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Comparative nutritional values of dinanath grass and sweet sorghum fodder at the post-flowering stage for crossbred heifers

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ABSTRACT

The feeding value of dinanath grass with sorghum fodder at the post-flowering stage was compared. In the present study, sixteen crossbred heifers (274±11 d; 85.3±4.9 kg) were grouped in 8 pairs based on their age and live weight. One animal from each pair was randomly allotted to one of the two groups, T_1 and T_2. In T_1, the animals were offered dinanath grass fodder, whereas in T2, sorghum fodder was offered ad libitum and the fodders were enriched with urea at 0.4 and 0.2% on a fresh weight basis, respectively. They were also given 1 kg of concentrate mixture (40% wheat grain; 40% groundnut cake; 20% husk), 30 g of common salt, and 30 g of chalk daily for 13 weeks. The bodyweight of the animals was calculated by the weekly multiplication of the length (cm) and heart girth (cm) of the animal divided by 11200. After 21 days of adaptation, a 7-day digestibility trial was conducted to compare the intake and digestibility of nutrients. The samples were chemically analyzed for proximate principles using standard techniques. The data were subjected to statistical analysis using the paired 't' test. It can be concluded that dinanath grass and sorghum fodders are both equally inferior in nutritive value at the post-flowering stage and may not be continued for a long period as the sole feed without nutrient supplementation.

Keywords: ADG, Digestibility, Dinanath grass, Intake, Sorghum.

Introduction

The regional deficits in fodder are more important than the national deficit (Tiwari et al., 2016). The pattern of deficits varies in different parts of the country. To supply green fodder from one location to another is not feasible because of the involvement of transportation. In such conditions, locally available weeds, inland crops, or imported fodder crops play an important role in sustainable livestock production.

It is very difficult to increase the area under fodder crops because of the population pressure for food and fibre (Riaz et al., 2020). Fortunately, the Indian sub-continent is one of the world's megacenters of crop origin and crop plant diversity because of the availability of a wide spectrum of eco-climates. The Indian gene centre possesses rich genetic diversity in native grasses and legumes. Almost one-third of Indian grasses are considered to have fodder value for livestock. It is necessary to explore high-yielding fodder crops that may be suitable for cultivation in particularly green fodder deficit locations, evaluate locally available fodder crops, and improve them to overcome inferiority factors.

With profuse tillering capability, dinanath grass (*Pennisetum pedicellatum*) is a quick-growing, luscious, leafy, and thin-stemmed grass that grows well in poor, eroded soils in areas receiving 500–1500 mm of annual rainfall. It is a high-yielding, tall, annual, tufted perennial forage (Asmare et al., 2017). This crop is of short duration and fits well in the small period between two major crops. The grass thrives and performs well on a wide range of soils (including degraded sandy or ferruginous soils), provided they are well-drained (FAO, 2010). Because of its high fodder production potential and tolerance towards drought, insect and disease infestation, dinanath grass is becoming more popular day by day, but reducing the unwanted volume and extracting true seeds from spikelets for efficient post-harvest handling, transportation, and various farm operations is required for large-scale utilization of dinanath grass as forage for animals (Vijay et al., 2018). Maity et al. (2017) worked on layered pelleting of the nucleus seed of dinanath grass with soil and observed the highest germination of 91%. Seed yield of grasses is very low, while demand for seed upgrading of grasslands is high (Meena and Nagar, 2019). The feeding value of dinanath grass fodder at early and pre-flowering stages has been assessed and found to be similar to that of sorghum fodder (Kishore and Verma, 2000).

Keeping the above facts in consideration, the present experiment was conducted to compare the feeding value of dinanath grass with sorghum fodder at the post-flowering stage.

Materials and Methods

Dinanath grass (Variety T-10) and sorghum (Variety CSH-1) were grown at the farm at a suitable interval to maintain the stage of the plant at harvest for feeding, following standard agronomical practices. At the stage of post-flowering, the crops (dinanath grass: 90–110 days after sowing; sorghum: 80–90 days after sowing) were harvested for proximate analysis (AOAC, 2019) and used for the experimental feeding of animals.

