ecotypes germinated at the end of July, 1977. Monthly phenological observations were recorded for all the ecotypes. Data on number of plants and air-dried forage production were collected in September/October each year from 1978-1981 regularly, by counting the plants and harvesting each plot. The average air-dried forage was multiplied with 200 to compute forage yield in kilograms per hectare. The average values for both forage and number of plants were calculated for the study period.

Analysis of variance was performed (SAS in IBM) to determine significant differences among

various ecotypes of *Cenchrus ciliaris* for air dried forage (kg/ha) and number of established plants in 10x5m plot. Duncan's Multiple Range Test was applied to evaluate the difference among averages.

RESULTS AND DISCUSSION

All the ecotypes of *Cenchrus ciliaris* were in seed dispersal stage at the time of data collection in September/October each year from 1978-1981. Four years air-dried forage production and establishment (number of plants) data were combined and averaged for statistical analysis.

Forage Production

An ecotype from India (269) had higher average air dried forage production ($P < 0.05$ Duncan's Multiple Range Test) as compared with other ecotypes (Table 2). The air-dried forage production of other ecotypes from Australia (426), USA (235), Pakistan (229) and India (268) was higher than those of other ecotypes, but were not significantly different from each other. The ecotype from Australia (425) produced significantly more air-dried forage than an ecotype from Pakistan (390), but did not differ significantly from the ecotypes of India (270) and Australia (424).

Establishment

The number of plants (1978-1981) were counted in each plot for each ecotype of *Cenchrus ciliaris* and averaged (Table 2). The ecotype from India (269) had significantly more number of established plants as compared with other ecotypes ($P < 0.05$ Duncan's Multiple Range Test). None of the other ecotypes from India (270, 268, 267), Australia (426) and Pakistan (229) showed any significant difference in the number of established plants among themselves, but had significantly

higher number of established plants than those of Australia (424,425) and Pakistan (390). Both the ecotypes from Australia (424 and 425) did not show significant difference in the number of established plants between themselves.

Although the ecotype from India (270) had significantly higher number of established plants but had lower air-dried forage production than those of Australia (424 and 425). This indicates that vigour of the plants contributes more towards the forage production than the number.

The ecotype from India (269) out yielded all other ecotypes in this experiment. The performance of other ecotypes was in this order; Australia (426), USA (235), Pakistani (229), India (2268) followed by India (267), Australia (425,424), India (270) while Pakistani ecotype (390) gave the poor performance in terms of air dry forage and number of established plants.

Table 2. Average air dried forage production (kg/ha) and number of plants per plot (10x5 m) for various ecotypes of *Cenchrus ciliaris*.

RM No.	Ecotype	Source	Average forage production(kg/ha)	Average No. of plants per 10x5 m
269	<i>Cenchrus ciliaris</i>	India	4726 a	470 a
426	-do-	Australia	2381 b	202 b
235	-do-	America	2327 b	262 b
229	-do-	Pakistan	2126 b	229 b
268	-do-	India	1925 b	192 b
267	-do-	India	1797 bc	240 b
425	-do-	Australia	1724 bc	108 c
424	-do-	Australia	1078 c	107 c
270	-do-	India	1056 c	228 b
390	-do-	Pakistan	277 c	28 d

Average followed by the same letter were not different from each other ($P < 0.05$, Dun can's Multiple Range Test).

CONCLUSION

In this 4 years research study the ecotype of *Cenchrus ciliaris* from India (269) showed best performance and out yielded all other ecotypes. The ecotypes from Australia (426), USA (235) and Pakistan (229) were the second best performers. Forage production and establishment data indicated that these ecotypes have potential for range improvement in arid and semi-arid rangelands. Therefore, these ecotypes may be

sown on large scale to provide adequate quality seed for reseeding arid and semi-arid rangelands.

ACKNOWLEDGEMENTS

The help rendered by M/S Gul Nabi, Research Officer and Rehmanullah, Forester in collection of data throughout this research study and Mr. Qasim Ali Shah in data analysis on PC, is gratefully acknowledged.

REFERENCES

- Bore, N.L. 1960. The grasses of Burma, Ceylon, India and Pakistan. Pergaman Press, New York, London.
- Coupland, R.T. 1979. Grassland ecosystems of the world. Cambridge University Press.
- FAO, 1975. Range Management in Sindh Project Findings and Recommendations UNDP/FAO Rome.
- Gould, F.W. 1951. Grasses of Southwestern United States. Univ. Ariz. Bull. Biol. Sci. No. 22: 266-327.
- Government of Pakistan (GOP) 1973. Rangelands of Pakistan - A study. National Range Management Committee. Islamabad.
- Hull, A.C. Jr. 1974. Species for seeding arid rangelands in Southern Idaho, J. Range Management. 27.
- Hughes, H.D., M.E. Heath and D.S. Metaalfe 1963. Forages Iowa State University Press, Ames, Iowa USA.
- Khan, Ch. M.A. 1966. A note on the effect of site on success of reseeding in Thal. Pakistan Jour. For. 16: 274-277.
- Khan, Ch. M.A. 1966. Artificial Reseeding in Thal Ranges. Pakistan Jour. For. 16: 28-42.
- Khan, Ch.M.A. 1971. *Cenchrus ciliaris* Linn. Review of Literature and Ecological Observations. Pakistan Jour. For. 21: 2031-206.
- Mohammad, N. 1989. Rangeland Management in Pakistan. International Centre for Integrated Mountain Development Kathmandu, Nepal.
- Patil, D.B. and A Singh. 1963. Studies on arjan grass-1. Intervertical variation in forage and seed production. Indian J. Agri. Sci. 33: 44-51.

NOISE HAZARD IN SAWMILLING INDUSTRY IN PAKISTAN

Mohammad Ayaz, Logging Officer, Pakistan Forest Institute, Peshawar.

ABSTRACT

Studies conducted on the noise level in large and small scale sawmills and exposure of workers to it, reveal that the noise of all the machines in the near work positions and in most cases in far work positions is higher than the threshold value of 85 dB(A), a safe limit for continued exposure. The daily and total anticipated exposure of the workers to this noise is long enough to cause permanent hearing damage and other noise induced health hazards. Proper

protection measures and maintenance of machines to reduce the noise is recommended for the safety and health of workers.

INTRODUCTION

Working conditions influence the efficiency, health and safety of workers. The most important components of work place conditions in industries are noise, temperature and light. Noise is defined as unwanted sound (STAUDT, 1984) and is the most potent environmental hazard of