

Feed Intake, Weight Gain and Haematology in Crossbred Heifers Fed on Green Maize (*Zea mays*) and Anjan Tree Leaves (*Hardwickia binata roxb.*)

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Abstract: A feeding management experiment was conducted to determine the effect of green maize and anjan tree leaves on the performance of crossbred heifers. Fifteen crossbred heifers of 7 to 26 months age and 79 kg average initial body weight were divided into three equal groups, T1, T2, T3 having green maize (zed mays) + jawar straw+ concentrate, 40:60 anjan tree leaves (hardwickia binata roxb.) + Green maize + jawar straw + concentrate, 60:40 anjan tree leaves (hardwickia binata roxb.) + Green maize + jawar straw + concentrate respectively. The trial was conducted with the help of factorial randomized block design (FRBD). Higher mean DM content was observed in anjan leaves (41.85) than green maize (25.75) on per cent DM basis. While CP content were higher in 60:40 anjan tree leaves+green maize mixed forage 60:40 and anjan tree leaves alone. Ash contents were significantly higher in jawar straw containing diet as compared to green maize and anjan tree leaves. Mean daily DMI was higher on T1 followed by T2 and T3. Daily water intake was significantly higher in T2 and T3 than T1. Highest body weight was observed on green maize T1 and T2 40:60 anjan trees leaves green maize mixed forage. Blood glucose level decreased, from 42.85 to 42.40 mg/dl on feeding T1 control diet. While levels showed an increase from 37.62 to 46.25 and 39.14 to 48.20 mg/dl in heifers on feeding T2 and T3 rations over 17 week's period. On the other hand, serum total cholesterol and serum triglyceride levels exhibited improvement irrespective of treatments in all heifers. The increase was from 75.64 to 81.84, 75.89 to 83.18 and 75.20 to 82.25 mg/dl in serum total cholesterol levels under T1, T2 and T3 group heifers. While the increase in serum triglyceride values were from 5.46 to 5.77, 5.78 to 6.32 and 6.15 to 6.75 mg/dl in T1, T2 and T3 heifers respectively. The level of blood parameters were found within the prescribed range of heifers. Hence it could be said that feeding of leguminous anjan tree leaves in combination with green maize along with dry roughage and concentrate had no health challenges to crossbred heifers.

Keywords: Hardwickia binata Roxb., crossbred heifers, weight gain, DMI, hematology

1. Introduction

Livestock sector has been steadily growing faster than any other subsectors. It is predicted that livestock sector will account more than half of total agriculture output by 2020 in economic terms (Inigo Gensis and Mahesh Chander 2010). It is true that performances of animals are dependent on heredity, though non genetic factors are equally important to explore the genetic potential. Of the different non genetic factors, feeding, management appears to be most critical one limiting the performance of animals. Edible fodder tree leaves appear to be the best alternative source as a supplement feed in the ration of growing heifers. Anjan tree (*Hardwickia binata roxb.*) is one of them, basically introduced in forest area for fodder, manure and fuel purpose (Prasad et al 1974). A leguminous tree providing the green foliage throughout the year, particularly during summer months. Anjan tree leaves contain 10 to 15% CP with fairly high amount of EE. The calcium content of leaves is 2 to 3 times more than that of cultivated fodder or grasses. Therefore, anjan tree leaves could serve as protein supplement to low grade greens and dry roughages.

However Tannin content of tree leaves is known to influence palatability, acceptability and utilization of nutrients in animals. Wide variations in the content of tannin in different species of tree leaves have been reported. The CP digestibility in some tree leaves is affected regardless of

their stage of harvesting vis-a-vis their tannin content, which, is mainly due to the partition of total tannin in condensed and hydrolysable forms (Lohan et al 1980). Anjan tree leaves do contain 10.45% tannin on dry matter basis which may vary according to season, being higher in summer followed by rainy and winter months cutting (Singh et al 1998). However ruminants tolerate relatively high level of tannin in feed as compared to non ruminants. Thus, in cattle when fed with a diet containing up to 5% tannic acid no toxic symptoms were observed (Bangarwa et al 1994).

