FEED INTAKE AND MILK YIELD RESPONSES TO SHEARING IN PLEVEN BLACKHEAD SHEEP WITH DIFFERENT LEVELS OF PRODUCTION

Y. ALEKSIEV
Institute of Mountain Stockbreeding and Agriculture, BG - 5600 Troyan, Bulgaria

Abstract


The effects of shearing on feed intake and milk yield was studied in local Pleven Blackhead breed of sheep kept in a shed. Ten lactating ewes were subdivided into two groups, of five ewes each, according to their daily milk production, a high level group (HL) and a low level group (LL), and shorn at the end of March. Measurements were made for 6 days before shearing and for 15 days thereafter. Ewes were fed a ration of chopped hay administered ad libitum and concentrate and were hand milked twice daily at approximately 0800 h and 1800 h. Shearing did not cause considerable change in feed intake. Daily MY fell gradually throughout the observation in both groups owing to advancing of lactation rather than treatment which effect was short-tem. Average for the week after shearing mean MY in HL and LL sheep dropped by 7.2% and 13.1%, respectively, compared to the pre-shearing levels. The observed reduction in daily yield predominantly was at the expense of morning yield, whereas the afternoon one remained almost constant throughout the study. The results suggest that the MY response to shearing may be ascribed to the differences in the capacity for homeorhetic regulation of nutrient partitioning in sheep with different levels of production.

Key words: Sheep; shearing; feed intake; milk yield.
Abbreviation key: MY-milk yield

Introduction

Shearing, no matter of the season is always accompanied by some degree of thermal stress. The latter drives a number of physiological and biochemical adjustments aimed at maintenance of the homeothermy that ultimately affects the level of production. It has been considered insulation and adequate food supply to have survival significance for adaptation in cold environment. In producing domestic animals this extra need of energy for maintenance have to be combined with the needs for production (Young et al., 1989). Studies in sheep (Russel et al., 1985; Vipond et al., 1987) have found that shearing in cold weather is usually accompanied by an increase in feed intake. This may occur at different time and/or to a different extent depending on environmental conditions, preliminary nutritional status, diet composition, and forage characteristics, as well as physiological state of animals (Baile and Forbes, 1974; Weston 1989; Forbes, 2007). Husain et al. (1997), Parker
et al. (1991) reported that the increase of feed intake may not occur until a few weeks following the shearing. Shearing at ambient temperatures below the limit of thermoneutrality may reduce the availability of metabolizable energy for productive processes. Cold may directly influence the rate of milk secretion. Thompson (1980) noted that cold exposure of ewes affected the distribution of blood flow within the mammary gland, but did not affect the total flow to the udder. McBride and Christopherson (1984b) indicated that during prolonged cold exposure of ewes (0°C for 8 wk) mammary blood flow tended to decrease but this reduction did not appreciably affect milk secretion. Some inconsistencies of data concerning the effect of cold stress on the rate of milk secretion may be ascribed, among other factors, to the severity of the cold exposure applied on different breeds in different studies. The majority of investigations, however, have been aimed at studying the effects of shearing on feed intake, wool production, and/or reproductive performance of sheep. There was scarce information about feed intake and milk yield responses to shearing under practical conditions. The objectives of the current investigation were to study the effects of early spring shearing on feed intake and milk yield in Pleven Blackhead ewes with different levels of production.

**Material and Methods**

The experiment was performed on the local Pleven Blackhead sheep at similar age, body mass, and stage (fourth month) of lactation. Ten ewes were selected from the flock and were subdivided into two groups, of five ewes each, according to their daily milk production, a high level group (HL – mean yield 803 ± 6 ml; mean live weight – 53.92 kg) and a low level group (LL – mean yield 527 ± 3 ml; mean live weight – 55.46 kg). Ewes were hand milked twice daily at approximately 0800 h and 1800 h in the morning and in the afternoon, and MY from each ewe was measured volumetrically. Sheep were shorn at the end of March. Experimental design, forages, feeding regime, and meteorological parameters (including minimum maximum and average daily temperature fluctuations, relative humidity and air velocity) during the observation period were all given in details in our previous announcement (Aleksiev, 2009).

The results were presented as mean and standard error of the mean. Treatment means were separated by pairwise t-test. Statistical difference was declared at P ≤ 0.05. Data were analyzed using package software STATISTICA (2001)

**Results**

The mean coat depth after shearing was 6.8 ± 0.30 mm and 7.2 ± 0.17 mm and the mean post-shearing daily gain was 66 ± 7 g and 73 ± 9 g respectively in HL and LL ewes, respectively. Throughout the observation period minimum, maximum and average ambient temperatures were all below the critical level which was found to be 18 °C for a shorn sheep fed at ad libitum intake (Blaxter, 1967).

