IJAS Iranian Journal of Applied Animal Science

Effect of Flushing on the Growth, Body Condition Score and Reproductive Efficiency of Corriedale Ewes during Breeding Season and Gestation Period

Research Article

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Received on: 9 Feb 2013
Revised on: 3 Mar 2013
Accepted on: 16 Mar 2013
Online Published on: Jun 2014

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Online version is available on: www.ijas.ir

ABSTRACT

The present study was aimed to improve the reproductive performance of Corriedale ewes by nutritional flushing. Forty Corriedale ewes were divided into four treatment groups (TC, T1, T2 and T3) with 10 ewes in each group (n=10). At the beginning of the breeding season extra feeding (flushing regime) was started for approximately 34 days such that two estrus cycles were covered. First group i.e. TC (control) received no concentrate supplement, only grazing for 6-8 h was practiced. The treatment groups were fed concentrate supplement of 300 g/ewe/d (T1), 400 g/ewe/d (T2) and 500 g/ewe/d (T3) for 34 days in addition to grazing for 6-8 h. Changes in body weight were significantly ($P \leq 0.05$) higher in the ewes fed 500 g concentrate than TC and T1 while no significant difference was found between the other groups in respect of the body weight gain of the ewes. T2 and T3 groups revealed significantly ($P \leq 0.05$) higher body condition score than that of control and between T2 and T3 groups than that of T1 group, however no significant difference between Control and T1 groups as well as between T2 and T3 groups were observed, respectively. The tupping percentage recorded in the ewes of all the four groups was 100% and the lambing percentage observed was found to be 70%, 80%, 90% and 100% in TC, T1, T2 and T3 groups, respectively. An increase ($P \leq 0.05$) was observed in the birth weight of lambs with highest average weight observed in T3 group followed by T2 group, T1 group ewes and control. The study revealed that the body weight of ewes, dam performance during their gestation period, lambing rate and birth weight of lambs of Corriedale ewes showed considerable improvement due to nutritional flushing. The study also indicated that among all four treatment groups, T3 showed significant improvement in body weight and reproductive efficiency as a result of flushing supplementation during mating season. Hence it was concluded that feeding 500 g of concentrate in addition to sufficient grazing is ideal feeding regimen as compared to other treatment groups in order to achieve a higher body condition score and reproductive performance.

KEY WORDS Corriedale ewes, flushing, growth, reproductive efficiency.

INTRODUCTION

The state of Jammu and Kashmir is predominantly an agrarian state and agriculture is the main economic activity of about 70 percent of its population. The state has a total geographical area of 222.24 lakh ha out of which only about

28 per cent (about 62 lakh ha of land) is cultivable and the rest being under forest cover, rocky hills, barren uncultivable land, etc. Geo-physically, Kashmir valley is a temperate zone lying in between the outer and inner range of Western Himalayas. Improvement in lambing rate (number of lambs born per ewe) and increase in birth weight is the key to meet the growing needs of the population which is possible through vertical intervention by way of improved feeding management especially around breeding time besides breed improvement. Among different managemental interventions, flushing is one of the important practices in sheep management which can help in achieving the objectives of high lamb production. Flushing is a practice of providing extra energy supply to ewes for two to three weeks prior to and during breeding season (Riitta and Lauri, 2002). Extra energy sources include good quality hay, fresh pasture or grain (corn, milo and oats) that can be fed two weeks before and two to four weeks after breeding are also used for flushing (Kerr, 2006). These factors help to feed sheep specifically to their nutritional needs, thus optimizing the cost of feed and ewe production performances. Greatest response is reported in mature ewes as well as in ewes in early and late stages of breeding season. Flushing during the seasonal peak is found to be least effective in increasing lambing percentage. Further, flushing is beneficial for thin ewes that have not recovered from previous lactation stress or which were on poor pasture (Bill, 1997).

