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# Evaluation of growth, feed conservation efficiency and carcass traits of Jamunapari goats under intensive feeding system

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Jamunapari is one of the important large sized dual-purpose goat breeds of India. These goats have been extensively used across the country and aboard for up-gradation of non-descript and poor performing goats. However, presently Jamunapari breed has come under endangered category on account of reduction in population in its home tract mainly due to lack of feeding resources (browsing material), improper marketing policy and inadequate development programmes etc. (Singh *et al.* 2008). Therefore, it is essential to find out alternate feeds to maintain the production potential of these goats so that sustainable livelihood of goat keepers and conservation of this valuable germplasm could be ensured. Balanced feeding in terms of energy and protein optimizes growth and this inter-relationship is additive (Chowdhury and Ørskov 1997). The complete feed pellet (CP12% and TDN 60%) containing *Cajanus cajan* straw as basal roughage gave 51.11 g ADG in weaned (5–10 months) Barbari kids (Dutta *et al*. 2003). Development of suitable feeding system for this endangered goat breed is one of the targeted areas for its conservation. Commercial goat farming is coming up with fast pace now-a-day. Therefore, it is high time to develop alternate feedings schedule suitable for pace of changes occurring in land utilization pattern particularly shrinkage of grazing land. Therefore, present study was conducted to evaluate complete feed based legume straw (*Cajanus cajan*) in 2 physical forms (pellet and total mixed ration) in Jamunapari kids.

The experiment was carried out in Jamunapari goat unit of All India Coordinated Research Programme located at the Central Institute for Research on Goats (CIRG), Makhdoom, Farah (P.O.), Mathura, Uttar Pradesh in 2006–07. Eighteen weaned Jamunapari males at 3 months of age were divided into two equal groups based on their body weight. Animals were kept individually during the experimental period i.e. 3 to 9 months of age. Kids under group 1 ($T_1$) were fed *ad lib*. complete pelleted feed and in group 2 ($T_2$) *ad lib*. total mixed ration (TMR). The rations were prepared using the ingredients as mentioned in Table 1.

Samples of feeds and residues were analyzed for Proximate Principles (AOAC 1984) and cell wall constituents (Goering and Van Soest 1970). Observations on body weights were recorded at weekly interval up to 9 months of age whereas nutrients intake was recorded daily. Freshwater was freely available to kids. These kids at the age of 9 months were slaughtered for carcass evaluation. The animals were weighed prior to slaughter. Bleeding, skinning and evisceration were done as per the standard procedures. After dressing the carcass measurements were taken as per Prasad and Agnihotri (1992). Weight of edible and non-edible offal's

Table 1. Formulation and chemical composition (%) of complete feeds

| Parameters | ($T_1$) complete pellet feed | ($T_2$) total mixed ration |
|---|---|---|
| *Ration formulation (%)* | | |
| Maize | 10 | 10 |
| Barley | 15 | 15 |
| Groundnut cake | 15 | 15 |
| Wheat bran | 8.5 | 8.5 |
| Mineral mixture | 1 | 1 |
| Common salt | 0.5 | 0.5 |
| *Cajanus cajan* straw | 50 | 50 |
| Total | 100 | 100 |
| *Chemical composition (%)* | | |
| CP | 14.52 | 14.38 |
| EE | 2.26 | 2.42 |
| Ash | 11.04 | 11.63 |
| NDF | 52.78 | 54.10 |
| ADF | 28.75 | 31.42 |

Vitamins supplemented per quintal of feed mixture: -vitamin-A 500000 IU, vitamin $D_3$ 100000 IU, vitamin $B_2$ 0.2 g, vitamin E 75 units, vitamin K 0.1 g, calcium pantothenate 0.25 g, nicotinamide 1.0 g, vitamin $B_{12}$ 0.6 mg.

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Table 2. Nutrient intake and growth in weaned Jamunapari kids under complete feeds

| Parameters | $T_1$ (complete pellet feed) | $T_2$ (total mixed ration) | Significance |
|---|---|---|---|
| Initial body weight (kg) | 11.33±0.57 | 10.61±0.50 | NS |
| DM intake (g) | 891.86±72.84 | 663.05±55.90 | NS |
| DMI (kg)/100 kg BW | 4.82±0.18 | 4.67±0.51 | NS |
| DMI (kg)/$W^{0.75}$ kg BW | 99.41±3.65 | 90.64±9.22 | NS |
| CP intake (g) | 129.50±10.58 | 95.35±8.04 | NS |
| CPI (g)/$W^{0.75}$ kg BW | 14.43±0.53 | 13.03±1.33 | P<0.05 |
| NDF intake (g) | 470.72±38.45 | 358.71±30.24 | NS |
| NDF (g)/$W^{0.75}$ kg BW | 52.46±1.93 | 49.04±4.99 | P<0.05 |
| Final body weight (kg) | 29.80±2.13 | 24.93±2.36 | NS |
| Weight gain (kg) | 16.42±2.15 | 11.81±0.52 | NS |
| ADG (g) | 90.23±8.92 | 64.89±2.89 | P<0.05 |
| Feed conversion efficiency (%) | 10.47±0.60 | 10.44±1.06 | NS |

