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Comparing the Effect of Feeding *Zea mays* and Cumbu Napier Hybrid Grass on Milk Yield and its composition in Cross Bred (Jersey x Sindhi) Cattle

M. Suganthi[1*], S. Gunasekaran[1], P. Anuradha[1], S. Usha[2] and L. Radhakrishnan[3]
[1]Assistant Professor, Institute of Animal Nutrition,
Tamil Nadu Veterinary and Animal Sciences University, Kattupakkam (Tamil Nadu), India.
[2]Assistant Professor, Department of Livestock Production and Management,
Madras Veterinary College, Tamil Nadu Veterinary and Animal Sciences University (Tamil Nadu), India.
[3]Professor and Head, Institute of Animal Nutrition,
Tamil Nadu Veterinary and Animal Sciences University, Kattupakkam (Tamil Nadu), India.

(Corresponding author: M. Suganthi)*
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ABSTRACT: Maize is one of the important most nutritious non-legume green fodders which is free of antinutritional factors. An lactation trail was conducted in crossbred (Jersey × Sindhi) milch cows for 60 days to compare fodder maize and Cumbu Napier Hybrid (CN Hybrid) grass on the milk yield and milk composition parameters. Eighteen crossbred (Jersey × Sindhi) cows in second and third lactation with an average body weight of 363 ± 15.86 kg were selected and were randomly divided into six groups (6 × 3 cows). The experimental animals were fed with green fodders Maize and Cumbu Napier hybrid grass in different combinations *viz*., T_1- Feeding green fodder with 100 % maize, T_2- Feeding green fodder with 75 % maize + 25% CN Hybrid, T_3- Feeding green fodder with 50 % maize + 50 % CN Hybrid, T_4- Feeding green fodder with 25 % maize + 75% CN Hybrid and T_5- Feeding green fodder with 100 % CN Hybrid. Control group animals (T_6) were fed with paddy straw alone. The experimental data revealed that feeding of recommended green fodder as maize 100 % (T_1) and feeding green fodder with 75 % maize + 25% CN Hybrid (T_2) increased the milk yield and milk quality parameters. This was followed by the next best treatments such as CN hybrid grass feeding along with maize in different combination (T_3, T_4 and T_5). Significantly higher milk fat and SNF was observed in T_1 group. Significant (0.05%) difference in SNF was observed between treatments and control. Similar trend was observed in lactation length and inter calving period also. Hence it could be concluded that feeding 100% of recommended green fodder as maize increased the milk yield and milk composition in crossbred (Jersey × Sindhi) milch cows.

Keywords: Cumbu Napier hybrid grass, Maize, Feeding, Milk yield, Lactation length, Fat, and SNF.

INTRODUCTION

Maize is one of the oldest and most versatile emerging crops having wider adaptability under varied agro-climatic conditions. Maize is known as queen of cereals because it has the highest genetic yield potential (Ananthi *et al.*, 2017). In world, Maize is cultivated in an area of 179.9 m.ha across 165 countries with average productivity of 5.63 t/ha (USDA 2016). In India, maize is cultivated in an area of 9.3 million hectares with a production of 24.2 million tonnes and productivity of 2564 kg ha^{-1} (Season and crop report, 2014). In Tamil Nadu, maize is cultivated in an area of 3.4 million hectares with a production of 18.30 million tonnes and the productivity is 5359 kg ha^{-1} (Season and crop report, 2014).

Maize is one of the most nutritious non-legume green fodders. The high acceptability of maize as fodder can be judged from the fact that it is free from any antinutritional components. Maize is quick growing, yields high biomass, and is highly palatable. It is a good quality fodder and contains sufficient quantities of protein and minerals and possesses high digestibility as compared to other non-legume fodder (Nkhata *et al*., 2018). Feeding alone accounts for two-third of the total cost in animal production (Chaudhary *et al*., 2014). In Tamil Nadu popularization of high yielding varieties and hybrid is easily possible due to rapid increase in the demand of maize for poultry and animal feed and for industrial uses (FAO, 2006).

The energy available from maize is used more efficiently for milk production. This is primarily because the majority of the starch from maize is digested in the intestine. A cow can use intestinally digested starch more efficiently for milk production (Granzin, 2004). It is quick growing high yielding and supplies essential nutrients which can be fed at any stage of growth without any risk to animals as it is free from anti-metabolites. Feed cost are considered to represent up to 45-60% or even more of the total cost of producing milk depending on management. It is a rich source of protein for livestock with constitutes sufficient quantities of soluble sugars (Naveen Kumar *et al*., 2020). It is highly palatability, rich in essential

nutrients, and helps to stimulate milk production and milk quality in cattle (Sattar *et al*., 1994).Similarly, nutritive and palatable cumbunapier hybrid grass is also fed to cattle to meet out its green fodder requirement.

