

RESULTS REGARDING THE BEHAVIOURAL INDICATORS DURING THE AUTOMATIC MILKING OF THE DAIRY CATTLE EXPLOITED AT S.C.D.A. ȘIMNIC CRAIOVA

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ABSTRACT

Respiratory rate accelerates during this action both at the morning milking and at the evening milking, which proves that automatic milking is stressful both during milking and after milking. During milking, the animals' pulse is altered and its rate increases significantly, especially during the evening milking. The milk production of Holstein Friesian cattle is about 35 litres/day, among which 53.48 % from the morning milking and 46.52 % from the evening milking. The values of the milking duration, both in the morning and in the evening, are registered in the framework of the limits of action of the hormone called oxytocin, that controls the milk secretion. The speed of milk removal may be considered as adequate for the morning milking, but it is under the limits of the minimum requirements for the evening milking.

INTRODUCTION

Considering that the milk production is the main goal of breeding and exploiting cattle within the farm of SCDA Simnic Craiova, studying the behaviour during automatic milking is extremely useful.

Even if the behavioural manifestations during automatic milking have many different aspects, this work studies only some of the indicators, namely: respiratory rate, pulse rate, milking duration and milking speed.

In order to have more details on these behavioural indicators, the analysis was made on dairy cattle, in the following moments of observation: before milking (B.M.), during milking (D.M.) and after milking (A.M.), 3-5 minutes after removing the cups from the teats. The behaviour studies want to establish optimal limits of feeding, of water, of the rest place, of the number of animals in the lot and also the way the exploited animals react to different stressful factors specific to different exploiting technologies.

MATERIAL AND METHOD

This work wants to approach some of the numerous behavioural aspects of the Holstein Friesian cattle from the farm of the Station of Agricultural Research-Development of Șimnic Craiova.

One of the important factors of the technology of exploiting cattle is the biologic material populating the farm. This should fulfil both productively and behaviourally the requirements imposed by the exploitation technology.

The research was accomplished during the years 2014-2015, on a set of 50 Hosltein Friesian cows selected randomly from the farm cattle.

The Friesian race is Dutch (from the province of Eastern Frisia): it was formed by crossbreeding the old local populations of brachycera black and white parti-coloured cattle with primigenius cattle. The resulted biologic material was submitted to an intense selection (starting from the 18th century), in order to produce milk, and starting from 1930,

in order to produce meat as well. The improvement means were: breeding as a clean race, by forming numerous lines and families, and guiding the copulation.

The primary data for respiratory rate were collected based on auscultation and the pulse rate, based on timers. In order to establish the other indicators, we used proceedings of directly observing the animals and the timing method.

In order to establish the average values of the observed behavioural characteristics, the primary data have been statistically processed, determining thus the following statistical indicators: average (\bar{X}), variance (s^2), standard deviation of the average (s), variability coefficient (s %) and standard error of the average (.sX).

RESULTS AND DISCUSSIONS

1. Respiratory rate during the milking process

For cattle, the respiratory rate is of 24-32 breaths per minute. This respiratory rate may be altered by many factors: digestion, muscle activity, fever, etc.

After our research, it results that the milking process also produces alterations of the respiratory rhythm rate. Therefore, based on the data of table 1, we may see that for the Holstein-Friesian cattle the average respiratory rate in the morning, before milking, is $\bar{X} = 28,82 \pm 0,79$ breaths/minute. It accelerates during milking up to an average value of $\bar{X} = 30,85 \pm 0,88$ breaths/minute, that is 2,02 breaths/minute higher (6,54 %).

