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ASSESSMENT OF SOME BEHAVIOURAL PATTERNS OF A SHEEP FLOCK ON PASTURE

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Abstract

The aim was evaluated of annual ethological observation of sheep flock which took place on the pastures. There were observed these daily activities in the flock: grazing, laying and chewing, standing and chewing, locomotion, resting, standing and observing, drinking, comfortable behaviour, mineral lick intake. Within special behaviour which were observed only in particular season was sexual and maternal behaviour. The most frequently observed activity in winter was grazing with value of 49,18 %, in spring “laying and chewing“ with value of 63,03 %, in summer “grazing“ with value of 49,49 % and in autumn “grazing“ with value of 77,91 % from the total observed time. Significant differences ($p < 0.01$) in the activities observed in sheep were demonstrated in different seasons in the case of grazing, lying down and chewing cud, and standing and chewing cud. On the basis of the balanced frequency of comfort behaviour demonstrated by the sheep during various seasons, we can state that the animals were kept in satisfactory conditions and their welfare requirements were met.

Key words: sheep, behaviour, daily activities

Introduction

Observation and assessment of the behaviour of animals kept by humans are the key activities of breeders (Broom and Fraser, 2007). Deviation of daily activities from normal activities signals the presence of problems caused by technology, farming technique, herd hierarchy and failure to meet welfare requirements (Smit et al. 2008). According to Carvalho (2013) the behaviour demonstrated by sheep can be used to determine the quality of pasture, achievement of optimum plant production and acceptance of fodder. The animals can be observed by direct observation, using video-recordings, possibly by using sensors. A tri-axial accelerometer (Brown et al. 2013, Decandia et al. 2018), which provides information about sexual behaviour, movement, feeding, chewing cud, rest and sleep (Robert et al. 2009, Hokkanen et al. 2011, Fukasawa et al. 2018) is currently primarily used in research work. In the case of our experiment the method of direct observation was used, which is however most labour intensive. The daily activities of sheep chiefly consist of feeding, i.e. animals grazing (Delagarde and Lambertson 2015) and chewing cud, which is carried out by animals standing and mainly by sheep who are lying down. Grazing is also influenced by the species of plant, whereas Papanastasis et al. (1999)

points out that as well as grasses and dicot plants, sheep should also have access to woody plants, which, according to *Spatze et al.* (1999) need to form up to 30% of the animals' feed.

Material and Methods

The goal of the work was to assess the behaviour of sheep kept on pasture year-round, in relation to their welfare. The experiment was carried out on a private farm that farms animals in the Křivoklátsko protected nature area in the Czech Republic. Suffolk breed sheep (n=35), which were bred to a ram during the breeding season (October - November), were included in the experiment. The animals had the option of staying on the pasture year-round. In the event of poor weather the sheep were able to take shelter in a stable. During the winter period hay was provided in this area and there was also a source of drinking water here. The pasture had an area of 16 ha. The strip grazing system was used. The sheep have a source of water and a mineral lick available in each strip. Only lambs receive additional grain feed. Etiological observation was carried out during all four seasons, whereas the presented results for each season always cover on average 20 days during which the herd was observed. The observation period was selected from 7:15 a.m. to 4:15 p.m., so that the observation period was the same during all four seasons. The method of synchronous observation (a group of animals demonstrating various behaviour was observed during the specific period) was used to record the behaviour of the sheep. Records were made at 5 minute intervals. The sample of ethogram for the first hour of observation was shown in the *Table 1*. The following activities were recorded in the ethogram: grazing, lying down and shewing cud, standing and chewing cud, locomotion, standing and observing, drinking, licking the mineral lick, comfort behaviour, rest, sexual behaviour and maternal behaviour. The acquired data was processed in the STATISTICA 12 program. The Kruskal-Walis test was used to determine differentiation between the seasons.

