

Performance of Tropical Grasses Under Sub-Humid Sub Tropical Conditions of Pakistan

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Abstract

Twenty tropical grass species of six different general were grown in spring 1983 in the forage and pasture experimental area of NARC, Islamabad, Pakistan. All the grass strains were replicated thrice in the plots of 3 × 4 m size. The grasses were harvested at ground level at the end of the growing season during the last week of October, 1983 and 1984. The harvested material was sun dried to determine the dry matter yield. Based on two years results it is recommended to grow *Cenchrus ciliaris* (RM 269), *Panicum antidotale* (RM 264) and *Pennisetum purpureum* (A146) in the rangelands of Pothwar tract of Pakistan.

Introduction

By and large Pakistan is a semi arid/arid country. Major areas (about 84%) receive less than 300 mm rainfall (Zafar Uddin, 1985). Pakistan, like most of the arid countries is facing the problem of degradation of its rangelands as a result of excessive grazing (Mohammad, 1987). The present condition of the range vegetation calls for quick ameliorative measures to increase the productivity of deteriorated range ecosystem. The most important activity in range improvement is increasing the production of forage through introduction of high yielding, palatable forage species and their strains in suitable habitats (Springfield, 1957 and Kaul and Thalen, 1971). In many tropical countries, improved selections and cultivars of perennial grasses have increased the forage yields several fold over that of native and naturalized grasslands (Walmsley *et al.*, 1978). The increase in carrying capacity of the highly depleted tropical rangelands of Pakistan is possible through reseeding with promising species (Mohammad and Naqvi, 1987).

Accordingly a programme of plant introduction to select suitable species for reseeding rangelands of Pakistan was started in 1975 by Pakistan Agricultural Research Council at National Agricultural Research Centre (NARC), Islamabad and other Provincial

Research Institutes.

During 1974-1975, approximately 500 strains of different species of grasses and legumes were obtained from India, Kenya, Swaziland, Australia, USA, Taiwan, FAO and various ecological regions of Pakistan. These strains were tested for adaptability for seven years at several locations in the country. The present study is the continuation of introduction, adaptability and screening test.

Materials and Methods

The study was conducted at forage and pasture research experimental area of National Agricultural Research Centre, Islamabad, located in the sub-humid sub tropical region of Pakistan. Average annual rainfall for last 80 years of the study area is 940 mm, major part of which is received during monsoon season (Mohammad, 1987). Its soil is loamy, somewhat sandy in texture with soil pH range of 7.8 to 8.2 (Anon., 1976). During spring 1983 twenty strains of ten different species were selected for further screening. The technical names and their accession numbers are given in table 1. The mode of establishment of these grasses varied with the availability of seed. The species whose seed were available were established through seed sowing while the other were established through planting tuft splits obtained from the forage nursery of NARC. Row to row distance was kept 25 cm at the time of planting in the plots of 3 × 4 m size. The sowing/planting of each cultivar was done in three replications. The basic dose of 25 kg/ha of N was applied at the start of the growing season in both years. Weeding was done manually whenever needed depends on the labour availability. The study was done under rainfed conditions. All the grasses were harvested at ground level at the end of the growing seasons during the last weeks of October, 1983 and 1984. The green harvested material from each plot was sun dried to determine the dry matter yield. The yield data were statistically analysed and the treatment means were compared using Fisher's Least Significant Difference Test (Steel and Torrie, 1980).

Results and discussions

Two years field results showed a highly significant difference in yields between species and between two successive years ($p < 0.0001$). Low dry matter yield of all the cultivars was obtained during the first year of growth. More than hundred percent increase in yields was observed in most of the strains during the second year. The results indicated that the difference in dry matter yields between two years of growth of *Cenchrus ciliaris* (RM 426), *Panicum antidotale* (RM 264) and *Pennisetum purpureum* (A 146) was not appreciable which show the species were established in the first year (Table 1).

During second year of growth each cultivar was

found to be well established and produced high forage yield. The *Digitarias* which were very leafy found to be high yielding grass species. *Cenchrus ciliaris* with very wide ecological range produced highest dry matter yield. *Cenchrus ciliaris* (RN 269) gave the maximum yield of 22.63 tones DM/ha and was followed by *Chloris gayana* (RM 276), *Pennisetum purpureum* (A 146), *Eragrostis superba* (RM 279), and *Panicum antidotale* (RM 264).