Mean daily feed intake throughout the observation period, expressed as a total (hay plus concentrate) dry matter intake in g. kg W$^{-0.75}$ is shown in Figure 1. Shearing did not measurably influence the level of feed intake, averaging 119.3 ± 0.4 g kg W$^{-0.75}$ and 121.1 ± 0.2 g kg W$^{-0.75}$ in unshorn ewes, whereas for the whole post shearing period it averaged 120.4 ± 0.4 g kg W$^{-0.75}$ and 121.2 ± 0.5 g kg W$^{-0.75}$ respectively in HL and LL sheep. A slight reduction in food consumption, at the expense of roughages, was noticed in both groups for a few days after shearing. It was followed by an increase of consumption and on day four the intake exceeded pre-shearing levels, and remained slightly elevated up to the end of the study.

Average daily MY in HL and LL groups of sheep is presented in Figure 2. In general, there was a reduction in daily MY throughout the observation period both in high and low producing animals. For the week before shearing daily MY in HL and LL sheep averaged 803 ± 6 ml, and 527 ±
3 ml, respectively. Shearing brought about a short-term (4 – 5 days) decline in average daily MY in both groups of sheep. Milk yield reduction after shearing, which lasted for five days in HL group, and for four days in LL group, was 6.8 % and 13.3 % respectively compared to pre-shearing levels. Average for the first week after shearing, daily MY in HL and LL group was 745 ± 5 ml, and 458 ± 5 ml, the reduction being 7.2% and 13.1% respectively compared to unshorn ewes. Despite the observed fluctuations throughout the study there was a definite trend of daily MY in both groups of sheep to decrease with advancing of lactation. Average for the whole post-shearing period the reduction in daily MY in HL and LL ewes were 8.2 and 16 % compared to unshorn sheep. Differences in the mean daily MY between HL and LL group were considerable at all controlled time points throughout the observation (and significant P<0.01 - P<0.001).
Average daily MY, separately in the morning, and in the afternoon in HL and LL sheep respectively are presented in figure 3 and figure 4. In HL ewes morning and afternoon MY for the whole pre-shearing period averaged 453 ± 2 ml and 350 ± 5 ml (P < 0.01), whereas in LL sheep it averaged 310 ± 2 ml, and 217 ± 3 ml respectively (P < 0.05). Shearing caused measurable, but short-term reduction mainly in the morning yields in both groups of sheep, and thereafter the observed smooth decline in the morning yields reflected the stage of lactation rather than treatment. On day 1, 2, 3 and 4 post-shearing, morning yield decreased by 5.1 %, 6.4 %, 9.1 % and 10.4 % in HL group, and by 13.1 %, 16.3 %, 22.1 %, and 25.5 % respectively in LL group, compared to the average levels in unshorn ewes. Average for the first week after shearing morning MY in HL and LL sheep dropped by 9.9% and 20.2% compared to pre-shearing levels, whereas for the whole post-shearing period the reduction was 13.3 and 25.1 % respectively. Afternoon MY during the first 4 days post-shearing
in HL ewes decrease by 6.1 %, 5.0 %, 1.0 % and 3.8 %, whereas in LL sheep the drop were 5.8 %, 7.2 %, 3.1 % and 7.7 % respectively compared to unshorn ewes. For the whole post-shearing period afternoon MY drop in HL and LL ewes were 3.2 and 3.7 % respectively compared to pre-shearing levels. During the last week of observation the mean morning and afternoon yields in LL sheep were very similar and did not differ (P > 0.05) from one another. The mean daily afternoon MY after shearing remained almost constant in both groups and was similar to that recorded in unshorn ewes.

**Discussion**

When exposed to cold sheep may adapt by an increase of insulation and/or feed intake in order to meet the expected elevation in energy requirements for heat production. Shearing did not have substantial effect on feed intake despite the expected increase of energy for heat production. The levels of intake were similar throughout the study in both groups of sheep. After shearing a negligible decline of feed intake was observed in both HL and LL groups of sheep that may be due to the combined effect of excitement and cold stress induced by the treatment. The small changes in feed intake caused by shearing indicated a major role of energy retention mechanisms in post-shearing adaptation. This suggestion was confirmed by the small increase of metabolic rate (inferred from the change in heart rate) (Aleksiev, 2009), and the observed changes in body weight of sheep showing an increase in both groups after shearing. The post-shearing reduction in feed consumption was slightly greater in LL sheep. This was most likely a result of some inappetance noted in one of the LL sheep for a few days after shearing rather than between group differences in responses to shearing. Then mean daily intake in LL ewes increased and often overmatched HL sheep in their feed consumption. Our results corresponded to the finding of Donnelly et al. (1974), who similarly reported a reduction of food intake in newly shorn sheep.

