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Combined effect of concentrate and area specific mineral mixture supplementation on the performance of Ganjam goat in its native tract

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Abstract

Twenty male Ganjam kids (2-3 months, 6.22 ± 0.15 kg BW) were divided into four groups (n=5 per group) following randomized block design. Animals in the control group (I) were maintained as per farmer practice, while animals in group II and III were additionally supplemented with 100 g concentrate mixture and 05 g of area specific mineral mixture respectively. Kids in group IV were supplemented with both 100 g concentrate mixture and 05 g of area specific mineral mixture. Experimental feeding was done for a period of 90 days. Blood was collected on 0 and 90 days of the experimental feeding to study the blood chemistry and serum mineral concentration of goats. Results revealed significant ($P < 0.05$) increase in average daily gain in supplemented groups than the control. Serum mineral concentrations were significantly ($P < 0.05$) higher all the treatment groups than control animals. It may be concluded that supplementation of 100 g of concentrate along with 05 g of area specific mineral mixture improved the performance of Ganjam goats in its native tract.

Keywords: blood, concentrate, goats, minerals

Introduction

Ganjam breed is known for its excellent meat quality and has higher feed conversion ratio. The breed is widely distributed in the whole of Ganjam district along with parts of Gajapati district of Odisha. Since generations, this breed has been a major source of livelihood for Golla tribe and hence also known as 'Golla goats'. Feeding of Ganjam goats has never been taken seriously by goat farmers. Ganjam goats usually subsist on browsing poor quality herbs, shrubs, tree leaves, matured grass and dry fallen leaves in the range forest of native tract. These feed resources are usually deficient in protein, energy, minerals, vitamins; in addition, the presence of certain anti nutritional factors further inhibit their utilization (Ramachandra and Sampath, 1995) [1]. The Ganjam goats were moved to distant jungles of 20-25 km away from home in search of browsing materials. Supplemental feeding to the grazing goats may be a possible way out of this situation. Reddy *et al.* (2017) [2] observed that supplementation of concentrate mixture @ 1 per cent of the body weight for 120 days improved the body weight gain and ADG of Deccani lambs. Sultana *et al.* (2012) [3] did not observe any significant effect on daily weight gain of kids supplemented with 300 g of concentrate mixture along with ad libitum green grasses. Sahu *et al.* (2015) [4] did not observe any significant changes in serum glucose and total protein content in Ganjam goats supplemented with 150 g of concentrate mixture for 120 days than control animals. In view of these facts, the present study was conducted on growing male Ganjam goats in its native tract to assess the effects of concentrate along with area specific mineral mixture supplementation (ASMM) on their body weight gain, blood chemistry and mineral concentration.

Materials and methods

The investigation was carried out on-farm, in the Podapadar village of Chhatrapur block in Ganjam district of Odisha, located in the native tract of Ganjam goats. Forty Ganjam male kids (*Capra hircus*; about 2-3 months of age, average live weight 6.22 ± 0.15 kg BW) owned by the farmers were selected for this study. Faecal samples of all the kids were examined for parasitological load and infested ones were dewormed by oral albendazole suspension @ 5 mg per kg BW. The kids were divided into four equal groups. Group I is the control animals without any supplementation, where as Group II and III were supplemented with 100 g of

concentrate mixture and 05 g of ASMM respectively. Animals in group IV were supplemented with both 100 g of concentrate mixture and 05 g of ASMM. ASMM was formulated considering the actual mineral requirement vis-à-vis supply to the animals (Mohapatra *et al.*, 2008) [5] and was prepared using the salts of Ca, P (di-calcium phosphate), Cu (copper sulphate), Zn (zinc sulphate), Mn (manganese sulphate) and iodine (potassium iodide). Feeding experiment was continued for 90 days and the body weights of kids were recorded at monthly interval. Blood samples were collected at 0 and 90 days of the experiment and harvested serum was used for determination of glucose, total protein, albumin, globulin, A:G ratio and urea by using Crest Biosystems kit (Goa, India). The proximate compositions of the concentrate mixture were estimated as per AOAC (2000) [6]. The serum calcium and phosphorus concentration was estimated by using the kit prepared by Crest Biosystems (Goa, India). The serum micro minerals like copper, zinc and manganese were estimated by Atomic Absorption Spectrophotometer (ELICO-SL 243, Hyderabad, India). Data were analyzed by using Software Package for Social Sciences (SPSS) version 17.0 (2008) [7] and one-way analysis of variance (generalized linear model, ANOVA) with comparison among means was made by Duncan's multiple range test (Duncan, 1955) [8] with significance level of $P \leq 0.05$.

