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PROXIMATE COMPOSITION, FIBRE FRACTION VALUES OF ENVIRONMENTALLY ADAPTED FODDER VARIETIES IN WAYANAD DISTRICT, KERALA, INDIA

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Abstract: The objective of present study was to evaluate the proximate composition and fibre fraction values of fodder varieties grown in area where highest amount of rainfall received more than 3000 mm rainfall, Pookode, Vythiri block, Wayanad, Kerala. The physical characteristics, proximate composition and fibre fractions of five fodder varieties*viz* Coimbatore 3 (CO-3), Coimbatore 4 (CO-4), Thumburmuzhy, Australian Napier, and wild grass (Sony grass) were estimated and compared. The dry matter content of fodder varieties ranges from 14.85 - 26.47 per cent. The crude protein varies between 10.49 – 16.97 per cent; crude fibre ranges 32.01 - 35.99 per cent; 1.50 - 3.11 per cent of ether extract;11.1 -14.8 per cent of total ash; 3.83 -5.60 per cent of Acid Insoluble ash and Nitrogen free extract content of 34.02-39.57 percent on DMB. The Neutral Detergent Fibre (NDF), Acid Detergent Fibre (ADF) and Hemicelluloses varied from 60.84 -77.10 per cent; 31.33- 41.27 per cent and 21.26- 41.49 per cent respectively.
Keywords: Australian Napier, Coimbatore 3 (CO-3), Coimbatore 4 (CO-4), cell wall fractions proximate composition, Thumburmuzhy, wild grass (Sony grass).

INTRODUCTION

Though feed and fodder is one of the most important contributing factors for the growth of livestock sector, development of this sector has not received the required level of focus in the past. The land devoted for fodder cultivation in Kerala is very negligible only 1 per cent of the cultivable area or 5,395 ha (Government of Kerala, 2011). It is estimated that out of the requirement of 23.2 million tons of fodder, only 5.1 million tons is produced in Kerala. Low productivity of dairy animals could be accredited to the less availability of forage and its quality. To maximize the milk production, it is essential to feed animals with quality green fodder. Subsequently, Animal Husbandry department and Dairy development department have introduced high yielding forages including hybrid varieties like Coimbatore- 3 (CO-3) and Coimbatore-4 (CO- 4) from Tamil Nadu Agricultural University (TNAU) Coimbatoreand popularized among farmers invariably in all districts of Kerala. Basically, CO-3, CO-4,

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Australian Napier are an inter-specific hybrid between Bajra (Pennisetumamericanum L.) and a selection of a common Napier (Pennisetumpurpureum Schum). These fodder varieties are one of the highest yielding perennial tropical fodder grasses and considered as cut-and-carry forage for stall feeder systems. The new grass variety Thumburmuzhy-I was developed by cattle breeding farm, Thumburmuzhy, research station during 2010 under Kerala Veterinary and Animal Sciences university developed with selection of Bajra and napier with local grass variety gives promising yield at different agro- climatic locations in Kerala. The another wild fodder which was collected from the forest tribal habitat of Wayanad, was propagated and named 'Sony Grass' (Thumburmuzhi 2). The yield potential, leaf to stem ratio, palatability, free from pest and nutritive value of the fodder varieties are varied from place to place because of the climate factors; varieties like CO3 and CO4 are promoted in different agro - climatic zones in Kerala. The topography of Wayanad is responsible for a unique climate in Wayanad that is quite distinct from the climate of neighbouring regions. There will be strong gradient rainfall in excess of 3000 mm per year in locations like Muttil, Vythiri and Mepaadi. Thus, the comparative nutritive study of wild grasses like sony grass (Thumburmuzhy II) and Thumburmuzhy I against very popular fodder varieties like CO-3 and CO-4 will give insight regarding selection of the fodder by the dairy farmers to feed to their animals based on the nutritive value.The present study was therefore undertaken to explore nutrient value of 5 fodder grasses invariably grown Wayanad, Kerala.

