*Indian Journal of Animal Sciences* **89**(8): 881–884, August 2019/Article
https://doi.org/10.56093/ijans.v89i8.93024

# Effect of feeding Hedge lucerne (*Desmanthus virgatus*) on intake, growth performance and body condition score in growing Osmanabadi goats

A S SONAWANE[1], K Y DESHPANDE[2], S B RATHOD[3], P R SHELKE[4], M G NIKAM[5] and A U GHOLVE[6]

*College of Veterinary and Animal Sciences, Parbhani, Maharashtra 431 402 India*

Received: 19 September 2018; Accepted: 5 February 2019

ABSTRACT

An experiment was planned to explore the possibilities of replacement of concentrate mixture by Hedge lucerne (*Desmanthus virgatus*) in growing Osmanabadi goats for 90 days. Osmanabadi growing goats (18) of either sex with similar age and body weights (12.77±0.53 kg) were divided into two treatment groups and one control group ($T_0$) with six goats in each group. Concentrate mixture was offered to control group ($T_0$), while $T_1$ and $T_2$ groups received ration in which 50% and 100% concentrate was replaced by Hedge lucerne on dry matter basis. The mean fortnightly dry matter intake (g/d) was significantly higher in control ($T_0$) and $T_2$ than $T_1$. The intake of DCP (g/d) was significantly higher in control and $T_1$ as compared to $T_2$. The per cent digestibility of nutrients namely DM, OM, CP, EE, CF and NFE did not differ significantly amongst the treatment groups. Total gain in body weight (kg) was significantly higher in $T_1$ (2.71±0.13) as compared to $T_0$ (2.58±0.50) and $T_2$ (2.25±0.02). The final body weight of experimental goats were 15.57 kg ($T_0$), 15.18 kg ($T_1$) and 15.61 kg ($T_2$) respectively. The body condition score was significantly higher in $T_0$ and $T_1$ than $T_2$. The total cost of production was significantly higher in $T_0$ (₹ 1858.86) followed by $T_1$ (₹ 1810.81) and $T_2$ (₹ 1725.85). The highest net profit per goat was recorded for $T_2$ (₹ 2957.15), followed by $T_0$ (₹ 2812.14) and $T_1$ (₹ 2743.15) groups. It is concluded that inclusion up to 50% Hedge lucerne to replace concentrate in diet of goats improves growth performance and increases net profit of Osmanabadi goat production.

**Key words**: Body condition score, Digestibility, Growth performance, Hedge lucerne, Osmanabadi goats

Livestock sector plays a significant economic role in developing countries and is essential for the food security of their population. The productivity of farm animals in most tropical countries is generally low, mainly due to poor quality and inadequacy of available feeds.

Moreover, conventional feed resources for animal production are highly expensive in many parts of the world. The population of goats in India was 135.173 million and 79.71 lakh in Maharashtra (19th Livestock Census) which decreased by 9.98% as compared to previous livestock census (2007). The demand for goat meat is on rise throughout the world, especially in developing countries due to increased human population, rise in income and great need for lean meat (Sanon *et al.* 2008). To meet this demand, there is a need to improve the productivity of goats, which is relatively low (Solomon *et al.* 2008). Hence the demand for alternative feed resources must be identified and aptly addressed. One such alternative feed for ruminant livestock is tree fodder/shrubs like Hedge lucerne (*Desmanthus virgatus*). Hedge lucerne trees are multi-purpose trees of economic importance and good feeding values. Hedge lucerne and other unconventional protein sources seem to be alternative protein source to traditionally used oil cakes in the ration of ruminants, particularly sheep and goat. Cook *et al.* (2005) reported that *Desmanthus virgatus* is palatable to grazing ruminants throughout the growing season. The production in India is very low due to acute shortage of grazing and browsing resources. Hence it is of prime importance to search alternative feed resources to roughages and concentrates for small ruminants. Only scanty information is available on feeding Hedge lucerne for small ruminants. Hence, present study evaluated the effect of feeding Hedge lucerne on performance of Osmanabadi goats.

Present address: [1,3,4,6]MVSc Scholar, Department of Animal Nutrition. [2]Assistant Professor (kuldeepydeshpande @gmail.com), Department of Animal Nutrition; [6]Assistant Professor (email..??), Department of Poultry Science.

