



Growth performance of crossbred goat kids under different rearing systems

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Received: 28 May 2019; Accepted: 29 September 2020

Keywords: Growth parameters, Mineral mixture, Mineralized salt lick, Rearing systems, Salem black goat

Goat plays a dominant role in small ruminant production systems and as a means of livelihood in the rural landless farmers. Success of goat farming depends on environment where the goats are reared and its management system. For the poor farmers who are unable to maintain large ruminants, goat justifies its designation as ‘the poor man’s cow’ (Ferduous *et al.* 2011). For optimum live weight gain and reproductive performance of goats, grazing alone could not be sufficient and henceforth by improved feeding and management, the level of production can be increased with minimum investment. Most of the farmers were unaware of providing concentrate feed to goats and as a result the kids don’t attain proper nutrition resulting in poor growth rate resulting in economy loss to the farmer. Also salt licks can help to increase the feed intake, resulting in improved production. As scanty information is available on offering salt licks to goat kids under tropical conditions, an experiment was conducted with the objective to explore the potential of mineral mixture supplementation and mineral salt lick licks as dietary supplement to study the body weight and growth parameters of crossbred Salem black goat kids under extensive system (free range system) and intensive system.

The experiments were conducted in farmer’s farm in Kolatheri village of Walajah block and Kalpattu village of Sholinghur block, Vellore district of Tamil Nadu from February 2018 to May 2018 for a period of 3 months. The experiment consisted of three treatments and for this purpose, a total of 24 healthy male Salem Black goat kids of 2–3 months age were selected, tagged individually consisting of eight animals per group in each farm. In Treatment 0 (T₀–control), extensive system of management was followed wherein the kids were allowed to graze from morning 9 AM to 5 PM. No green fodders and concentrate were offered to this group. In Treatment 1 and 2 (intensive system –T₁ and T₂), the kids were offered green fodders along with measured quantity of concentrates (Balanced ration – One treatment containing mineral mixture (T₁) and other with mineralized Salt lick (T₂) in the following

proportion, viz. maize– 25 kg, cumbu– 25 kg, ragi– 5 kg, jowar– 7 kg, ground nut oil cake– 25 kg, wheat bran– 25 kg (T₁) and 27 kg (T₂), mineral mixture – 2 kg (T₁ alone), mineralized salt lick (T₂ alone) and common salt – 1 kg. In the 1st month, the kids were offered concentrates of 100 g/day/kid, 2nd month 125 g/day/kid and 3rd month 150 g/day/kid for T₁ and T₂.

Moreover, the kids were administered with albendazole solution for deworming on 0th day of the experiment. Body weight of the goat kids were recorded using spring balance and growth parameters, viz. body length, height at withers, rump height and heart girth using tailors tape during the study period on 0th day, 30th, 60th and 90th day.

The data collected on body weight and growth parameters of the crossbred Salem black goat kids between treatments and between days were subjected to one way Analysis of Variance (ANOVA) by the statistical software, IBM SPSS version 20.0 for Windows to find the significant difference between treatments and between days. Also interpretation of data was done as per the procedure described by Gomez and Gomez (1984).

Body weight: Average gain in body weight under different treatments (Table 1) during the experiment revealed that overall body weight gain/ ADG was higher for T₁ followed by T₂ and the least for T₀. Highly significant difference ($P < 0.01$) was observed between treatments in overall body weight gain and average daily gain. In general, the kid’s weight increased gradually during the experimental study and variations existed between treatments. Higher overall body weight gain in T₁ could be attributed to the balanced rationing of feeding concentrates to the kids along with *ad lib.* greens during this period. Bharambe and Burte (2012) studied the comparative growth performance of Deccani lambs under various rearing systems in agro-ecological conditions of Konkan and reported higher weight gain in lambs under stall fed system than semi stall fed and grazing system. They also concluded that, sustainable lamb production could be promoted in stall-fed (Intensive) system in Konkan region of Central India.

