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Effect of Feeding Non-conventional Creep Mixtures on Growth Performance of Pre-weaned Lambs

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ABSTRACT

Twenty four farm born lambs of Marwari, Patanwadi and Merino x Patanwadi breeds were divided into three groups of eight each based on weight at three weeks of age and assigned to three treatments. In addition to suckling, the lambs were offered *ad libitum* conventional creep mixture (T_1: Maize 43%, GN Cake 15%, Rice polish 29%) or non conventional creep mixture I (T_2: GN Cake 17%, Rice polish 17%, P.J. pods 23%, babul pods chuni 14%, Mango seed kernel 16%) or non conventional creep mixture II (T_3: P.J. pods 22%, babul pods chuni 22%, Mango seed kernel 19%boiled C*assia tora* seeds 9%, Corn steep liquor 15%). Jaggery solution and mineral mixture were incorporated @ 10 and 3%, respectively, in all the three creep mixtures. Lambs of all the three treatments were fed limited quantity of green NB_{21} fodder (200 g/h/d) and *ad libitum* mature pasture grass (*Dicanthium annulatum*). The lambs were weaned at 15 weeks of age. Initial average body weight was 5.63±0.47 and 5.80±0.45 kg in T_1, T_2 and T_3, respectively. The corresponding body weights at weaning were 13.65±0.06 (T_1), 13.69±0.92 (T_2) and 13.95±0.88 (T_3) kg. The lambs of three treatments registered an overall average daily body weight gain (g) of 95.46±3.48 (T_1), 94.64±4.01 (T_2) and 97.03±5.19 (T_3). The differences between the three groups were statistically non-significant. The gain in skeletal growth in terms of linear body measurements viz., Body length, heart girth and height at withers was statistically similar in the three treatment groups. The cost of feeding solid feeds and the total cost of rearing were significantly ($P < 0.05$) lowest in lambs given non-conventional-II (T_3) creep mixture. The feed cost per kg weight gain and per kg dressed weight as well as the total cost per kg weight gain and per kg dressed weight were the lowest in T_3. The lambs of T_3 group provided maximum return over feed cost as well as maximum return over total cost of rearing. It was concluded that both conventional and non-conventional creep mixtures were equally effective for enhancement of pre-weaning lamb growth and therefore, the later could safely be used for economical raising of the lambs.

Key Words: Non conventional; Creep mixtures; Pre-weaned lambs; Growth; Economics

INTRODUCTION

Growth is a trait exhibited early in life and has direct bearing on market weight of lambs and in turn the expected mutton output. The growth rate increases until the point of inflection is reached in the lambs between one and five months of age (Owen, 1976). Thereafter, the animal continues to increase in weight, but its growth rate declines as the mature weight is approached. Thus the maximum advantage in terms of daily body weight gain can be availed during the pre-weaning phase of life. The pre-weaning growth is largely determined by the nutrition of lambs from the dams' milk and creep feeding. The growth rate at a higher rate cannot be sustained only on the milk supply from the dams. Therefore the creep feeding is obligatory to improve the growth and for enhancing the rate of anatomical and physiological maturation of gastro-intestinal tract. In earlier researches on creep feeding of lambs conventional feed ingredients were used (Al-Bakkour *et al.*, 1991; Bhatia & Solanki, 1994; Sawal *et al.*, 1996). These ingredients are very costly and their prices are ever increasing. Further, India is facing the shortage of livestock feeds and fodders. Ramachandra *et al.* (2001) reported the deficit of green forage to be 47 million tonnes, dry fodder 45 million tonnes and concentrates to be 9 million tonnes in India. On the other side, there are large number of non-conventional feeds available from forests and in form of agricultural and industrial byproducts, viz. Mango seed kernel (*Mangifera indica*), pods of vilayati babul (*Prosopis juliflora*), puvad seeds (*Cassia tora*), babul pods (*Acacia nilotica*) etc. The ever increasing prices of conventional feed ingredients and the vast availability of non-conventional feedstuffs, make it essential to use latter in formulation of animal rations without adversely affecting the health and productivity of livestock. Present experiment was, therefore, conducted to study the effects of feeding non-conventional creep mixture on growth rate and economics of preweaned lambs.