Table 1: The sample of ethogram for the first hour of observation

Date of observation		Behaviour										
Time of observation	grazing	laying and chewing	standing and chewing	locomotion	observing and standing	drinking	mineral lick intake	comfortable behaviour	rest	sexual behaviour	maternal behaviour	
7:15												
7:20												
7:25												
7:30												
7:35												
7:40												
7:50												
7:55												
8:00												
8:05												
8:10												
8:15												

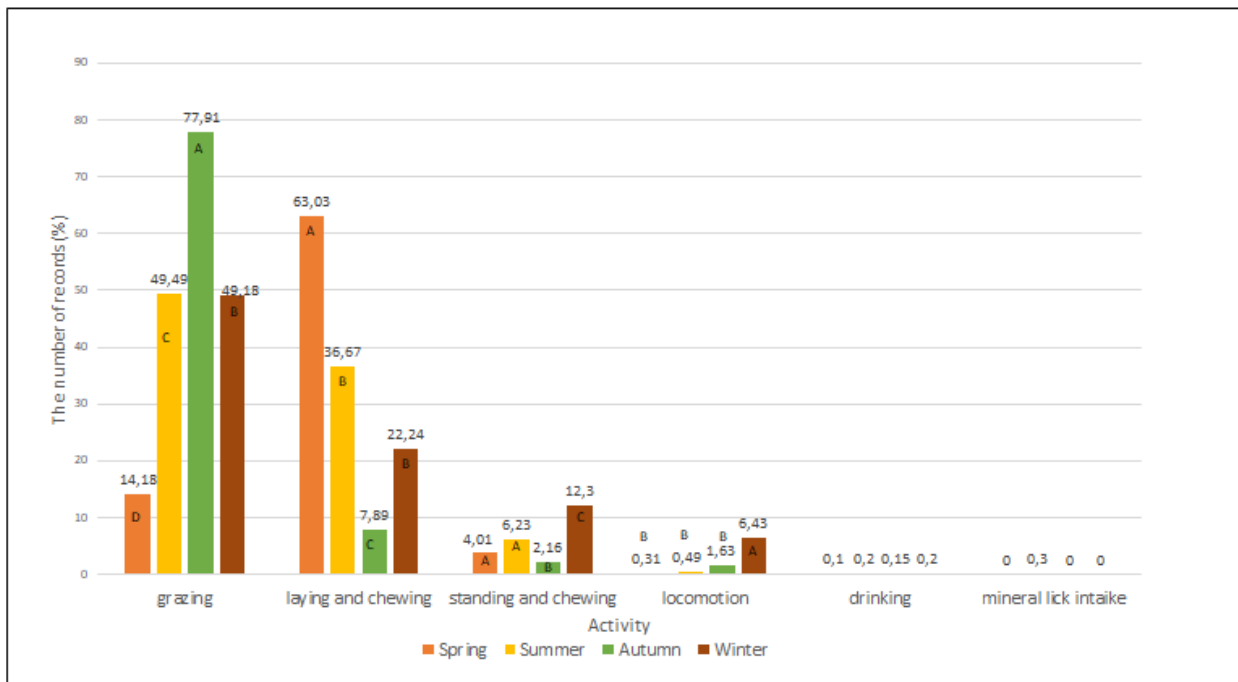
Results and Discussion

The most frequent activity during all four seasons was "grazing". Whereas the highest ($p < 0.01$) proportion of this activity (77.91%) was registered during the autumn observation (*Figure 1.*) In winter this activity was observed in 49.18% cases, during the summer observation period, grazing took up nearly half the observation time (49.49%). Animals grazed least during the spring period (14.18%). The low proportion of this activity was mainly affected by the mothers' care of the newly-born lambs. Assumed that the sheep grazed more at night, when the lambs were resting. The most important activity was the grazing behaviour. Therefore we focused on this trait and we performed detailed observation of proportion of daily activity during the day (*Figure 2.*). The behaviour was observed in 5-minute intervals and for graphic presentation was summarized to 1-hour observations. The graph reveals that the highest grazing behaviour was in morning hours and then slightly decreased till 10.00 a.m.. Second highest activity was observed in midday which ended at 2:15 p.m. The last increasing of activity was observed from 3.00 p.m. There was the same trend in all seasons. The results pointed almost identical grazing behaviour in winter and summer seasons. On the contrary different results were observed in spring and autumn, although they had similar trends between themselves. The lower amount of grazing animals in spring could be explained by presence of lambs and higher grazing behaviour in autumn could be related with poor nutrition quality of pasture.

The established results correspond to the data given in the work by *Rutter (2002)*, when the average grazing period per day is given as 8 - 9 hours. *Fraser and Broom (1997)* state that this activity can take up to 10 hours a day. *Haupt (2011)* adds the statement that the sheep feed more in colder weather. The daily activity of "lying down and chewing cud" was the second most frequent behaviour demonstrated by the observed herd of sheep. This activity took up 63.03% of the observation time during the spring observation period, during the summer period this activity took up 36.67% of the observation time and in winter it took up 22.24% of the observation time.