Moniruzzaman *et al.* (2002) observed the effect of different feeding systems on carcass and non-carcass parameters of Black Bengal goats. They reported higher preslaughter weight and significant post slaughter weight

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Table 1. Average gain in body weight (mean±SE) of crossbred Salem black goat kids

Treatment	Average weight gain (in kg)			Overall gain (kg)	Average daily gain (g/day/kid)	F value
	30 th day	60 th day	90 th day			
T0	0.60±0.29 ^b	1.53±0.36 ^a	1.60±0.36 ^a	3.73±0.14 ^p	41.75±0.001 ^x	21.11 ^{**}
T1	1.87±0.81 ^c	2.31±0.80 ^{cd}	2.75±0.63 ^d	6.93±0.40 ^r	77.42±0.004 ^z	5.37 [*]
T2	1.46±0.22 ^g	1.98±0.48 ^f	2.46±0.68 ^e	5.90±0.21 ^q	65.89±0.001 ^y	19.31 ^{**}
F value		28.49 ^{**}	30.19 ^{**}			

Means bearing same superscripts within rows and columns do not differ significantly. ^{**}Highly Significant (P<0.01), ^{*}Significant (P<0.05).

for goats maintained under intensive system and the least for grazing animals which could be attributed to several environmental factors such as sunshine, rainfall and dirty pastures resulting poor growth rate. Imasuen and Ogedegbe (2014) conducted experimental study on growth and physiological performance of West African goats reared under intensive and extensive systems of management, and reported that growth rate was significantly better in animals reared under intensive system of management. Pathan *et al.* (2017) studied the growth performance and behavior pattern of sangamneri goats under different rearing systems, viz. extensive, semi intensive and intensive and reported that the goats reared under intensive system significantly (P<0.05) attained higher growth rate than the other systems. This is attributed to the availability of ample amount of feed and more comfortable environmental zone to stall fed as compared to other groups such as heat stress and less availability of grasses during grazing.

Patil *et al.* (2014) conducted a study on comparison of stall fed system of goat rearing with grazing system and concluded significantly higher overall body weight gain in stall fed group than grazing system. Faisal *et al.* (2017) studied the combined effect of concentrate and area specific mineral mixture (ASMM) supplementation in Ganjam goat kids and reported that significant increase in body weight was observed in kids supplemented with concentrates containing ASMM. Also they stated that the higher growth rate may be due to increased energy and protein supplementation in concentrate supplemented groups and better nutrient utilization in mineral supplemented animals. Tiwari *et al.* (2014) also studied the effect of mineral mixture supplementation daily on body weight in non-descript male

goats and concluded that body weight and average daily weight gain were higher for goats which received both concentrates and mineral mixture. Rawat *et al.* (2015) studied the growth rate and survivability patterns in Jamunapari breeds of goats under farm conditions in Mahoba district of Bundelkhand region. They reported higher body weights and ADG were higher for goats under stationary tracts than migratory tracts.

Body length and withers height: The average gain in body length and withers height of goat kids under different treatments are presented in Table 2. It is evident that overall body length and withers height (cm) gain was higher for T1 (10.63 and 8.63) followed by T2 (8.56 and 7.75) and the least for T0 (6.38 and 6.76) in the descending order of magnitude. It could be understood that high significant difference/ significant difference (P<0.01/ P<0.05) was evident between treatments in overall gain in body lengths and withers height of the crossbred goat kids. Also significant difference (P<0.05) was evident for T1 between days in overall gain in body length. Bharambe and Burte (2012) studied the comparative growth performance of Deccani lambs under various rearing systems in agro-ecological conditions of Konkan and observed significant (P<0.05) values in body length and withers height were higher for stall fed (9.92 cm and 9.57 cm) followed by semi stall fed (9.07 cm and 9.40 cm) and the least for (8.77 cm and 8.90 cm) grazing animals in the descending order. Moniruzzaman *et al.* (2002) studied the effect of different feeding systems on carcass and non-carcass parameters of Black Bengal goats. They compared different feeding systems such as stall fed, tethering, restricted grazing and grazing and observed preslaughter measurements of body

Table 2. Average gain in body length and withers height (mean±SE) of crossbred salem black goat kids