## MATERIALS AND METHODS

*Experimental animals:* Eighteen Osmanabadi growing goats of either sex with similar age (3 months) and body weights (12.77±0.53 kg) were divided into two treatment groups and one control group ($T_0$) with six goats in each group. All the experimental goats were housed in a shed with individual feeding facilities.

*Feeds and fodders:* The feeds used in the experiments were Hedge lucerne (*Desmanthus virgatus*), concentrate

mixture, DHN-6 (Dharwad hybrid napier grass) and jowar straw as roughages. Concentrate mixture was formulated from the locally available feed ingredients, i.e. (maize, soybean meal, DORB and cotton seed cake) and offered to control group ($T_0$), while $T_1$ and $T_2$ groups received ration in which 50% and 100% concentrate was replaced by Hedge lucerne (*Desmanthus virgatus*) on dry matter basis. Per cent composition of ingredients in concentrate mixture is given in Table 1.

Table 1. Per cent ingredient composition of concentrate mixture

| Ingredient | (%) |
|---|---|
| Maize | 43.75 |
| Soybean meal | 21.25 |
| Deoiled ricebran | 16.00 |
| Cottonseed cake | 15.50 |
| DCP | 0.50 |
| Calcite | 1.50 |
| Trace minerals | 0.30 |
| Vitamin premix | 0.20 |
| Salt | 1.00 |

*Experimental procedure:* The feeds were offered once a day at 08:30 AM including concentrate, green and dry roughages. The experimental goats were fed as per ICAR (2013) nutrient requirements. To determine the nutrient digestibility, a digestibility trial was carried out at the end of experiment (i.e. after 90 days). The trial lasted for 10 days with 3 days adaption period. Daily feed offered and faeces voided during this period were recorded. Feed residues for each animal were collected and weighed throughout the trial in order to determine the feed intake per day. Body condition scoring was done by using hand to feel muscle and fat cover over and around the vertebrae. Scoring was performed in goats using a BCS ranging from 1.0 to 5.0, with 0.5 increments. Mario Villaquiran scale was used to score the goats.

*Statistical analyses:* Statistical analyses of data were done as per Snedecor and Cochran (1994). The data obtained were subjected to one-way analysis of variance (ANOVA). The period effect was calculated as per Univariate analysis using SPSS software version 20.0. Means were compared and allotted suitable superscripts as per Duncan's multiple range test.

## RESULTS AND DISCUSSION

*Chemical composition of feed and fodders:* The chemical composition on per cent DM basis of experimental feeds namely Hedge lucerne (*Desmanthus virgatus*), DHN-6 (Dharwad hybrid napier-6) and jowar straw (Dry roughage) and formulated concentrate mixture is given in Table 2. The dry matter content of concentrate and jowar straw were 94.78 and 90.34% respectively. The dry matter content in Hedge lucerne and DHN-6 were 24.88 and 21.45% respectively. The per cent CP content of concentrate and Hedge lucerne were comparable (21.99 vs 19.71%). Per cent crude fibre and ether extract of all the offered feed and fodders remained in normal range for respective category. The total ash content of DHN-6 and jowar straw were 12 and 9.35% respectively.

Table 2. Chemical composition of feed and fodder offered to growing experimental Osmanabadi goats (% DM basis)

| Nutrient (%) | Concentrate | Hedge lucerne | DHN6 (Green) | Dry roughage (Jowar straw) |
|---|---|---|---|---|
| DM | 94.78 | 24.88 | 21.45 | 90.34 |
| CP | 21.99 | 19.71 | 10.50 | 3.20 |
| CF | 4.55 | 21.26 | 27.00 | 32.2 |
| EE | 3.49 | 4.50 | 5.30 | 1.67 |
| Total ash | 7.36 | 5.60 | 12.00 | 9.35 |
| NFE | 62.61 | 48.93 | 45.20 | 53.58 |

DM, Dry matter; CP, crude protein; CF, crude fibre; EE, ether extract; NFG, nitrogen free extract.