Materials and Methods

The samples of CO-3, CO-4, Thumburmuzhy I and Australian Napier were collected from the fodder plots and wild grass (Sony) in the College of veterinary and animal sciences, Pookode campus, and wayanad. The campus is geographically located at latitude 11 ° 32′0" and longitude 11 ° 32′ and 770 meters above mean sea level with average rainfall above 2000 mm per year.The Plant samples from all the plots were collected at the fourth harvest except wild grass; leaves and stems were separated, chopped, and oven dried at 65^{o}C ± 5ºC for 24 hours. The dried samples were ground to pass through 1-mm sieve and stored in polythene bags at room temperature for chemical analysis. The dry matter (DM), crude protein (CP), crude fibre (CF), ether extract (EE), total ash (TA), acid insoluble ash were analysed (AOAC, 2012).

The Nitrogen Free Extract (NFE) values were calculated as per formula

NFE (%) = DM (%) – (EE (%) + CP (%) + TA (%) + per cent CF)

The fibre fractions *viz* Neutral Detergent Fibre (NDF); Acid Detergent Fibre (ADF) were analysed (AOAC, 2012). The Neutral detergent insoluble nitrogen (NDIN) and Acid Detergent Insoluble Nitrogen (ADIN) were estimated as nitrogen content in residues of NDF and ADF respectively (Goering, 1972).The NDF -CP and ADF-CP were calculated as follows:

NDF-CP (per cent) = NDIN X 6.25; ADF- CP (per cent)= ADIN X 6.25

Results and Discussion

The quality of the fodder varieties are decided upon by the dry matter, crude protein, crude fibre, ether extract and total ash content. The proximate composition of the fodder varieties are summarized in Table -1. The leaf stem ratio, harvesting age, soil, climate, rainfall pattern decides the proximate composition values. In general, the percentage content of crude protein was higher in leaves than stems.

Proximate Composition

The dry matter content depicts the actual amount of nutrients present in the fodder. The average dry matter content of CO3 grass varieties reported by Vijaya Kumar et al. (2009) was 19.10 per cent compared against 14.85 per cent reported in this study. The highest DM value was observed for the wild grass (sony grass) followed by Australian Napier. The present study reports that there was high dry matter content in Australian napier (22.69 per cent) and less (15.94 per cent) in Thumburmuzhi I variety compared against (14.8 and 19.1 per cent for Australian Napier and Thumburmuzhi I respectively) as reported by Xavier et al.2010.The dry matter content will vary more in the monsoon compared to spring season (Arshadullah *et al.*, 2009); leaf portion have less dry matter compared to stem.

The average CP content in leaves and stems for CO-3; Austaliannapier; Thumburmuzhy I and Sony were ranges from 14.8 to 17.5 per cent (Xavier et al.2010). Vijayakumar et al. (2009) reported that the cultivar CO-3 had an average crude protein content of 10.5 per cent (considering stems and leaves together) and the same result reported in this study also. The another author explains that the crude protein content of CO 3 and CO4 cultivars in Thrissur, Kerala was 14.06 and 11.46 per cent of CP content in leaf portion of CO3 and CO 4 respectively (Savitha Antony and C. George Thomas., 2014). The leaf stem ratio of the grass influence the total CP content.

The reported values of EE content for Thumburmuzhy I and Australian Napier varieties are 1.3 and 1.4 per cent respectively (Xavier et al.2010) which is comparable to the present

study. Comparatively, leaf portion is having more EE content than stem portion (Savitha Antony and C. George Thomas., 2014).

The analysis of TA and AIA content is important in calculating mineral portion of the grass. The quality of the grass was decided upon the less per cent of AIA and more per cent of TA. The results obtained for TA and AIA in this study are within the reported values of other researchers for Thumburmuzhi I, Australian napier (Xavier et al.2010); for CO3 and CO4 (Savitha A and Thomas, 2014). Very high 16.17 per cent of TA was reported for CO3 (Vijayakumar et.al.2009). The variation could be due to soil mineral profile, harvesting age, rainfall pattern etc.

