



Effect of supplementation of concentrate on reproductive performance of grazing Ganjam goat in its native tract

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ABSTRACT

To study the availability of nutrients to grazing Ganjam goats, survey was carried out in the native tract and 17 shrubs were indentified. Further, 1 digestibility trial was conducted by using indicator method. To assess the effect of supplementary feeding, total 100 pregnant Ganjam does at mid pregnancy were chosen and randomly allotted to 4 treatments i.e. T₁ (control) and 3 concentrate supplementation groups, viz. T₂ (50g), T₃ (100g) and T₄ (150g) and supplemental feeding was made for minimum 2 months pre-partum to maximum 60days of lactation. The body weights of does were recorded at the beginning of experiment and subsequently at fortnightly intervals of prepartum and post-partum. The proximate composition of the shrubs revealed that the average DM, CP, CF, EE, TA and NFE were 37.72, 13.52, 23.35, 5.12, 8.92 and 49.10%, respectively, on DM basis. The digestibility coefficient of DM, OM, CP, EE, CF and NFE were 46.85, 46.83, 51.77, 43.33, 42.00 and 46.18% on dry matter basis, respectively. The average body weight gains during prepartum were 2.680±0.018, 3.056±0.027, 3.436 0.027, and 3.712 0.024 kg, respectively in T₁, T₂, T₃ and T₄, respectively. There was no significant difference in the body weight of does between groups at 0th, 15th, 45th day of post partum. At 60th day of post partum, the body weight of T₃ and T₄, was significantly higher than that of T₁. The body weight loss of the does in groups T₁, T₂, T₃ and T₄ during post partum 60 days feeding period have been recorded as 2.744, 1.596, 0.768 and 0. 320 kg for T₁, T₂, T₃ and T₄, respectively.

Key words: Body weight, Concentrate supplementation, Ganjam goat, Reproduction

The Ganjam goat is one among the 22 recognized goat breeds of India. These goats are reared under extensive system of management without any supplementary feed. Intensive raising of goats is not a profitable proposition as it raises the cost of production. Supplemental feeding to the grazing goats may be a possible way out of this situation. In this regard, some encouraging results have been obtained by many workers through supplementation of concentrates to grazing goats (Dowson *et al.* 2005, Rastogi *et al.* 2008 and Chaturvedi *et al.* 2008). Similarly supplementation of concentrates during postpartum period of goats had been tried successfully by Chaturvedi *et al.* (2008) and Grayling *et al.* (2005). The present experiment was planned with the objective of assessment of nutrient available for the does during periparturient period from native pasture and further

development of a supplemental feeding package on the performance of grazing the Ganjam goat in its native tract.

MATERIALS AND METHODS

The investigation was carried out in the Pannuagaon village of Khallikote block in Ganjam district of Odisha. The study was conducted for 120 days during summer to early rainy season. A survey was conducted to find out various top fodders available in the native tract of Ganjam goats. Seventeen top fodders were identified and collected from the native track and kept in polyethylene cover packet in air-tight condition. The fodder trees were identified by local name from the villagers and botanical name by the help of Botany Department of Regional Research Laboratory Bhubaneswar. The proximate compositions of the top fodders were estimated as per AOAC (1975) and the calcium and available phosphorus content were determined as per Talapatra *et al.* (1940) and IS: 1374 –1968, respectively. To study the nutrient availability, 6 does were selected. The digestibility trial with 7-day collection period was conducted during the feeding period by using indicator method. In this trial chromic oxide was taken as an external indicator and acid detergent lignin was taken as an internal indicator. Each

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experimental goat was fed with 1g of chromic oxide/goat/day in capsular form at morning before feeding for 7 days. The faeces were collected at every 6 hourly and pulled to estimate the crude protein (CP) content in the faeces in the fresh fecal sample. The chromic oxide was estimated by using Czarnoaki *et al.* (1961) method. The mouth grab was collected at every 4 h interval. Pulled sample were in kept in polyethylene for further analysis. The digestibility of nutrient was estimated by using formula given:

$$\text{Fecal out put (DM) in gram} = \frac{\text{external indicator given in mg/animal}}{\text{external indicator in faeces mg per gram of fecal DM}}$$

$$\text{Digestibility} = 100 - \frac{\text{g of nutrient in faeces}}{\text{g of nutrient in feed}}$$

$$\text{Feed intake from fodder (DM) in gram} = \frac{\text{fecal output(g)} \times \text{g of internal indicator per g of faeces}}{\text{internal indicator in g per g of fodder}}$$

The DCP and TDN intake were calculated and compared with the ICAR standards to develop a feeding package. Further, to study the effect of supplementation, Ganjam goats (does) at mid pregnancy preferably on third to fifth parity were chosen. Total 100 pregnant does were taken for this study. The selected does were randomly allotted to 4 treatment groups based on complete randomize design.