MATERIALS AND METHODS

The present experiment of 12 weeks duration was conducted at the Instructional Farm of the College. Twenty-four farm born lambs of Marwari, Patanwadi and Merino x Patanwadi breeds were randomly distributed into three groups, each of eight, based on their body weights at the average age of 21 days. They were individually fed Conventional (T_1), Non-conventional-I (T_2) or Non-conventional-II (T_3) creep mixtures *ad libitum*. The proximate analysis of experimental feeds was carried out as per AOAC (1975). The ingredients used for the formulation of three creep mixtures and proximate composition are shown in Table I. Before allocation to the treatments, an adaptation period of seven days was given to all lambs to acquaint them to creep feeding. The lambs were allowed to suckle their dams twice a day and the milk consumption was recorded by the technique of Sahni *et al.* (1963). In addition to suckling and creep mixtures, *ad libitum* mature pasture grass (*Dicanthium annulatum*) and limited quantity (200 g/head/day) of green Hybrid Napier (*Pennisetum purpureum X Pennisetum typhoides*) were also offered to each lamb. The quantity of creep feed and dry forage offered to lambs were adjusted every week after considering the intake in previous week, their body weights and growth rate. The consumption of solid feeds was recorded daily, whereas the body weights were recorded every week in the morning (8.00 a.m.) before offering feed, water or suckling. Linear body measurements, viz. body length, heart girth and height at withers were measured at the beginning and at the end of experiment. The lambs were weaned at 15 weeks of age.

The cost of creep mixture was Rs. 6.20, 5.10 and 3.94 per kg for three different creep mixtures, respectively. Similarly, the price of one kg of green Hybrid Napier, mature pasture grass and milk were Rs. 0.25, 1.20 and 6.0, respectively. The expenses incurred towards the labour and health cover of lambs were added to feeding cost to arrive at total cost of rearing. The dressing percentages of experimental lambs were adopted from Anonymous (1993). Based on the information collected through personal inquiries from the retailers in the local meat market, the total realizable receipt (Rs./lamb) was worked out . The mutton and liver are sold on weight basis but the skin, head, cannon, empty rumen, intestine etc. are sold on fixed price irrespective of weight. The data were analyzed statistically (Snedecor & Cochran, 1980).

RESULTS AND DISCUSSION

Ingredients/proximate composition of experimental feeds and fodders. The proportion of different ingredients used in formulation of conventional, non-conventional-I and non-conventional-II creep mixtures and proximate composition of all three creep mixtures, green Hybrid Napier (*Pennisetum purpureum X Pennisetum typhoides*) and matured pasture grass (*Dicanthium annulatum*) used in the experiment are presented in Table I.

Growth performance. The data on average body weights, body weight gain and body measurements of experimental lambs are given in Table II. At the beginning of the experiment, the average body weight of lambs in the treatments T_1, T_2 and T_3 was 5.63±0.47, 5.74±0.47 and 5.80±0.45 kg, respectively. The differences were statistically non-significant. The body weights at weaning (105 days of age) were 13.65±0.60, 13.69±0.92 and 13.95±0.88 kg for the lambs of three respective groups, which were statistically similar. However, significant ($P < 0.05$) period effect was observed. The weaning weights recorded in the present study were higher than those reported at 119 days of age in Marwari (11.99±1.61 kg) and Patanwadi lambs (12.16±0.96 kg) by Patel (1981). At 90 days' weaning the lambs of Marwari, Patanwadi and Merino x Patanwadi ewes were reported to have attained body weights of 10.68, 11.26 and 10.67 kg, respectively (Wadhawani *et al.*, 1994). Similarly Pandey and Parekh (1994) reported body weight at 90 days' weaning to be 10.79 kg in Patanwadi and 12.11 kg in Merino x Patanwadi breeds. At 105 days' weaning, the body weight of Marwari, Patanwadi and Merino x Patanwadi lambs reared on milk plus creep feeding was recorded to be 11.40 to 11.67 kg (Anonymous, 1993, 1994). Thus, the body weights attained at 105 days of age by the lambs under study was higher than previous reports. However, Karambele (1998) reported higher weaning weight (15.68 to 20.35 kg) than the present study, but in that case, the lambs were weaned at older age (140 days). The higher weaning weight observed could be attributed to better feeding management of pre-weaned lambs, i.e. creep feeding in addition to suckling. Weaning weight did not differ significantly between the three treatment groups. In other words, the non-conventional feed ingredients based creep feeds gave similar growth response to that of conventional creep feed, and agreed with the previous studies (Anonymous, 1993; 1994).