Table 1: Proximate Composition comparison of Fodder varieties (Per cent on DMB)

Variety	Dry matter (DM)	Crude protein (CP)	Ether extract (EE)	Crude fibre (CF)	Total ash	Acid insoluble ash (AIA)	NFE
Australian Napier	22.69	16.96	2.77	33.07	12.4	4.6	34.79
Coimbatore 3 (CO-3)	14.85	10.49	3.11	32.02	14.8	4.5	39.57
Coimbatore 4 (CO-4)	17.16	15.01	2.69	32.78	14.4	3.83	35.12
Wild grass (Sony grass)	26.47	16.18	1.51	35.99	12.3	4.47	34.02
Thumburmuzhy1	15.94	16.97	2.37	35.03	11.1	5.60	34.53

The NFE content is calculative value of proximate principle and supposed to be representing the soluble carbohydrate such as starch and sugar. Crude fibre represents insoluble carbohydrate. The NFE is supposed to be very inaccurate name because the NFE value nothing to do with nitrogen and not an ether extract. However, nutritive value of grasses need not be decided upon the calculative value of the NFE. The NFE values reported in this study for all grass varieties are ranges between 34.02 to 39.47 per cent. Xavier *et al*. (2010) reported 49.2 per cent for Australian Napier and 50.2 per cent for Thumburmuzhy I. This difference could be due to high per cent of CF in this study compared against values reported by Xavier *et al* (2010).

Table 2: Cell wall composition of fodder varieties (Per cent on DMB)

Variety	NDF	NDIN	NDF-CP	ADF	ADIN	ADF - CP	Hemicellulose (NDF - ADF)
Australian Napier	60.84	2.04	12.75	31.95	1.03	6.44	28.89
Coimbatore 3	72.81	1.19	7.44	31.33	0.68	4.25	41.49
Coimbatore 4	69.18	1.43	8.93	33.88	1.56	9.75	35.30
Wild grass (Sony Grass)	77.10	2.09	13.1	41.00	1.34	8.38	36.10
Thumburmuzhy 1	62.53	1.26	7.89	41.27	1.53	9.56	21.26

The CF content in leaf and stem portion are more or less same in CO3 and CO4 (Savitha A and Thomas G.2014); but in contrast high fibre content of fodder could be due to higher proportion of stems in the forage (Amiri*et.al*.,2012). High fibre content of 35.99 per cent is reported the present study in wild grass (sony) compared to other varieties in this study. The content of CF is decided upon by stage at harvest, climate and soil quality.

Cell wall fractions

The cell wall compositions of fodders (per cent on DMB) are summarized in Table-2.NDF and ADF are most common measure of fibre used for animal feed analysis; it measures the structural components in plant cells (lignin, hemicellulose, cellulose, lignin and pectin).

The maturity of the plant at harvest increases cell wall content as NDF, ADF increases. As advancing maturity, plants develop xylem tissue for water transport, accumulate cellulose and other complex carbohydrates and tissues become bound together by a process known as lignification. The leaf to stem ration declines as grass mature and stem have more NDF and ADF content. The level of NDF in the animal ration influences bulk or fill effect, time of rumination and is negatively correlated with feed intake. The NDF and ADF values reported in this study are well ranges reported for CO3 and CO4 values by other researchers (Garg*et.al* 2012). The per cent DM, ADF and NDF in the wild grass was highest with values of 26.47, 41.00 and 77.10 respectively, which indicate chances of low dry matter digestibility and dry matter intake that will result in a decrease in livestock consumption (Belyea et al, 1993).However, the ADF and NDF values were lowest for Australian Napier 31.95 and 60.84 per cent respectively that indicated less fiber content and a more digestibility for livestock (Amiri *et al.* 2012).

The calculative values of NDIN, ADIN, NDF-CP and ADF-CP help us to evaluate the fodder quality where the in-digestible nitrogen portion presents in NDF and ADF residues. The values are summarized in Table-2.Hence the total protein estimated in leaf and stem need not be fully digestible and digestibility varies between the grass varieties.

Conclusion

The present study results revealed that Australian Napier fodder are having better nutritive value compared to other grass varieties. The wild grass (sony) variety is having high per cent of crude protein but high per cent of NDF and ADF. The other varieties are well adopted in climatic conditions of wayanad and qualities also well comparable to other agro-climatic conditions.

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