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PJBS

ISSN 1028-8880

Pakistan Journal of Biological Sciences

ANSInet
Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Pakistan Journal of Biological Sciences 3 (12): 2077-2078, 2000

Determination of Carrying Capacity of a Sown Pasture in the Pothwar Plateau of Pakistan

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Abstract: Highest forage yield, protein yield and carrying capacity was recorded in case of elephant grass followed by mott grass, blue panic grass and sesbania. Crude protein content was highest in sesbania, followed by mott grass, elephant grass and blue panic grass. It was concluded that rangeland can be improved by reseeding with improved varieties of forage grasses and legumes.

Key words: Carrying capacity, pasture, forage, crude protein, Pothwar

Introduction

Of the total 80 million hectare area of Pakistan, 49 million hectare is under rangelands which are mostly arid to semi-arid. The area under different rangelands is 40%, in Punjab 55% in Sindh 60% in NWFP and 90% in Balochistan. On country basis, the rangelands in Pakistan cover about 65% (Mohammad and Naz, 1985). The rangelands are areas devoted to livestock production from natural and semi-natural vegetation. Rangelands in Pakistan extend from alpine pastures in the northern mountains to temperate and mediterranean ranges in the western mountains and arid and semi-arid desert ranges in the Indus plains. About 70% area of the country is arid to semi-arid. Summers are extremely hot while winters are cold. Rainfall varies from 100 mm in south to 2000 mm in north (Mohammad, 1989). At present, sheep and goats obtain about 60% of their feed from the rangelands. Forage production of desert ranges and arid lands is low due to low rainfall.

In Pakistan, land under fodder production is about 2.7 million hectares which produces 58 million tons of fodder which is not sufficient even to meet the maintenance requirements of the livestock (Bhatti and Khan, 1996). The forage production has declined from one third to one tenth of its potential (GOP., 1983). The total livestock requirement has doubled during the past two decades and now totals 93.5 million heads (Mohmmad, 1989). According to Qureshi (1992), the present situation is that livestock feed pool is deficient by 21% of total dry matter, by 29% of energy and by 33% of the crude protein requirements.

Materials and Methods

The study was carried out in an improved pasture in the experimental area of Rangeland Research Institute, National Agricultural Research Centre (NARC), Islamabad during monsoon 1998. It is situated in the sub-tropical, sub-humid continental Pothwar plateau. The climate is characterized by very hot summers and cold winters. The mean annual rainfall may exceed 1000 mm but is mostly received during the summer monsoon season. The hottest month of June has the mean temperature of above 40°C and the coldest month of January receives few frost events. The soils are slightly alkaline with a pH value of 8.4 and are non-saline, loamy in texture, low in organic matter and deficient in major nutrients with the exception of the available Potassium.

Three perennial grass species/varieties reseeded in the pasture during 1981-82 were selected for study. These include elephant grass, mott grass and blue panic grass. One annual legume species of sesbania was sown in the pasture during 1999 to improve the forage quality as the legumes contain higher level of crude protein content. The sizes of the plots under the species were 98m × 105m for elephant grass, 61 m × 82 m for mott grass, 61 m × 23m for blue panic grass and 89m × 105m for sesbania legume. Three line transects, each having 30 m length were laid out in all the blocks. Along each transect, at an interval of 6 m, five quadrate of 1 m^2 were placed (Khan, 1966). The grasses growing within the quadrate were clipped leaving 2.5 cm stubble height. These samples were weighed and were later on, oven dried and their dry phytomass was recorded to determine forage production.

Plant material was ground and samples were analysed for crude protein content at the Food Technology Research Laboratory, NARC using the micro Kjeldahl method (AOAC, 1975). Carrying capacity was calculated on the basis of **50% allowable grazing material. Animal units were** calculated by 2% dry forage of the body weight of a mature cow of 455 kg (9.1 kg/day). The data were subjected to analysis of variance (ANOVA), treatment means were compared by Fisher's Least Significant Difference (LSD) Test.

Results

Data on dry matter yield, crude protein and carrying capacity are presented in Table 1. Regarding the forage yield, there were highly significant differences among the species. Elephant grass and mott grass were significantly more productive yielding circa 70 ton fresh yield and around 25-30 ton dry matter per hectare. Blue panic grass produced 25 ton fresh matter and 12.7 ton dry matter per hectare while sesbania was least productive producing 24 ton fresh matter and 6.4 ton dry matter.