The dry matter content of Hedge lucerne (24.88%) was significantly lower when compared to that reported by Jayaprakash *et al.* (2016) and Suksombat and Buakeeree (2006) who have recorded higher dry matter content (29.14 and 31.77%) of Hedge lucerne in their studies. The composition of concentrate, DHN-6 and jowar straw used ranged in normal limits for said feed and fodders. It was noteworthy that Hedge lucerne fodder used in present study contained comparable protein (19.71%) with that of the concentrate mixture (21.99%).

*Nutrient intake:* The intake of jowar straw expressed as g/d, g/kg $W^{0.75}$ and per cent of live body weight was significantly higher in $T_2$ as compared to control ($T_0$) and $T_1$. The intake of dry matter as well as organic matter expressed as g/day, g/kg $W^{0.75}$ and per cent of live weight were comparable (P>0.05) amongst the treatment groups. The present finding is supported by observations of Cook *et al.* (2005) who reported that *Desmanthus virgatus* is palatable to grazing ruminants throughout the growing season. They further stated that the Hedge lucerne was less palatable than *Leucaena* but more readily eaten than *Staylosanthes sacbra* in their study. Gohl (1982) devised that *Desmanthus virgatus* is non-toxic to ruminants and is used as fodder and for grazing. This claim was bolstered by Cook *et al.* (2005) who reported that *Desmanthus* sp. did not cause bloat in ruminants because it contained 2–3% (of total dry matter as tannic acid) condensed tannins. However, the intake of dry matter and organic matter was not influenced (P<0.05) by Hedge lucerne feeding. Fortnightly dry matter intake (DMI) (g/d) revealed that the mean intake was significantly higher (P<0.05) in control ($T_0$) and $T_2$ than $T_1$ in said order. The intake of dry matter increased significantly (P<0.05) in last three fortnights when compared with earlier three fortnights. The dry matter intake in sheep expressed as per cent of body weight and g/kg $W^{0.75}$ as reported by Radhakrishanan *et al.* (2007) (4.97 and 10.52) was much higher than that observed in goats in present study (3.11–3.19 and 60.97–62.81). The fortnightly

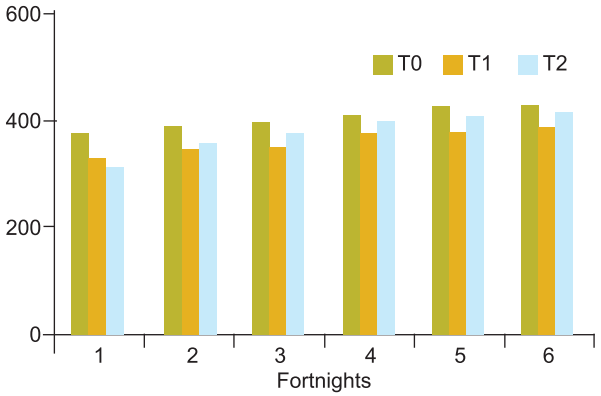


Fig. 1. Effect of feeding Hedge lucerne on fortnightly dry matter intake (g/d) in growing experimental Osmanabadi goats.

DMI (g/d) is shown in Fig. 1.

*Voluntary feed intake:* The intake of Jowar straw increased significantly (P<0.05) in $T_2$ (405.83±4.79) followed by $T_0$ (325.83±8.52) and $T_1$ (314.70±3.03) respectively (Table 3). However, the average total voluntary dry matter intake (g/d) was comparable amongst the treatment groups (P=0.142).

*Nutrient digestibility:* The per cent digestibility of nutrients namely DM, OM, CP, EE, CF and NFE did not differ significantly (P>0.05) amongst the treatment groups (Table 4). The values for per cent digestibility of various nutrients remained within the normal range. The data regarding utilization and digestibility of nutrients by goats fed Hedge lucerne is hardly reported. However, Sultana *et al.* (2015) evaluated sole Moringa foliage diet and Moringa–Napier mixture diets against sole Napier grass diets in Bengal goats. They deduced that the dry matter and organic matter digestibility in goats was significantly higher in sole Moringa foliage diet than other two types of diets. An attempt to feed pigs with sundried leaves of Hedge lucerne (17% in the diet of dry matter) was made. Organic matter and N digestibility of the diet decreased when *Desmanthus* meal was introduced in the diet of pig. This same effect was evident for DM digestibility. N retention as percentage of intake was lower in pigs fed *Desmanthus* meal, but there was no treatment effect when N retention was related to the amount of digested N (Ly *et al.* 2001).