2. Materials and Methods

A feeding experiment was conducted to determine the effect of anjan tree leaves and green maize on the performance of crossbred heifers. Everyday fresh leaves were lopped from the tree for feeding heifers. Fifteen crossbred heifers having 54 to 120 kg BW with 7 to 26 months age were selected. The selected heifers were divided into three groups on the basis of nearness in BW and age thereby five heifers in each group and housed individually in the conventional tail to tail system. The crossbred heifers were provided one week pre experimental trial for adjustment with new feed. Further one heifer from each group was allocated randomly to each treatment namely: (T1) green maize + concentrates: conventional feeding as per recommendations.

(T2) 40:60 anjan leaves green maize mixed forage + concentrates to fulfill remaining DCP and TDN.

(T3) 60:40 anjan leaves green maize mixed forage + concentrates to fulfill remaining DCP and TDN.

(All the heifers were provided ad lib. Jawar straw as dry fodder.)

Care was taken to maintain hygienic environment in the shed by adopting regular practice a cleaning the sheds, cleaning and grooming of heifers, deworming of heifers and disinfection of sheds by using 0.5% malathion @ 50 EC spray. The nutrient requirements of heifers were computed individually as per norms suggested by Jagdish Prasad and Neeraj (2008). A commercial compounded concentrate mixture 'Sagr Shakti' was provided to fulfill DCP and TDN requirements of the control T1 group heifers considering the supply of DCP and TDN through 40:60 T2 and 60:40 T3 anjan leaves green maize mixed forage on fresh basis, the balance nutrient requirements were provided through concentrates. The feed were offered in the morning hours and left over was measured at 15.00 hours and again measured quantity of feed was given of which left over was taken in the next day morning in order to calculate intake of different feeds by the heifers. Observations on DMI, and VWI were recorded twice a week while changed in BW were recorded at weekly interval. Beside this metabolic blood profile in terms of serum glucose, serum total cholesterol and serum triglyceride were recorded at the start of trial and subsequently at monthly interval.

3. Results and Discussion

3.1 Feed Composition

Table 1: Average Chemical Composition of Feedstuff (% on DM Basis)

Feedstuffs	DM	CP	EE	CF	TA	NFE
Green Maize	25.75	9.76	1.17	32.73	7.81	48.53
Anjan Leaves	41.85	12.66	3.31	27.72	8.92	47.39
Jawar Straw	91.6	3.37	1.48	34.23	7.14	43.95
Concentrate Mixture	89.2	19.65	6.55	6.1	7.58	60.12
Anjan : Maize (40:60)	35.86	11.93	2.06	36.85	7.52	41.64
Anjan : Maize (60:40)	38.97	12.03	2.58	33.13	8.16	44.10

It appears from Table.1 that on an average the Anjan tree leaves were rich in CP, EE and TA contents by 2.9, 2.14 and 1.11 % respectively than that of traditional green maize roughages. Anjan leaves were leguminous which might be the reason to have more nutrient contents as compared to non leguminous fodder. In this reference Dharia et al (1987), Kundu and veena Sharma (1988) and Majgaonkar et al. (1990) reported that CP content of tree leaves were comparable with that of cultivated leguminous fodder and were higher than that of common cultivated fodders like sorghum, maize, oat and hybrid Napier.

The CP values reported by Rekhate et al (2002) in the range of 12.44 to 12.76 % in Anjan leaves are comparable with that of present results while the CP content (12.66) of Anjan leaves obtained in the present study falls within the range of 11.27 to 13.85 % as reported by Mehta and Bhaid (1984). Perhaps locality, season of cutting and cutting interval might be the factor to influence CP content in leaves. These views

get supported with the observation of Singh et al (1994). It was specially observed that Anjan tree leaves were containing practically 2.8 times more EE nutrient than that of green maize, being 3.31 % against and contained of 1.17 % in maize. This means Anjan tree leaves are capable to provide more energy in the ration. The EE contained of Anjan leaves were higher than many cereal and legume forages according to Prasad et al (1974).

