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Analysis of nutritional and anti-nutritional factors in certain *Cenchrus* grass species

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Abstract : Six cultures of *Cenchrus* grass were compared with the variety Co-1 based on nutritional and antinutritional factors. The culture CAZRI 75 recorded highest crude protein content. Crude fibre was highest in CAZRI 1263. Dry matter production was highest in the culture CAZRI 1128. Analysis of mineral content has revealed culture CAZRI 75 to have highest inorganic phosphorus and potassium contents. CAZRI 1263 and CAZRI 1128 recorded highest calcium and magnesium contents respectively. The check variety Co-1 had the lowest oxalate content. Co-1, CAZRI 1106 and CAZRI 75 recorded highest thiamine, riboflavin and carotene contents respectively. Micronutrients iron, zinc and manganese were highest in Co-1, while CAZRI 1263 recorded highest copper content. (***Key Words*** : *Cenchrus, Nutritional and Antinutritional Factors)*.

The nutritive value of forages is often estimated on the basis of the content of chemical constituents i.e. their potential to meet the energy, protein and mineral requirements of the animal. Crude protein and crude fibre have long been used for this purpose. With increased animal production, more emphasis is put on the supply of specific nutrients required for the synthesis of macromolecules such as (milk) protein, (milk) fat, lactose and immunoglobulins. Therefore in addition to energy, the potential to supply specific compounds for the synthesis of animal tissues and products should be considered more precisely. In addition to this, antinutritional factors present in forages influence the availability of vital nutrients to the animals and hence play a major role in determining the quality of forages.

Materials and Methods

Seven *Cenchrus* grass Spp. *viz.*, CAZRI 358, CAZRI 75, IGFRI 3813, CAZRI 1128, CAZRI 1106, CAZRI 1263 and the variety Co-1 grown in the specimen plot of Department of Agricultural Botany, Agricultural College, Killikulam, were analysed for certain nutritional and antinutritional factors to assess their forage value. The first cutting was done 60 days after planting and subsequent cuttings after 40-45 days interval. A total of eight cuttings were done per year.

The crude protein, crude fibre content and dry matter production of the seven cultures of *Cenchrus* grass spp. were estimated. The dry matter content was estimated for the total yield of eight cuttings. The mineral content in terms of inorganic phosphorus, calcium, potassium and magnesium were estimated. The antinutritional factor oxalate content was estimated in all the seven spp. of *Cenchrus* grass. The vitamins such as thiamine, riboflavin and carotenoids of the *Cenchrus* grass spp. were analysed. The seven *Cenchrus* grass spp. were estimated for

Table 5. Micronutrient content of seven *Cenchrus* cultures

Cenchrus cultures	Mineral content (%)			
	Iron	Copper	Zinc	Manganese
CAZRI 358	288	14	18	52
CAZRI 75	295	14	23	56
IGFRI 3813	329	16	21	55
CAZRI 1128	257	15	19	58
CAZRI 1106	279	15	18	53
CAZRI 1263	311	17	22	50
Co-1	385	26	25	58
SEd	1.25	0.02	0.03	0.03
CD	2.50	0.04	0.07	0.06

and Das, 1995). Sukanya Subramanian *et al.* (1990) in their studies on *Cenchrus glaucus* in comparison to *C.ciliaris* and *C.glaucus* local reported crude protein and crude fibre content of 9.06% and 34.62% respectively. This *Cenchrus* recorded a dry matter production of 28 t ha^{-1}.

Table 2 gives the mineral content of seven *Cenchrus* cultures in terms of inorganic phosphorus, calcium, potassium and magnesium.

Of the seven cultures analysed, the culture CAZRI 75 recorded the highest inorganic phosphate content of 0.30%. Gupta *et al.* (1980) reported in cowpea (*Vigna sinensis)*, with increasing maturity, dry matter increased from 14.5 to 23.3, whereas protein decreased from 21.3 to 15.8, ash was 11.8-8.0. Further, they observed that forage cut 55-65 days after sowing at prebloom stage had protein of 18-20% and had sufficient minerals to meet the requirements of dairy cattle. The culture CAZRI 1263 recorded calcium content of 0.59%. Interestingly, this culture recorded an oxalate content of 1.70% (Table 3). Postassium and magnesium content was highest in IGFRI 3813 and CAZRI 1106 respectively. Mineral contents, calcium and phosphorus in *Cenchrus glaucus* was reported as 0.58% and 0.26% respectively (Sukanya Subramanian *et al.* (1990). Analysis of the antinutritional factor oxalate, revealed the Co-1 had the lowest (1.65%) and CAZRI 1128, the highest (2.22%) among the seven *Cenchrus* cultures.

