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Effect of replacement of paddy straw with shredded arecanut spathe in total mixed ration on growth performance and haematobiochemical parameters of crossbred calves#

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Abstract

A feeding trial of 120 days was conducted to assess the effect of replacement of paddy straw by shredded arecanut spathe in total mixed ration for crossbred calves on growth performance and haematobiochemical parameters. Eighteen female crossbred calves of eight to twelve months of age were selected from Cattle Breeding Farm, Thumburmuzhy and randomly allotted to one of the three experimental groups were fed with complete rations viz., control- paddy straw based complete feed, T1- Complete feed with replacement of 50 per cent paddy straw by areca sheath and T2 – Complete feed with replacement of 100 per cent paddy straw by areca sheath (CP 13%, TDN 60%). All the experimental calves were fed as per ICAR, 2013. Statistically similar (P>0.05) average daily gain (ADG), total body weight (TWG), feed conversion ratio (FCR) were observed in animals fed control, T1 and T2 rations. The haemato-biochemical parameters such as haemoglobin, serum glucose, total protein, BUN, creatinine, calcium, phosphorus, magnesium, copper and zinc were similar (P>0.05) between the groups and the values were within the normal range reported for the species. Hence it was concluded that areca sheath can be effectively included in TMR completely replacing paddy straw without affecting growth performance and haematobiochemical parameters in female crossbred dairy calves.

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India is basically an agrarian country, where crop farming and rearing of livestock have economic and socio-cultural roles in the wellbeing of rural households. Although India has the largest population of livestock in the world, their productivity is comparatively low (Katoch *et al*., 2017). Studies have revealed that scarcity of year round availability of feed, continuous hike in the prices of commercial feeds over- reliance on low quality feed stuffs along with low genetic potential are the key reasons for low livestock productivity in the country. It has been estimated that by the year 2025, Indian livestock has an expected deficit of 68 per cent green fodder, 25 per cent dry fodder and 64 per cent feeds for meeting the mounting feed requirements (Ayyadurai *et al.,* 2013; Singh *et al.*, 2013).

A major gap exists between the demand and supply of conventional feed resources for feeding livestock in the world. In order to manage this gap of demand and supply, it is essential to increase the availability of unconventional feed resources for the different livestock production and management systems. One method is to exploit the use of non-conventional feed resources (NCFR) in livestock production systems (Salem *et al*., 2004). Potentially available NCFR includes materials such as crop residues and agro-industrial by-products. Most of these feed materials are low in energy, protein, minerals and contain high amounts of anti-nutritional components (Salem *et al.,* 2004).

Areca (*Areca catechu*) is a commercial plantation crop with high economic returns, widely cultivated in some regions of Karnataka, Kerala and Assam. Each arecanut tree sheds about 10 sheaths per year and the total annual yield of sheath is about 4500 sheaths per hectare. It is estimated that the potential availability of areca sheath is about 1.20 million tonnes annually and could be utilised as a valuable source of roughage feed for feeding ruminant livestock (Gaikwad and Bhargav, 2012).

Shredded arecanut spathe (AS), as replacement for paddy straw in total mixed ration for crossbred calves has not yet been studied thoroughly. Hence, the present study aims to assess the effect of replacing of paddy straw by shredded AS in TMR for crossbred calves on growth performance and haematobiochemical parameters.

Materials and methods

The feeding trial was conducted at the Cattle Breeding Farm, Thumburmuzhy Kerala, India.

Experimental animals

Eighteen female crossbred calves formed three treatments control, T1 and T2. The calves were selected as uniformly as possible with regard to age (between 8-12 months) and body weight, from Cattle Breeding Farm, Thumburmuzhy. These animals were maintained under uniform management conditions prevailing in the farm. All animals were dewormed before the start of experiment.

Experimental ration

Paddy straw based total mixed ration formed the control ration. T1 ration with paddy straw replaced with 50 per cent areca catechu spathe shred and T2 ration with paddy straw replaced with 100 per cent areca catechu spathe shred formed the test rations. All the feeds were isocaloric and isonitrogenous (13 per cent of CP, 60 per cent TDN). The proximate analysis of TMRs were done as per standard procedure (AOAC, 2016).