A reference to Table 1 further indicates that Anjan leaves were containing high amount of ash indicating high mineral content in leaves. TA content in leaves was 8.92 % against the content of 7.81 % in green maize and 7.58 % in concentrate mixture. However Prasad et al (1974) and Singh et al (1994) indicated that Anjan leaves were rich in Ca but poor in P content, resulting a wide ratio between Ca and P. Anjan leaves and green maize mixed forage in the proportion of 40:60 and 60:40 on fresh basis was prepared for feeding to heifers. It is evident for Table 1 that the mixed forage (40:60) provided 35.86 % DM along with 11.93, 2.06, 36.85, 7.52 and 41.64 % CP, EE, CF, TA and NFE on DM basis respectively. While corresponding principle constituents of (60:40) mixed forage was 38.97% DM and 12.03, 2.58, 33.13, 8.16 and 44.10 % on DM basis respectively. Thus the incorporation of Anjan tree leaves with green maize was found to raise the CP contents of mixed forage in particular and in all the nutrients in general. However, the increased in nutrient content were dependant on the proportion of Anjan leaves with green maize, being higher with more proportion and vice versa. Pachauri and Pathak (1989) reported the CP content of mixture of green napier and leucaena forage (1:1 green basis) as 10.13%. The low CP content of mixed forage was attributed by them to high DM content (68%) of napier as compared to only 30% in leucaena. In the present study such effect was not observed because Anjan leaves were containing moderate DM (41.85%) as compared to 25.75 % in green maize fodder.

The concentrate mixture, a commercial product under the trend name "Sagar Shakti" was containing 89.20% DM and 19.65, 6.55, 6.10, 7.58 and 60.12 % CP, EE, CF, TA and NFE on DM basis respectively. Use of higher CP level concentrate mixture in the present study was on account of fulfilling the nutritional requirements of growing heifers. Thus it appears that the Anjan tree leaves posses a potential of providing sufficient protein and energy in the ration during summer and rainy season. When there is a shortage of green roughages for animal feeding beside this, higher TA content is indicative of higher and sufficient mineral balance in leaves.

3.2 Dry Matter Intake

The highest DMI was observed for T1 having green maize fodder alone, followed by T2 and lowest on T3. Analyses of variance show significance difference between treatments. Deshmukh (2000) and Adagle (2013) also reported significant decrease in DMI of heifer with the increase level of anjan leaves feeding along with basal diet, the decrease being from 3.93 to 3.59 kg and 4.79 to 4.35 kg/day/heifer on feeding 3 and 5 kg anjan leaves respectively. However their DMI values are marginally higher than that of present DMI

values. Perhaps feeding of restricted quantity of anjan leaves by them might be the cause to raise DMI values in heifers. Thus the trend of DMI did suggest that the decrease in DMI on T2 and T3 feeding groups in relation to T1 group were not of a greater magnitude to influence adversely on nutrient intake in heifers. On the other hand, feeding of anjan leaves and green maize mixed forage was found advantageous to increase the roughage component in the ration. On one hand, and the reduction in the use of costly concentrate on the other hand in the ration of heifers.

Table 2: DMI, water intake, weight gain and hematology in crossbred heifers fed on green maize and anjan tree leaves

Variables	Treatments		
	T1	T2	T3
DMI / day (Kg)	3.77 ^a	3.76 ^a	3.20 ^b
Daily WI (lit)	11.42 ^a	12.28 ^b	12.09 ^b
Daily weight gain (Kg)	0.44 ^a	0.42 ^a	0.38 ^b
Plasma glucose (mg/dl)	42.40 ^a	46.25 ^b	48.20 ^c
STC (mg/dl)	81.84 ^a	83.18 ^{bc}	82.25 ^{ac}
Serum triglyceride (mg/dl)	5.77 ^a	6.32 ^b	6.75 ^c

A value with different superscripts within a row differs significantly.

DMI= Dry matter intake, WI = Water intake. STC = Serum total cholesterol.

3.3 Water Intake

The heifers maintained on T2 and T3 anjan leaves and green maize mixed rations drunk significantly more water by 5.86 to 7.53 % than that of heifers revealed on sole green maize diet T1. The average VWC was 11.42, 12.28 and 12.09 lit/day/heifers under T1, T2 and T3 treatments respectively. However the differences in water intake between T2 and T3 groups were found non significant. VWC in heifers was influenced by the type of ration viz. green maize alone or mixed forage diets. But source of protein viz: either from concentrates or from anjan leaves was not the factor to affect water intake in heifers. On the other hand, lower water consumption in T1 heifers could be justified on the fact that T1 heifers received green maize containing approximately 75 % water against the water content of 64 and 61 % on T2 and T3 mixed forage diet. As result, the heifers received 58.44, 52.29 and 51.32 % water through ration in T1, T2 and T3 treatments respectively. This might have fulfilled some more water requirement of the heifers on T1 diet as compared to T2 and T3 rations. This logic gets confirmed from the results of Chaudhary and Gupta (2002) where they reported that the buffaloes consumed 31.80 % of water through feeding of 40 kg maize against an intake of 5.71 % on feeding 5 kg maize/day/buffaloes. Moreover Bade (1993), Chaudhary and Gupta (2002), Looper et al (2007), Pereyra et al (2010) and Belay Duguma et al (2012) reported that many factors like type of diet, quantity of roughage, body size, physical environment, drinking water temperature, season and location were known to influence water intake in animals.