and separated fat to the nearest of 1 g, empty body weight to the nearest of 5 g and dressing percentage were recorded as described by Dhanda *et al.* (1999). Immediately after dressing carcass measurements were recorded using a measuring tape to the nearest of 1 mm. Different cut weights were taken following standard procedure. Statistical analysis of data was done using student t-Test as per Snedecor and Cochran (1980).

The CP, EE and NDF were 14.52, 2.26 and 52.78% in complete feed pellet, corresponding estimates were 14.38, 2.42 and 54.10% in total mixed ration (Table 1). Higher DM intake in $T_1$ than $T_2$ was recorded, though the difference was nonsignificant (Table 2). The DM intake/kg $W^{0.75}$ was 99.41 in $T_1$ and 90.64 g in $T_2$. Whereas, CP and NDF intakes/kg $W^{0.75}$ were (P<0.05) higher in $T_1$ (14.43 and 52.46 g) as compared to $T_2$ (13.03 and 49.04 g). Therefore, palatability of complete pelleted feed was better than total mixed ration in these kids. The results corroborated the findings of Dutta *et al.* (2003) in Barbari kids. Weight gain and final body weight (slaughter) were higher in $T_1$ by 4.61 and 5.33 kg over $T_2$, but the difference was nonsignificant, which might be due to high individual variations within group. However, average daily gain (ADG) was significantly (P<0.05) higher in $T_1$ (90.23 g) than $T_2$ (64.89 g), which was mainly due to higher nutrients intake in pellet fed group. Feed conversion efficiency (%) was statistically similar in both the groups (10.47 vs 10.44). Prakash *et al.* (2006) in Barbari kids reported similar finding. The complete feed pellet (CP12% and TDN 60%) containing *Cajanus cajan* straw as basal roughage gave 51.11 g ADG in weaned (5–10 months) Barbari kids (Dutta *et al.* 2003). Higher growth rate in $T_1$ due to higher intake was almost similar with the results of earlier study in Mawari kids reared under feed lot system (Shinde *et al.* 2000).

The slaughter weight was 4.87 kg higher in $T_1$ than $T_2$ although difference was non-significant (Table 3). Body measurements and carcass measurements were higher in $T_1$ than $T_2$, however significant (P<0.05) effect was observed

Table 3. Carcass traits, variety meat and different cut weights of Jamunapari kids fed with different pelleted feeds

| Traits | $T_1$ | $T_2$ | Significance |
|---|---|---|---|
| Slaughter weight (kg) | 29.80±2.13 | 24.93±2.36 | NS |
| *Carcass measurements* | | | |
| Carcass loin width (cm) | 12.94±0.47 | 11.67±0.34 | NS |
| Chest circumference (cm) | 66.44±1.77 | 59.78±2.19 | NS |
| Leg circumference (cm) | 29.22±1.26 | 26.97±1.69 | NS |
| GR measurement (mm)[#] | 1.16±0.07 | 1.08±0.03 | P<0.05 |
| Loin eye area ($cm^2$) | 10.68±0.71 | 9.88±0.54 | NS |
| *Fat thickness*[##] | | | |
| Back fat (mm) | 1.18±0.07 | 1.10±0.02 | P<0.05 |
| Breast fat (cm) | 2.26±0.26 | 1.72±0.29 | NS |
| *Carcass traits* | | | |
| Hot carcass weight (kg) | 14.29±0.29 | 11.27±1.25 | NS |
| Dressing (%)[b] | 47.56±1.29 | 44.71±0.88 | NS |
| Dressing (%)[a] | 55.55±1.20 | 55.65±0.97 | NS |
| *Variety meat*[b] | | | |
| Testes (g) | 170.00±13.87 | 125.56±11.68 | NS |
| Pancreas (g) | 39.44±2.42 | 32.22±4.01 | P<0.05 |
| Spleen (g) | 56.11±8.93 | 40.00±5.27 | NS |
| Kidney (g) | 98.33±6.24 | 86.11±9.20 | NS |
| Liver (g) | 483.33±30.26 | 401.11±35.68 | NS |
| Heart (g) | 117.22±9.39 | 87.22±9.32 | NS |
| *Depot fat (kg)* | | | |
| Cod fat (kg) | 77.22±8.68 | 64.44±9.23 | NS |
| Kidney fat (kg) | 149.44±20.92 | 131.11±40.36 | NS |
| Omental fat (kg) | 250.00±24.49 | 194.44±30.76 | P<0.05 |
| *Cut weights* | | | |
| Leg cut weight (kg) | 2.19±0.20 | 1.93±0.13 | NS |
| Loin cut weight (kg) | 0.88±0.07 | 0.82±0.10 | NS |
| Rack cut weight (kg) | 0.96±0.09 | 0.90±0.06 | NS |
| Neck and shoulder weight (kg) | 1.66±0.20 | 1.58±0.16 | NS |
| Breast and shank cut weight (kg) | 1.41±0.12 | 1.25±0.12 | NS |
| Saleable meat yield as % of SW | 44.03±1.18 | 40.76±1.08 | NS |