Plan of nutrition in sheep affects conception rate, lambing rate, birth weight of lambs and lamb mortality as well as blood biochemical constituents. With increase in nutritional status of the animals there is improvement in blood glucose, total protein, calcium and phosphorus (Sabra and Hassan, 2008). The major goals in any breeding season are to get ewes settled in as few cycles as possible, minimize the number of open ewes, have multiple ovulations and have a low incidence of embryonic mortality. These goals are achieved by having the ewes in optimum body condition just prior to ram introduction which in turn can be achieved by adequate flushing the ewes. In view of enormous benefits of flushing and its role in improving the lamb crop and reproductive efficiency of Corriedale ewes especially the dam performance during the gestation period, the present study was conceived to increase the sheep population of state, ensure self sufficiency in meat production and thereby discourage the import of large population of sheep for mutton purpose, in the temperate climatic conditions of Kashmir Valley.

MATERIALS AND METHODS

The present study was conducted on Corriedale sheep at sheep research station of Sher-e-Kashmir University of Agricultural Science and Technology, Kashmir.

Management

The flock was kept under Semi-intensive type of housing and group management system, wherein sheep were reared under intensive and semi-intensive management systems depending upon the availability of pastures and climatic conditions during different seasons of the year. The sheep were housed during cold harsh winter (mid-November to mid-March) and let loose only for one hour exercise period. During summer (mid-June to mid September), the animals were taken to high land pasture for free range system of rearing.

During spring and autumn months (March-June and September-November) animals were kept under semi-intensive system of management. Mean temperature in Kashmir valley ranges from sub zero to 8 ˚C in winters and 30-35 ˚C in summers. The housing space for the animals was specified as per BIS Standards. This system of housing provides more comfort to the animal in terms of free air movement, sufficient exercise and protection from extreme climate. The rams and ewes were weighed and reared separately. To avoid inbreeding, ewes were grouped in such a way that same ram did mate with the ewe, only which it was not related upto three generations. Both rams and ewes were sheared in full or ringing, crutching etc was performed for proper mating.

The rams were fed concentrate ration at 500 g/ram/d in addition to grazing prior to onset of breeding season to boost up their spermatogenesis and libido. Special feeding was continued till the end of two breeding cycles. The rams were allotted in the ratio of 30-35 ewes for one ram at the station in routine. These animals exhibited estrus in October and breeding was done in the same month by natural service of pen system of breeding.

Selection of animals

The present investigation was carried out on 40 healthy Corriedale ewes randomly selected with mature body weight of 35-40 kg and rams with a body weight of 45-50 kg. Forty ewes were selected one month before the onset of breeding season randomly and were divided into four group's control (TC), T1, T2 and T3 with 10 ewes in each group with uniform body weight and uniform parity. Each animal represents one replicate. The reproductive frequency of ewes was one lambing per year, using natural pen mating in autumn. For breeding, active rams with proven fertility were introduced during night hours only. The rams were painted in the brisket zone with coloured oil paints to mark the ewes at the rump region during mating and the mating dates were recorded daily in the morning for two successive breeding cycles.

Feeding of ewes

The ewes in four groups designed for the trial were managed on a daily feeding of flushing ration from the time when the rams were introduced for mating up to the end of breeding season after servicing the ewes for two breeding cycles (34 days) so that two estrous cycles are covered. First group (TC) was kept without extra supplementation for flushing to serve as control and was managed in 6-8 h grazing per ewe per day as their maintenance ration, whereas other groups T1, T2 and T3 were flushed with 300, 400 and 500 g per ewe per day respectively, in addition to 6- hrs grazing (9 a.m. to 5 p.m.). The animals were allowed to graze in the grazing land of Sheep Research Station. After end of breeding season, the ewes were maintained with uniform feeding schedule as followed at Sheep Research Station, Shuhama routinely i.e. 100 and 500 g concentrate/ewe/d was provided during early gestation and late gestation respectively, in addition to grazing / dry fodder feeding. The pelleted concentrate feed (Agro feed) supplied by The Jammu and Kashmir State Agro Industries Development Corporation Limited to the station routinely was used for the feeding ewes under trial. The nutritive value of the feed was CP-20% and TDN-60% with nutrient composition given in Table 1. The forage composition of the pasture in grazing land was CP-6.4% and TDN-58%.

