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EFFECTS OF SHEARING ON FEED INTAKE AND MILK YIELD IN TSIGAI EWES

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Abstract

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The effect of shearing on voluntary feed consumption, water intake and milk yield was studied in Tsigai sheep kept in natural indoor environment. Sheep were clipped at the beginning of April and fed concentrate and chopped hay offered at lib. Shearing had no effect on feed intake. Average daily dry matter intake was 1779 and 1795 g respectively in unshorn and shorn ewes. Mean daily water intake differed significantly ($P<0.001$) being higher in unshorn compared to shorn sheep: 4170 and 3147 g respectively. Treatment did not alter the level of milk production and mean daily milk yields during pre- and post-shearing periods were 349 and 353 g respectively. The results suggest that shearing of lactating ewes kept indoor did not have any measurable effect on feed intake and milk yield although in the case of the present study ambient temperatures were often below the critical point throughout the observation period. The increase of water intake after shearing indicate involvement of appropriate adaptive responses directed at preservation of the heat content of the body.

Key words: ewes, lactation, shearing, feed intake, milk yield, water intake

Introduction

The adaptive flexibility of sheep to a wide range of thermal conditions is mainly a result of the microclimate created by the fleece. Removing of the insulation lead to an increase energy exchange between an animal and the environment, which may influence the welfare and productivity of sheep. Shearing shifts the borders of the themoneutral zone, lowering the critical temperature and evokes a number of adaptive responses required to maintain homeostasis. The elevated heat transfer between an animal and its environment, especially in cold weather, suggests that feed intake would be increased in order to match the increased energy demands for heat production. Many authors stated an increase in voluntary feed intake in shorn ewes compared to pre-shearing levels (Russel et al., 1985; Symonds et al., 1988; Vipond et al., 1987). This increase occurred at different time and to a different extent according to the environmental conditions, preliminary nutritional status, type of the diet and quality of forages, especially roughages, as well as physiological state of animals (Baile and Forbes, 1974; Weston, 1989). Some authors noticed that an increase in feed intake may not be evident until a few weeks after shearing (Dabiri et al., 1996; Parker et al., 1991). Despite the numerous investigations concerning effect of shearing on feed intake and performance of sheep in the literature reviewed limited information was found about the shearing effect on milk yield and quality. In Bulgaria under the management practices employed sheep of different breeds are usually shorn in April-May when the weather is quite variable and temperatures are often below the critical (Graham et al., 1958). This, in turn, could have an adverse effect on productivity especially when coupled with precipitation, wind and restriction of food supply.

The objective of the present study was to investigate the effect of shearing of lactating ewes kept in natural indoor environments on feed intake and milk yield.

Material and Methods

The experiment was carried out at a research farm at the Institute of Mountain stockbreeding and Agriculture (latitude 42° 54" N) with Tsigai breed of sheep raised for years in this region and so being well adapted to the environment. Five ewes at similar age and stage of lactation, and good body condition (average live weight 39.4±1.19 kg) were separated from the flock three weeks before shearing and placed in a pen located in open fronted barn where about 3 mI per ewe was ensured. The sheep were fed similar type of diet as that in the preceding period, but the concentrate (commercial mix, containing 18% crude protein and 6.46% crude fibres) was increased from 500 to 700 g per head daily. The chopped hay (10.01% crude protein and 32.93% crude fibres) was offered *ad libitum.* The roughage and concentrate were given separately in different troughs. Diet was calculated to be above the requirements of the sheep for maintenance and lactation. The concentrate was offered in the morning and in the afternoon immediately before milking of the sheep. The hay was given at the same time and the next morning the residual was collected and weighted. The ewes had a free access to water throughout the day. At the beginning of April the sheep was shorn manually (by clippers) in order to minimize handling stress. The data concerning feed intake were collected for a week before and two weeks after shearing. The sheep were weighted after shearing and again at the end of the observation. During the observation period air temperature and humidity, and air movement were also recorded at sheep's height, using thermometers for air temperature, whirling psychrometer and kata-thermometer respectively. All environmental characteristics were registered three times daily at 07.00, 14.00 and 21.00 h. The daily water intake was also recorded. The data were analyzed according Snedecor and Cochram (1970). The differences were tested by Student's test of significance.