The goats were divided into 4 groups and kept in different feeding regimens as follows

T₁: (control) Normal Browsing at range

T₂: control + 50g concentrate mixture supplementation/ per day

T₃: control + 100g concentrate mixture supplementation/ per day

T₄: control + 150g concentrate mixture supplementation/ per day

The concentrate supplementations were given minimum 2 months prepartum to maximum 60 days of lactation. The % ingredients composition and the chemical composition of the concentrate mixture are presented in the Table 1.

The body weight of does was recorded at the beginning of the feeding experimental diet and subsequently at fortnightly intervals in the morning hours before feeding and watering for consecutively for 2 days and average weight was taken on 65th, 50th, 35th, 20th and 5th days of prepartum and 15th, 30th, 45th and 60th days of post-partum. The weights of the goat were also taken on the date of parturition, before and after kidding. The data were analysed statistically (Snedecor and Cochran 1967).

Proximate composition and digestibility of feeds and fodders

The CP% of the fodder ranged from 6.94 to 17.75% on dry matter (DM) basis, the average being 13.52±0.76. The

Table 1. Ingredient and chemical composition of the concentrate mixture

Ingredients	Concentrate mixture (%)	Chemical composition Item	(%) on DM basis
Maize	32	DM	90
Wheat bran	33	CP	22
De-oil rice bran	15	EE	2.4
Groundnut oil cake	17	CF	10.0
Mineral mixture	2	NFE	55.19
Common salt	1	TA	10.41
		NDF	40.1'
		ADF	20.0
		Lignin	5.55

Table 2. Digestibility coefficient (%) during digestion trial for nutrient availability from pasture

Animal no	DM	OM	CP	EE	CF	NFE
1	45.91	45.84	50.00	42.00	41.00	45.45
2	50.75	50.86	55.00	45.00	44.00	51.57
3	45.94	45.93	52.00	48.00	40.00	45.26
4	45.81	45.70	55.1	44.00	43.00	42.77
5	45.81	45.80	50.00	41.00	44.00	43.66
6	46.85	46.85	48.50	40.00	40.00	48.40
Average	46.85	46.83	51.77	43.33	42.00	46.18
	±0.80	±0.82	±1.13	±1.20	±0.77	±1.33

average DM, CP, CF, EE, TA and NFE were found to be 37.72, 13.52, 23.35, 5.12, 8.92 and 49.10%, respectively on DM basis. The present findings of proximate composition of some top fodders were within the range as reported by various research workers (Rai *et al.* 2005). The digestibility coefficient of the pasture is presented in Table 2. The digestibility coefficient of DM, OM, CP, EE, CF and NFE were 46.85±0.80, 46.83±0.82, 51.77±1.13, 43.33±1.20, 42.00±0.77 and 46.18±1.33% on dry matter basis, respectively. The digestible coefficient observed in this experiment was slightly lower than as reported by Hossain *et al.* (2003). The average nutrient availability is presented in Table 3. DCP and TDN availability were less than that of the requirement. A supplementation strategy was followed in a feeding trial.

Body weight and net gain of the does

The average body weight and net gain of weight of the does in different treatment for the pre-partum period are presented in Table 4. There was no significant difference in body weight in the does between groups, although the increase in body weight was consistent during the prepartum period in each of the groups. Cheema *et al.* (2002) reported nonsignificant effect of supplementation of concentrate on the weight gain of pregnant does. There was significant

Table 3. Estimation of nutrient availability from pasture

Animal no	Body weight of does (kg)	DM intake (g)	DM out go (g)	DM intake g/kg body weight	DCP in take g/kg body weight	TDN in take g/kg body weight
1	30.00	538.90	291.50	18.00	26.90	232.50
2	33.00	585.10	288.20	17.70	32.20	279.70
3	31.00	540.10	292.00	17.40	28.10	234.90
4	29.00	538.00	291.60	18.60	29.60	231.90
5	28.00	538.50	291.80	19.20	26.90	231.90
6	30.00	548.50	291.50	18.30	26.60	241.10
Average	30.20±0.70	548.20±7.60	291.10±0.60	18.20±0.30	28.40±0.90	242.00±7.70
Requirement maintenance*	30.00	830.00		29.00	34.00	350.00

*As per ICAR, 1994, an additional 60% TDN, 80% DCP for pregnancy.