Table 1 Nutrient composition of concentrate mixture (dry matter basis)

Contents	%
Moisture	11
Dry matter	89
Crude fat	2.5
Crude protein	20
Crude fibre	12
Calcium	0.5
Phosphorus	0.5

Parameters studied

The experiment was conducted for a period of 180 days which included about 34 days (two breeding cycles) and gestation period of 150 days. The following parameters were recorded during experimental period.

Body weight (kg)

The body weight was recorded at fortnight intervals upto parturition using an electronic platform balance after thoroughly securing the animals. The animals were weighed at 8 a.m. in the morning before feeding and watering. The weight was expressed in kilograms. In addition, dam's weight was recorded before and after parturition to assess the loss in weight due to lambing.

Body condition scoring

To assess the body condition of the animal with a fairly high accuracy, body condition scoring was done in accordance to the technique described by Thompson and Meyer (1994). The system scores sheep from emaciated to those that are grossly obese due to overfeeding or being nonproductive.

Reproductive efficiency

Tupping percentage

Tupping percentage was assessed by the number of animals covered / serviced by ram in each group during breeding cycle as evidenced by rump marks of the ewes.

Lambing percentage

Lambing percentage was calculated by the number of lambs born per ewe in each group during the breeding season.

Lamb parameters

Lamb parameters such as birth weight, type of birth (live or stillbirths, normal or assisted births), mortality and morbidity, if any, was recorded.

Statistical analysis

The data obtained were statistically analysed by one-way ANOVA using the General Linear Model procedure of Statistical Package for the Social Sciences, Base 10.0, 1999 (SPSS Software products, Marketing Department, SPSS Inc. Chicago, USA). To test the significance of difference between means, Duncan's New Multiple Range test (DMRT) for the significance of difference between means and post-hoc analysis by LSD was done. The probability level for determining the significance was 0.05.

RESULTS AND DISCUSSION

Body weight

The effect of supplementation of concentrate ration on and above maintenance ration on body weight changes in experimental ewes during flushing period and early gestation period at fortnightly intervals showed that all the three treatment groups (T1, T2 and T3) attained comparatively higher body weights than that of Control (TC) from day 15 to 60; but the difference was found to be non significant ($P>0.05$) between the groups. Numerically higher value were obtained in T3 group (36.25±1.36 kg) followed by T2 (34.11±0.97 kg) and T1 (34.12±1.18 kg) against their control group (33.40±1.22 kg) on 60 days. During the mid gestation period (60-120 days), all the treatment groups showed a non-significant but numerically higher values were obtained on 75th day compared to 60th day of the experimental period, the highest value being recorded in T3 ewes (36.85±1.41 and 36.25±1.36, respectively). However, from 90th day onwards a positive but significant ($P\leq0.05$) increase in their body weights was observed in all the three

treatment groups compared to that of control group (Table 2). The results were significantly higher (P≤0.05) in T3 group of ewes as compared to control group (TC). During late gestation period the mean ± SE values of the body weight changes in ewes of T1, T2 and T3 groups were non-significant (P>0.05) (Table 2). However, a significant (P≤0.05) difference was found between T3 group of ewes and the control during the period of study.