Results and Discussion

Fluctuations of minimal, maximal and mean ambient temperatures in the barn during the observation period are presented in Figure 1. They all varied slightly throughout the experimental period with the exception of day 7 and 8 when a fall of temperatures was registered followed by an enhancement and recovery to the previous levels. Air movement, like the other microclimatic variables, was, to some extent, influenced from the speed and direction of the wind in the open, and varied between 0.07 to 0.32 m/s throughout the observation period. Relative humidity recorded in different days and time of the day varied between 39 and 73 % being higher in the morning and lower in the afternoon. From the data obtained it could be considered that air velocity and humidity could not strongly influence the levels of feed intake and milk yield.

Feed intake throughout the observation period, expressed as a total dry matter intake, is presented in Figure 2. Shearing did not cause any noticeable changes in voluntary feed consumption, which re-

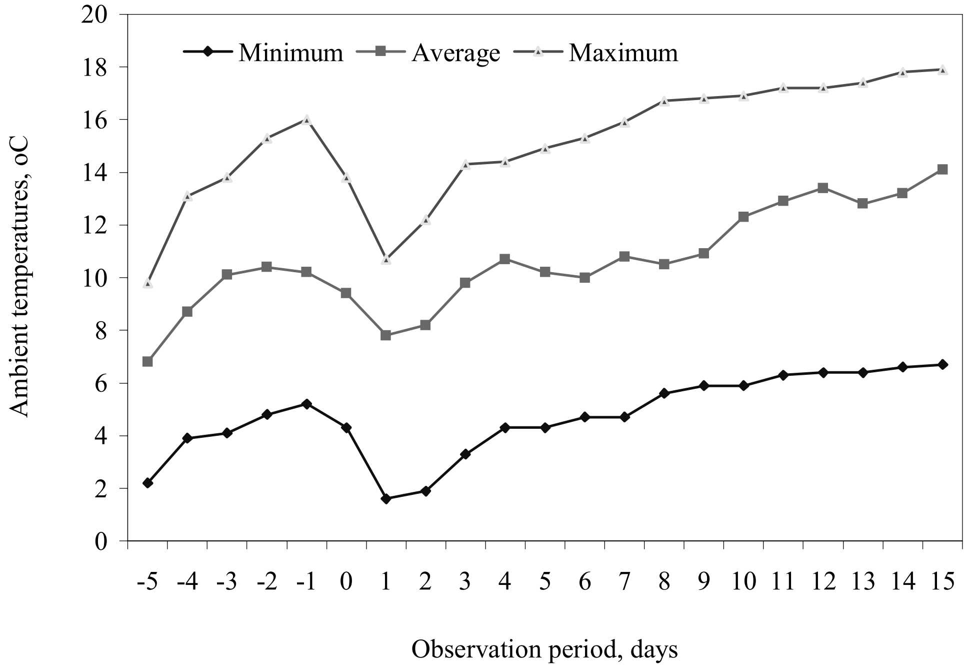

Fig. 1. Ambient temperature fluctuations, (minimum, maximum and average daily temperatures, °C) throughout the observation period

