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Effect of feeding garden cress (*Lepidium sativum*) seeds in the ration on nutrient utilisation and haemato-biochemical parameters in crossbred heifers

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Abstract

A feeding trial was carried out for a period of 5 months to evaluate the effect of dietary inclusion of garden cress (GC) seeds in the ration on nutrient utilisation and haemato-biochemical parameters in crossbred heifer calves. Eighteen crossbred heifer calves of ten to twelve months of age were selected from University Livestock Farm and Fodder Research and Development Scheme (ULF & FRDS), Mannuthy and were divided into three groups of six animals each based on age and body weight. The animals were randomly allotted to three dietary treatments, T₁ (concentrate with 20 per cent CP and 70 per cent TDN), T₂ (T₁ containing 5 per cent GC seed) and T₃ (T₁ containing 10 per cent GC seed). Analysis of data obtained from the study revealed that the nutrient utilisation and haemato-biochemical parameters were similar between groups. Thus, it was determined that GC seeds can be safely incorporated up to 10 per cent in the ration of heifers without compromising the health and nutrient utilisation.

Keywords: Garden cress seeds, digestibility, nutrients, heifers

1. Introduction

Nutritional management plays a vital role in optimising the growth, health and productivity of crossbred heifers. The incorporation of nutrient rich feed supplements can significantly enhance the efficiency of nutrient utilisation and promote overall wellbeing. Garden cress seed (*Lepidium sativum*), a rich source of protein, fibre and micronutrients has been traditionally used as a feed additive in animal nutrition. Doke and Guha (2014) ^[2] reported that GC seeds were rich sources of minerals like iron (76-100 mg/100 g), calcium (296-377 mg/100 g), magnesium (430 mg/100 g), phosphorus (723 mg/100 g), and zinc (5 mg/100 g), thus they could be considered as nutraceutical seeds. Lahiri and Rani, (2020) ^[7] found that GC seeds contain the amino acids such as methionine and lysine. Methionine had a major role in burning fat; hence, EE digestibility was high for the supplemented group, and lysine played an important role in improving the nitrogen balance. Nayana *et al.* (2023) ^[11] reported that haematological parameters such as RBC, Hb, MCH, and MCHC (%) were found to be significantly higher (P<0.05) in rabbits fed with 5 per cent GC in the diet, followed by 7.5 per cent.

However, limited scientific information is available on its effects on nutrient utilisation and haemato-biochemical parameters in crossbred heifers. This study aimed to investigate the impact of feeding garden seed in the ration on nutrient utilisation and haemato-biochemical parameters in crossbred heifers, providing valuable insights into the potential benefits of this feed supplement in heifer nutrition.

Materials and methods

Location of study

The present study was conducted by the Department of Animal Nutrition at University

Livestock Farm and Fodder Research Development Scheme (ULF & FRDS), Mannuthy, College of Veterinary and Animal Sciences, Mannuthy, Thrissur, Kerala, India.

Experimental animals, management and feeding

Eighteen healthy crossbred heifer calves of ten to twelve months of age were selected from University Livestock Farm and Fodder Research Development Scheme (ULF&FRDS), Mannuthy formed the experimental subjects for the study. The calves were housed individually in well ventilated, clean and dry shed with facilities for feeding and watering. The calves were divided into three groups of six each as uniformly as possible with regard to age, and body weight. The animals were allotted randomly to one of the three dietary treatments, T1(Concentrate with 20 per cent CP and 70 per cent TDN), T2 (T1 containing 5 per cent garden cress seed) and T3(T1 containing 10 percent garden cress seed). All the calves were

dewormed before the commencement of the study. All the animals were maintained under uniform managerial conditions throughout the experimental period of 150 days. Body weight of the animals was recorded at fortnightly intervals during the trial. Based on the body weight, feed and fodder allowances were revised fortnightly. Weighed quantities of feed and fodder were fed individually based on the requirement as per ICAR (2013) ^[4] recommendation to all the animals in the morning 9 AM and afternoon 3 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. The data on daily dry matter intake was recorded during the entire experimental period. Clean fresh drinking water was offered to all the animals *ad libitum*. Ingredient composition of experimental feed for three dietary treatments of the experimental calves is given in Table 1.

Table 1: Ingredient composition of experimental rations offered to heifers maintained on three dietary treatments

Ingredient	Percentage composition of Experimental ration's		
	T1	T2	T3
Maize	28	27	25
Corn gluten fibre	18	20	21
Tapioca starch waste	1	1	1
Coconut cake	18	14	10
Alfalfa	14	13	13
Rice polish	7	8	7
Black gram husk	4	3	4
De oiled rice bran	7	6	6
Garden cress seed	-	5	10
Calcite	1.5	1.5	1.5
Salt	1	1	1
Mineral mixture	0.5	0.5	0.5
Total	100	100	100