The level of milk production depends on many factors the most important being genetic, nutrition and environment. Feed intake in shorn and unshorn ewes was almost equal and would not be expected to affect daily milk yield the predominant effect being that of stage of lactation. It may be considered that in the course of observation the sheep studied approximated the end of their normal lactation period. Mean daily MY in HL group remained greater than that recorded in LL group throughout the observation despite the similar feed intake in both groups. The gradual reduction in mean daily MY in both groups appeared to reflect the advancing of lactation rather than shearing which effect was of short-term. Knight et al (1993) similarly found no effect of shearing on daily MY in Dorset ewes. Mc Bride and Christopherson (1984a), studying the effects of exposure of shorn ewes to low (0 °C) ambient temperature found out an increase in heat production by up to 55 %, compared to that in sheep kept at thermo neutrality, but no changes in milk yield. The observed slight decrease in consumption immediately after shearing might not be expected to affect seriously milk secretion. Thompson et al. (1981) observed a drop in MY by 9 %, but after 17-24 h of fasting. The short-term fall in daily milk yield, found in both groups after shearing, was predominantly at the expense of the morning yield, whereas the afternoon one remained almost unchanged. The stated changes may be attributed primarily to the cold stress induced by shearing and corresponding physiological and biochemical adjustments to the environment. As well, the voluntary dehydration of ewes after shearing (water intake in shorn ewes decreased by 29.3% compared to the pre-shearing level) brought about a decrease in total body water content and corresponding increase of the plasma osmolality. This may affect water movement between blood and milk and contribute to the reduction in milk fluid and milk yield. Besides, the immediate post shearing reduction in MY, was more recognizable in LL sheep compared to HL
ewes despite the equal level of food consumption. The observed differences in responses to shearing may be due to the differences in partitioning and utilization of nutrients by the sheep of different groups. Thus, between groups differences in MY may be ascribed to the differences in the priorities in coordinating the nutrient partitioning. In HL ewes, having greater capacity for homeorhetic regulation, the partitioning of nutrients was in favor of tissues essential for milk secretion. Contrary, in LL sheep mechanisms of nutrient partitioning favored the homeostatic adjustments and/or other non mammary tissues. Homeostatic and homeorhetic mechanisms coacted in sustaining homeothermy and milk production, but altered nutrient partitioning to a different extent in HL and LL group of sheep. Our results were in accordance with findings of Cronje et al. (2000), who studied the effects of genetic selection for milk production on nutrient partitioning in different goat genotypes. They concluded that differences in the partitioning of nutrients appeared to be the most important mechanism determining differences in productive potential of animals, and that the priority in nutrient partitioning was in the interest of the selected character. Symonds et al (1990), similarly noticed that the increase of milk production in shorn ewes, compared to unshorn controls at equal level of energy intake, may be a result of either mobilization of body reserves or altering of the nutrients partitioning to different body tissues, or both. Our data showed that milk secretion in both groups of shorn sheep was influenced predominantly during the cool night hours resulting in a drop of the morning MY. This suggested an increased rate of heat production for maintenance of the body heat content with effects on milk secretion and a recovery period during the day. In a previous study (Gudev et al., 2000) it was found that winter shearing did not influence daily MY in fine wool ewes with low level of production instead of high producing ewes sustain the pre-shearing levels; anyway in the latter ones milk production sharply decreased following the reduction of the environmental temperatures which closed to the freezing point. Early spring shearing of lactating Tsigai ewes was also found to have no effect on feed intake and milk yield (Aleksiev, 2008).

These data suggest the existence in different breeds and genotypes of a certain temperature thresholds, below which the homeostatic control for survival may overweigh homeorhetic mechanisms supporting milk secretion.

**Conclusion**

The results derived from the current study showed that shearing of lactating ewes had no considerable effect on feed intake. Shearing caused a short-term fall in daily MY in both groups of sheep, but the reduction was recognizably greater in ewes with low level of milk production. The observed post-shearing drop in daily MY predominantly was at the expense of morning yield whereas the afternoon yield remained almost constant in HL and LL group throughout the study. The post shearing rate of decline in milk production was similar in both groups of ewes reflecting advancing of lactation rather than treatment. The results suggest that MY response to shearing may be ascribed to the differences in the capacity for homeorhetic regulation of nutrient partitioning in sheep with different levels of production.

**References**


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