The average body weight gain was recorded as 95.46±3.48, 94.64±4.01 and 97.03±5.19 g/day for treatment groups T_1, T_2 and T_3, respectively (Table II). The differences were statistically non-significant. However, the period effect was significant ($P < 0.05$). Patel (1981) also observed significant effect of periods on average daily body weight gain in Marwari and Patanwadi lambs. The total gain in the body weight during the experimental period was recorded to be 8.02±0.40, 7.95±0.55 and 8.15±0.57 kg in T_1, T_2 and T_3, respectively. The treatment means were at par. Patel (1981) reported average pre-weaning body weight gain of 69.38 to 76.06 g/day in Marwari and 74.24 to 79.12 g/day in Patanwadi lambs, which were lower than the values observed in the present study. The body weight gains up to 90 days of age were 100.66, 102.53 and 105.27 g/day in T_1, T_2 and T_3, respectively. These values are higher than the average daily gain (from birth to 90 days of age) reported in

Table I. Ingredients and proximate composition of experimental feeds and fodders

Particular	Creep mixtures			Green NB_{21}	Matured pasture grass
	Conventional (T_1)	Non- Conventional-I (T_2)	Non- Conventional-II (T_2)		
		Ingredients (%)			
Maize	43.00	-	-	-	-
G.N.cake	15.00	17.00	-	-	-
Rice polish	29.00	17.00	-	-	-
Prosopis juliflora pods	-	23.00	22.00	-	-
Babul pods chuni	-	14.00	22.00	-	-
Mango seed kernel	-	16.00	19.00	-	-
Cassia tora seeds (boiled)	-	-	9.00	-	-
Corn steep liquor	-	-	15.00	-	-
Jaggery solution (6.5 kg				-	-
Jaggery +3.5 kg water)	10.00	10.00	10.00		
Mineral mixture	03.00	03.00	03.00	-	-
Total	100.00	100.00	100.00	-	-
		Proximate composition (% on DM basis)			
DM	91.00	89.98	89.15	29.00	91.80
OM	90.00	88.00	87.00	87.24	91.77
CP	15.85	16.50	16.80	11.87	1.91
CF	06.65	11.50	10.52	31.00	41.50
NFE	62.50	54.00	53.48	40.67	46.10
Ash	10.00	12.00	13.00	12.76	8.23

Note: Supplevite-M was incorporated in all three-creep mixtures @ 2.5 g/kg of feed.

Table II. Average body weight, body weight gain and linear body measurements of experimental preweaned lambs

