RESEARCH REGARDING THE THERMAL STRESS ON MILK PRODUCTION IN ROMANIAN SPOTTED CATTLE FROM RESEARCH AND DEVELOPMENT STATION FOR BOVINE ARAD

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Abstract

The aims of the paper was to establish the influence of environment on milk production. Research were carried out on 98 cows Romanian Spotted from Research and Development Station for Bovine Arad. Studied animals calved in the first tree months of 2011 (January, February and March), and lactations were completed at data processing time. Parameters included in the study were: total milk production, average daily milk production, milk production of each calendar month, morning and evening milk weight from total daily milking weight. The study show that both monthly milk production and morning and evening milk weight from total daily milking weight, are strongly influenced by the temperature comfort of the animals. Thus, in the months with low temperatures (December-February) average daily production is lower (10-14 l / day) than in warmer months (June to August), when average is 20-22 l / day. Even if milk average productions increase in warmer months, the weight of both milks from total daily milks weight, highly ranging. Those, observe a higher weight of morning milk (54-55% of total) compared to the evening weight milking (44-45% of total). In months with temperatures near to the thermal comfort (March to May, September to November) milking weight tends to equalize.

Key words: milk production, termic stress

INTRODUCTION

Heat stress negatively affects health, production and reproduction in dairy cows. Most affected are cows with high milk production, where the production can be lower than 50% under conditions of extreme heat and humidity [2]. Low temperatures are better tolerated by dairy cows.

Microclimate is a factor of great importance for animal welfare, a factor that can greatly influence both the level of milk production, milk chemical composition of milk production and weight relative to the two daily milking [1]. Maintaining cows outside the limits of thermal comfort leads to:
- Decrease voluntary feed consumption leads to a decrease of total milk production.
- Decreased dry matter intake and increased water consumption leads to decreased milk dry matter, protein and fat from milk.
- Reduced secretion of thyroxine and thus reducing the intensity of metabolism.
- Reduce intestinal motility and speed of passage in the digestive tract.
- Increasing the nutrient requirement for maintenance to the detriment of milk production.
- The intensity of these changes, increases proportionally with the amount exceeding the limits of thermal comfort [3].

MATERIAL AND METHOD

The study was carried out on a total of 98 dairy cows from the Research and Development Station for Bovine Arad. Studied cows, calved during the months of January, February and March of 2011, and when data processing in April 2012, lactations were completed. During the study

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milk production was studied throughout lactation, by alternatively monthly controls.

The percentage of the morning and evening milk from total daily milking and evolution of these parameters during a calendar year were studied to see the effect of environment temperature on the milk production.

The rearing and feeding system was maintained constant and identical for all cows during the study.

The collected data were statistically processed. Differences were calculated, and their significance was calculated using Student test.

RESULTS AND DISCUSSIONS

After processing the collected data, a noticeable increase of milk production in the hot summer months, compared to yields obtained in cold season was observed. However, the morning milking percentage grows in warm season compared to the cold season. This is definitely influenced by high temperatures recorded during the day to reduce appetite cows. At night, when temperatures drop and physiological tolerance approach, cows increases appetite and thus increase voluntary feed intake. Also at night, the resting period is considerably higher than during the rest of the day.

We can see a strong influence of high temperatures on the relationship between the two milking. Milk production increases during the summer months, mainly due to the structure of feed ration composed largely of succulent forage, powerful lactogen.

Table 1 presents the evolution of the average daily production during a calendar year and the two milkings quantity and percentage of total daily milking.

Table 1 Evolution of the average daily milk production and share of two daily milking

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	I
Number of cows	21	55	86	98	98	98	98	98	98	97	91	58	24
Total milk/day	13.07	14.52	15.6	17.37	19.56	21.77	22.9	22.24	20.41	18.04	13.23	12.33	10.93
Morning milking	6.85	7.59	8.14	9.07	10.39	11.67	12.51	12.35	11.32	9.8	7.08	6.51	5.8
Evening milking	6.22	6.93	7.46	8.3	9.17	10.10	10.39	9.89	9.09	8.24	6.15	5.82	5.13
% morning milking	52.39	52.31	52.18	52.28	53.08	53.67	54.7	55.68	55.47	54.22	53.49	52.82	53.35
%evening milking	47.61	47.69	47.82	47.72	46.92	46.33	45.3	44.32	44.53	45.78	46.51	47.18	46.65

where

N - number of animals calved in month indicated.