Body weight

Body weight of the animals was recorded at fortnightly intervals during the feeding trial of 120 days.

Daily dry matter intake (DMI)

Weighed quantities of experimental rations were fed individually based on the requirement as per ICAR (2013) recommendation to all the animals in the morning 8:30 AM and afternoon 1 PM. The residue if any in the manger was collected manually and weighed daily for analysing

the moisture content and estimating daily dry matter intake during the entire experimental period.

Data obtained on body weight was analysed statistically by using SPSS 21.0 software.

Haematological and serum biochemical parameters

Blood samples were collected at the end of the feeding trial from all the animals to estimate glucose, haemoglobin, blood urea nitrogen, total protein and serum creatinine using semi- automatic biochemical analyser with the help of standard kits from Agappe Diagnostics, Cochin, Kerala. Serum minerals such as calcium, magnesium, copper and zinc were estimated by Atomic Absorption Spectrophotometer (AAS) and inorganic phosphorus was estimated using semi-automatic biochemical analyser.

Results and discussion

The mean initial body weight, final body weight, total body weight gain, average daily and feed to gain ratio of calves fed three different feeding regimens, viz., control, T1, and T2 are given in Table 1. The haematobiochemical parameters assessed were haemoglobin (g/dL), serum glucose (mg/dL), total protein (g/dL), BUN (mg/dL), creatinine (mg/dL), calcium (mg/dL), phosphorus (mg/dL), magnesium(mg/dL), copper (mg/L) and zinc (mg/L) is given in Table 2. Data analysis revealed that the above parameters were similar (P>0.05) between groups.

The average initial body weights of the experimental calves were 126.90±7.71, 121.30±8 . 2 1 , 123.48±5.34 kg, the average final body weights were 192.58±16.21, 200.8 ±14.22, 183.68±5.56 kg, the average total weights gain were 65.68 ±10.51, 79.50 ±7.42 and 60.20±4.59, the average daily gain was 0.58 ± 0.09, 0.70 ± 0.06, and 0.53 ± 0.04 kg, and feed to gain ratio was 8.98 ± 0.86, 6.84 ± 0.35 and 8.48 ± 0.74 respectively, for calves maintained on rations control, T1 and T2.

The values of haemato-biochemical parameters of calves fed on experimental rations viz., control, T1 and T2 were 13.16 ± 1.03, 14.26 ± 0.88, 13.00 ± 0.87 for haemoglobin (g/dL), 63.03 ± 3.71, 65.09 ± 3.13, 62.98 ± 2.42 for serum glucose (mg/dL), 6.20 ± 0.26, 6.01 ± 3.33, 6.07 ± 0.52 for total protein (g/dL), 0.79 ± 0.09, 0.79 ± 0.07, 0.84 ± 0.06 for serum creatinine (mg/dL), 13.10 ± 0.70, 13.22 ± 1.67 , 13.59 ± 1.75 for serum BUN (mg/dL), 9.57 ± 0.26, 9.20 ± 0.42, 9.77 ± 0.13 for serum calcium (mg/dL), 7.19 ± 0.26, 7.44 ± 0.23, 6.93 ± 0.27 for serum phosphorus (mg/dL), 0.80 ± 0.08, 0.89 ± 0.07, 0.80 ± 0.05 (mg/L) for serum copper, 1.01 ± 0.07, 1.03 ± 0.09, and 1.01 ± 0.08 (mg/L) for serum zinc, 2.29 ± 0.02 , 2.26 ± 0.01, and 2.25 ± 0.01 (mg/dL) for magnesium respectively.