There were highly significant differences in crude protein content of different forage species studied. Sesbania being a legume was the highest in crude protein content with 12.7% followed by mott grass with 7.2% crude protein content while elephant grass and blue panic grass were least productive having less than 5% crude protein content. Highly significant differences were also observed in case of crude protein yield. Mott grass produced the highest crude protein yield of 1864 kg/ha followed by elephant grass, sesbania and finally blue panic. Highly significant differences were also recorded for carrying capacity

Table 1: Forage yield, crude protein and carrying capacity of grasses and legume in a sown pasture at NARC

Species	Fresh matter, Ton/ha	Dry matter Ton/ha	Crude protein content, %	Crude protein yield, kg/ha	Carrying capacity, AUM
Elephant grass	68	29.3	4.7	1374	53.7
Mott grass	76	25.8	7.2	1864	47.3
Blue panic grass	25	11.7	3.5	403	21.4
Sesbania	24	6.4	12.7	87	11.8
LSD	± 12.01	± 4.75	± 1.77	± 276.5	± 8.72

of the pasture. Elephant grass and mott grass could support around 50 Animal Unit per Month (AUM), blue panic around 21 and sesbania 12.

It was concluded that in a pasture of 3.37 ha which was 1.8 ha under elephant grass, 0.5 ha under mott grass 0.15 ha under blue panic grass and 0.9 ha under sesbania could support 134 animals for one month. Elephant grass and mott grass were highly productive while sesbania had higher crude protein content.

Discussion

The data revealed that 6.4 to 29.3 ton dry matter per hectare was produced for the seeding of improved varieties of forage species. Forage production in the unprotected areas of Pothwar is less than one ton per hectare (Mohammad, 1989). This increase can only be attributed to the improvement interventions carried out in the pasture. As the forage species sown in the pasture were high value forage crops including mott grass and sesbania, therefore they had comparatively higher values for crude protein content and hence crude protein yield. It has been suggested that for better performance of the dairy cattle, their rations should include higher amounts of crude protein (ARC., 1975). This purpose can be achieved if forage species with higher crude protein content are introduced in the pastures. Legumes like sesbania can be grown successfully to achieve this target as legumes have higher crude protein content as compared with grasses (Qamar *et al.*, 1999). Greater use of legumes along with grasses due to their high crude protein level has been considered a way of providing more protein supplements in the livestock industry (Petkov, 1989).

As the rangeland of Pothwar are deteriorated and cannot support more than one AUM per ha (Muhammad, 1989), therefore, it is desirable that measures may be taken to improve the carrying capacity of the rangelands. The most appropriate way of improving the rangeland is to reseed them with high yielding and palatable forage grasses and legumes (Sharma and Verma, 1983). It is clear from the results of the present study that with improvement interventions, the carrying capacity could be raised more than 50 times of the current value. Baig (1978) reported five times increase in forage production and carrying capacity in Himalayan forest grazing lands at Muzaffarabad with improvements. This outstanding increase in yield and carrying capacity in the Pothwar region may be attributed to the favourable climatic conditions owing to comparatively higher temperature and high value crops sown.

References

AOAC., 1975. Association of the Official Analytical Chemists. Official Methods of Analysis. 12th Edition (W. Worwitz ed.). Washington, DC. AOAC.

ARC., 1975. The nutritive requirements of livestock, Ruminants. 2. London. HMSO.

Baig, M.S., 1978. An integrated approach for evaluation of rangelands in arid zones. Pakistan Soils Bull. No. 12. Soil Survey of Pakistan, Lahore.

Bhatti, M.B. and S. Khan, 1996. Fodder Production in Pakistan. Proceedings of the National Conference on the Improvement, Production and Utilization of Fodder Crops in Pakistan, March 25-27, 1996. Pakistan Agricultural Research Council and Food and Agriculture Organization of the United Nations, pp: 230.

GOP., 1983. An institutional strategy for the development of range resources of Pakistan, Sub Committee on Range Management, M/O Food, Agriculture and Cooperatives, Government of Pakistan, Islamabad, pp:33.

Khan, C.M.A., 1966. New adjustable, decimal, collapsible quadrate versus three old quadrate – an evaluation. Journal of Range Management, 27: 71-75.

Mohammad, N., 1989. Rangeland Management in Pakistan. International Centre for Integrated Mountain Development, Kathmandu, Nepal, pp:198.

Mohammad, N. and M. S. Naz, 1985. Range Management and Forage Research in Pakistan. Progressive Farming, 5: 44-51.

Petkov, P.S., 1989. Ways of solving protein problems in Bulgaria. *Selsostopanska-Nauka*, 27:46-69.

Qamar, I.A., J.D.H. Keatinge, N. Mohammad, A. Ali and M.A.Khan, 1999. Introduction and management of vetch/barley forage mixtures in the rainfed areas of Pakistan. 2. Forage quality. Australian Journal of Agricultural Research, 50:11-19.

Qureshi, M.S., 1992. An overview of livestock and poultry problems in Pakistan. A paper presented inn Pakistan Poultry Feed Technology Seminar, Lahore.

Sharma, S.K. and C.M.Verma, 1983. Performance of *Cenchrus ciliaris* Lin. Strains in arid rangelands of western Rajhisthan. Annals of Arid Zone, 22: 23-27.