Table 4. Body weight (kg) of doe in different treatment during prepartum period

Periods	Treatments			
	T ₁ (control)	T ₂ (50g supplementation)	T ₃ (100g supplementation)	T ₄ (150g supplementation)
65 th day prepartum	30.644±0.608	30.380±0.611	29.840±0.412	29.940±0.245
50 th day prepartum	31.140±0.609	30.880±0.607	30.412±0.418	30.540±0.248
35 th day prepartum	31.616±0.609	31.484±0.616	31.028±0.417	31.128±0.253
20 th day prepartum	32.472±0.611	32.436±0.624	32.148±0.426	32.448±0.247
5 th day prepartum	33.372±0.6139	33.428±0.625	33.148±0.426	33.448±0.250
0 th day prepartum	33.324±0.610	33.436±0.625	33.276±0.424	33.652±0.250
. Net body weight gain	2.680 ^{a±} 0.018	3.056 ^{b±} 0.027	3.436 ^{c±} 0.027	3.712 ^{d±} 0.024

a, b, c, d– Means with different superscripts in a row differed significantly (P<0.05).

Table 5. Body weight (kg) of doe in different treatment during post partum period

Periods	Treatments			
	T ₁ (control)	T ₂ (50g supplementation)	T ₃ (100g supplementation)	T ₄ (150g supplementation)
0 th day post partum after kidding	29.724±0.608	29.616±0.613	29.304±0.428	29.504±0.248
15 th day post partum	29.016±0.600	29.024±0.613	28.932±0.423	29.148±0.238
30 th day post partum	28.476±0.604	28.788±0.611	28.732±0.423	29.128±0.238
45 th day post partum	27.824±0.598	28.564±0.610	28.632±0.423	29.128±0.239
60 th day post partum	26.980 ^{a±} 0.603	28.020 ^{ab±} 0.617	28.536 ^{b±} 0.422	29.184 ^{b±} 0.236
Average change	-2.744 ^{a±} 0.019	-1.596 ^{b±} 0.019	-0.768 ^{c±} 0.023	-0.320 ^{d±} 0.038

a, b, c, d– Means with different superscripts in a row differed significantly (P<0.05).

(P<0.05) difference between groups and that each groups differed from the other. This indicated that there was an appreciable improvement in body weight gain when the does were supplemented with increasing amount of concentrate mixture. This finding corroborated with the findings of Madibela and Segwagwe (2002). It was apparent that the does were somewhat under nourished and that the supplemental concentrates mixture clearly contributed to higher body weight gain as the level of supplementation went up. Rastogi *et al.* (2008) supplemented concentrate mixture @ 20g per kg metabolic body weight and observed that there

was a significant difference in live weight. In contrast Saluja *et al.* (2006) had supplemented concentrate to a berseem fodder diet at 1:1 ratio and observed no significant difference of body weight change due to supplementation. Hence, it may be recommended that 100 to 150g of concentrate supplementation is necessary to improve birth weight of kids. Beneficial effect of concentrate supplementation to grazing goats has been reported by Guaha *et al.* (1968), Josh *et al.* (1998), Rai and Singh (2005) and Chaturved *et al.* (2008). However, Kochapakdec *et al.* (1994) and Grelying *et al.* (2005) reported that better supplementary feeding did not

significantly play a potential role in attainment of higher birth weight of kids.

The post-partum body weight changes and the net body weight (kg) change of the experimental goats are presented in Table 5. There was no significant difference in the body weight between groups at 0th, 15th, 45th day of post-partum. At 60th day the body weights of T₃ and T₄, were significantly higher than that of T₁ indicating the beneficial effect of concentrate supplementation at the rate of 100 and 150g on body weight. The loss of weight was the highest in T₁ and lowest in T₄. The loss in body weight of all the groups were significantly different from each other (P<0.05). This result is in agreement with the findings of Oyeyemi *et al.* (2002) who reported that nutrition has a significant influence on mass change at different period of gestation and in the preweaning period. Chaturvedi *et al.* (2008) reported a significant increase in body weight gain in the concentrate supplemented groups in grazing goats. Similarly Grayling *et al.* (2004) reported that in extensive feedings, the indigenous goat showed a decrease in body weight while the goats in intensive group showed a slight increase in body weight. In the light of these finding, the beneficiary effect of supplemental feeding on body weight of does is also apparent in the present study. Although, the goats of supplemental group did not show any increase in body weight, prevention of loss of body weight in T₂, T₃ and T₄ in comparison to T₁ has been significant.