Particular	Creep mixtures			Test of significance
	Conventional (T_1)	Non- Conventional-I (T_2)	Non- Conventional-II (T_3)	
		Body weight and body weight gain		
Initial (kg)	5.63±0.47	5.74±0.47	5.80±0.45	NS
Final (kg)	13.65±0.60	13.69±0.92	13.95±0.88	NS
Total body weight gain (kg)	8.02±0.40	7.95±0.55	8.15±0.57	NS
Av. body weight gain (g/day)	95.46±3.48	94.64±4.01	97.03±5.19	NS
		Linear body measurements		
Initial HG (cm)	43.38±1.29	43.63±1.35	43.13±1.30	NS
BL (cm)	36.13±1.53	36.63±1.89	38.00±1.76	NS
HW (cm)	39.13±1.34	39.63±1.51	38.63±1.45	NS
Final HG (cm)	55.88±1.43	58.00±1.44	55.63±1.27	NS
BL (cm)	52.25±0.80	52.13±1.75	51.75±1.82	NS
HW (cm)	48.50±0.76	48.88±0.72	48.63±1.44	NS
Gain HG (cm)	12.50±1.58	14.38±1.12	12.50±1.24	NS
BL (cm)	16.13±1.46	15.50±0.87	13.75±1.81	NS
HW (cm)	9.38±1.12	9.25±1.22	10.00±1.39	NS

NS=Non-significant, HG=Heart girth, BL=body length, HW= Height at withers

different breeds by different workers, viz. 85.85 to 94.22 g for Marwari (Shukla, 1973; Wadhawani *et al.*, 1994), 85.24 to 96.30 g for Patanwadi (Shukla, 1973; Shah, 1987; Pandey & Parekh, 1994; Wadhawani *et al.*, 1994) and 87.66 to 99.26 g for Merino x Patanwadi lambs (Pandey & Parekh, 1994; Wadhawani *et al.*, 1994). However, the present values are comparable with the growth rates at similar stage reported by Karambele (1998). The higher weight gain observed in the present study could be attributed to provision of extra energy and protein in the form of creep mixture to the lambs. The enhancement in preweaning growth rate due to creep feeding has been reported by Jordan and Gates (1961), Ragab *et al.* (1968), Poe *et al.* (1969), Al-Bakkour *et al.* (1991) and Karambele (1998). The treatment means for average daily body weight gain did not differ significantly, which indicated that conventional and non-conventional feed ingredients based creep mixtures were equally effective for enhancement of preweaning growth rate. This finding is in agreement with the earlier studies of Parnerkar *et al.* (1993) and Anonymous (1994).

The gain (cm) in the heart girth, body length and height at withers in T_1 (12.50±1.58, 16.53±1.46 and 9.38±1.12), T_2 (14.38±1.12, 15.50±0.87 and 9.25±1.22) and T_3 (12.50±1.24, 13.75±1.81 and 10.00±1.39) groups were statistically similar. The increase in the heart girth observed in the present study is more than that reported (9 to 11 cm) by Anonymous (1993, 1994) on account of better growth. However, Karambele (1998) found higher gain (16.28 to 23.57 cm) in heart girth. In the later study, the lambs were weaned at 140 days as against 105 days of age in the present study, which could be the reason for higher gain observed in heart girth. The increase in the body length observed in the

present investigation is more than that recorded (13 to 14 cm) by Anonymous (1993, 1994) on account of better growth of lambs. Similarly, the gain in height at withers (cm) of lambs during the experimental period was higher than that observed (8.52 to 9.93 cm) by Anonymous (1993, 1994). Karambele (1998) reported comparable values for gain in the body length and height at withers. The initial and final body measurements recorded in the present study are higher than those reported by Anonymous (1993, 1994) at similar age. Sejra (1990), however, reported comparatively higher values for all the three body measurements at three months of age in Marwari lambs. Saiyed (1994) observed similar height at withers (cm) in Marwari, Patanwadi and Merino x Patanwadi lambs at 3 to 4 months of age. Thus, these findings indicated that the inclusion of non-conventional feed ingredients in the creep mixture did not have any adverse effect on the body measurements that represents skeletal growth.