Parameter	Treatment	30 th day	60 th day	90 th day	Overall gain	F value
Average gain in body length (cm)	T0	1.87±0.62 ^a	2.00±0.33 ^a	2.50±0.36 ^a	6.38±0.41 ^x	1.72 ^{NS}
	T1	3.38±0.25 ^c	3.25±0.44 ^c	4.00±0.62 ^b	10.63±0.29 ^z	3.78 [*]
	T2	2.75±0.55 ^d	2.94±0.68 ^d	2.87±0.56 ^d	8.56±0.32 ^y	2.04 ^{NS}
	F value				36.57 ^{**}	
Average gain in withers height (cm)	T0	2.13±0.81 ^a	2.25±0.77 ^a	2.38±0.72 ^a	6.76±1.24 ^y	0.395 ^{NS}
	T1	2.75±0.44 ^b	2.88±0.80 ^b	3.00±0.65 ^b	8.63±0.89 ^z	0.276 ^{NS}
	T2	2.50±0.89 ^c	2.50±0.78 ^c	2.58±0.82 ^c	7.75±0.86 ^{zy}	0.484 ^{NS}
	F value				6.229 [*]	

Means bearing same superscripts within rows and columns do not differ significantly. ^{**}Highly Significant (P<0.01), ^{*}Significant (P<0.05), ^{NS}Non-significant (P>0.05).

Table 3. Average gain in rump height and heart girth (mean±SE) of the crossbred salem black goat kids

Parameter	Treatment	30 th day	60 th day	90 th day	Overall gain	F value
Average gain in rump height (cm)	T0	2.50±0.67 ^a	2.37±0.86 ^a	2.31±0.66 ^a	7.18±1.15 ^x	0.189 ^{NS}
	T1	2.88±0.62 ^b	2.87±1.12 ^b	2.68±1.05 ^b	8.43±1.31 ^y	0.155 ^{NS}
	T2	2.69±0.70 ^c	2.63±0.50 ^c	2.50±0.73 ^c	7.82±1.13 ^{xy}	0.342 ^{NS}
	F value				2.38 ^{NS}	
Average gain in heart girth (cm)	T0	1.62±0.33 ^a	1.44±0.29 ^a	2.19±0.51 ^a	5.25±0.49 ^y	1.68 ^{NS}
	T1	2.25±0.68 ^b	2.50±0.44 ^b	3.13±0.46 ^b	7.88±0.42 ^z	2.01 ^{NS}
	T2	2.06±0.57 ^c	1.87±0.35 ^c	2.25±0.68 ^c	6.18±0.40 ^y	0.554 ^{NS}
	F value				9.04 ^{**}	

Means bearing same superscripts within rows and columns do not differ significantly. NS, Non-significant ($P>0.05$); **Highly Significant ($P<0.01$).

length and height at withers were higher for stall fed followed tethering, grazing and restricted grazing animals.

Rump height and heart girth: The average gain in rump height and heart girth (cm) of goat kids under different treatments are presented in Table 3. Overall high gain in rump height and heart girth was observed for T1 (8.43 and 7.88 cm) followed by T2 (7.82 and 6.18 cm) and the least for T0 (7.18 and 5.25 cm), in the descending order of magnitude. Moreover highly significant difference ($P<0.01$) was evident in overall gain in heart girth of the crossbred goat kids between treatments. It could be concluded that although no significant difference were evident between the groups, Treatment 1 revealed higher gain in rump height owing to the nutritious diet provided in terms of balanced concentrate feed as well as the green fodder supplementation. Highly significant ($P<0.01$) gain values in chest girth were recorded for stall fed (10.30 cm) followed by semi stall fed (10.15 cm) and the least (9.15 cm) for grazing system animals while studying the comparative growth performance of Deccani lambs under various rearing systems in agro-ecological conditions of Konkan (Bharambe and Burte 2012). Average gain in heart girth of goat was higher for stall fed animals than other rearing system and lower values obtained in case of goats reared by grazing, though no significant difference ($P>0.05$) was evident between the treatments (Moniruzzaman *et al.* 2002).

SUMMARY

It is thus concluded that imbalanced feeding could affect the physiological function due to inadequate nutrient and further lead to reduction in growth performance and productivity of the farms. Also it may result in decreased kid growth, delay in puberty, lowered fertility, and lowered resistance to disease and parasites. Thus proper feeding to herds would ensure the goats in good body condition for breeding as well as improvement in growth performance with respect to the body weight (BW) and it in turn fetches more profit to the farmer. Hence by adopting intensive system of rearing, i.e. stall fed, goat rearing progressive farmers have

a large potential for gaining more economic benefit with positive net returns compared to grazing system.

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