INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2001/03–1–39–41
http://www.ijab.org

Effect of Stage of Growth and Nitrogen Fertilization on Protein Contents of Mott Grass and its Morphological Fractions

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ABSTRACT

The experiment was conducted at the livestock Research Farm, University of Agriculture, Faisalabad. Treatments were T_1= control; T_2=24 t FYM ha^{-1}; T_3=300 kg N ha^{-1}; T_4=150 kg N+12 t FYM ha^{-1}; T_5=200 kg N + 8 t FYM ha^{-1} and T_6=225 kg N + 6 t FYM ha^{-1}. Samples of whole plant, leaf and stem were taken after each 15 days from planting to harvesting and analyzed for crude protein and true protein contents. Leaf had the maximum protein content, followed by whole plant and stem, respectively. Crop fertilized @ 300 kg N ha^{-1} resulted in maximum protein content at all growth stages compared to other treatments. On the contrary, the minimum protein content was found in control. However, the protein contents decreased with the advancement of plant age.

Key Words: Mott grass; Nitrogen: Protein contents; Growth

INTRODUCTION

In Pakistan, production per animal unit is much lower as compared to developed countries. One important factor for this lower production is inadequate supply of forages. Large ruminants are traditionally raised on farm grown fodders and crop residues in Pakistan. Under optimum agronomic conditions the importance of nutritive value of fodders at different stage of growth cannot be ignored (Malik, 1988). It is the need of time to increase the production of good quality fodders since this is a key to increase livestock production on economic lines. The value of green fodder for animal production depends upon its nutrient concentration as well as intake by an animal. Generally, the chemical composition of fodders varies due to variations in soil, plant species, climatic conditions and agronomic practices (Mislvey *et al*., 1989). The protein and fiber contents in the forages are not constant rather both varied according to stage of cut and fertilizer application (Knettle *et al.,* 1991). Poor digestibility and lower intake are usually associated with high fiber content and low protein content. As the plant matures, dry matte and cell wall constituents increase and protein contents decreased (Hunt *et al.*, 1992). Mott dwarf elephant grass (*Pennisetum purpureum*) has potential to provide quality fodder even during feed shortage period (May and June). Mott grass provides adequate proteins for milk production of cattle and buffalo. The yield of Mott grass is 192 t per acre/year on fresh basis (Gill & Bhathi, 1996). The information on Mott Grass is scanty, particularly with reference to plant parts and harvesting stages. The study under report was, therefore, conducted to determine the effect of fertilizer application and stage of cut on protein contents of Mott grass whole plant and its morphological fractions.

MATERIALS AND METHODS

The experiment was conducted at Fodder Production Area of the Department of Livestock Management, University of Agriculture, Faisalabad. Experiment comprised the following treatments: T_1= control; T_2=24 t FYM ha^{-1}; T_3 = 300 kg N ha^{-1}; T_4 = 150 kg N + 12 t FYM ha^{-1}; T_5 = 200 kg N + 8 t FYM ha^{-1} and T_6 = 225 kg N + 6 t FYM ha^{-1}. Farm Yard Manure was incorporated in soil at the time of seedbed preparation. Double-budded stem cuttings were planted at 60 X 60 cm spacing. Nitrogen was applied in two equal splits. The other agronomic practices were kept normal and uniform for all the treatments. The represented samples were harvested from different parts of the experimental plots after each 15 days from planting to harvesting. The Mott grass as a whole plant and its morphological fractions were collected and saved separately. The leaves were chaffed into 2-3 cm pieces and dried at 60°C to constant weight (AOAC, 1990). The dried fodder samples were ground in a laboratory mill and passed through 1mm screen (Harris, 1970). The crude protein and true protein contents were determined by the methods of Hiller *et al.* (1948) and Munro and Fleck (1966), respectively.

The data were subjected to statistical analysis using one way analysis of variance technique. Comparison of treatment means was made by Fisher's Least Significant difference test (Steel & Torrie, 1982).

RESULTS AND DISCUSSION

Crude protein. The results showed significant differences among the crude protein (CP) contents of Mott grass and its morphological fractions (Table I). Application of 300 kg N

Table I. Average crude protein contents of Mott grass (whole plant) and its morphological fractions as affected by different levels of nitrogen and farm yard manure at various growth stages

	Treatments						
Growth Stages	**T_1**	**T_2**	**T_3**	**T_4**	**T_5**	**T_6**	**LSD Value**
			Whole plant				
D15	11.80	11.28	16.35	14.81	15.91	16.11	0.024
D30	9.72	9.85	15.28	13.40	14.45	14.61	0.007
D45	8.62	8.91	14.65	12.35	13.34	13.50	0.007
D60 (H)	7.72	8.20	13.58	11.49	12.56	12.95	0.024
			Leaf				
D15	12.35	12.64	16.97	15.45	16.46	16.51	0.007
D30	11.74	11.81	16.01	14.64	15.81	15.94	0.024
D45	10.61	10.75	15.17	14.41	14.64	14.74	0.007
D60 (H)	9.87	10.14	14.86	13.66	13.81	13.91	0.024
			Stem				
D15	9.16	9.14	13.10	12.18	13.16	13.26	0.007
D30	5.85	5.91	10.65	9.75	10.34	10.12	0.431
D45	4.90	4.85	9.54	8.24	8.34	8.27	0.024
D60 (H)	3.61	4.02	8.10	7.11	7.19	7.20	0.024