Sixteen crossbred heifers (*Sahiwal x Jersey*) were selected at the dairy farm and grouped into 8 pairs based on their age (274±11 d; 85.3±4.9 kg). One animal from each pair was randomly allotted to one of the two groups, T_1 and T_2. In group T_1, the animals were offered dinanath grass, whereas in group T_2, they were given sorghum fodder *ad libitum*. As the crude protein content in dinanath grass (4.90%) and sorghum (5.16%) at the post-flowering stage was very low (Table 1), the fodders were enriched with urea at a rate of 0.4 and 0.2% on a fresh fodder weight basis in the T_1 and T_2 groups, respectively. They were also given 1 kg of concentrate mixture (40% wheat grain; 40% groundnut cake; 20% husk), 30 g of common salt, and 30 g of chalk daily.

The experimental heifers were housed in a large shed with partitions in the troughs for individual feeding. The fodder was offered to the animals in the morning and the concentrate mixture in the afternoon. The heifers were let loose in an open enclosure for 4 hours before feeding fodder. The animals had free access to drinking water.

Table 1: Chemical Composition at post flowering stage (%)

Nutrient	Dinanath grass		Sorghum fodder		Concentrate Mixture
	Enriched with urea		Enriched with urea		
	Without	With	Without	With	
DM	30.5	29.2	39.6	37.4	92.5
CP	4.90	7.00	5.16	8.04	16.9
EE	4.26	4.28	4.33	4.36	5.59
CF	38.9	38.3	36.7	36.2	18.1
NDF	68.3	67.0	65.6	64.2	51.3
ADF	39.4	39.0	33.7	32.	25.7
GE*	3.31	3.28	3.35	3.33	3.73
ASH	10.3	10.2	7.49	7.58	12.0
NFE	46.6	39.9	46.3	43.8	47.4
OM	89.7	89.9	92.5	94.4	88.0
AIA	2.79	2.78	3.05	3.02	3.09
H.Cell.	28.9	28.0	31.9	32.2	25.6
TCHO	80.5	78.5	83.0	80.0	65.5
** Mcal/kg*					

The bodyweights of the animals were calculated weekly based on body measurements, i.e., the multiplication of the length (cm) and heart girth (cm) of the animal divided by 11200. After 21 days of adaptation, a 7-day digestibility trial was conducted to find out the intake and digestibility of the nutrients. The collected samples were chemically analyzed for proximate principles using standard techniques. The data recorded during the experiment were subjected to statistical analysis using suitable methods (Snedecor and Cochran, 1994).

Results and Discussion

The contents of dry matter, crude protein, ether extract, gross energy, organic matter, acid insoluble ash, hemicellulose, and total carbohydrates were high and crude fibre, neutral detergent fibre, acid detergent fibre, ash, and nitrogen-free extract low in sorghum fodder in comparison to those in dinanath grass (Table 1). These results were found to be contrary to Kishore and Verma (2000), which could be due to the different stages of fodder harvesting. The ranges of nutrients in both fodders varied from the study of Tilahun et al. (2017), which may be because of the different conditions of growing dinanth grass. However, the findings confirmed the results of Chakrabarti et al. (1988). Because of enrichment with urea, the content of crude protein increased, which may be due to the high nitrogen content (46% in urea). The chemical composition showed very little variation with the observations of Sonawane et al. (2019), which could be due to different varieties of sorghum fodder.