Cost of rearing lambs. The cost of feeding milk and solid feeds as well as the labour and health coverage charges of lambs are presented in Table III. Both the cost of feeding solid feeds as well as the total rearing cost were significantly lowest ($P < 0.05$) in non-conventional-II creep mixture (T_3) group. The cost of feeding solid feeds was reduced in T_2 and T_3 groups as compared to T_1 group by 14.55 and 28.75 per cent, respectively, due to incorporation of non-conventional feed ingredients in them. The differences in the cost of feeding roughages and milk were statistically non-significant between the three groups. Thus the economic efficiency in terms of solid feed cost per kg weight gain and solid feed cost per kg dressed weight was significantly higher ($P < 0.05$) in T_3 group. Similarly, the total cost per kg of weight gain and per kg of dressed weight was also the lowest in this group. Thus the non-conventional-II creep mixture that was cheapest of the three creep mixtures could be used to significantly bring down the rearing cost.

Realizable receipts. The calculated average dressed weights in three treatment groups were 6.30±0.27, 5.89±0.40, and 6.15±0.39 kg, respectively .Based on the information collected through personal inquiries from the retailers in the local meat market, the total realizable receipt (Rs./lamb) was worked out . The mutton and liver are sold on weight basis but the skin, head, cannon, empty rumen, intestine etc. are sold on fixed price irrespective of weight. Realizable receipt in T_3 group was almost equal to that of T_1 and T_2 groups. The return over feed cost and the return over total cost were observed to be the highest in T_3 group. These findings were in agreement with the earlier study (Anonymous, 1993-1994).

It can be inferred that incorporation of non conventional feed ingredients viz., *Prosopis juliflora* pods, Babul pods chuni, *Cassia tora* seeds (boiled) and Corn steep liquor in the formulation of creep mixture reduced the feed cost significantly and can be incorporated safely in the ration of preweaned lambs without affecting their growth rate.

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Table III. Cost of rearing and realizable receipts from lambs under different feeding regimes

Particulars	Creep mixtures		
	Conventional (T_1)	Non-conventional-I (T_2)	Non- conventional-II (T_3)
Feeding cost (Rs/head)			
Creep mixtures	$70.62^{a} \pm 1.95$	$58.50^{b} \pm 1.47$	$47.23^{c} \pm 1.29$
Napier hybrid	2.21 ± 0.07	2.24 ± 0.07	2.31 ± 0.08
Matured Pasture grass	9.44 ± 0.31	9.56 ± 0.34	9.09 ± 0.34
Milk	165.90 ± 16.93	175.43 ± 21.01	168.19 ± 7.70
Solid feeds	82.27 ± 1.96^{a}	70.30 ± 1.73^{b}	58.62 ± 1.69^{c}
Cost of labour and health care (Rs.)	27.43 ± 0.65^{a}	23.43 ± 0.58^{b}	19.54 ± 0.56^{c}
Total cost/lamb (Rs.)	275.60 ± 16.29^{a}	269.15 ± 19.62^{b}	246.35 ± 8.24^{c}
Solid feed cost/kg weight Gain (Rs.)	10.46 ± 0.62^{a}	9.14 ± 0.63^{a}	7.41 ± 0.49^{b}
Solid feed cost/kg dressed wt (Rs.)	13.24 ± 0.70^{a}	12.36 ± 0.95^{a}	9.82 ± 0.73^{b}
Total cost/kg weight gain (Rs.)	34.68 ± 2.08^{a}	34.42 ± 2.64^{a}	30.98 ± 1.78^{b}
Total cost/kg dressed weight (Rs.)	43.82 ± 2.07^{a}	45.94 ± 2.28^{a}	41.00 ± 2.53^{b}
Receipt (Rs/head)			
Mutton	504.00 ± 21.95	471.20 ± 31.81	492.20 ± 31.12
Liver	11.79 ± 0.52	11.83 ± 0.80	12.05 ± 0.76
Others	100.00	100.00	100.00
Total	615.79 ± 22.47	583.03 ± 32.61	604.25 ± 31.88
Return over feed cost (Rs)	533.52 ± 22.83^{a}	512.74 ± 32.76^{b}	545.63 ± 32.20^{c}
Return over total cost (Rs)	340.20 ± 17.54^{a}	313.88 ± 20.77^{b}	357.90 ± 31.01^{c}

Means with different superscripts in a row differ significantly ($P < 0.05$)

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