From this experiment, it may be concluded that the pasture in and around the experimental site i.e. the Ganjam district of Odisha is deficient in meeting the requirement of Ganjam breed does during gestation. The concentrate supplementation to the grazing does brought about improvement in body weight maintenance by reducing the body weight loss encountered in the non-supplemented group. A minimum of 100g per doe per day would be just sufficient to maintain body weight and support gestation demands. There was an increase in digestibility of protein and crude fibre due to concentrate supplementation.

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REFERENCES

- A O A C. 1975. *Official Methods of Analysis*. 12th edn. Association of official Analytical Chemists, P.O. Box-540, Benjamin Franklin Station, Washington, D.C. 20044.
- Chaturvedi O H, Verma D L, Singh N P and Man J S. 2008. Effect of concentrate supplementation on production performance of ewes grazing on community rangeland. *Indian Journal of Animal Sciences* **78** (10): 1162–64.
- Cheema A U, Khan M Q, Azeem M and Ayaz M. 2002. Effect of supplemental feeding on the performance of late pregnancy goats and pre-weaning kids and profitability. *Pakistan Journal of Agricultural Research* **17**(4): 390–94.
- Dowson E R, Carson A F, Kilpatrick D J and Laidlaw A S. 2005. Effect of herbage allowance and concentrate food level offered to ewes in late pregnancy on ewe and lamb performance. *British Society of Animal Science* **81**: 413–21.
- Grayling J P C, Mmbengwa V M, Schwalbach 2005. Potential of indigenous and boer goats under two feeding systems in South Africa. *Small Ruminant Research* **55**: 97–105.
- Guaah H, Gupta S, Mukherjee A K, Moutick S K and Bhattacharya S. 1968. Some cause of variation in the grown rates of Black Bengal goats. *Indian Journal of Veterinary Science and Animal Husbandry* **38**: 269–78.
- Hossain M E, Shahjalal M, Khan M J and Hasanat M S. 2003. Effect of dietary energy supplementation on feed intake, growth and reproductive performance of goats under grazing condition. *Pakistan Journal of Nutrition* **2** (3): 159–63.
- Josh Sumitra Singh, Haran C and Kale M M. 1998. Response to enhanced prepartum feeding on lactation performance of crossbred goats. *Indian Journal of Animal Production and Management* **14**(1): 31–34.
- Kochapakde S W, Pralomkarn S, Saithanoo A Lawpetchara and B W Norton 1994. Grazing management studies with Thai goats: 2. Reproductive performance of different genotypes of goats grazing improved pasture with or without concentrate supplementation. *Asian Australasian Journal of Animal Science* **7**: 289–94.
- Madibela O.R. and Segwagwe, B.V. E. 2002. Nutritional effects of supplementary feeding on maternal blood metabolites, cortisol, thyroid hormonal level and on outcome of pregnancy of dry season kidding Tswana goats. *Livestock Research for Rural Development* **20**: 4.
- Oyeyemi, Matthew O, Akusu, Matthew O. 2002. Response of multiparous and primiparous west African dwarf goat to concentrate supplementation. *Veterinarski Archiv* **72** (1): 29–38.
- Rai B and Singh M K. 2005. Production performance of Jakhra goats in its home tract. *Indian Journal of Animal Sciences* **75** (10): 1176–78.
- Rastogi Ankur, Dutta Narayan and Sharma K. 2008. Effect of strategic feed supplementation during pregnancy on the performance of goats. *Indian Journal of Animal Sciences* **78** (1): 97–101.
- Saluja Manju, Tyagi Amrish and Singhalk K. 2006. Effect of berseem feeding on nutrient utilization and milk yield in goats. *Indian Journal of Dairy Science* **59**: 29–32.
- Snedecor G W and Cochran W G. 1967. *Statistical Methods*. 6th edn. Oxford and IBH Publishing Co., Calcutta.
- Talapatra S K, Ray S C and Sen K C. 1940. The analysis of mineral constituent in biological material, I. estimation of phosphorus, choline, calcium, magnesium, sodium and potassium in food stuff. *Indian Journal of Veterinary Science and Animal Husbandry* **10**: 243–58.