Table 3. Effect of feeding Hedge lucerne on voluntary feed intake (g/d) in growing experimental Osmanabadi goats

| Voluntary feed intake (g/d) | Treatment | | | SEM | P value |
|---|---|---|---|---|---|
| | $T_0$ | $T_1$ | $T_2$ | | |
| Concentrate | 144.40 | 108.00 | – | 0.000 | 0.000 |
| Green | 200.00[a] | 223.50[a] | 280.17[b] | 17.671 | 0.001 |
| Jowar straw | 325.83[a] | 314.70[a] | 405.83[b] | 8.356 | 0.000 |
| Total | 670.23 | 646.20 | 685.99 | 18.973 | 0.142 |

[a,b,c]Means bearing different superscripts in a row differ significantly (P<0.05).

Table 4. Effect of feeding Hedge lucerne on nutrient digestibility (%) in growing experimental Osmanabadi goats

| Attribute | Treatment | | | SEM | P value |
|---|---|---|---|---|---|
| | $T_0$ | $T_1$ | $T_2$ | | |
| DM | 65.89 | 65.06 | 64.77 | 5.058 | 0.974 |
| OM | 65.20 | 64.96 | 64.20 | 4.971 | 0.978 |
| CP | 81.11 | 83.81 | 83.70 | 0.191 | 0.328 |
| EE | 58.00 | 59.06 | 61.01 | 7.521 | 0.921 |
| CF | 71.71 | 67.18 | 77.93 | 5.770 | 0.207 |
| NFE | 50.84 | 41.84 | 51.58 | 8.888 | 0.491 |

DM, Dry matter; CP, crude protein; CF, crude fibre; EE, either extract; NFG, nitrogen free extract.

*Nutritive value and plane of nutrition:* The live body weight and metabolic body size (kg) did not differ significantly amongst the treatment groups. The intake of digestible dry matter (DDM), digestible organic matter (DOM), digestible crude protein (DCP) and total digestible nutrients (TDN) expressed as g/d and g/kg$W^{0.75}$ did not differ significantly (P>0.05) amongst the treatment groups. However, intake of DCP (g/d) was significantly higher (P<0.05) in control ($T_0$) and $T_1$ as compared to $T_2$. The per cent nutrient density (DCP and TDN) was comparable (P<0.05) between treatment groups. Radhakirshanan *et al.* (2007) reported similar values for nutrient density (10.86% DCP and 59.79% TDN) to those observed in present study. They further stated that due to good nutrient density the *Desmanthus virgatus* fodder could be used as potential leguminous fodder source for small ruminants. The per cent digestibility of nutrients namely DM, OM, CP, EE, CF and NFE did not differ significantly (P>0.05) amongst the treatment groups.

*Body condition score:* The body condition score was significantly higher in $T_0$ and $T_1$ than $T_2$. Though the score in control (2.35±0.09) and $T_1$ (2.23±0.10) was significantly higher than $T_2$ (2.06+0.07), the values were nearing the body condition scores of healthy goats (2.5–4.0). The normal body condition scores and average daily gain in Hedge lucerne supplemented groups indicates its better nutritional worth and further warrants its potential to mitigate shortage of costly protein source. The findings are in agreement with Patra *et al.* (2002). The monthly body condition scores of experimental goats are depicted in Fig. 2.

The highest net profit per goat was recorded for $T_2$ (₹ 2,957.15); while $T_0$ (₹ 2,812.14) and $T_1$ (₹ 2,743.19) groups could generate lesser profit. The higher net profit recorded in treatment $T_2$ group might be due to the least total cost of feed consumed (₹ 420.85) as against $T_1$ (₹ 505.81) and $T_0$ (₹ 553.86) respectively. The present findings support the very hypothesis of this experiment that tree fodders are instrumental in reducing the feed cost and thereby enhancing the net profit in small ruminant production. The cost economics in experimental goats is shown in Fig. 3.