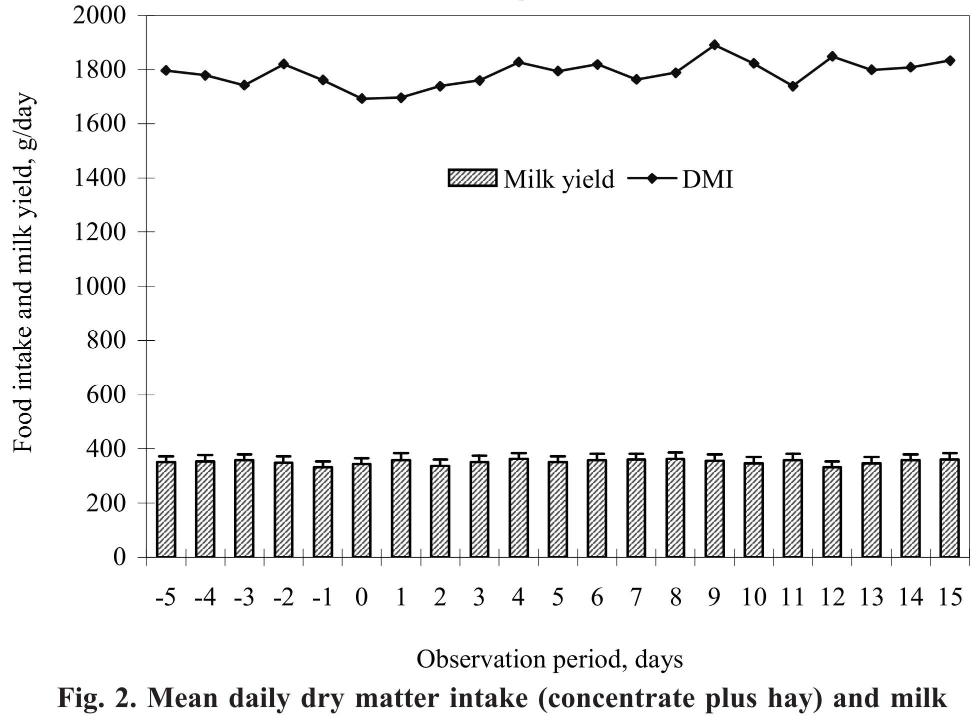

Fig. 2. Mean daily dry matter intake (concentrate plus hay) and milk yield (g) in shorn and unshorn ewes. Denote bars represent SE. Day 0 = shearing day

mained at pre-shearing values throughout the observation period. Daily values before and after shearing varied slightly and independently of the environmental temperature fluctuations and were 1779±9.5 and 1795±13.5 g respectively. Shearing did not measurably affect the level of milk production, which remained almost unchanged throughout the observation period (Figure 2). The levels recorded during the pre- and post-shearing periods were 349±4.2 and 353±2.9 g respectively. Shearing caused a remarkable fall in the amount of water intake (Figure 3). Mean daily water intake in unshorn and shorn ewes differed significantly ($P<0.001$) and were 4170±57 and 3147±43 g respectively. The water intake showed a tendency to increase towards the last few days of the study in parallel to changes in ambient temperatures.

Shearing was expected to increase voluntary food consumption as a result of elevated heat loss but the level of intake remained almost unchanged all over the observation period. Donelly et al. (1974) found in newly shorn Merino withers an increase in average daily consumption up to 5%. Aleksiev and Iliev (2003) also established an increase of 27.5% of feed intake in hogget's shorn in winter at ambient temperature bellow freezing point, without any substantial effect on digestibility of nutrients but a little decline in crude fibers digestibility. In the case of this study the ambient temperatures during the night and early in the morning were below the critical, while at daytime they were close to the thermal indifference for shorn sheep at a high plane of nutrition (NRC, 1981). The sheep used in this study were still acclimatized to lower winter temperature and apparently had a higher basal metabolic rate (Slee, 1974; Webster, 1969). This, at the given climatic parameters, may have contributed to avoid metabolic overshot. Furthermore, it could be postulated the lactating sheep have greater heat production than non-producing animals (Young, 1983) that could also alleviate metabolic adaptation usually accompanied by an increase of feed intake. The other contributing factor for maintaining the thermal balance without remarkable increase in heat production might be the fleece depth left after shearing. In this study sheep were shorn by clippers that left longer fleece stubble compared to machine shearing. Holmes et al (1992), Burnham et al. (1996) reported that shearing method affect appreciably the levels of heat loss and heat production. Another factor providing indirect evidence that lactating ewes did not experience severe climatic stress or energy deficiency was the increase of the body weight during the post-shearing period. This indicated that, at the given nutritional state, the sheep did not use body stores to match elevated energy demands for heat production. Furthermore, as it was mentioned above, the sheep were at high previous and current plane of nutrition and consequently with high energy reserves that support the capability to meet short-term increase in energy demands without any detectable changes of consumption