Table 1

Respiratory rate during the milking process (breaths/minute)

Milking round	Moment of observation	$\bar{X} \pm s_x$	Variability estimations			Safety limits for p = 5 %
			Limits	s	s %	
In the morning	B.M.	28.82 ± 0.79	20 – 38	5.59	19.33	27.38 – 30.46
	D.M.	30.85 ± 0.88	22 – 40	6.23	20.19	29.13 – 32.57
	A.M.	29.35 ± 0.83	21 – 38	5.93	20.20	27.73 – 30.97
	Media	29.74 ± 0.85	21 – 40	6.01	20.21	28.08 – 31.40
In the evening	B.M.	29.58 ± 0.86	21 – 39	6.10	20.62	27.90 – 31.20
	D.M.	32.01 ± 0.97	21 – 41	6.90	21.55	30.11 – 33.91
	A.M.	31.12 ± 0.90	23 – 38	6.39	20.53	29.36 – 32.88
	Media	30.89 ± 0.86	22 - 39	6.14	19.87	29.21 – 32.57

After milking, the respiratory rhythm is reduced to the average value of $\bar{X} = 30.85 \pm 0.88$. which is 0.53 breaths/minute higher than the rate established for the initial moment.

During the evening milking, the moments of observation of the respiratory rate suffer the same rhythm alterations as the morning milking, except for the fact that the average values established for every moment of observation are higher ($\bar{X} = 29.58 \pm 0.86$

breaths/minute before milking. $\bar{X} = 32.01 \pm 0.97$ breaths/minute during milking and $\bar{X} = 31.12 \pm 0.90$ breaths/minute after milking).

The fact that the number of respiratory movement accelerates during milking proves that automatic milking is a stressful factor whose influence is felt both during and after milking.

Considering the average of the three milking moments ($\bar{X} = 29.74 \pm 0.85$ breaths/minute), we may state that the Holstein-Friesian cattle from S.C.D.A. Șimnic have a high respiratory rate, illustrating intense metabolic processes specific to dairy cattle.

2. Pulse rate during the milking process

The number of beats per minute varies depending on the species; for cows, the values are between 60 and 80 beats/minute.

Pulse also depends on sex, age, temper, the physiological state of the animal, whether the animal is asleep or working etc.

From the analysis of the data from chart 1, we may observe that the average values of the pulse rate, both in the morning and in the evening, are within the limits mentioned by the specialty literature.

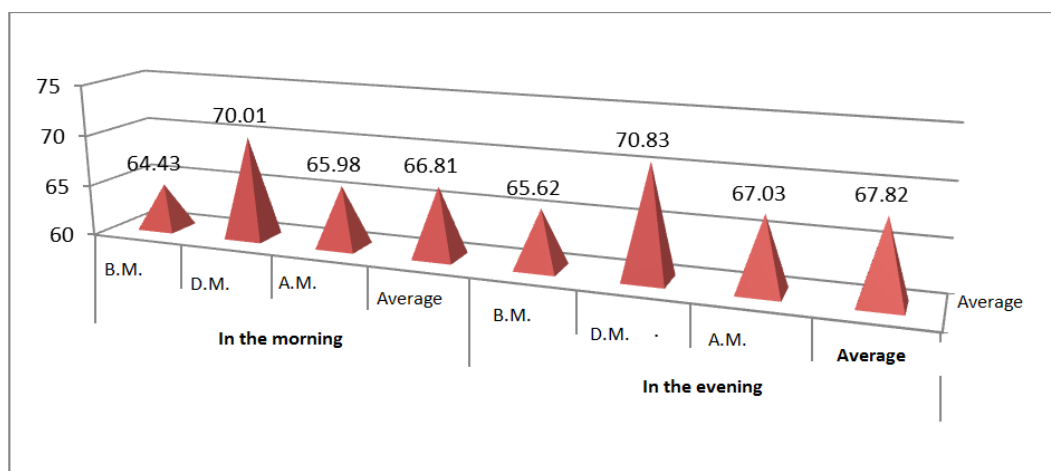


Chart 1. Pulse rate during the milking process (beats/minute)

We found significant differences between the morning milking and the evening milking; we should mention that the pulse rate is slightly higher during the evening milking ($\bar{X} = 67.82 \pm 0.71$ beats/minute compared to $\bar{X} = 66.81 \pm 0.68$ beats/minute).