Table 2 Average fortnightly live body weight of ewes (kg) in different treatment groups during early, middle and late gestation. (0-180 days, 34 days covering two breeding cycles and 150 days gestation period)

Days	Treatment groups			
	Control (n=10)	T1 (n=10)	T2 (n=10)	T3 (n=100)
0 day	33.0±1.19	33.3±1.19	33.0±0.97	33.3±1.35
15 day	33.0±1.19	33.4±1.19	33.3±0.97	34.0±1.36
30 day	33.1±1.22	33.6±1.18	33.6±0.97	34.8±1.37
45 day	33.2±1.22	33.8±1.19	33.8±0.97	35.5±1.36
60 day	33.4±1.22	34.1±1.18	34.1±0.97	36.2±1.36
75 day	33.5±1.25	34.3±1.19	34.3±0.95	36.8±1.41
90 day	33.7^{a}±1.28	34.5^{ab}±1.21	34.5^{ab}±0.94	37.4^{b}±1.41
105 day	33.9^{a}±1.33	35.0^{ab}±1.26	35.0^{ab}±0.92	38.0^{b}±1.38
120 day	34.5^{a}±1.42	35.7^{ab}±1.31	35.8^{ab}±0.93	38.7^{b}±1.37
135 day	35.1^{a}±1.53	36.3^{ab}±1.36	36.7^{ab}±0.93	39.4^{b}±1.37
150 day	35.8^{a}±1.63	37.0^{ab}±1.45	37.6^{ab}±0.98	40.1^{b}±1.37
165 day	36.5^{a}±1.76	37.8^{ab}±1.53	38.5^{ab}±0.97	40.9^{b}±1.37
180 day	37.3^{a}±1.90	38.6^{ab}±1.63	39.6^{ab}±1.05	41.8^{b}±1.36

The means within the same row with at least one common letter, do not have significant difference (P≥0.05).

The overall increase in body weight of the ewes during the experimental period was found to be higher in all the treatment groups (T1, T2 and T3) than the control (TC), the mean values being 5.37 ± 0.44, 6.61 ± 0.08, and 8.53 ± 0.58 kg respectively, while as in case of control group (TC) increase in body weight was found to be 4.34 ± 0.71 kg only (Table 3).

Table 3 Average body weight gain (kg) in ewes under different treatment groups during the period of trial

Period	Control (n=10)	T1 (n=10)	T2 (n=10)	T3 (n=10)
0-60 days	0.35^{a}±0.11	0.82^{b}±0.05	1.12^{c}±0.02	2.94^{d}±0.04
60-120 days	1.43^{a}±0.33	2.00^{b}±0.28	2.41^{c}±0.24	2.52^{c}±0.12
120-180 days	2.56^{a}±0.51	2.55^{a}±0.44	3.08^{b}±0.36	3.06^{b}±0.09
Pooled	4.34^{a}±0.71	5.37^{b}±0.44	6.61^{c}±0.08	8.53^{d}±0.58

The means within the same row with at least one common letter, do not have significant difference (P≥0.05).

Changes in body weight were significantly (P≤0.05) higher in treatment group T3 than control (TC) and T1 while no significant difference was found between the other groups in respect of the body weight gain of the ewes.

Body condition scoring

During flushing period and early gestation period, flushing of ewes revealed that all the three treatment groups (T1, T2 and T3) attained comparatively higher body condition scores, but the score was found significantly (P≤0.05) higher only in T3 and T2 groups than that of control and T1 (Table 4). During mid gestation period, the values were significantly (P≤0.05) higher in T2 and T3, than the control and T1 groups. However, control (TC) and T1 groups did not have any significant difference in between them (Table 4). The effect of supplementation during late gestation period showed that all the three treatment groups (T1, T2 and T3) attained comparatively higher body condition Score than the control group (TC).

