

INFLUENCE OF THE ECOLOGICAL CONDITIONS ON BREEDING IN CLOSED COVERED BRICK BARN OF BLACK-AND-WHITE COWS AND SOME ETHOLOGICAL REACTIONS **

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Abstract: This study was done with the aim to establish the season dynamics of ethological indicators: lying, standing, feeding and drinking of milk cows with is result of such abiotic factors as: temperature, relative humidity and wind velocity movement in production environment.

The animals were bred during the year in closed covered brick barn with natural ventilation. From the analysis of the received results is clear that the parameters of the ethological reactions are changing in a cycle during the seasons of the year. This is an expression of the reaction towards the influence of the abiotic factors of the environment.

Key words: dairy cows, lying, standing, feeding, milch, drinking, abiotic factors.

Introduction and literature review

Ethological behavior the cows influenced by ecological factors in the production facility is complicated and not to the end process. In our previous article, it was found that cows reared in the barn were under influence of a complex of abiotic factors (Krastev and Gaydarska, 2000; Krastev, 2002; Krastev, 2003; Krastev et al., 2000). Bozakova and Stoyanchev (2007) and Bozakova et al., (2008) showed some ethological parameters of well fare on the mullands in conditions on ecological comfort and stress. Manteifel (1980)

observed important ecological role of the seasons and day-night variations on the abiotic factors of environment, which induce changes of organisms.

Dajo (1975), Odum (1986), Riklefs (1993), Raimers (1994), Novikov (1998) established, that the temperature, relative humidity and wind velocity of air effected adaptation reactions of organisms.

Many research workers (*Vurlqkov et al., 1988, 1989, 1993; Zahariev et al., 2004; Stoikov and Simeonova, 2005*) proved that the method of breeding of milk cows effected the behavior of animals. According to *Nikolov (2003)* elements of the production technology should be related to ethology of animals for their ecological comfort.

The investigation is part of one year complex study, with purpose to establish seasons and day-night dynamics of the ethological parameters: feeding, lying, staying, milking, drinking of Black-and-White dairy cows under the effect onf abiotic factors: temperature, relative humidity, wind velocity in the production facility.

Material and methods

The dairy cows were raised year-round in closed covered brick facility of concrete steel elements of following dimensions: length 72m, width 12 m, height 3.50m. The capacity of the barn is for 100 cows, distributed in two rows, 50 cows each. The walls consist of one-layer panels with 0.18m thickness and the joints are solidified without plaster. They are sprayed with whitewash on the outside and inside. The roof is flat, constructed of double T-shaped concrete steel panels with heat insulation above of total thickness 0.30m. There are windows with dimensions 1.20/ 0.80m at 1.80m above floor level along the whole length of both longitudinal walls with a light coefficient 1:14. The ventilation was natural. The cribs were placed opposite to each other with a feeding path between them. The beds were made of floor bricks at a 3° inclination. Excrements were disposed of by flat chain transporter. Watering was in individual automatic watering-troughs. Milking was performed with aggregates in cans. The supply of roughage and green fodder was mechanized and that of concentrates- manual.

The study involved 56 Black-and-White cows in It, II and III lactation. The animals were fed corn silage with 25-32 % dry matter and concentrate mixture. In the summer the silage was changed with alfalfa.

The observation of the behavior of animals was carried in five days-night during the seasons of the year by the groups timing method with a 10' min interval.

Environmental temperature in the barn was measured and relative humidity by thermo hygrograh TZ-18, wind velocity-by kata-thermo-meter on Hill. The measuring equipment was placed at the level of the living zone of the cows (1.50m above the floor). Measurements were made in four opposite points of the barn for whole the experimental period. Data was calculated by ten days.