The level of milk synthesis strongly depends on genetic, nutritional and environmental factors. Milk production did not measurably change throughout the observation period. Similarly Gudev et al. (2000) found out a significant decrease of daily milk yield after winter shearing in high producing animals but not in the sheep with low milk production that may suggest both homeostatic or homeorhetic regulation. Homeostatic adjustments in lactation are influenced by many factors most important being the energy intake, the level of production, the partitioning of nutrients between the tissues and organs, and environmental conditions (Hartmann et al., 1998). Homeorhetic model could be suitable for sheep in low body condition and food restriction that may limit energy supply for milk synthesis. This support the suggestion that the cold stress induced by shearing was not strong enough to evoke energy deficiency and insufficiency of nutrients for both heat and milk production in relatively low-producing sheep in the present trial. The results obtained are in accordance with the findings of Knight et al. (1993) who has studied the effect of

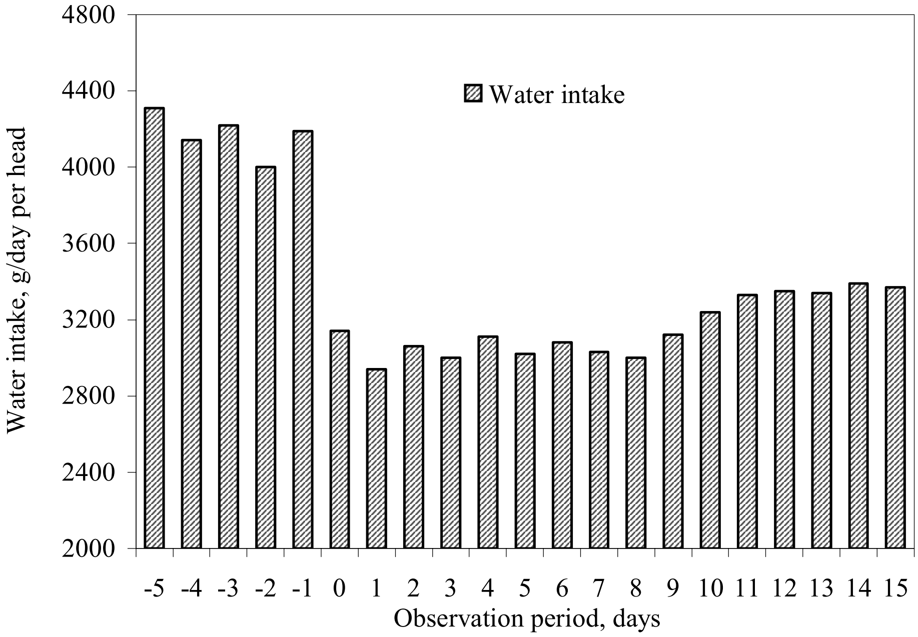

Fig. 3. Mean daily water intake (g/day) throughout the observation period. Day 0 = shearing day

shearing on milk yield and composition in Dorset ewes shorn at different stages of lactation and seasons of the year. In general, they stated shearing to increase the concentration of fat and proteins by 8-24% with an accompanying increase in the concentration of total solids in the milk but found no effect on milk yield. Unfortunately, this very interesting paper does not include any data about the climatic conditions over the observation period. In another study under controlled environment Mc Bride and Christopherson (1984) noticed that exposure of shorn ewes to low ambient temperatures (0°C) caused an increase in heat production by up to 55% compared to the sheep kept at thermo neutrality but did not substantially affect milk production. As in the work of Knight and coworkers the authors observed an elevation of milk fat content apparently a result of lipolysis due to the sub critical temperatures.

Considerable reduction of the water intake recorded after shearing did not affect daily milk yield. This, along with the observed decline in respiratory activity, suggest that the reduction of water intake despite the unchanged level of consumption was mainly at the expense of the remarkable decrease in evaporative heat loss directed at minimizing of energy expenditure under sub critical temperatures.

Conclusions

Shearing of ewes kept in confinement and on high plane of nutrition had no effect on voluntary food consumption and the levels of feed intake were 1779 and 1795 g respectively in unshorn and shorn ewes although most of the time the sheep were out of the zone of thermal indifference. Milk yield was not affected by shearing and was similar in unshorn and shorn ewes-349 and 353 g respectively over the observation period. Water intake considerably decrease ($P<0.001$) after shearing and average daily intake reached 3147 g compared to 4170 g over the time before shearing. The water intake tended to increase in parallel to changes in ambient temperatures.

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