Table 4 Average fortnightly values of dams body condition score in different treatment groups during early, middle and late gestation

Days	Treatment groups			
	Control (n=10)	T1 (n=10)	T2 (n=10)	T3 (n=10)
0 day	2.45±0.11	2.42±0.11	2.50±0.08	2.50±0.09
15 day	2.45±0.11	2.50±0.11	2.62±0.10	2.72±0.09
30 day	2.47^{a}±0.10	2.55^{a}±0.11	2.72^{ab}±0.07	2.85^{b}±0.07
45 day	2.50^{a}±0.09	2.57^{a}±0.10	2.75^{ab}±0.08	2.87^{b}±0.08
60 day	2.55^{a}±0.10	2.60^{a}±0.11	2.75^{ab}±0.08	2.92^{b}±0.09
75 day	2.52^{a}±0.10	2.60^{a}±0.11	2.75^{a}±0.08	3.05^{b}±0.07
90 day	2.55^{a}±0.11	2.62^{a}±0.12	2.77^{ab}±0.07	3.05^{b}±0.07
105 day	2.50^{a}±0.11	2.62^{ab}±0.12	2.90^{bc}±0.09	3.17^{c}±0.08
120 day	2.60^{a}±0.12	2.62^{a}±0.12	2.95^{b}±0.08	3.25^{b}±0.09
135 day	2.60^{a}±0.12	2.62^{a}±0.13	2.95^{b}±0.08	3.30^{c}±0.07
150 day	2.60^{a}±0.12	2.65^{a}±0.11	3.00^{b}±0.10	3.32^{c}±0.08
165 day	2.62^{a}±0.14	2.65^{a}±0.11	3.00^{b}±0.09	3.47^{c}±0.08
180 day	2.62^{a}±0.14	2.65^{a}±0.11	3.00^{b}±0.09	3.52^{c}±0.06

The means within the same row with at least one common letter, do not have significant difference (P≥0.05).

Statistical analysis revealed significantly (P≤0.05) higher condition score in T2 and T3 groups than that of control and between T2 and T3 groups than that of T1 group, however no significant difference was observed between control and T1 groups as well as between T2 and T3 groups, respectively (Table 4). The overall increase in body condition score of ewes during the experimental period was also found to be higher in all the treatment groups than the control. The animals in treatment groups T1, T2 and T3 showed an increase of 0.23 ± 0.01, 0.5 ± 0.01 and 1.02 ± 0.03 score, respectively, compared to animals in Control (TC) group (0.17±0.03).

Reproductive efficiency

Tupping percentage

The tupping percentage recorded in the ewes of all the four groups was 100%. However, it was observed that most of the ewes of T3 and T2 group tupped earlier during first breeding cycle compared to T1 and TC group of ewes, as evidenced by paint marks on the rump of ewes.

Lambing percentage / twinning percentage

Out of ten ewes allotted in each group, no twinning was recorded during the experimental period of 180 days. How-

ever, the lambing percentage observed in the present study was found to be 70%, 80%, 90% and 100% in control (TC), T1, T2 and T3 groups, respectively.

Lamb parameters

Significant (P≤0.05) effects were observed in birth weight of lambs with highest average weight observed in ewes of T3 group (4.00±0.11 kg) followed by ewes of T2 group (3.19±0.37 kg), ewes of T1 group (2.83±0.48 kg) and Control (2.46±0.55 kg). T3 was significantly (P≤0.05) higher than Control, however T1 and T2 were at par with Control as well as T3 (Table 5). All the lambs born were normal without any outside assistance. No mortality and morbidity was recorded at the time of lambing.