Field observations revealed that *Digitarias*, *Chloris gayana* and *Eragrostis superba* were difficult to establish. Moreover, the later two species were found to be very stemmy and coarse and had low forage value.

Table 1

Mean dry matter (tons/ha) of twenty tropical grasses at NARC (in October 1983 and 1984)

Grass species	Accession No.	1983	1984
<i>Digitaria decumbense</i>	A 254	3.50	22.00
<i>Digitaria decumbense</i>	A 24	7.43	19.10
<i>Digitaria swazilandensis</i>	A 80	7.50	18.33
<i>Cenchrus ciliaris</i>	Local Sind	4.83	8.33
<i>Cenchrus ciliaris</i>	RM 267	5.04	15.35
<i>Cenchrus ciliaris</i>	RM 268	4.33	7.36
<i>Cenchrus ciliaris</i>	RM 269	8.75	22.63
<i>Cenchrus ciliaris</i>	RM 270	9.97	14.63
<i>Cenchrus ciliaris</i>	RM 426	6.00	7.42
<i>Eragrostis curvula</i>	RM 270	3.06	9.98
<i>Eragrostis superba</i>	RM 159	5.05	10.52
<i>Eragrostis superba</i>	RM 279	4.54	14.02
<i>Chloris gayana</i>	RM 245	4.92	8.35
<i>Chloris gayana</i>	RM 259	4.75	9.39
<i>Chloris gayana</i>	RM 276	3.87	16.73
<i>Panicum antidotale</i>	RM 249	7.60	12.07
<i>Panicum antidotale</i>	RM 264	12.00	14.00
<i>Panicum antidotale</i>	RM 335	9.03	11.73
<i>Panicum maximum</i>	Local	8.08	13.77
<i>Pennisetum purpureum</i>	A 146	11.57	16.00
Standard Error of the Means		1.53	2.70

Based on the results of this study it is recommended to grow *Cenchrus ciliaris* (RM 269), *Panicum antidotale* (RM 264) and *Pennisetum purpureum* (A 146) on large scale for seed multiplication and for further studies. It is also recommended to propagate these species in the rangelands of Pothwar tract of Pakistan.

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Table 1. Mean dry matter (DM) content (%) of twenty tropical grasses at NAR (in October 1987 and 1988)

Grass species	Accession No.	1987	1988
<i>Pennisetum purpureum</i>	A	14.6	11.57
<i>Pennisetum purpureum</i>	Local	3.04	3.04
<i>Panicum antidotale</i>	RM	33.2	9.03
<i>Panicum antidotale</i>	RM	28.4	12.00
<i>Panicum antidotale</i>	RM	24.9	7.60
<i>Panicum antidotale</i>	RM	23.6	7.87
<i>Panicum antidotale</i>	RM	23.9	4.72
<i>Panicum antidotale</i>	RM	24.4	4.92
<i>Panicum antidotale</i>	RM	23.9	4.24
<i>Panicum antidotale</i>	RM	15.9	2.02
<i>Panicum antidotale</i>	RM	23.0	2.06
<i>Panicum antidotale</i>	RM	42.8	6.00
<i>Panicum antidotale</i>	RM	23.0	9.97
<i>Panicum antidotale</i>	RM	26.9	8.72
<i>Panicum antidotale</i>	RM	26.8	4.32
<i>Panicum antidotale</i>	RM	20.7	2.04
<i>Panicum antidotale</i>	Local Sind	1.87	1.87
<i>Panicum antidotale</i>	A	8.0	2.30
<i>Panicum antidotale</i>	A	2.4	7.42
<i>Panicum antidotale</i>	A	2.4	3.20

Standard Error of the Mean

Literature cited

1. Anon. 1978. Soils and land capability. Pakistan Agricultural Research Centre, Islamabad. Government of Pakistan, Ministry of Food and Agriculture, Soil Survey of Pakistan, 2 p.

Based on the results of this study it is recommended to grow *Panicum antidotale* (RM 267), *Panicum antidotale* (RM 268) and *Pennisetum purpureum* (A 146) on large scale for seed multiplication and for further studies. It is also recommended to propagate these species in the rangelands of hotwar tract of Pakistan.