Hence, the present study was conducted to compare the feeding of maize fodder and Cumbu Napier hybrid grass in different combination in crossbred (Jersey × Sindhi) milch cows on the milk yield and milk composition.

MATERIALS AND METHODS

The fodder cultivation experiment and lactation trial was conducted at Post Graduate Research Institute in Animal Sciences, Tamil Nadu Veterinary and Animal Sciences University, Kattupakkam. This institute is located in the North Eastern agroecological zone of Tamil Nadu at 13.04°N latitude, 80.17°E longitude and at an altitude of 6.7 MSL. The mean annual rainfall is varied from 1105-1214mm. The mean maximum and minimum temperatures were 34.4 and 25.1°C during 2017-2018. The mean annual rainfall recorded was 1108.2 mm during 2017-18 with an average relative humidity of 75.6%. Table 1 provides the details of the climatic parameters during the experimental period.

Soil parameters. The soil type of the fodder cultivated field for maize and CN hybrid grass was sandy clay loam with medium for available nitrogen (284 kg/ha), phosphorus (30 kg/ha) and potassium (184kg/ha), respectively. The physio chemical properties of the soil at experimental sites are presented in Table 2.

Table 1: Climatic parameters during the experimental period.

Month	Temperature (°C)		Relative humidity (%)	Rainfall (mm)
	MAX.	MIN.		
April - 17	37.4	26.5	74	0.00
May-17	38.2	27.2	68	18.90
June-17	38.1	27.2	66	80.30
July-17	37.7	27.0	66	107.0
August- 17	37.1	26.6	68	224.6
September-17	36.5	26.4	70	101.6
October-17	32.5	24.7	82	253.6
November-17	31.3	24.1	85	275.6
December -17	30.9	23.4	83	42.6
January -18	30.6	22.6	83	2.60
February -18	30.9	22.4	82	1.60
March-18	31.4	22.6	81	0.00

Table 2: Physio chemical properties of the soil value characteristics.

Soil type	Sandy Clay Loam
pH	6.16
EC (dS/m)	0.13
Soil bulk density (g/cc)	1.58
Organic Carbon (%)	0.295
Available Nitrogen (kg/ha)	284
Available Phosphorus (kg/ha)	30
Available Potassium (kg/ha)	184

Experimental animals and design of experiment. The experiment was conducted at Post Graduate Research Institute in Animal Sciences, Tamil Nadu Veterinary and Animal Sciences University, Kattupakkam in cross bred (Jersey × Red Sindhi) milch cows for a period of sixty days. Eighteen mid - lactating with an average body weight of 363 ± 15.86 kg was selected and divided into six groups of three each according to their body weight, age, parity and stage of lactation. The experimental animals were housed in well ventilated barns. All the animals were dewormed before the start of experiment for ecto and endo parasites. Animals were fed with green fodder as Maize and Cumbu Napier Hybrid grass in different combinations from Treatment T_1-T_5 to satisfy 60 % (5.45 kg) of the dry matter requirement. Treatment details were given in Table 3. All the treatment cows were offered concentrate feed to satisfy 40% of the dry matter requirement. The control animals were offered paddy straw as roughage source to meet the dry matter requirement.

Table 3: Roughage feeding details of the experimental animals.

Treatments	Details
T_1: Feeding green fodder - 100 % maize	
T_2: Feeding green fodder 75 % maize + 25% CN Hybrid	
T_3: Feeding green fodder 50 % maize + 50 % CN Hybrid	
T_4: Feeding green fodder 25 % maize + 75% CN Hybrid	
T_5: Feeding green fodder - 100 % CN Hybrid	
T_6: Control (feeding with paddy straw)	

Parameters studied. Growth parameters and nutrient parameters such as biomass yield, crude protein, crude fiber, total ash and Nitrogen Free Extract of maize and Cumbu Napier hybrid crops were compared. The samples for the nutritive parameters were analyzed as per AOAC (2000).

Average milk yield and milk yield per lactation, lactation length and milk quality parameters (Fat % and SNF %), were recorded. Milk samples were analyzed chemically based on ISI standard methods. Milk fat, was analyzed by Gerber method.

Statistical analysis. Statistical analysis was carried out by Gomez and Gomez method (Gomez and Gomez 1984).