3.4 Daily Weight Gain

The average daily gain (ADG) in heifers between T1 and T2 groups did not differ significantly. The ADG was 0.44, 0.42

and 0.39 Kg/ heifers on T1, T2 and T3 feeding groups respectively. It is therefore clear from the trend that the growth rate was accelerated by feeding 40:60 anjan leaves + green maize T2 mixed forage to heifers and increasing the proportion of anjan leaves to level of 60% with green maize in T3 ration resulted in decrease of growth rate in heifers. Chadhokar and Sivasupiramaniam (1983) also opined that the growth of heifers was more sensitively to change in the proportion of gliricidia leaves in paddy straw rice polished ration. This observation supports the present trend. Perhaps the lower DMI coupled with short supply of proteins and energy in T3 heifers might be the reason for lower growth rate in heifers. On the other hand, adequate intake of DM and sufficient protein energy intake on T2 diet might have favored the growth rate in heifers.

3.4 Hematology

The average levels of blood glucose concentration were 42.40, 46.25 and 48.20 mg/dl/heifer under T1, T2 and T3 treatments respectively. All the values were found within normal range of 35 to 55 mg/dl (Brar et al 2011). However the average blood glucose concentration in heifers differed significantly between the treatments. Significantly highest blood glucose value of 48.20 mg/dl was recorded on feeding T3. While significantly lowest value of 42.40 mg/dl was obtained on feeding green maize T1 control diet to heifers. This means feeding of anjan leaves with green maize along with dry roughages and concentrate to heifers was found advantageous to improved blood glucose concentration due to better utilization of carbohydrates another by more energy status in heifers. This contention gets support of Hagawane et al (2009), where they opined that blood glucose level was one of the indicators of energy status of animals. Because the blood glucose levels exhibited a marginal decrease of 2.43% (from 42.85 to 41.83 mg/dl) in T1 heifers while it was increased by 40% (from 3.62 to 52.70 mg/dl) in T2 heifers and by 38.04% (from 39.14 to 54.03 mg/dl) in T3 heifers over a period of 120 days. However, in spite of either decrease or increase blood glucose levels, the values fall within the normal limit of 35 to 55 mg/dl Cole (1974) and Brar et al (2011).

The pooled means of STC content were 81.84, 83.18 and 82.25 mg/dl under T1, T2 and T3 heifers respectively. The STC concentration noticed in T1 and T3 group heifers were at par. While T1 value were significantly lower than that of STC levels of T2 heifers, but T2 values were found at par with T3 values. Despite of this the heifers from all the groups were meeting out the normal range of 70 to 150 mg/dl (Radostits et al 2000). Thus it appears that feeding of 40:60 anjan leaves + green maize T2 mixed forage diet was found beneficial to elevate STC levels in heifers. The serum triglyceride content of blood improved significantly on feeding 60:40 anjan leaves + green maize T3 mixed forage ration to heifers, the value being 6.75 mg/dl/heifer. Whereas it was 5.77 and 6.32 mg/dl in heifers on feeding green maize T1 control and 40:60 anjan leaves + green maize T2 mixed forage ration respectively. Moreover serum triglyceride values in T2 heifers were significantly more and lower over that of T1 and T3 values respectively. In spite of this the triglyceride content of all the heifers was within the normal range of 0 to 14 mg/dl (Romero et al 2000).

4. Conclusion

The crossbred heifers show comparable intake and gain on diets having conventional fodder green maize, specially the performance of heifers was comparatively better on mixing green maize anjan tree leaves in different combination. Anjan tree leaves can be incorporated in the conventional diet of the heifers to maintain daily intake and growth performance during feed scarcity period when conventional fodders are short and their nutrient contents are low.

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