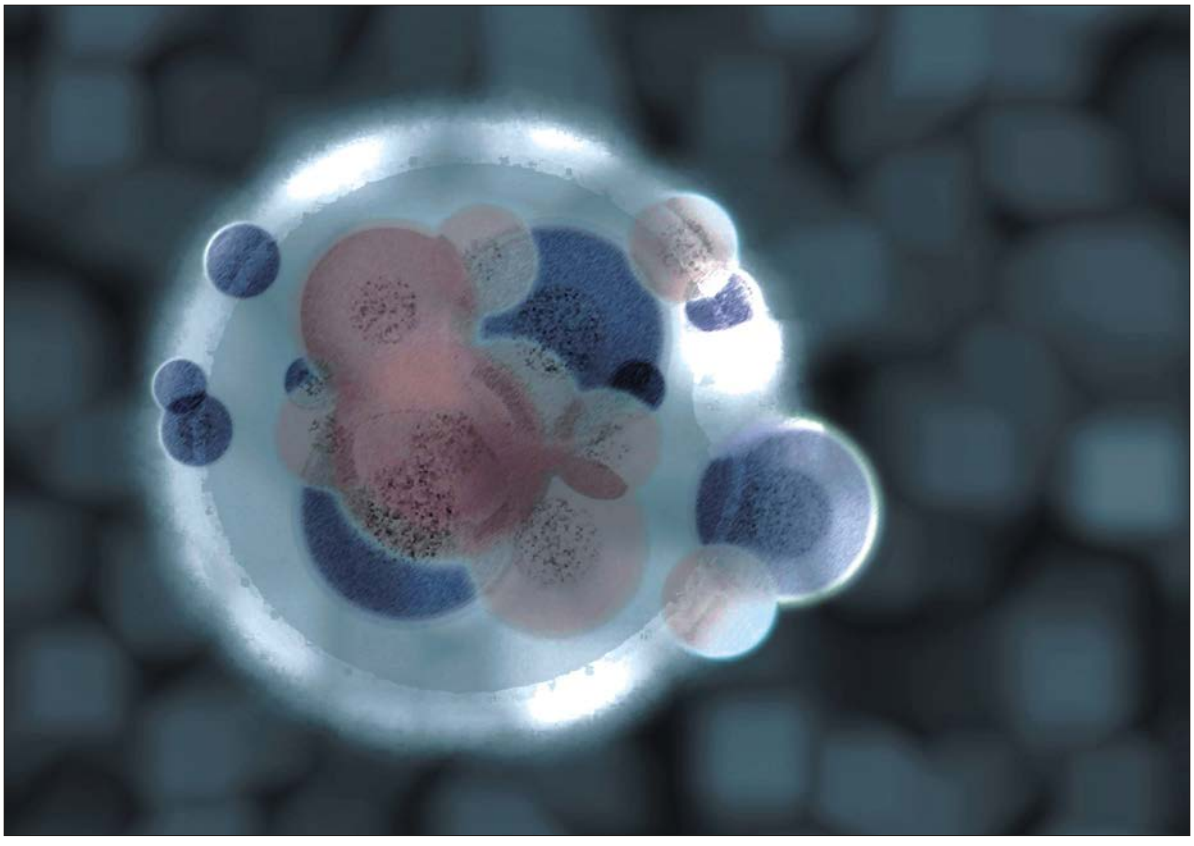

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Hemi-cellulose and Cellulose Contents of Mott Grass as Affected by Nitrogen Fertilizer and Stage of Maturity

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Abstract: The effect of nitrogen fertilizer and farm yard manure application was studied for hemi-cellulose and cellulose contents of Mott grass and its morphological fractions at various vegetative growth stages. Treatments applied 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 FYM ha^{-1}. Samples of Mott grass whole plant and its morphological fractions were analyzed for hemi-cellulose and cellulose contents. Leaf had the maximum hemi-cellulose content while cellulose contents were highest in stem fractions. Cellulose and hemi-cellulose contents significantly increased as compared to control.

Key words: Mott grass, cellulose, hemi-cellulose, nitrogen, farm yard manure, maturity

Introduction

Production of quality fodder is need of the hour so as to increase livestock productivity. The value of green fodder for animal production depends upon its nutrient concentration and intake by an animal. Most of the work conducted on forage evaluation is on forages grown in temperate regions. The same information may not be applicable to tropical forages as the chemical composition and nutritive value are affected by forage specie, stage of cut, fertilizer application, climatic condition and agronomic practices (Misleyy *et al*., 1989). The fiber contents such as cellulose and hemi-celllulose in forage varied in accord with the stage of cut and fertilizer application (Knettle *et al*., 1991). Low feed intake is usually associated with high fiber content and low protein. As the plant matures, dry matter and cell wall contents are increased but crude protein and cell contents are decreased (Gupta *et al*., 1976). Mott grass is being used as fodder in Pakistan for the last 15 years. It provides adequate protein for physical growth and milk production of cattle and buffaloes. The dry matter yield of Mott grass/year/h is 14.9 t and is important because of its availability during feed shortage period (May and June). The study was therefore, conducted to determine the changes in hemi-cellulose and cellulose contents with fertilizer application and growth stages.

Materials and Methods

The study was carried out at fodder production area of the Department of Livestock Management, University of Agriculture, Faisalabad.