According to the findings reported by Singh *et al*. (2016) crossbred calves fed with wheat or rice straw based complete bocks had similar (P>0.05) average daily gain (ADG) as that of mash form of complete feed. Gowda (2019)

Table 1. Summarised data on body weight, total weight gain and average daily gain[1] of experimental crossbred calves

Parameters	Control	T1	T2	P value
Initial body weight (kg)	126.90±7.71	121.30±8.21	123.48±5.34	0.610^{ns}
Final body weight (kg)	192.58±16.21	200.8±14.22	183.68±5.56	0.387^{ns}
Total weight gain (kg)	65.68±10.51	79.50±7.42	60.20±4.59	0.121^{ns}
Average daily gain (kg)	0.58±0.09	0.70±0.06	0.53±0.04	0.237^{ns}
Feed to gain ratio	8.98 ± 0.86	6.84 ± 0.35	8.48 ± 0.74	0.103^{ns}

[1]Mean values are based on six replicates with SE

ns-non significant (P>0.05)

Table 2. Summarised data on haemato-biochemical parameters1 of crossbred dairy calves maintained on three experimental rations

Parameters	Control	T1	T2	P value
Blood haemoglobin (g/dL)	13.16±1.03	14.26±0.88	13.01±0.87	0.593^{ns}
Serum glucose (mg/dL)	63.03±3.71	65.09±3.13	62.98±2.42	0.864^{ns}
Total protein (g/dL)	6.20±0.26	6.01±0.33	6.07±0.52	0.945^{ns}
Creatinine(mg/dL)	0.79±0.09	0.79±0.07	0.84±0.06	0.869^{ns}
Blood urea nitrogen (mg/dL)	13.10±0.7	13.22±1.67	13.59±1.75	0.970^{ns}
Calcium (mg/dL)	9.57 ± 0.26	9.20 ± 0.42	9.77 ± 0.13	0.336^{ns}
Phosphorus (mg/dL)	7.19 ± 0.26	7.44 ± 0.23	6.93 ± 0.27	0.411^{ns}
Magnesium (mg/dL)	2.29 ± 0.02	2.26 ± 0.01	2.25 ± 0.01	0.106 ^{ns}
Copper (mg/L)	0.80 ± 0.08	0.89 ± 0.07	0.80 ± 0.05	0.623^{ns}
Zinc (mg/L)	1.01 ± 0.07	1.03 ± 0.09	1.01± 0.08	0.966^{ns}

[1]Mean values are based on six replicates with SE

ns-non significant (P>0.05)

also reported that there was no difference in the average daily gain (ADG) between the group of crossbred calves that were fed with complete feed block containing straw, dhanwantharam oil residue and tapioca starch waste. Suong *et al*. (2022) also stated that average daily gain was not affected when goats were fed a total mixed ration supplemented with Napier grass silage (NS) or anthocyanin-rich black cane silage (AS).

According to the findings reported by Singh *et al*. (2016) crossbred calves fed with wheat or rice straw based complete bocks had similar (P>0.05) serum glucose, total protein, albumin and globulin, total cholesterol, ALT and ALP concentrations as that of mash form of complete feed. Gowda (2019) also reported that there was no difference (P>0.05) in haematological and biochemical parameters such as haemoglobin, total protein, serum calcium, serum phosphorus, serum glucose between the group of crossbred calves that were fed with complete feed block containing straw, dhanwantharam oil residue and tapioca starch waste. Suong *et al*. (2022) also stated that plasma concentrations of glucose, albumin, cholesterol, insulin, triglycerides, HDL, LDL, VLDL, or plasma urea nitrogen was not affected when goats were fed a total mixed ration supplemented with Napier grass silage (NS) or anthocyanin-rich black cane silage (AS).

In contrast to present study Sharma *et al.* (2020) reported that feeding of TMR supplemented with herbal feed additives Jaiphal, Suva and Haldi at 1 per cent of DM basis in crossbred calves had no effect on serum glucose, aspartate aminotransferase, alkaline kinase phosphate, total protein, albumin and BUN concentration. Wadhwani *et al*. (2022) observed that crossbred calves fed TMR with varying concentrate levels had higher average daily gain as compared to the conventional feeding.