It is concluded that the inclusion of up to 50% Hedge lucerne to completely replace concentrate in diet of goats improved growth performance and increases net profit of Osmanabadi goat production.

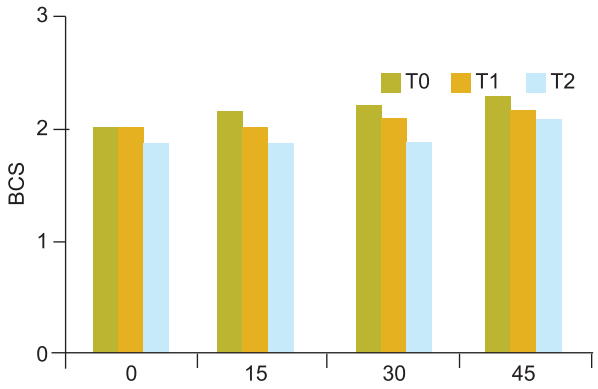


Fig. 2. Effect of feeding Hedge lucerne on body condition score in growing experimental Osmanabadi goats

## ACKNOWLEDGEMENTS

Facilities provided by the Associate Dean, CoVAS, Parbhani, for undertaking this study, are gratefully acknowledged.

## REFERENCES

Cook B G, Pengelly B C, Brown S D, Donnelly J L, Eagles D A, Franco M A, Hanson J, Mullen B F, Partridge I J, Peters M and Schultze-Kraft R. 2005. Tropical Forages: an interactive selection tool. CSIRO, DPI & F (Qld), CIAT and ILRI, Brisbane, Australia. Accessed July 2013.

Gohl B. 1982. The feed in the tropics. FAO, Production and Animal Health Division, Rome, Italy.

ICAR. 2013. *Daily Nutrient Requirements of Growing Male Goats Under Tropical Conditions*, Indian Council of Agricultural Research, New Delhi.

Jayaprakash G, Shyama P, Gangadevi K, Ally K, Anil K S, Asha K Raj, Sathiyabarathi M and Arokia R M. 2016. Biomass yield and chemical composition of *Calliandra calothyrsus*, *Desmanthus virgatus* and *Stylosanthes hamata*. *International Journal of Science, Environment and Technology* **85**(4): 2290–95.

Ly J and Pok S. 2001. Nutritional evaluation of tropical leaves for pigs; Desmanthus (*Desmanthus virgatus*). *Livestock Research for Rural Development* **13**(4).

Patra A K, Sharma K, Dutta N and Pattanaik A K. 2002. Effect of partial replacement of dietary protein by a leaf meal mixture containing *Leucaena leucocephala, Morus alba* and *Azadirachta indica* on performance of goats. *Asian Australasian Journal of Animal Science* **15**(12): 1732–37.

Radhakrishnan L, Murugan M and Sivakumar T. 2005. Biomass yield, chemical composition and nutritive value of *Desmanthus virgatus* (Hedge lucerne) for sheep. *Animal Nutrition and Feed Technology* **7**: 119–23.

Sanon H O, Kabore-Zoungrana C and Ledin I. 2008. Growth and carcass characteristics of male Sahelian goats fed leaves or pods of *Pterocarpus lucerns* or *Acacia senegal*. *Livestock Science* **117**: 192–202.

Solomon W, Solomon M and Adunga T. 2008. Supplementation of cotton seed meal on feed intake, digestibility, live weight and carcass parameters of Sidama goats. *Livestock Science* **119**: 137–44.

Suksombat W and Buakeeree K. 2006. Utilization of Hedge lucerne meal (*Desmanthus virgatus*) as protein supplement in layer diets. *Suranaree Journal of Science and Technology* **13**(2): 181–87.

Sultana N, Alimon A R, Huque K S, Baba M and Hossain J. 2015. Evaluation of moringa foliage (*Moringa oleifera*) as goat feed. *Iranian Journal of Applied Animal Science* **5**(4): 865–71.

Villaquiran M, Gipson T A, Gipson R C, Merkel R C, Goetsch A L and Sahlu T. 2004. *Body Condition Scores in Goats*. Enhanced goat production systems for the Southern United States (American Institute for Goat Research).