Body weight

At the start of flushing, the average live weight of ewes was approximately 33 kg (30-35 kg). On perusal of body weight and its gains during different periods of gestation, it was evident that ewes maintained on higher quantities of flushing supplementation attained better average weights during the whole gestation period compared to the control group thereby showing a superiority of 48.08, 34.34 and 19.18 percent by ewes of T3, T2 and T1 groups with body weight gains over the control. The body weight in T3 and T2 groups fed at 500 g/d/ewe and 400 g/d/ewe showed higher trends of body weight gains from 15 to 120 days as compared to the group which was not supplemented or supplemented at 300 g/d/ewe. This increase in body weight in two treatment groups of T3 and T2 compared to Control and T1 group was as a result of supplemental feeding during the breeding season. Since the foetal size does not increase much during early and mid gestation period, the birth weight increase exhibited by the ewes is indicative of the reserves accumulated by the ewes due to flushing supplementation only. The conversion of flushing supplementation into body reserves and thereby increases in the body weight of treatment groups are in agreement with the findings of Rafiq *et al*. (2003) who reported an increase in body weight of ewes which were fed flushing diet during breeding season. Similar findings were reported by Islam *et al*. (2007) and Santos *et al*. (2009). However, the results of Kassem *et al*. (1989) and Smith (1985) were in contrary to the present findings. A close relation between the weight of ewe and its reproductive performance was observed in the present study which is in consonance with the findings of Thomson and Bahhady (1988) who reported a strong correlation between the fertility of the Awassi sheep and body weight at the time of mating. From 120 days onwards, there was almost similar pattern of increase in body weight in all the four groups which could be attributed to development of growing foetus as well as carry over effects of body gains due to flushing supplementation (ARC, 1990; Forgarty *et al*. 1992).

Body condition score

At the initial stage, there was no significant difference in the body condition score amongst the four groups. At the start of flushing, the body condition score of ewes was in the range of 2.45-2.5. The body condition and live weight of the ewe at mating have a highly significant effect on the prolificacy through their influence on puberty (NRC, 1985). However, there was a clear effect of supplementation on body condition scores during the overall flushing period with significant difference between treatment groups (T3 and T2) and the control with group T1 being intermediate. The results revealed an increased trend in body condition score of ewes just after flushing supplementation during early gestation and effects were carried over till late pregnancy though there was uniform feeding pattern adopted amongst the trial groups during whole pregnancy period. The effects were highest in flushed group of T3 followed by T2. This might be due to partitioning of feed supplementation towards body weight gains as well as increasing condition score which was reflected later by their better reproductive performances. The ideal condition score of more than 3 (on scale from 1 to 5) was achieved by T3 group of ewes due to flushing supplementation which later proved beneficial economically in terms of highest lambing percentage and birth weight during the trial. This is in agreement with the findings of Thomas *et al*. (1987) who reported that ewes supplemented with 0.45 kg corn grain/head/day at mating has higher body condition scores (3.2 *vs*. 2.9). Also, the findings of Santos *et al*. (2009) and Kerr (2006) are in concomitance with the present study.

Similarly, with increase in body condition score there was an increase in conception rate and lambing. This was in conformity with Gunn *et al*. (1991) who reported that conception and lambing rates increased significantly with increasing body condition score and decreased significantly below 2.5 levels. Similar results were obtained by Afonson and Thompson (1996) who reported better the condition score at mating, the higher the ovulation rate and therefore the higher the potential lambing percentage.

Reproductive efficiency

Tupping and lambing percentage

In the present study, all the treatment groups showed improved lambing rates as compared to control. Lambing percentage in T3 was 30% higher than the control group. This finding is in agreement with that of Santos *et al*. (2009) who observed improved lambing rates (40%) in supplemented ewes as compared to those that were not supplemented.

Table 5 Effect of supplementation on lamb's birth weight (kg)

Birth weight	Treatment groups			
	Control (n=7)	T1 (n=8)	T2 (n=9)	T3 (n=10)
Day 0	2.46^{a}±0.55	2.83^{ab}±0.48	3.19^{ab}±0.37	4.00^{b}±0.11

The means within the same row with at least one common letter, do not have significant difference (P≥0.05).

The conception rate was 100% in all the 4 under trial groups but did not correspond to their respective lambing rates which might be due to early embryonic deaths due to poor maternal nutrition and thereby low body condition score of ewes in groups T2, T1 and control. The result indicate that flushing supplementation of ewes during mating season at 500 g/ewe/d, in addition to sufficient grazing is ideal feeding regimen compared to the other treatment groups in order to achieve body condition score of 3-3.5, so as to avoid early embryonic deaths. The findings are in agreement with the observations of Kerr (2006), Narayan *et al*. (2003) and Rafiq *et al*. (2003).