Experiment comprised the following treatments

Treatments	N (kg ha^{-1})	FYM (t ha^{-1})
T_1	0.0	0.0
T_2	0.0	24.0
T_3	300.0	0.0
T_4	150.0	12.0
T_5	200.0	8.0
T_6	225.0	6 .0

Farm yard manure (FYM) was incorporated in soil at the time of seed bed preparation. Nitrogen was applied in two equal splits. Double budded stem cuttings were planted at 60x60 cm^2 spacing with same row to row spacing. The representative 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 chaffed separately 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 1 mm screen (Harris, 1970). The Hemi-cellulose and cellulose were determined by the method of Van Soest and Robertson (1985). The data was subjected to statistical analysis by using analysis of variance technique. Comparison of treatment means was made by Fisher's least significant difference test (Steel and Torrie, 1984).

Results and Discussion

Hemi-cellulose: A significant increase in hemi-cellulose contents of Mott grass whole plant, leaf and stem was observed with fertilizer application and advancement in stage of maturity (Table 1). Hemicellulose contents of leaf fraction ranged from 18.7 to 30.06%, being higher than that of whole plant (17.30 to 28.67%), whereas, the stem fraction of the plant had lowest hemi-cellulose (17.16 to 28.64%) concentration.

Gupta and Sagar (1987) and Grabber *et al*. (1991) have shown that hemi-cellulose contents of plant increase with maturity. They further reported maximum values in leaves and minimum in stem. Kim and Voigtlaender (1985) reported that hemi-cellulose content of the plant increased with N/FYM application.

Cellulose: Cellulose contents of Mott grass whole plant and its morphological fractions continued to increase significantly with each increase in nitrogen fertilizer level and with advancing stage of growth (Table 2). A rapid increase was observed upto 30 days of plant age. However, a slight increase was recorded at 45 to 60 days growth stage, as well. Higher cellulose (30.46 to 43.84%) was observed in stem fraction than whole plant (28.94 to 39.75%) and the leaf fraction had the lowest cellulose (27.61 to 37.86%) contents. Chauhan (1983) reported 27.51, 31.28, 31.57 and 31.91 percent cellulose contents in hybrid Napier (NB-21) when fodder was harvested at four different growth stages. Kim and Voigtlaender (1985) reported that cellulose and hemicellulose were the main cell wall constituents with cellulose accumulating mainly in stem. They also found an increase in cellulose contents with fertilizer application. Azim *et al*. (1989) found maximum cellulose content in the stem followed by whole plant. Similar findings were reported

Table 1: Average hemi-cellulose 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.

Growth Stages	Treatments						
	T_1	T_2	T_3	T_4	T_5	T_6	LSD value
Whole Plant							
D-15	17.30	16.90	20.42	17.65	18.31	18.09	0.774
D-30	20.71	20.99	25.33	21.09	23.25	22.00	0.024
D-45	24.95	25.55	28.00	26.62	27.08	26.67	0.701
D-60 (H)	25.40	25.54	28.67	27.34	27.40	28.28	0.042
Leaves							
D-15	18.77	18.63	22.17	19.10	19.90	19.90	0.024
D-30	28.85	22.05	26.12	21.56	23.41	23.41	0.042
D-45	25.42	26.48	28.97	27.17	27.95	27.95	0.024
D-60 (H)	26.56	26.57	30.06	28.48	28.39	28.39	0.024
Stem							
D-15	17.16	17.46	20.53	17.33	18.31	17.78	0.024
D-30	20.33	20.84	24.00	21.05	22.93	21.18	0.679
D-45	24.60	24.99	28.64	25.00	26.27	25.59	0.045
D-60 (H)	24.80	24.86	26.33	26.70	25.85	26.79	0.024

D = Days; H = Harvest

Table 2: Average cellulose contents (%) of Mott grass (whole plant) and its morphological fractions as affected by different levels of nitrogen and farm yard manure at various growth stage.

Growth Stages	Treatments						
	T_1	T_2	T_3	T_4	T_5	T_6	LSD value
Whole Plant							
D-15	28.94	29.06	30.86	30.27	30.27	30.17	0.007
D-30	33.75	34.16	35.29	35.45	35.61	35.63	0.024
D-45	37.24	38.27	39.16	38.83	39.00	39.02	0.024
D-60 (H)	37.85	38.96	39.75	39.13	39.34	39.51	0.24
Leaves							
D-15	27.61	27.95	29.89	29.14	29.01	28.90	0.024
D-30	31.65	32.05	33.42	33.52	33.41	33.43	0.024
D-45	35.14	36.47	37.26	36.74	37.14	37.02	0.024
D-60 (H)	35.80	36.92	37.86	37.16	37.86	37.68	0.024
Stem							
D-15	30.46	31.18	32.74	32.19	32.11	32.08	0.024
D-30	37.64	38.01	39.40	39.62	39.79	39.49	0.024
D-45	41.16	42.16	43.04	42.62	43.16	43.19	0.024
D-60 (H)	41.66	42.59	42.92	42.92	43.79	43.84	0.24

D = Days; H = Harvest

by Gupta *et al*. (1976).

It is concluded that hemi-cellulose and cellulose contents of Mott grass increased with maturity and nitrogen fertilization. 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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