*P<0.05; [#]GR measurement is the soft tissue thickness, measured 11 cm from midline on 12th rib of the carcass; [##] Fat thickness measured with vernier caliper. [a]On empty body weight basis; [b]includes heart, liver kidney, pancreas, spleen and testes; CW carcass weight; SW slaughter weight.

only in GR measurement ($T_1$, 2.16 mm and $T_2$, 2.08 mm). Kids from the pellet fed group had better type chevon carcass with larger loins and enhanced back and breast fat thickness. Hot carcass weight and dressing percentage on slaughter weight basis was also numerically higher in $T_1$ than $T_2$, however, difference in both the group for carcass and non-carcass traits was nonsignificant (Table 3). Kidney and cod fat depot were similar in both the groups, whereas, pelleted feed resulted higher ($P<0.05$) omental fat deposit in $T_1$ than $T_2$. Due to higher body weight in $T_1$, the weight of different edible organs (testis, spleen, kidney, liver and heart) tended to be higher in $T_1$ than $T_2$. Different cut weights like leg cut, loin cut, rack cut, neck and shoulder cut and breast and shank cut were higher in $T_1$ than $T_2$. Sealable meat yield was 44.03 in $T_1$ and 40.76% in $T_2$, however, differences were nonsignificant. The complete feeds in this experiment contained 50% concentrate mixture, therefore, contain higher protein (CP 14.52 and 14.38%) and energy (estimated TDN 60.65% in both treatments) contents. The intake of nutrients was increased by the kids under $T_1$ due to reduced particle size of pelleted feed, which triggered into more fat deposit in the carcass as compared to TMR fed kids. Higher proportion of cod and kidney fat for intensively fed kids were probably brought about by higher intake of protein and energy (Shinde *et al.* 2000 and Abdullah and Musallan 2007).

Additional DM intake of 229 g/day/kid in complete pellet fed group resulted into 3.02 kg higher meat yield in the same feeding period than TMR fed kids of Jamunapari breed. The growth rate (90.23 g) of Jamunapari kids under $T_1$ was better than the reported weight gain/day (50.33 g) in the same breed reared under intensive feeding. Therefore, complete pelleted feed prepared with 50% concentrate mixture and 50% roughage (*C. cajan*) can be used for higher growth and chevon production in Jamunapari kids under commercial goat production as well as conservation of this endangered breed of goat.

## SUMMARY

Post-weaned Jamunapari males at 3 months of age were fed either with *ad lib*. complete pelleted feed (CPF) ($T_1$) or with total mixed ration (TMR) ($T_2$). The rations were prepared with 50% concentrate mixture and 50% *Cajanus cajan* straw. Kids consumed numerically higher DM in $T_1$ than $T_2$, however, the difference was nonsignificant. Whereas, CP and NDF intakes/kg $W^{0.75}$ were significantly ($P<0.05$) higher in $T_1$ as compared to $T_2$. Average daily gain (ADG) was significantly higher ($P<0.05$) in $T_1$ than in $T_2$. Biometrical and carcass measurements were statistically similar in both the groups. Kids from the pellet fed group had better type chevon carcass with larger loins and enhanced back and breast fat thickness. Hot carcass weight and dressing percentage on slaughter weight basis was numerically higher in $T_1$ than $T_2$. Additional DM intake of 229 g/day/kid in complete pellet fed group on account of better palatability resulted into higher body weight by 4.87 kg, weight gain by 25.34 g/day and 3.02 kg higher meat yield over total mixed ration in the same period. Results indicate that Jamunapari goat farmers could utilize complete pelletd feed for higher growth and sustainable conservation of the unique Jamunapari goat breed.

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