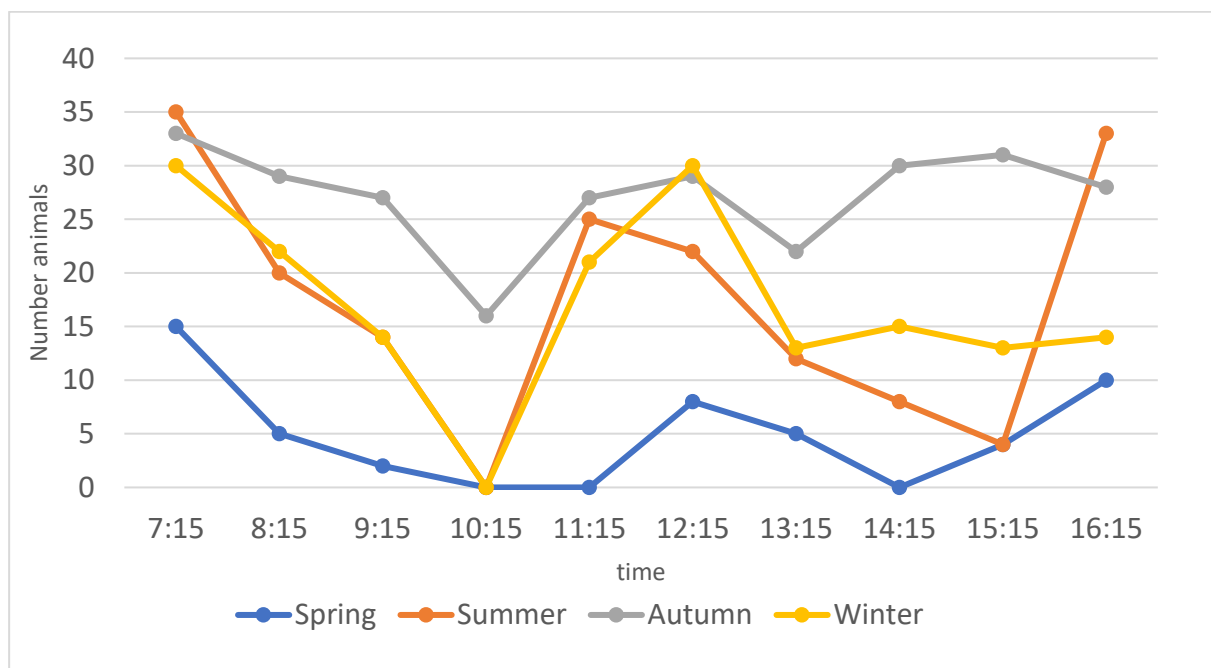
The smallest ($p < 0.01$) proportion of the lying down and chewing cud activity was observed in autumn (7.89%). The animals always chose areas in the shade and protected against bad weather to lie down and chew cud. "Standing and chewing cud" was another observed activity that took up a significant proportion of time. It is significant ($p < 0.01$) that this activity was observed most in the winter period (12.30%), when there was more precipitation and the pastures were wet. This activity was observed only exceptionally during other seasons (spring 4.01%, summer 6.23%, autumn 2.16%). *Decandia et al. (2018)* give a range of from 15 to 17% of the time spent chewing cud by sheep. Locomotion was observed most frequently ($p < 0.01$) in the winter period (6.43%), this activity represented 1.63% of the total number of recorded activities in the autumn. During the spring and summer observation periods animals were observed to ambulate aimlessly practically exceptionally in 0.31 - 0.49% of cases. Similar low numbers of cases (0.44%) were recorded in relation to rest, which was only observed during the summer period.

Figure 1: Basic daily activities of sheep



*the different letters A, B, C, D, mean significant differences ($p < 0.01$) between the seasons.