Results and Discussion

The percent ingredients composition and the chemical composition of the concentrate mixture are presented in the Table 1. The concentrate mixture consisted of crushed maize grain 30%, soybean meal 35%, wheat bran 32%, mineral mixture 2% and common salt 1%. Crude protein contents of the concentrate mixture was 20.85 %

The growth performance of male Ganjam goat is presented in Table 2. The gain in body weight and average daily gain was significantly ($P < 0.05$) higher in supplemented groups than control animals. Similar to our observation Sahu *et al.* (2013) [9] in pregnant Ganjam goats and Mahanta *et al.* (2002) [10] in local goats reported significantly higher growth rate due to supplementation of concentrate mixture. Similar observation on growth performance has been recorded due to supplementation of concentrate mixture in different breeds of goats (Hossain *et al.*, 2003; Kabir *et al.*, 2004) [11, 12]. The higher growth rate may be due to increased energy and protein supplementation in concentrate supplemented groups and better nutrient utilisation in mineral supplemented animals.

The average blood chemistry of goats supplemented with concentrate and mineral mixture in browsing condition at 0 and 90 days of the experiment were presented in Table 3. The

blood glucose level was significantly ($P < 0.05$) higher in concentrate and mineral supplemented groups than control. This increase in blood glucose level was probably due to increased dietary protein and increased availability of nutrients, which might have provided more gluconeogenic precursors. Similarly, Sahoo *et al.* (2016) [13] observed increased glucose concentration in cross-bred cattle supplemented with area specific mineral mixture @ 50 g/day, which may be due to alteration of molar proportion of volatile fatty acid in the rumen with an increase in propionate concentration resulting in increased glucose level in the plasma. More *et al.* (2008) [14] also observed a significant increase in blood glucose concentration in Osmanabadi goats when supplemented with concentrate. Increased blood glucose level due to supplementation of concentrate to browsing goats had also been reported by Singh and Shinde (1997) [15].

No significant variation ($P > 0.05$) was observed among different treatment groups at 90 days of the experiment indicating that the supplementation of concentrate mixture and ASMM had no effect on serum total protein, albumin, globulin, A:G ratio and urea level. Similar types of findings were reported by Porwal *et al.* (2005) [16] in lambs and Sahu *et al.* (2015) [4] in pregnant goats supplemented with concentrate mixture. But Sahu *et al.* (1995) [17] showed a significant ($P < 0.05$) increase in total serum protein value linearly with addition of energy diet.

The average serum mineral concentration of goats supplemented with concentrate and mineral mixture in browsing condition at 0 and 90 days of the experiment were presented in Table 4. The results on mineral profiles indicated that serum mineral values were significantly ($P < 0.05$) higher in treated groups than the control animals at 90 days of the experiment. The increased serum mineral concentration may be due to extra supplementation of minerals through concentrate and ASMM. Similar results were reported in dairy cattle by other workers (Agrawalla *et al.*, 2017; Samanta *et al.*, 2005) [18, 19].

Table 1: Chemical composition (% DM basis) of concentrate mixture fed to the Ganjam goats

Nutrients	Concentrate mixture
Crude protein	20.85
Ether extract	3.12
Total ash	9.90
Acid insoluble ash	3.15
Crude fibre	5.60
Nitrogen free extract	60.53
Calcium	1.60
Phosphorus	0.90

Table 2: Effect of concentrate and ASMM supplementation on body weight gain of Ganjam goats

Attributes	Groups				P value
	I	II	III	IV	
Initial body weight, kg	6.30±0.16	6.15±0.10	6.22±0.14	6.20±0.10	0.917
Final body weight, kg	9.47 ^a ±0.29	10.39 ^b ±0.18	10.25 ^b ±0.21	11.06 ^c ±0.30	0.022
Body weight gain, kg	3.17 ^a ±0.09	4.24 ^b ±0.11	4.03 ^b ±0.07	4.86 ^c ±0.06	0.018
Average daily gain, g	35.22 ^a ±2.16	47.11 ^b ±3.19	44.77 ^b ±2.24	54.00 ^c ±2.31	0.035

