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Evaluation of Tropical Grasses for Forage Yield and Crude Protein Content in the Pothwar Plateau of Pakistan

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Abstract: Yield and forage quality was estimated for buffel grass, blue panic grass, love grass, napier grass and mott grass was estimated. Mott grass out-yielded all other grasses in terms of plant height (248 cm), number of tillers per plant (96), dry matter yield (22 t ha⁻¹) while love grass was least productive with plant height of 121 cm, dry matter yield of 2.9 t ha⁻¹ and crude protein of 75.3 kg ha⁻¹. Mott grass may be regarded as the best choice for high forage yield and crude protein content in the Pothwar plateau conditions.

Key words: Forage yield, crude protein, tropical grasses, Pothwar plateau

Introduction

Rangelands in Pakistan cover about 65% area (Younas *et al.*, 1993). The range resources are contributing only 10-50 % of their actual potential whereas it can be used to feed the increasing human and livestock population. The current annual production from rangelands is about 21 mt DM (dry matter) that could at least be increased three times. Yield of forage species is known to depend upon a number of environmental factors, such as, management, temperature, water resources, soil fertility and ecotype (Mohammed and Naqvi, 1987). If improved varieties or ecotypes of grass species are reseeded in these areas, forage production can be increased manifold (Qamar *et al.*, 2000).

Due to over-grazing, mismanagement in utilization of water resources and deforestation, the palatable forage species are decreasing. The contribution of livestock to Gross National Product (GNP) of Pakistan is about 9% and plays a vital role in the economy of Pakistan.

To determine average yield by height, fresh weight, dry weight etc of selected species, and protein available from grasses to the livestock in the Pothwar plateau of Pakistan, the present project was aimed.

Materials and Methods

At National Agricultural Research Centre (NARC), Islamabad during 1998 the mean annual rainfall is about 1000 mm mostly during the summer monsoon season. In June the temperature may rise up to 44°C and in January it was upto 3°C. The soils are slightly alkaline, non-saline, loamy in texture, low in organic matter and major nutrients with the exception of potassium.

Five grass species were *Cenchrus ciliaris* (buffel grass), *Panicum antidotale* (blue panic grass), *Pennisetum purpureum* cv. napier (napier grass), *Pennisetum purpureum* cv. mott (mott grass) and *Eragrostis superba* (love grass). The plot size was 5 × 5 m² and row to row distance was 50 cm. The experiment was run according to Randomized Complete Block Design (RCBD).

The grasses were harvested in the first week of October, 1998 at the panicle emergence stage. Five plants were selected randomly and their height and number of tillers were recorded. Five quadrats at random were harvested for fresh and dry forage yield determinations. All the plants in 1 m² quadrat were clipped at 5 cm height above ground level and

the biomass was weighed. The dry weight was recorded after oven drying at 70°C for 72h. Plant material was ground and samples were analyzed for the crude protein content at Food Technology Research Laboratory, NARC using the micro Kjeldahl method (AOAC, 1975). The data were subjected to ANOVA and treatment means were compared by the Fisher's Least Significant Difference (LSD) Test at alpha 0.05 (Steel *et al.*, 1997).

Results and Discussion

There were highly significant (F = 58.48; p < 0.01) differences in plant height. Plant height was greatest in mott grass (248 cm), followed by blue panic grass (173 cm), napier grass (139 cm), love grass (121 cm) and buffel grass (111 cm). Number of tillers per plant showed highly significant (F = 622.831; p < 0.01) differences. Mott grass tillered more profusely while tillering in napier grass was mostly sparse. Fresh and dry matter yield also showed significant (F = 127.48; p < 0.01) difference among the species. Mott grass was outstandingly high yielding with 52.3 t ha⁻¹ fresh and 22.4 t ha⁻¹ dry matter as compared to other grasses both in fresh and dry forage production. There were significant (F = 77.33; p < 0.05) differences in crude protein content among various grass species. The highest crude protein content was found in mott grass (5.09 percent) followed by napier grass (4.14%), buffel grass (4.01%) and in blue panic grass (2.62%) and lowest in love grass (2.33%). Crude protein yield also showed significant (p < 0.05) differences being the highest in mott grass and the lowest in love grass (Table 1).

The yield and carrying capacity of the over-grazed and deteriorated pastures of the Pothwar plateau of Pakistan can be increased manifold. This can increase livestock and livestock production. The carrying capacity of the rangelands of Pothwar without improvement interventions is less than one and can be increased to over 40 with reseeding of suitable forage grasses (Sultana *et al.*, 2000). The amount of forage available from these rangelands is just enough for the maintenance requirements of the present livestock. The better production of livestock and thus livestock products is being carried out at less than 25% of their potential (Khan and Zaraf, 1982). Seeding of these rangelands with improved ecotypes of forage grasses will not only increase the production of livestock many times of their present level but will also help in the economic improvement of these areas.

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Table 1: Performance of different grass species grown in the Pothwar plateau of Pakistan under natural conditions

Species name	Height (Cm)	No. of tiller/plant	Fresh wt. (t ha ⁻¹)	Dry wt. (t ha ⁻¹)	Cp* (%)	Cp* (kg ha ⁻¹)
Buffel grass	111	33.8	8.91	4.2	4.01	167.4
Blue panic						
Grass	173	21.8	6.9	3.3	2.62	77.1
Love grass	121	32.7	7.0	2.9	2.33	75.5
Napier grass	139	16.1	7.4	3.3	4.14	135.8
Mott grass	248	96.4	52.3	22.4	5.091	139.0
**LSD _(0.05)	25	4.2	4.3	2.2	1.66	69.2

* Crude protein

** The species were significantly ($p < 0.05$) different for all parameters recorded

Mott grass was found to meet the ever-increasing forage demands in the region. This species showed vigorous growth and produces high biomass within shortest possible time to make the forage available on sustainable basis. It has out-yielded all other species/genotypes in biomass production and CP content, which shows its adaptability to the Pothwar environmental conditions. This species may be used for the improvement of forage resources in this area.

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