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A STUDY ON NUTRITIVE VALUE AND CHEMICAL COMPOSITION OF SORGHUM FODDER

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Abstract: In the present study 50 different samples of Sorghum fodder grown in Rayalaseema region of Andhra Pradeshwere evaluated for their chemical composition (DM, crude protein, total ash, NDF, ADF, ADL, cellulose, silica and hemicellulose). The dry matter content varied from 11.82 to 38.19 with a relative mean value of 26.30 ± 0.50 per cent on DM basis. The mean crude protein content was 12.42 ± 0.47 per cent and exhibited a range of 15.95 per cent. The total ash content varied from 6.15 to 13.08 with a relative mean value of 9.18 ± 0.21 per cent. The per cent cell wall constituents were in the range of 70.13 to 82.19(NDF), 47.87 to 78.86(ADF), 1.32 to 22.18(ADL), 13.85 to 45.57 (cellulose), 0.33 to 8.33 (silica), and 0.34 to 28.38 (hemicellulose) and the mean values were 76.99 ± 0.41, 68.78 ± 0.86, 8.39 ± 0.58, 33.23 ± 0.71, 3.10 ± 0.21, 8.20 ± 0.79 per cent, respectively for NDF, ADF, ADL, cellulose, silica and hemicellulose. From this study it was concluded that Sorghum fodder was nutritionally superior cereal fodder for livestock in scarce rainfall areas.
Keywords: Chemical composition, Sorghum fodder, Cellwall constituents.

Introduction

Forage plays a key role in ruminant feeding as basal component of animal diet and variation in its quality has direct effect on digestive functionality, concentrate supplementation, animal performance and health. Sorghum is one of the important cereal crops grown for grain and fodder production in irrigated and rainfed regions of India constitute a major part of green fodder in kharif and later as a stover. The importance of this multipurpose crop is being further realized due to its adaptability to high temperature,water scarcity and salt tolerant conditions (Brouk *et al*., 2011) and combination of tolerance to drought and salt makes Sorghum an interesting feed resource for saline soils in arid and semi arid regions (Fahmy *et al*.,2010). Sorghum has high nutritive value which might be comparable with that of Maize (Nichols *et al*.,1998) and as such it has been used successfully for feeding lactating dairy cows (Aydin *et al*., 1999). Various hybrids and varieties of Sorghum differ in their chemical composition including content of water soluble carbohydrates (WSC), protein and as well as

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in their structural fibrous fractions including neutral detergent fibre (NDF), acid detergent fibre (ADF) and acid detergent lignin(ADL). Forage quality of Sorghum may also be affected strongly by interactions between the genotype, the maturity stage of the plants at harvest and environmental factors (Pederson *et al*.,1982). So the present study was undertaken to evaluate the Sorghum fodder grown in scarce rainfall zone of Rayalaseema region of Andhra Pradeshfor its chemical composition and nutritive value.

Materials Methods

Source of samples

A total number of 50 fresh Sorghum fodder samples were cut from the fodder plots of Livestock Research Stations of Sri Venkateswara Veterinary University and fodder fields of farmers of Rayalaseema region of Andhra Pradesh.A modified random sampling with a 70 cm x 35 cm quadrant was followed and the samples were cut at various stages of development (viz. stem elongation, boot stage, early heading, pre-milk, milk and dough stage). Similar sampling technique was used by Leevi (2014) on Wheat forage.Fresh fodder samples were kept in metallic trays and dried overnight in a hot air oven at 100^0C. The dried samples were ground separately in a laboratory Willey mill through 2 mm screen. The ground samples were then stored in air tight plastic bottles, suitably labelled for wet chemistry/laboratory analysis.All the samples were collected within one week to minimize chemical analysis effects of sampling time onnutrient composition.

Chemical Analysis

All chemical analysis were performed in duplicate and expressed on dry matter basis. Samples of dried Sorghum fodder were analyzed for dry matter, crude protein, ash (AOAC, 2007) and for forage fibre fractions (Van Soest *et al*., 1991). The moisture content was estimated as the loss in weight of the sample upon drying in a hot air oven at 100^0 C for overnight and the residue thus obtained is the dry matter. Total ash was determined by ashing the sample at 550^0C in a muffle furnace. Crude Protein (CP) content was estimated from the total nitrogen content (N) measured by Micro Kjeldahl method, with the relationship, CP= N x 6.25. For the description of forage fibre fractions, the sequential method of Van Soest *et al*. (1991) was used. This method provides an estimate of NDF, ADF, ADL, hemicellulose, cellulose and silica.Statistical analysis of the data was carried out according to the procedures suggested by Snedecor and Cochran (1994).

