

Effect of stage of growth on chemical composition and *in sacco* dry matter degradability of colonial grass

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A drought-resistant and improved variety of grass from Brazil, popularly known as 'Colonial grass', has been recently introduced in Andhra Pradesh. Nutritive value of the grass at flowering stage in terms of DCP and TDN was reported to be 4.9 and 55.2% in sheep (Devasena *et al.* 1993), and 8.72 and 52.20% in buffalo bulls (Reddy *et al.* 1994) respectively. The present communication furnishes the data on chemical composition, and *in sacco* dry matter (DM) of grass samples collected at 15-day intervals to determine the optimum stage of its harvest. The forage samples were oven-dried at 70°C for 48 hr and ground in a Wiley mill using a medium mesh screen of 2 mm. The ground samples were subjected to proximate analysis (AOAC 1980) and cell-wall fractionation (Goering and Van Soest 1970). Calcium and phosphorus levels were determined according to the method of Talapatra *et al.* (1940). *In sacco* evaluation of forages was carried out using nylon-bag technique according to Kempton (1980). Dried samples of 3 g each were incubated in the rumen of 3 permanently rumen-cannulated Nellore Brown rams for 12, 24, 36, 48 and 72 hr by suspending in nylon-bags with cloth pore size of 25-28 µm. The Effective

degradable dry matter of forage samples was calculated at a rumen outflow rate (K) of 0.05/hr according to the model proposed by Orskov and McDonald (1979). *In vitro* DM digestibility studies were carried out using rumen liquor collected from a fistulated ram fed at maintenance level with test forage using the two-stage technique of Tilley and Terry (1963).

The effect of stage of growth on the nutritional quality of forage was reflected in the form of decreased crude portion (CP), ether extract (EE) and total ash levels, and increased levels of crude fibre (CF) and acid-insoluble ash (Table 1). Highest per cent nitrogen-free extract (NFE) was recorded in samples collected at 45 and 60 days of growth. While the phosphorus (P) content increased from 0.25% to 0.44% and calcium (Ca) concentration decreased progressively from 0.73% to 0.39% over a period of 75 days. Though the CP content was highest (15.79%) at 15 days, samples collected to represent 45 to 60 days of growth had CP content ranging from 8.39 to 8.78% which is sufficient to get a positive nitrogen (N) balance. Similar influence of stage of growth on the proximate composition of several native forages has been reported earlier (Sen and Ray 1975).

Cell-wall constituents in terms of neutral-detergent fibre (NDF), acid-detergent fibre (ADF), hemicellulose, cellulose, lignin and silica increased by 18.86, 14.47, 36.67, 40.38, 103.71 and 269.24 %, respectively, when the forage was allowed to grow for 15 to 90 days. There was a steep increase in the level of all the cell-wall constituents up to 45 to 60

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Table 1. Effect of stage of growth on the chemical composition of colonial grass (% of DM)*

	Days of harvest					
	15	30	45	60	75	90
Dry matter	14.34	15.64	23.42	24.75	28.24	30.68
Crude protein	15.79	10.79	8.39	8.78	7.85	7.02
Ether extract	3.73	3.17	2.13	2.01	1.96	1.87
Crude fibre	25.26	27.58	28.67	31.37	33.67	34.79
Nitrogen-free extract	39.44	43.01	46.12	44.04	43.80	43.61
Total ash	15.78	15.45	14.69	13.80	12.72	12.71
Calcium	0.73	0.41	0.38	0.40	0.40	0.39
Phosphorus	0.25	0.33	0.28	0.30	0.40	0.44
NDF	61.18	64.63	68.95	70.87	71.95	72.72
ADF	49.07	50.53	54.54	55.25	55.75	56.17
Hemicellulose	12.11	14.10	14.41	15.62	16.20	16.55
Cellulose	24.59	25.55	25.82	31.34	33.25	34.52
Lignin	5.39	6.30	7.69	8.55	8.93	10.98
Silica	0.98	1.37	1.88	2.04	2.91	3.55

*Each value is the average of duplicate analysis. On DM basis except for dry matter.

Table 2. Effect of stage of harvest on *in sacco* DM disappearance and effective dry matter degradability of colonial grass*

Incubation time (hr)	Stage of harvest (days)					
	15	30	45	60	75	90
	<i>% DM disappearance</i>					
12	49.02	33.25	31.25	32.35	32.27	29.25
	±2.45	±8.03	±1.21	±0.56	±2.80	±1.80
24	64.74	45.54	45.88	42.17	38.80	37.43
	±1.34	±5.62	±0.51	±5.76	±2.29	±2.30
36	67.21	52.76	48.29	43.83	46.31	40.18
	±2.42	±1.53	±0.74	±2.29	±2.04	±5.77
48	73.09	58.48	51.99	53.14	53.87	44.68
	±0.92	±1.16	±1.14	±2.83	±0.72	±7.38
72	70.42	62.77	54.32	53.89	52.14	45.72
	±0.48	±0.81	±1.81	±1.52	±0.23	±1.58
	<i>Effective degradable dry matter (EDDM)</i>					
Readily soluble DM fraction (a)	35	17	20	20	20	15
Insoluble but degradable DM fraction (b)	38	46	34	34	34	31
Rate constant/hr (c)	0.0470	0.0424	0.0482	0.0439	0.0400	0.0649
EDDM (%)	53.41	38.11	36.69	35.98	35.11	32.51

*Average of values representing 3 fistulated Nellore rams.

days of growth with the influence of stage of growth having least impact beyond 60 days of growth. The per cent ADF and ADL are most frequently recommended for the prediction of nutrient digestibility and the per cent NDF to relate intake of ruminants fed forage-based rations. Lignin accumulation is undoubtedly the major factor that depresses digestibility of forages with advancing maturity. Silica also has been shown to have a depressing effect on digestibility similar to that observed with lignin (Ham and Garret 1986) as was seen in the present study.

The average *in sacco* DM disappearance values decreased by 40.33, 42.18, 40.22, 38.87 and 35.06%, respectively, for the forage samples incubated for 12, 24, 36, 48 and 72 hr over a growth period of 75 days (Table 2). Highest DM disappearance was observed at early stages of growth due to lesser lignification of plant cell-walls and high proportion of cell contents (Van Soest and Moore 1965). It was evident that the stage of growth had a profound effect on the *in sacco* DM disappearance at all hours of incubation in the rumen. The readily soluble DM fraction (a) was highest (35%) at 15 days of growth and lowest (15%) at 90 days of growth. Even though the depression in DM fraction was maximum between 15 and 30 days of growth, constant 'a' values observed at preflowering stage of 45 to 75 days resulted in a near uniform EDDM values of 35-36%. The insoluble but degradable 'b' fraction also remained static between 45 and 75 days of growth which has reflected on the per cent EDDM values of the forage.

The average per cent IVDMD values as determined with sheep rumen liquor were 68.13, 59.75, 52.66, 52.08, 47.42 and 42.94, respectively, for the grass samples of 15, 30, 45, 60, 75 and 90 days of growth. A fall of 5.24 and 9.14 percentage units of IVDMD was observed by extending the harvesting

interval from 60 to 75 and 90 days respectively. Based on the results of *in sacco* and *in vitro* evaluation studies, optimum stage to harvest Colonial grass adopted to Indian conditions appeared to be between 45 and 60 days of preflowering stage of growth.

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