Analysis of the seven *Cenchrus* cultures for vitamin content *viz.*, thiamine, riboflavin and carotene has revealed that the variety Co-1 has the highest thiamine content. Riboflavin content was highest in the culture CAZRI 1106. CAZRI 75 was estimated to have highest carotene content among the seven *Cenchrus* cultures (Table 4).

The micronutrient contents *viz.*, iron, copper, zinc and manganese of the seven *Cenchrus* cultures were estimated (Table 5).

The culture Co-1 had the highest micronutrient content of iron, zin and manganese. Copper content was highest in CAZRI 1263. The micronutrient content of *Cenchrus glaucus* with respect to iron, copper, zinc and manganese was 385 ppm, 16 ppm, 23 ppm and 56 ppm as reported by Sukanya Subramanian *et al.* (1990). Nooruddin and Roy (1998) reported that feeding bullocks with cowpea (*Vigna unguiculata)* forage at the pod stage having crude protein (15.75%), other extract (2.55%), crude fibre (16.01%), nitrogen-free extract (45.41%), total carbohydrate (71.42%), total ash (10.28%) calcium (1.47%) and phosphorus (0.39%) maintained the animals in positive nitrogen, calcium and phosphorus balance. The analysis of the nutritive and anti-nutritive factors in *Cenchrus* grass species will help in evolving new varieties.

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Table 1. Crude protein, crude fibre and dry matter content of seven cultures of *Cenchrus* grass.

Cenchrus cultures	Crude protein (%)	Crude fibre (%)	Dry matter (t ha^{-1})
CAZRI 358	7.80	34.00	26.75
CAZRI 75	9.42	32.30	28.10
IGFRI 3813	8.21	31.00	27.44
CAZRI 1128	8.75	28.96	29.00
CAZRI 1106	8.52	27.32	28.40
CAZRI 1263	8.02	35.75	22.70
Co-1	9.08	34.50	27.50
SE_d	0.02	0.52	0.60
CD	0.051	1.04	1.23

Table 2. Mineral content of seven *Cenchrus* cultures

Cenchrus cultures	Mineral content (%)			
	Inorganic phosphorus	Calcium	Potassium	Magnesium
CAZRI 358	0.28	0.42	0.56	0.32
CAZRI 75	0.30	0.50	0.60	0.24
IGFRI 3813	0.20	0.05	0.45	0.29
CAZRI 1128	0.24	0.52	0.48	0.44
CAZRI 1106	0.22	0.39	0.51	0.38
CAZRI 1263	0.18	0.59	0.53	0.40
Co-1	0.26	0.58	0.50	0.41
SE_d	0.002	0.003	0.004	0.003
CD	0.004	0.006	0.009	0.007

Table 3. Oxalate content of seven *Cenchrus* cultures

Cenchrus cultures	Oxalate (%)
CAZRI 358	1.79
CAZRI 75	1.84
IGFRI 3813	2.22
CAZRI 1128	2.10
CAZRI 1106	1.78
CAZRI 1263	1.70
Co-1	1.65
SE_d	0.003
CD	0.006

Table 4. Vitamin content of seven *Cenchrus* cultures

Cenchrus cultures	Thiamine (µg/100 g)	Riboflavin (µg/100 g)	Carotene (µg/100 g)
CAZRI 358	66.0	43.8	0.75
CAZRI 75	80.2	55.0	0.82
IGFRI 3813	82.0	52.0	0.64
CAZRI 1128	69.3	61.0	0.51
CAZRI 1106	70.0	67.0	0.57
CAZRI 1263	64.0	59.3	0.48
Co-1	90.0	60.0	0.61
SE_d	0.50	0.30	0.03
CD	1.10	0.70	0.06

the micronutrient content *viz.*, iron, copper, zinc and manganese. All the analyses were carried out by the method of AOAC (1990).

Results and Discussion

The analysis of crude protein content (Table 1) of the seven *Cenchrus* species has revealed CA 75 to contain the highest. The cultures CAZRI 1 and CAZRI 1128 recorded highest crude fibre dry matter production respectively. Cowpea (*Vi unguiculata)* genotypes evaluated for crude fibre crude protein contents 50 days after sowing reco maximum of 25.1 and 23.6% respectively (Aravin