RESULTS AND DISCUSSION

Biomass yield and nutritional quality of Maize and Cumbu Napier Hybrid Grass. *Zea mays* and Cumbu Napier hybrid grass crops nutrient status of these two crops were studied to assess its quality and to calculate the required quantity of green fodder. Details of the study is given in Table 4.

The crude protein content and fat percentage of maize fodder was higher compared to CN hybrid grass. However crude fiber content was lower in maize compared to Cumbu Napeir Hybrid grass.

Milk yield and milk quality parameters. Milk yield and milk quality parameters are the most important criteria to workout the cost of production of milk. The average milk yield between treatments ranges from 6.15 to 7.27 kg/animal/day. The highest milk yield (7.27 kg/animal/day) was recorded in T_1 group. From this experiment, no significant difference in milk yield was observed between maize at 100 % (T_1) and 75 % maize + 25% CN Hybrid grass (T_2) level groups. There is a significant difference in milk yield noticed between the treatments of feeding maize and CN hybrid grass. Lesser percentage of Maize feeding (50 % and 25 % maize) reduced the milk yield accordingly which was on par with 100 % CN hybrid grass fodder feeding. In control, the average milk yield was reduced to the tune of 31.77 percent (Table 5).

Table 4: Comparative biomass yield and nutritional quality of Maize and Cumbu Napier Hybrid Grass (Mean±SE).

Crop	Plant height at harvest (in cm)	Biomass yield (t/ha)	Dry matter yield (t/ha)	Crude protein (%)	Crude fiber (%)	Fat (%)	Total ash	NFE
Cumbu Napier hybrid grass	172.5 ±0.83	347.25 ±0.75	75.25 ±0.29	8.25 ±0.04	31. 90 ±0.51	2.30 ±0.05	8.12 ±0.05	49.30 ±0.08
Maize	160.2 ±1.16	32.2 ±0.40	18.1 ±0.14	8.95 ±0.08	31.20 ±0.20	4.10 ±0.04	7.85 ±0.11	47.90 ±0.53

*Mean of six samples

Table 5: Average milk yield (Kg), Fat (%) and SNF (%) of experimental groups (mean values).

Treatments	Average milk yield (kg/animal)	Lactation length (days)	Milk quality		Intercalving period (days)
			Fat (%)	SNF (%)	
T_1	7.27	310	4.86	8.14	281
T_2	7.20	305	4.85	8.12	301
T_3	6.76	280	4.38	8.04	306
T_4	6.43	278	4.28	8.08	321
T_5	6.35	295	4.54	8.07	326
T_6	4.96	270	4.13	8.01	331
S.Ed	0.28	0.519	0.11	0.07	16.5
CD(0.05)	0.58	1.4	0.20	0.15	34.08

There is no significant difference was observed in fat and SNF content in T_1 and T_2 group. Higher fat and protein content and high palatability of maize may be the reason for increasing milk quality parameters. Feeding of Maize fodder above 50 percent (*i.e.* T_1 and T_2) increased lactation length significantly. The next best treatments were T_3, T_4, T_5.

Significant increased in lactation length and inter calving period was observed in T_1 and T_2 groups compared to other treatment groups. The same trend was noticed in inter calving period also (Table 5). Higher fat and protein content in maize may improved the animal health of the experimental animals could be the reason for increasing lactation length and reducing intercalving period.

The results such as milk yield and milk quality parameters are in coincidence with Iqbal *et al.* (2006); Hukkeri *et al.* (1977); Sattar *et al.* (1994). They observed that fodder maize contains desirable forage characteristics *viz*., high dry matter yield, high protein concentration, high energy concentration (high digestibility), high intake potential (low fibre content) and optimum dry matter concentration at harvest. This might be the reason for increasing the milk yield and milk quality parameters such as fat percent and SNF content in milk.

Carter *et al.* (1991) also reported that maize fodder contains higher fat percentage and which increases the milk yield and milk quality parameters of cows. Lactating dairy cows require high-energy maize fodder for maximum milk production (Marsalis *et al.* 2010; Irlbeck *et al*., 1993).

CONCLUSION

From this experiment, it can be concluded that feeding green fodder as maize 100 % (T_1) and feeding green fodder with 75 % maize + 25% CN Hybrid (T_2) increased the milk yield and milk quality parameters like fat and SNF. The same trend was observed in lactation length and intercalving period also. Hence it could be concluded that feeding of recommended green fodder as maize at 100% or at 75% level in the roughage component can increase the milk yield and

milk parameters in crossbred (Jersey × Sindhi) milch cows.

FUTURE SCOPE

Further the study can be continued with feeding of maize in different stages of harvest. The milk quality parameters and yield could be compared in different stages of maize feeding.

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