Regarding the moments of observation, the pulse rate is higher during milking than before milking, both for the morning milking ($\bar{X} = 70.01 \pm 0.70$ beats/minute compared to $\bar{X} = 64.43 \pm 0.64$ beats/minute) and for the evening milking ($\bar{X} = 70.83 \pm 0.75$ beats/minute compared to $\bar{X} = 65.62 \pm 0.66$ beats/minute).

Based on the values we found, we may state that milking is also stressful for the animals concerning the respiratory rhythm rate; this effect and the fatigue accumulated by cattle during the day determine a higher pulse rate during the evening milking.

3. Indicators of the milking duration and speed

The analysis of the data of table 2 highlight the fact that the cows have high daily productions. Therefore, the daily milk production is 34.94 litres, among which 17.99 litres are from the morning milking (53.48 %) and 16.95 litres from the evening milking (46.52 %).

The milking duration has values of $\bar{X} = 4.08 \pm 0.10$ minutes for the morning milking and $\bar{X} = 3.50 \pm 0.11$ minutes for the evening milking. We may see that both values are within the limits of the action duration of oxytocin, a hormone which controls milk secretion. This is extremely important in practice whereas it has a favourable influence on the speed of milk removal.

The indicator of the milking speed has an average value of $\bar{X} = 1.88 \pm 0.05$ litres/minute, with slight oscillations between the morning milking and the evening milking ($\bar{X} = 1.93 \pm 0.05$ litres/minute and, respectively, $\bar{X} = 1.81 \pm 0.04$ litres/minute).

If we compare the established values with the minimum requirements for dairy cattle (1.9-2.2 litres/minute), we may see that the observed Holstein-Freisian cattle have an adequate milking speed for the morning milking and a speed which is slightly under the limit for the evening milking.

Table 2

Average values of the daily milk quantity, of the milking duration and speed

Specification	Milking rounds	$\bar{X} \pm s_x$	Variability estimations			Safety limits for $p = 5\%$
			Limits	s	s %	
Quantity of milked milk (litres)	M	17.99 ± 0.19	5.50 – 11.00	1.38	17.27	7.25 – 8.36
	E	16.95 ± 0.21	4.25 – 10.80	1.52	21.87	6.54 – 7.36
	T	34.94 ± 0.29	9.45 – 21.80	2.12	14.19	14.38 – 15.50
Milking duration (minutes)	M	4.08 ± 0.10	2.30 – 7.50	0.76	18.62	3.59 – 4.27
	E	3.50 ± 0.11	2.15 – 6.54	0.81	23.14	3.29 – 4.11
	T	7.58 ± 0.17	5.50 – 13.55	1.24	16.35	7.25 – 8.31
Milking speed (litres/minute)	M	4.40 ± 0.05	1.35 – 2.60	0.41	21.24	1.84 – 2.02
	E	4.84 ± 0.04	1.05 – 2.25	0.35	19.33	1.74 – 1.88
	A	4.62 ± 0.05	1.20 – 2.40	0.36	19.14	1.79 – 1.97

M = in the morning; E = in the evening; T = daily total; A = average on milking rounds.

CONCLUSIONS

Based on our research and its results regarding some behavioural aspects manifested by the Holstein-Freisian cattle from S.C.D.A. Șimnic, we may draw the following conclusions:

1. Both for the morning milking and for the evening milking, the respiratory rate accelerates during this activity, which proves that automatic milking is stressful during this activity and after it, as well.
2. During milking, the animals' pulse is altered; their pulse rate is significantly higher, especially during the evening milking.
3. The milk production of the Holstein-Freisian cattle has values of about 35 litres per day, among which 53.48 % are from the morning milking and 46.52 % from the evening milking.
4. The values of the milking duration, both in the morning and in the evening, are within the action limits of the hormone called oxytocin, that controls milk secretion.
5. The speed of milk removal may be considered as adequate for the morning milking, but it is under the limits of the minimum requirements for the evening milking.

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