D Days; H Harvest; T_1= control; T_2=24 t FYM ha^{-1}; T_3=300 kg N ha^{-1}; T_4=150 kg N+12 t FYM ha^{-1}; T_5=200 kg N + 8 t FYM ha^{-1}; T_6=225 kg N + 6 t FYM ha^{-1}

ha^{-1} increased CP contents significantly when compared to other treatments. On the contrary, the minimum CP content was found in control. Crude protein contents decreased with the advancement of plant age. This might be due to increase in percentage of lignin, pentosans and cellulose. The highest CP content was found in leaf fraction (9.87 to 13.91%) followed by whole plant (7.72 to 12.95); whereas, the lowest CP contents (3.61 to 7.20%) were observed in stem fraction. This was probably due to increased photosynthetic activity in leaves than in stem leading to higher CP production. Previous studies (Valentim *et al*., 1988; Kanneganti *et al*., 1997) have shown that application of N fertilizer and FYM increased CP contents of the plant. Mislvey *et al.,* 1989) and Siddiqui (1994) reported increased CP percentage in Mott grass with each increase in nitrogen fertilizer application. Griffan and Jung (1981) found that CP contents decreased with the advancement of plant age. They further reported that the maximum CP content was found in leaf fraction followed by whole plant and stem, respectively.

True protein. Application of N/FYM increased true protein (TP) contents significantly over control (Table II). Crop fertilized @ 300 kg N ha^{-1} exhibited the maximum CP contents in Mott grass whole plant (11.27%) as well as in leaf (12.01%) and stem (6.56%) at harvest stage when compared to other treatments. However, the difference between 200 kg N + 8 t FYM ha^{-1} and 225 kg N + 6 t FYM ha^{-1} treatments was non-significant.

A decrease in TP contents was observed in whole plant, leaf and stem fractions with advancing stages of maturity. This might be due to increase in fiber content with advancement of plant age. True protein concentration was higher in leaf (7.89 to 11.14%) than that of whole plant (4.92 to 10.41%), where as the stem fractions of the plant

Table II. Average true protein contents of Mott grass (whole plant) and its morphological fractions as affected by different levels of nitrogen and farm yard manure at various growth stages

	Treatments						
Growth Stages	**T1**	**T2**	**T3**	**T4**	**T5**	**T6**	**LSD Value**
			Whole plant				
D15	8.14	9.01	13.57	13.50	12.74	13.02	6.350
D30	6.43	7.87	12.67	10.86	11.70	11.82	0.007
D45	5.42	7.12	12.15	10.05	10.92	10.93	0.024
D60 (H)	4.92	6.56	11.27	9.29	10.29	10.41	0.007
			Leaf				
D15	9.87	10.23	13.76	12.35	13.32	13.38	0.024
D30	9.55	9.45	12.98	11.85	12.80	12.90	0.024
D45	8.48	8.64	12.29	11.69	11.85	11.92	0.024
D60 (H)	7.89	8.12	12.01	11.05	11.015	11.14	0.024
			Stem				
D15	5.70	7.30	10.74	9.74	10.65	10.61	0.219
D30	3.91	4.72	8.84	7.89	8.13	8.19	0.024
D45	3.14	3.88	7.81	6.55	6.76	6.60	0.024
D60 (H)	2.84	3.20	6.56	5.47	5.89	5.59	0.007

D Days; H Harvest; T_1= control; T_2=24 t FYM ha^{-1}; T_3=300 kg N ha^{-1}; T_4=150 kg N+12 t FYM ha^{-1}; T_5=200 kg N + 8 t FYM ha^{-1}; T_6=225 kg N + 6 t FYM ha^{-1}

had lower (2.84 to 5.59%) TP contents. Kanneganti *et al.* (1997) reported that application of nitrogen fertilizer and FYM increased protein contents of the plant. Several previous studies (Aerts *et al.*, 1976; Gupta *et al*., 1976; Rocha & Vera, 1981) have shown that protein contents decreased with advancement of plant age. They further reported that the maximum protein content was found in leaf and minimum in stem.

CONCLUSION

The crop fertilized @300 kg N ha^{-1} increased the protein contents in Mott grass. To obtain more nutritious and digestible feed for livestock, Mott grass should be cut preferably between 45 to 60 days of age.

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(Received 10 October 2000; Accepted 20 November 2000)