Total milk/day - average milk production in control day.

Morning - average of morning milk production from total daily milking.

Evening – average of evening milk production from total daily milking.

% morning – percentage of the morning milk from total daily milking.

% evening – percentage of the evening milk from total daily milking

Calculating the milk production differences depending on the season, we see a clear upward trend due to the structure of feed ration.

In Table 2 we present the differences and statistical significance for the average daily yields.

Table 2 Differences and statistic significance of differences in average daily milk yields

Season	Spring	Summer	Autumn
Winter	-7.3 **	-12.1 ***	-7.03 **
Spring	-	-4.8 *	0.27
Summer	-	-	5.07 *
Autumn	-	-	-

We find very significant differences between yields obtained in summer compared to winter season where the feeding system used provides rations having diametrically opposite structure.

Distinct significant differences appear between yields obtained in the intermediate temperature seasons, spring and autumn compared to winter. This is explained by the

start of the spring green fodder which is able to compensate for lower production of milk through its lactogen effect. Autumn milk production begins to decline mainly due to weaning proximity. However, there are still distinct significant differences in autumn compared to winter due to the structure of the feed ration that still contains green forage, possibly the last cut.

Hot weather in summer, with high temperatures well above the thermal comfort of the cows, but also with a forage ration based largely on lactogen feed comes with a very significant difference to the winter and by the fact that cows calved in the first 3 months of year are in the ascendant or plateau phase of the lactation curve. Only significant differences were observed for intermediate temperature seasons, due to surpassing by far the limits of the thermal comfort.

More specifically, between the three seasons significant differences could occur if cows would benefit from thermal comfort during the summer. A decrease in milk production in July and August is seen from Table 1, then a slight recovery. This productive rebound is due to extreme high temperatures reached in these two months of the year and is directly responsible for the significant difference compared to the production recorded fall.

Referring further to percentage of the two daily milkings, the quantitative differences obtained and their significance were calculated (Table 3).

Table 3 Difference and statistic significance of differences in the share of the two daily milkings from the total daily milking

Season	Morning milkink	Evening milking	Differences and statistically significant
Winter	6.78	6.02	0.76
Spring	9.2	8.31	0.89
Summer	12.17	10.12	2.05**
Autumn	9.4	7.82	1.58*

During the cold season non-significant differences were observed between the morning and evening production, due to a relative balance of temperatures between day and night. Spring brings no significant differences between milkings, because there was a balance of effects, the rising temperatures both during the day and night that favors specific consumption on the one hand, and the green fodder is gradually entering in feed ration structure on the other hand. So both the optimum comfort temperature and green fodder in the ration concur to establish a balance on the voluntary feed consumption somewhat evenly distributed over 24 hours and implicitly the milk production distributed on milkings.

Distinct significant differences appear during the warm season, summer, when daytime high temperatures reduce voluntary feed intake, rest periods and rumination of dairy cows. Thus there is a higher share of the morning milking than the evening milking, the balance breaking being the increased consumption and rest at night.
There are significant differences between the two daily milking in autumn, due to still relatively high temperatures in the early part of the season, especially during September. A tendency to balance the weight of the milkings as the winter approaches could be seen in Table 1.

CONCLUSIONS

Average daily amount of milk obtained from dairy cows is strongly influenced by environment temperatures.

The weight of the two daily milkings from total milking is strongly influenced by the thermal comfort. Percentage of the morning milking is higher in the warm season (summer), tends to equalize in the intermediate seasons (spring and autumn) and is maintained in a certain physiological balance during the cold season (winter) when temperature differences between day and night are not that high.

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