Digestion trial

A digestibility trial for five days duration was carried out at the end of feeding trial by total collection method. During digestion trial quantities of daily feed offered, residue left and dung voided were recorded. Dry matter content of the feed offered as well as residue was determined daily. Feed samples were collected in double lined polyethylene bags and stored in a deep freezer (-20°C) for further analysis. The dung voided by each animal was collected quantitatively uncontaminated from urine, feed residue or dirt as and when they were voided in individual containers, on a continuous 24-hour basis during the digestion trial. The entire quantity of dung voided by each animal during the previous 24 hours were weighed separately at 8 A.M. every day and representative samples at the rate of 10 per cent of the total quantity voided were taken after mixing thoroughly and stored in double lined polyethylene bags. The samples collected each day were stored in deep freezer (-20°C) for further analysis. At the end of the trial, samples of dung collected for the five consecutive days from each animal were pooled, mixed and representative samples were taken after through mixing for chemical analysis. The moisture and crude protein content in faecal samples was estimated using fresh samples. The proximate composition of feed, fodder and dung were determined as per the standard procedure (AOAC, 2016) ^[1]. Fiber fractions were estimated

by the detergent method (Van Soest *et al.*, 1991) ^[15].

Haematological parameters

Blood samples collected from the experimental animals at the end of feeding trial. Haemoglobin was determined by Cyanmethaemoglobin method. The serum was separated after centrifugation at 3000 rpm for 10 minutes. Serum samples were used to determine the glucose (GOD-PAP methodology), blood urea nitrogen (BUN) (modified Berthelot method), serum creatinine (AOAC, 2016) ^[1], total protein (Jong and Vegeter, 1950) ^[5] and albumin (Bromocresol green method) by semiautomatic analyser using standard kits.

Statistical analysis

Statistical analysis of the data obtained was carried out in accordance with Snedecor and Cochran (1994) ^[14] using SPSS 24.0 computer software.

Results and discussion

Chemical composition of feed, fodder and dung

The per cent chemical composition of the various experimental rations and green fodder are given in Table 2. Chemical composition of dung of heifers maintained on three experimental rations is given on table 3.

Table 2: Chemical composition¹ of experimental rations and fodder fed to the heifers, %

Nutrients	Dietary Treatments			Green grass
	T1	T2	T3	
Dry matter (DM)	92.59 ±0.25	92.90±0.09	92.41±0.17	16.95±0.05
Crude protein (CP)	20.30±0.13	20.30±0.15	20.40±0.15	12.59±0.93
Ether extract (EE)	4.01±0.05	4.46±0.08	4.65±0.03	2.17±0.54
Crude fibre (CF)	8.41 ±0.14	8.67±0.15	8.60±0.23	31.58±0.13
Total ash (TA)	9.48±0.10	8.71±0.08	8.42±0.07	10.54±0.74
Nitrogen free extract (NFE)	57.80±0.12	57.86±0.25	57.93±0.09	43.12±0.07
Neutral detergent fibre (NDF)	38.11±0.31	36.38±0.21	39.03±0.60	64.74±0.33
Acid detergent fibre (ADF)	14.27±0.02	14.52±0.07	16.71±0.21	36.64±0.76
Calcium	1.33 ±0.01	1.73±0.002	1.95±0.007	0.98±0.62
Phosphorus	0.85 ±0.01	0.90±0.01	0.97±0.02	0.41±0.09

¹Mean values are based on six replicates with SE**Table 3:** Chemical composition of dung¹ of heifers maintained on three experimental rations, %

Nutrients	Experimental rations		
	T1	T2	T3
Dry matter (DM)	19.03±0.43	19.06±0.44	19.85±0.30
Crude protein (CP)	12.55±0.30	12.77±0.18	12.15±0.71
Ether extract (EE)	2.17±0.12	2.09±0.03	2.11±0.03
Crude fibre (CF)	25.15±0.45	23.40±0.56	25.82±0.25
Total ash (TA)	15.68±0.26	15.21±0.17	15.44±0.29
Nitrogen free extract (NFE)	44.45±0.56	46.53±0.66	44.48±0.71
Neutral detergent fibre (NDF)	58.66±1.63	59.79±0.37	55.40±1.02
Acid detergent fibre (ADF)	39.52±0.54	36.78±0.43	39.02±0.95

¹Mean values are based on six replicates with SE

Nutrient utilisation

Digestibility coefficients of nutrients calculated from the data acquired from the digestibility trial is presented in Table 4. Digestibility coefficient of nutrients in the experimental diets were 61.81±1.65, 62.60±0.75, 62.60±1.68, per cent for DM, 69.39±1.64, 69.39±0.89 and 70.91±2.30 per cent for CP, 59.74±1.65, 58.72±1.96 and 57.18±1.43 per cent for CF, 74.76±1.72, 78.31±0.63 and 78.39±1.16 per cent for EE, 63.53±0.54, 64.49±1.52 and 65.08±1.73 per cent for NFE, 58.98±2.49, 59.20±0.72 and 63.04±1.72 per cent for NDF and 46.61±2.95, 50.75±1.35 and 51.77±2.91 per cent for ADF for T1, T2 and T3, respectively. There was no significant (P>0.05) variation among the experimental groups in the digestibility coefficient of DM, CP, EE, CF, NFE, NDF and ADF studied.