^{abc} Means bearing different superscripts in a row differ significantly ($P < 0.05$)

Table 3: Effect of concentrate mixture along with ASMM on the blood chemistry of Ganjam goats

Attributes	Days	Groups				P value
		I	II	III	IV	
Hb (g/dl)	0	9.45 ±0.16	9.30 ±0.33	9.44 ±0.32	9.58 ±0.41	0.210
	90	9.29 ±0.22	9.26 ±0.18	9.30 ±0.32	9.18 ±0.33	0.108
Glucose (mg/dl)	0	44.10 ±3.11	45.60 ±3.94	44.40 ±4.21	44.40 ±3.76	0.374
	90	43.60 ^a ±3.71	53.64 ^b ±1.48	51.20 ^b ±1.20	55.70 ^b ±1.78	0.012
Total Protein (g/dl)	0	6.64 ±0.16	6.42 ±0.26	6.76 ±0.24	6.48 ±0.19	0.728
	90	6.50 ±0.05	6.39 ±0.19	6.59 ±0.14	6.62 ±0.11	0.503
Albumin (g/dl)	0	3.88 ±0.11	3.67 ±0.15	3.66 ±0.09	3.32 ±0.12	0.166
	90	3.48 ±0.28	3.58 ±0.09	3.59 ±0.02	3.63 ±0.05	0.609
Globulin (g/dl)	0	2.76 ±0.11	2.84 ±0.19	3.10 ±0.28	3.16 ±0.09	0.094
	90	3.02 ±0.27	3.62 ±0.25	3.01 ±0.15	3.99 ±0.07	0.079
A/G ratio	0	1.40 ±0.15	1.01 ±0.24	1.22 ±0.25	1.06 ±0.18	0.102
	90	1.21 ±0.20	1.02 ±0.09	1.20 ±0.06	0.91 ±0.01	0.011
Urea (mg/dl)	0	38.88 ±1.16	41.55 ±1.10	39.08 ±0.56	40.28 ±2.15	0.754
	90	42.04 ±0.14	43.15 ±0.50	42.58 ±1.01	44.91 ±0.43	0.120

^{ab} Means bearing different superscripts in a row differ significantly (P<0.05)

Table 4: Serum minerals of Ganjam goats

Attributes	Days	Groups				P value
		I	II	III	IV	
Ca (mg/dl)	0	8.23 ±0.09	8.04 ±0.42	8.10 ±0.24	8.00 ±0.21	0.547
	90	8.28 ^a ±0.10	8.34 ^a ±0.16	8.86 ^b ±0.18	8.91 ^b ±0.15	0.020
P (mg/dl)	0	4.20 ±0.19	4.15 ±0.17	4.18 ±0.15	4.12 ±0.07	0.250
	90	3.89 ^a ±0.13	4.76 ^b ±0.19	5.10 ^b ±0.10	5.21 ^b ±0.13	0.004
Cu (ppm)	0	0.51 ±0.065	0.59 ±0.03	0.52 ±0.05	0.53 ±0.03	0.162
	90	0.50 ^a ±0.01	0.58 ^a ±0.02	0.77 ^b ±0.07	0.75 ^b ±0.03	0.018
Zn (ppm)	0	0.68 ±0.13	0.71 ±0.14	0.65 ±0.06	0.67 ±0.09	0.947
	90	0.62 ^a ±0.13	0.77 ^b ±0.15	0.87 ^b ±0.17	0.84 ^b ±0.16	0.02
Mn (ppm)	0	0.30 ±0.09	0.32 ±0.08	0.33 ±0.13	0.35 ±0.16	0.204
	90	0.32 ^a ±0.08	0.41 ^{ab} ±0.12	0.54 ^b ±0.04	0.56 ^b ±0.05	0.029

^{ab} Means bearing different superscripts in a row differ significantly (P<0.05)

Conclusion

On the basis of these results it may be concluded that supplementation of 100 g of concentrate mixture along with 05 g of ASMM improved the growth rate and mineral status in Ganjam goats

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