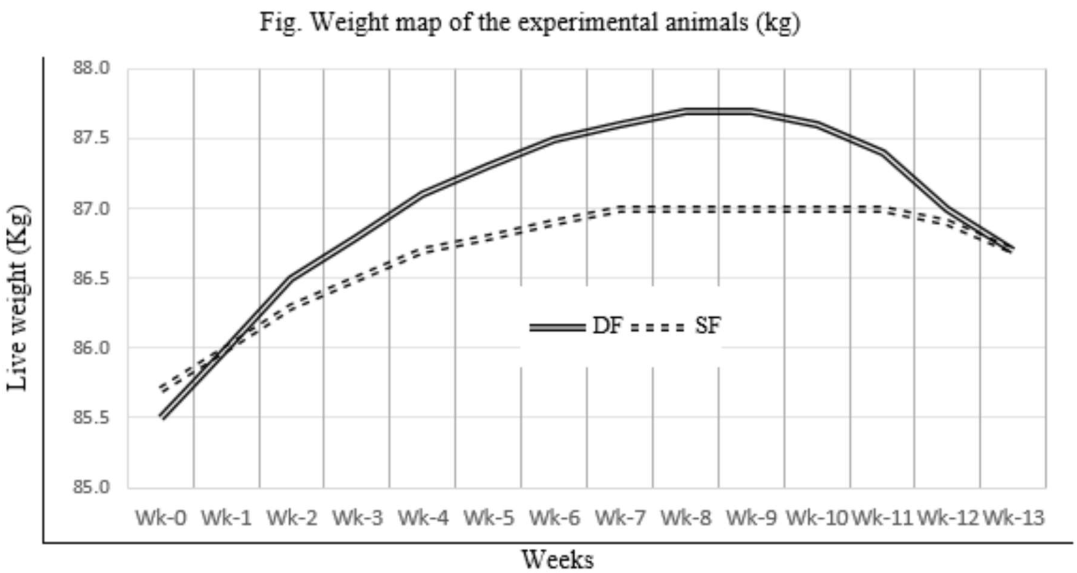
The consistently but not significantly ($P > 0.05$) higher dry matter digestibility of dry matter in T_1 compared to that in T_2 is presented in Table 2, which confirms the results of Kishore and Verma (2000). Higher digestibility coefficients in T_1 in comparison to those observed in the literature (Jakhmola and Pathak, 1983) may be due to the enrichment of fodder with urea, which increased the CP content of the feed and hence enhanced microbial activities in the rumen ecosystem. It is a well-known fact that for the fullest expression of the potential digestibility of non-leguminous forages, the crude protein content of the diet should be 8 per cent. The digestibility coefficients of energy and fibre components, especially acid detergent fibre, were observed on the higher side in T_1 in comparison to those in T_2 and confirmed the findings of Kishore and Verma (2000).

Table 2: Nutrient utilization Nutrient

Digestibility Coefficient			
Nutrient	**Unit**	**T1**	**T2**
DM	(%)	60.7±1.1	57.9±1.7
CP	(%)	68.6±1.0	64.3±1.3
CF	(%)	40.7±3.9	42.8±3.0
NDF	(%)	53.2±1.2	52.9±1.5
ADF	(%)	60.1±1.3	57.0±1.8
Gross Energy	(%)		
Intake			
DM	kg/100kg LW	2.17±0.10	3.31±0.18
	$g/kgW^{0.75}$	68.8±4.7	102±7
DDM	kg/100kg LW	1.87±1.00	1.73±0.9
	$g/kgW0^{.75}$	38.8±2.2	66.8±3.6
CP	kg/100kg LW	243±13	352±13
	$g/kgW^{0.75}$	7.19±0.30	10.76±0.5
DCP	kg/100kg LW	161±9	225±7
	$g/kgW^{0.75}$	4.94±0.28	6.89±0.26
DE	M cal/100kg LW	5.12±0.27	6.57±0.37
	$K cal/kgW0.^{75}$	134±7	190±11
Gains			
ADG	g/d	101±99.83	76±85.57

Significantly higher intakes of dry matter and crude protein were recorded in T_2 ($P < 0.05$) in comparison to T_1 (Table 2). The intake data in T_2 is in agreement with Randhawa et al. (1988). A higher intake of digestible nutrients like digestible dry matter, digestible crude protein, and digestible energy may perhaps be due to a higher intake of the nutrients. The present intake data was recorded in line with the results reported in the literature (Kishore and Verma, 2000).

The average daily gains in the two groups (Fig. 1) under study were non-significant ($P > 0.05$), despite significantly higher intake data in T_2. The average daily gain was showing a trend towards fall. The animals started losing weight in weeks 10 in T_1 and 12 in T_2. The reason for this declension could perhaps be due to the availability of nutrients in both fodders at the post-flowering stage.



Note: DF denotes T1, and SF T2.

It can be concluded based on this study that dinanath grass and sorghum fodder are both inferior in nutritive value in the post-flowering stage and should not be continued for a long period of time. If it is necessary to continue with these fodders, the diet should be enriched or supplemented with nutrients to meet the nutritional requirements of growing crossbred heifers.

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