In agreement to the present study, Rani *et al.* (2006) [12] supplemented two herbs namely bringaraj (*Eclipta alba*) and kutki (*Kutki picorrhiza*) in buffalo calves at 0.4 per cent dose rate and observed similar dry matter, CP and NDF digestibility in supplemented and control group. Margret (2022) [8] reported a similar CF, EE, NFE and ADF digestibility in buffalo heifers fed with 0 per cent, 10 per cent and 20 per cent dried moringa leaves in their ration. On contrary to the above findings, El- Bordeny *et al.* (2006) [3] reported a significantly higher NFE digestibility in calves supplemented with eucalyptus leaves (*Eucalyptus globulus*) at 22g/ day compared to control without any supplementation. Meel *et al.* (2012) [9] reported a significantly higher CP digestibility in Rathi calves after dietary supplementation of 3 per cent Ashwagandha (*Withania somnifera*) in the ration compared to control having no supplementation. Zeng *et al.* (2017) [16] obtained a higher dry matter digestibility and lower

NDF digestibility in dried moringa leaf supplemented group than control. Seethal (2018) [13] reported a higher EE and ADF digestibility coefficient in calves fed with 30 per cent Dhanwantharam thailam residue containing ration compared to control. Mishra *et al.* (2020) [10] reported a higher CF digestibility in calves supplemented with turmeric powder when compared to other groups supplemented with garlic and combination of garlic and turmeric powder at the level of 15 g/ day.

Table 4: Digestibility coefficient¹ of nutrients in the experimental rations, %

Nutrients	Experimental rations			P value
	T1	T2	T3	
Dry matter	61.81±1.65	62.60±0.75	62.60±1.68	0.902 ^{ns}
Crude protein	69.39±1.64	69.39±0.89	70.91±2.30	0.771 ^{ns}
Crude fibre	59.74±1.65	58.72±1.96	57.18±1.43	0.617 ^{ns}
Ether extract	74.76±1.72	78.31±0.63	78.39±1.16	0.096 ^{ns}
Nitrogen free extract	63.53±0.54	64.49±1.52	65.08±1.73	0.722 ^{ns}
Neutral detergent fibre	58.98±2.49	59.20±0.72	63.04±1.72	0.232 ^{ns}
Acid detergent fibre	46.61±2.95	50.75±1.35	51.77±2.91	0.336 ^{ns}

¹Mean values are based on six replicates with SEs- non significant (P>0.05)

5.6 Haemato biochemical parameters

The haemato-biochemical and serum mineral parameters of the experimental crossbred calves such as haemoglobin, serum glucose, total protein, albumin, globulin, albumin to globulin ratio, blood urea nitrogen and creatinine, serum calcium, phosphorus, copper, magnesium and zinc estimated at the end of the experimental trial were listed in Tables 5. The values of haemato-biochemical parameters of heifers fed on experimental rations viz., T1, T2 and T3 were 11.41±0.73, 14.07±1.55, 13.21±0.92 for haemoglobin (g/dL), 56.31±1.89, 58.79±2.86, 59.25±2.61 for serum glucose (mg/dL), 6.93±0.08, 7.07±0.07, 6.92±0.10 for total protein (g/dL), 3.35±0.06, 3.43±0.03, 3.28±0.02 for albumin (g/dL), 3.49±0.09, 3.54±0.04, 3.40±0.05 for globulin (g/dL), 0.96±0.01, 0.97±0.01, 0.96±0.01 for A/G ratio, 0.70±0.02, 0.73±0.01, 0.74±0.01 for serum creatinine (mg/dL), 24.38±0.67, 23.73±0.60, 23.08±0.78 for serum BUN (mg/dL), respectively. The values obtained in present study were within physiological range reported for the crossbred heifer calves (Kaneko *et al.*, 2008) [6] and there was no variation between the treatments.

Table 5: Haemato- biochemical parameters¹ of heifers maintained on the three experimental rations

Parameters	T1	T2	T3	P value
Haemoglobin (g/dL)	11.41±0.73	14.07±1.55	13.21±0.92	0.260 ^{ns}
Glucose (mg/dl)	56.31±1.89	58.79±2.86	59.25±2.61	0.674 ^{ns}
Total protein (g/dL)	6.93±0.08	7.07±0.07	6.92±0.10	0.380 ^{ns}
Albumin (g/dL)	3.35±0.06	3.43±0.03	3.28±0.02	0.076 ^{ns}
Globulin (g/dL)	3.49±0.09	3.54±0.04	3.40±0.05	0.334 ^{ns}
Albumin: Globulin ratio	0.96±0.01	0.97±0.01	0.96±0.01	0.871 ^{ns}
Creatinine (mg/dL)	0.70±0.02	0.73±0.01	0.74±0.01	0.090 ^{ns}
Blood urea nitrogen (mg/dL)	24.38±0.67	23.73±0.60	23.08±0.78	0.429 ^{ns}

¹Mean values are based on six replicates with SE

ns- non significant (P>0.05)

Conclusion

On summarising the results obtained from the study, it could be concluded that GC seeds can be safely incorporated up to 10 per cent in the ration of heifers without compromising the health status and nutrient utilisation.

Conflict of Interest

Not available

Financial Support

Not available

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