Results and discussion

The summary of the chemical composition of Sorghum fodder is presented in Table1.

Table 1. Summary of chemical composition of Sorghum fodder (% DM basis)

Parameter	Sample size (n)	Minimum value	Maximum value	Mean± SE	Range
Dry Matter	145	11.82	38.19	26.30± 0.50	26.26
Crude Protein	50	5.29	21.24	12.42± 0.47	15.95
Total Ash	50	6.15	13.08	9.18± 0.21	6.93
NDF	50	70.13	82.19	76.99± 0.41	12.06
ADF	50	47.87	78.86	68.78± 0.86	30.99
ADL	50	1.32	22.18	8.39± 0.58	20.85
Cellulose	50	13.85	45.57	33.23± 0.71	31.72
Silica	50	0.33	8.33	3.10± 0.21	7.99
Hemicellulose	50	0.34	28.38	8.20± 0.79	28.03

Perusal of the results on laboratory evaluation of Sorghum fodder revealed that the dry matter content varied from 11.82 to 38.19 with a mean value of 26.30 ± 0.50 per cent on dry matter basis which is in agreement with the values of 24.70, 26.80 and 26.90 per cent as reported by Colombo *et al*. (2007), Miron *et al.* (2005) and Carmi *et al.* (2005), respectively. There exists a wide range of 26.26 per cent variability in the present study which might be attributed to the stages of maturity of fodder samples. However, Singh *et al*. (2003) reported lower mean dry matter content of 18.30 and 19.70 per cent, respectively in brown midrib and white midrib genotypes of Sorghum forage.

The mean crude protein recorded in the study was 12.42 ± 0.47 per cent with a range of 15.95 per cent. This finding is comparable with the reported value of 13.70 per cent by Colombo *et al*. (2007). Similarly, marginally lower values of 7.20 and 9.98 per cent, respectively were reported by Marsalis *et al*. (2010) and Singh and Shukla (2010). The differences of values reported by different authors might be due to variation in soil types and fertilizer applications.

The total ash content varied from 6.15 to 13.08 per cent with a mean value of 9.18 ± 0.21 per cent which is in agreement with Miron *et al*. (2005) who reported 9.02 per cent for Sorghum fodder. However, marginally higher value of 11.30 per cent was reported by Colombo *et al*. (2007).

The NDF content varied from 70.13 to 82.19 with a mean value of 76.99 ± 0.41 per cent, which is in agreement with the value of 75.80 per cent reported by Singh *et al*. (2003) in white midrib genotype of Sorghum forage. The values in the present study are comparatively higher than the values of 62.80, 62.60 and 65.80 per cent reported by Carmi *et al*. (2005),

Colombo *et al*. (2007) and Singh and Shukla (2010), respectively. These variations might be due to the stages of maturity and leaf area index of the samples, soil types and agro climatic conditions prevailing in those regions. The mean ADF content recorded in the study was 68.78 ± 0.86 with a range of 30.99 per cent which was higher than the reported values of 47.50 and 37.10 per cent by Singh *et al*. (2003) and Colombo *et al*. (2007), respectively. This might be attributed to the cultivar differences and stages of maturity of the samples used in this study.The mean ADL content observed in the present study was 8.39 ± 0.58 per cent which is marginally higher than the value 7.30 per cent reported by Singh *et al*. (2003) in white midrib genotype of Sorghum forage. However, lower values of 3.12 and 6.67 per cent were reported by Colombo *et al*. (2007) and Miron *et al*. (2005), respectively. These variations might be attributed to the stages of maturity, leaf to stem ratio while sampling.

The mean values recorded for cellulose and hemicellulose were 33.23 ± 0.71 and 8.20 ± 0.79 per cent, respectively in the present study. The present findings on cellulose content are comparable with the value 35.40 per cent reported by Singh *et al*. (2003) but the hemicellulose content reported in this study is not in agreement with Miron *et al*. (2005) and Singh *et al*. (2003) who reported marginally higher values of 25.70, and 27.30 per cent, respectively. Lower hemicellulose recorded in this study might be due to higher ADF content which in turn related to the stages of maturity of fodder samples used in the study. The mean value for silica content observed in this study was 3.10 ± 0.21 per cent which is in agreement with Zahid *et al*. (2014) who reported 3.04 per cent in Sorghum cultivars. However, marginally lower value of 2.62 per cent was reported by Firdous and Gilani (2001) in whole plant Sorghum samples harvested at mature stage. The differences of values reported by different authors might be due to variation in soil types.

Conclusion

The present study on nutritional evaluation of Sorghum fodder has revealed that it is a good sourceof nutrients marginally rich in protein content and can be used as a potential green fodder to feed livestock in scarce rainfall areas.

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