In agreement to the present study, Terefe *et al*. (2021) also observed similar feed conversion ratio across treatment groups when Jersey calves fed maize stover silage based TMR and control ration consisting of natural pasture hay (50 per cent) basal ration and concentrate mixture (50%) separately while Anjum *et al*. (2022) observed that buffalo calves fed maize stover and maize cob based TMR had higher feed conversion efficiency compared to calves fed wheat straw based TMR.

Conclusion

It is concluded that areca sheath can be effectively included in TMR completely replacing paddy straw without affecting growth performance and haemato-biochemical parameters in female crossbred dairy calves.

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Conflict of interest

The authors declare that they have no conflict of interest.

References

Anjum, M.I., Javaid, S., Yunus, A.W., Ashfaq, F. and Iqbal, J. 2022. Nutrient digestibility and cost effectiveness of maize stovers and maize cobs as replacement of wheat Straw in total mixed ration and their effect on growth performance in Nili-Ravi buffalo calves. *Pakistan J. Zool*. **25**: 1-7.

AOAC [Association of Official Analytical Chemists]. 2016. *Official Methods of Analysis.* (20th Ed.). Association of Official Analytical Chemists, Washington DC, 1885p.

Ayyadurai, P., Priya, R.S., Jegathjothi, N. and Gokila, J. 2013. A review on optimizing forage quality through management. *Int. J. Agric. Sci. Res*. **3**: 173-180.

ICAR [Indian Council of Agricultural Research]. 2013. Nutrient Requirements of Animals-Cattle and Buffalo. (3rd Ed.). Indian Council of Agricultural Research, New Delhi, 59p.

Gaikwad, B.B. and Bhargav, V.K. 2012. Cutting characteristics of arecanut sheath for use as animal. *Fodder. J. Agrotechnol.* **1**: 66.

Gowda, S. 2019. Evaluation of densified complete feed blocks in crossbred cattle*. M.V.Sc. thesis,* Kerala Veterinary and Animal Sciences University, Manuthy,82p.

Katoch, R., Apoorva, T.A. and Sood, S. 2017. Improving nutritive value and digestibility of maize stover—A review. *Forage Res.* **43**: 174-180.

Salem, H.B., Makkar, H.P.S. and Nefzaoui, A. 2004. Towards better utilisation of non-conventional feed sources by sheep and goats in some African and Asian countries. *Options Méditerranéennes. Série A*. **59**: 177-187.

Sharma, V., Lamba, J.S., Grewal, R.S., Hundal, J.S. and Singh, C. 2020. Effect of supplementation of herbs containing essential oils on nutrients digestibility, rumen fermentation and blood parameters in cross bred calves. *Int. J. Curr. Microbiol. App. Sci*. **9**: 1327-1336.

Singh, K.M., Singh, R.K.P., Jha, A.K. and Kumar, A. 2013. Fodder market in Bihar: An exploratory study. *Econ. Affairs*. **58**: 357-365.

Singh, P.K., Chandramoni, C., Kumar, K. and Kumar, S. 2016. Effect of feeding wheat and rice straw based complete feed blocks on nutrients utilization, blood biochemical and growth performance in crossbred calves. *Indian J. Anim. Sci*. **86**: 771-776.

Suong, N.T.M., Paengkoum, S., Schonewille, J.T., Purba, R.A.P. and Paengkoum, P. 2022. Growth performance, blood biochemical indices, rumen bacterial community and carcass characteristics in goats fed anthocyanin-rich black cane silage. *Frontiers Vet. Sci.* **9**: 880838.

Terefe, G., Kitaw, G., Walelegne, M., Fekadu, D., Kehaliew, A., Dejene, M., Mekonnen, B. and Yadesssa, E. 2021. Growth Performance of Jersey calves fed maize stover silage based total mixed ration compared to calves fed hay and concentrate separately. *Ethiopian J. Agric. Sci.* **31**: 93-100.

Wadhwani, K.N., Patel, D.C., Khant, M.R., Vaidh, P.P., Patel, J.H., Lunagariya, P.M. and Pandya, P.H. 2022. Growth performance of crossbred calves fed a conventional and total mixed ration with varying concentrate level. *Curr. J. Appl. Sci. Technol.* **41**: 10-16. ■