Ewes in the control group did not achieve higher lambing percentage because green herbage allowance and availability in the pre mating period was below the levels required to optimize lambing percentage in ewes mated on grasslands. Since pasture and grazing management was same for all groups of ewes therefore intake of dry matter is assumed to be similar. Whatsoever differences in the performance of sheep have been observed is due to supplemental feeding.

No twinning was observed in the present trial, since the Corriedale ewes have a low genetic potential for twinning as observed in the control group. In addition, time and duration of flushing as well as quality and level of administration might play a role in twinning, which warrants further investigation. Torell *et al*. (1974), Crocker *et al*. (1985) and Abboud (2007) reported that high intake of protein impairs multiple ovulation and protein: energy ratio is critical for high fecundity. However, contrary findings whereby Lassoueda *et al*. (2004) and Abboud (2007), reported that by providing excess dietary protein a few days prior to mating is a potential way to improve fecundity, but effects vary according to source of protein. On the contrary, Brink (1990) reported that acute deficiency of energy and over fattening of ewes reduces progesterone concentration in blood and embryo survival during the first stages of pregnancy.

Therefore, flushing must be limited to the pre mating period, which implies synchronization of oestrus. Further energetic substances act as metabolic signals to the reproductive system (Rachid *et al*. 1997) which are involved within the hypothalamic pituitary axis and increase the releasing rate of GnRH (Martin and Walkden, 1995). Robinson (1996) stated that energy intake increases blood glucose and insulin level which increases the pulsatile LH secretion and improve ovarian response to LH stimulation.

On the contrary, Butler (2000) reported that positive energy balance increases the plasma level of insulin growth factor-1 which is critical to ovarian follicular development.

Lamb parameters

The present study revealed that the birth weights of lambs were in accordance with the level of supplementary feeding of their dams. Ewes in treatment group T3 performed better in terms of birth weight of their lambs in comparison to the ewes in control, T1 and T2 groups. These findings are in agreement with earlier reports (Russel *et al*. 1981; Mukasa-Mugerwa *et al*. 1994; Chaturvedi *et al*. 2009; Meyer *et al*. 2010). El-Hag *et al*. (1998) also reported higher birth weights in ewes supplemented with flushing ration during breeding time as compared to ewes which were not supplemented.

Differences observed in birth weight of lambs born to ewes of all groups are mainly related to size, nutritional status and subsequent performance of their dams. Low birth weight of the lambs born to the ewes in the control group could be attributed to the low plan of nutrition.

Birth weight is a critical factor affecting lamb production through mortality, morbidity and survival rate. High birth weights are associated with dystocia and low birth weight with starvation (Scales *et al*. 1986). In view of these factors, birth weight recorded in treatment groups is optimum. Early findings of Rafiq *et al*. (1990), Helali *et al*. (1990) and West *et al*. (1991) have shown that malnutrition during mating season reduces size of foetus. So it is imperative to supplement ewes so that there is improvement in lamb's birth weight and survival rate during early lactation (Rafique *et al*. 1991).

CONCLUSION

It is concluded that the nutritional flushing showed considerable improvement the in body weight, dam performance during their gestation period and reproductive performance of Corriedale ewes. The study also indicated that among all the four treatment groups, ewes of T3 showed marked reproductive efficiency as a result of flushing supplementation during mating season and feeding of 500 g/ewe/d of concentrate in addition to sufficient grazing is ideal feeding regimen compared to other treatment groups in order to achieve a higher body condition score and improve reproductive performance of Corriedale ewes.

ACKNOWLEDGEMENT

Authors are highly thankful to all the staff of sheep research station, FVSc and A.H. Shuhama, for their timely help and support during the entire study period.

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