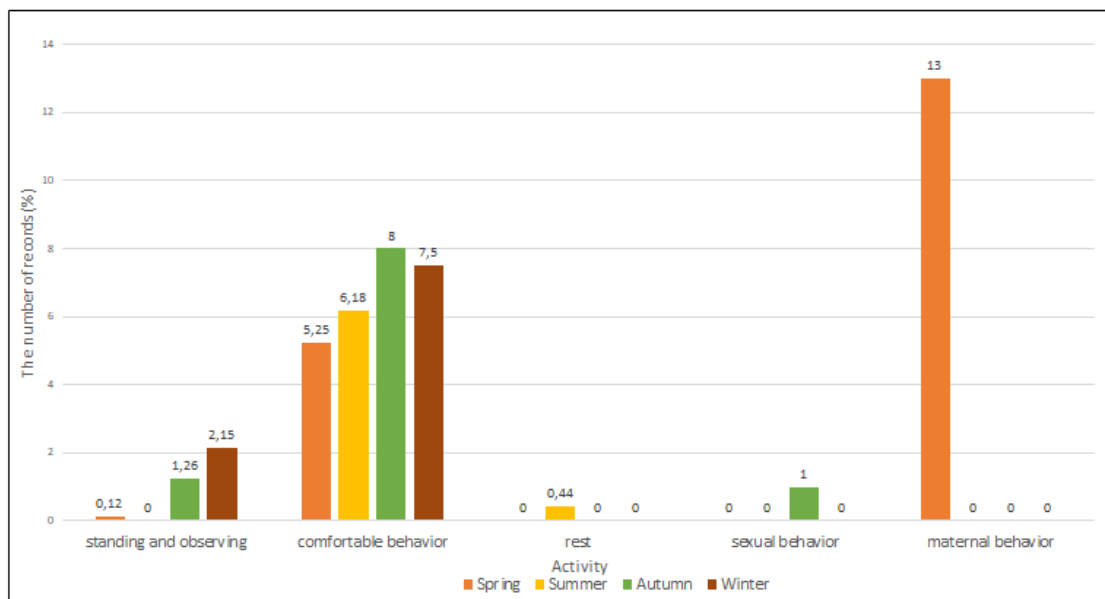
Figure 2: Proportion of grazing periods during day in different seasons



This result corresponds to the statement by Lynch et al. (1992) that sheep mostly rest at night. The "standing and observing" activity can be described as the attention of the herd of sheep being captured by external factors, when most of the animals focused their attention on the observed subject and assessed it for potential danger. During the winter period this activity was registered in 2.15% of cases, during the autumn it was observed in 1.26% of cases and in spring in just 0.12% of cases. This activity was not observed during the summer ethology observation period. Drinking made up only a small proportion of the total number of records of daily activities. Drinking ranged from 0.10% to 0.20% with a higher need ($p>0.05$) for drinking in the winter and summer periods. Damian et al. (2018) states that water consumption depends mainly on the quantity and type of food, the climatic conditions, milk production, the amount of movement by the animals and the season. During assessment of the quality of the animals' stabling, or more precisely inspection that suitable welfare conditions are maintained, the appearance of comfort behaviour is considered a reliable indicator that the animals are comfortable.

Of the total number of observed incidents, comfort behaviour did not represent a great percentage (2 - 8%). However, it is important that it appeared during all seasons, which proves that the animals were satisfied in the pasture. The activity of the sheep scratching against items (trees, fences, hay mangers), respectively the animals scratching themselves with their rear limb, was observed most frequently from the activities included in comfort behaviour. Licking the mineral lick was observed in the summer and autumn periods only in 0.30% of the cases. To some degree a specific daily activity is the appearance of sexual and maternal behaviour because this behaviour does not occur throughout the entire year, but is connected to the season in sheep. Demonstration of sexual behaviour (the ram seeking out sheep in season, the animals mating) was observed during the autumn ethological observation period, during which it took up 1% of the time spent on the observed activities (Figure 3). Maternal behaviour distinguished as care of lambs and suckling, only took place in the spring period in 13% of ethological records. Alhamada et al. (2016) state that demonstration of sexual behaviour depends on the physical condition of the animals, when individuals in optimum condition provably demonstrated a higher score of attractiveness ($p>0.05$).

Figure 3: Other daily activities of sheep



Conclusion

The results of the experiment indicate that the season had a significant influence on most of the activities observed in the herd of sheep. The most significant changes were proven in the case of grazing and chewing cud when it is ideal from the aspect of welfare that most of the animals chew cud when lying down. We can state at this point that most of the animals demonstrated this behaviour and therefore the specific breeding conditions can be considered satisfactory. This statement is also substantiated by the fairly balanced number of incidents of comfort behaviour, appearing in animals that are not subject to stress. The appearance of sexual and maternal behaviour during only one season is related to the seasonal nature of breeding sheep in the conditions of the Czech Republic. In conclusion we can state that the originally English Suffolk breed has adapted fully to the climatic conditions of the Czech Republic and these animals can be kept on the pasture year-round.

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