Results and discussion

Table 1. Mean 10-day temperature and relative humidity of the air

Tabela 1. Srednje vrednosti temperature I relativne vlažnosti vazduha u 10-dnevnim periodima

Season/ Sezona	Month Mesec	Covered brick barn/ Pokriveni objekat od cigala						Out of the cover brick barn/ Izvan pokrivenog objekata od cigala					
		1 – 10		11 –20		21 –31		1 – 10		11 -20		21 -31	
		T°C	R%	T°C	R%	T°C	R%	T°C	R%	T°C	R%	T°C	R%
Winter/ Zima	I	1,8	88	2,2	88	3,2	94	-0,2	74	0,1	76	1,1	80
	II	2,0	88	3,1	88	3,9	86	0,9	78	1,5	81	1,8	76
	III	2,6	85	7,0	84	7,8	82	6,3	72	4,9	65	11,6	68
Spring/ Proleće	IV	14,1	73	13,5	63	16,6	73	15,9	65	14,1	70	19,2	74
	V	16,8	62	16,2	61	17,4	66	18,1	56	17,6	72	20,1	69
	VI	18,0	63	17,8	68	18,7	77	19,3	62	17,9	71	20,5	78
Summer Leto	VII	23,1	58	26,9	66	27,7	62	26,3	55	23,8	60	27,7	51
	VIII	28,0	52	31,3	50	34,3	57	33,6	44	35,2	40	30,5	52
	IX	25,1	56	23,8	66	19,5	70	24,8	52	23,2	62	21,8	65
Autumn Jesen	X	18,0	63	17,2	65	17,5	65	19,7	60	19,3	62	19,8	61
	XI	9,3	87	7,8	85	5,1	85	5,4	77	3,1	74	1,5	72
	XII	2,2	88	3,7	89	7,2	92	1,4	85	2,0	85	5,1	88

In Table 1 the average ten day temperatures out of the barn environment during the experimental period are presented, which were within the limits of -0,2°C in January to 35,2°C in August. At the same time in the production facility of this index was 1,8°C-7,8°C during the winter (Table 1.). The temperature of 1,8°C in the barn was measured when temperature of the air out of barn was -0,2°C. These parameters show that the biological heat from dairy cows was insufficient for optimum temperature of the air in the production facility.

The average ten days a barn environment during the summer (19,5°-34,3°C) in two of the weeks were higher from the standards.

The average temperature in the barn was lower in comparison with the standards during the first and second ten days of December (2,2°-3,7°C).

The average ten days relative humidity in the period of study was fluctuating from 40% in second ten days of August to 88% in first ten days during the winter. At the same time, the minimum value of this index in the barn was 50% during the summer and 94% in the winter. This data was higher with 9% comparison with technological level (50-85 %). It was established that relative humidity of the air in the barn was higher, when the average ten day temperature is lower than minimum value of the norms for this category of animals.

The average ten day wind velocity in the production facility was within 0,45m/s in winter, 0,60m/s in the spring, 1,25m/s in summer, 0,95m/s- in autumn.

In the background of thus, registered ecological abiotic parameters in the barn, it is interesting to follow the behavior of dairy cows in the day-night during the seasons of the year.

Table 2. Total ratio and duration of behavior in cows (n = 56)

Tabela 2. Ukupni odnos i trajanje oblika ponašanja krava (n = 56)

Behavior/Ponašanje	Winter/Zima		Spring/Proleće	
	Ratio, %	Time, min	Ratio, %	Time, min
Laying / Ležanje	49,81	717,46	45,20	650,88
Staying / Stajanje	22,72	327,19	27,12	390,53
Feeding / Hranjenje	23,25	334,58	22,58	325,15
Milking / Muža	2,82	40,61	2,79	40,18
Drinking / Pijenje	0,90	12,96	0,98	14,11
Other activity / ostalo	0,50	7,20	1,33	19,15
Total/ Ukupno	100,00	1440	100,00	1440
Behavior/Ponašanje	Summer/Leto		Autumn/Jesen	
	Ratio, %	Time, min	Ratio, %	Time, min
Laying / Ležanje	43,75	630,01	46,37	667,73
Staying / Stajanje	34,63	498,67	29,52	425,09
Feeding / Hranjenje	17,31	249,26	19,05	274,32
Milking / Muža	2,18	31,39	2,93	42,19
Drinking / Pijenje	1,15	16,56	1,02	14,69
Other activity / ostalo	0,98	14,11	1,11	15,98
Total/ Ukupno	100,00	1440	100,00	1440

Information from monitoring (Table 2) shows that the basic behavior reactions of the cows in the experimental period were laying 46.28% or 666.47 min of the day-night. Season dynamics are present on Figure 1. She shows that the milky cows were more laying during the winter- 49.81% or 717.46 min; a spring- 45.20% or 650.88 min; a summer- 43.75% or 630.01 min; an autumn- 46.37% or 667.73 min.

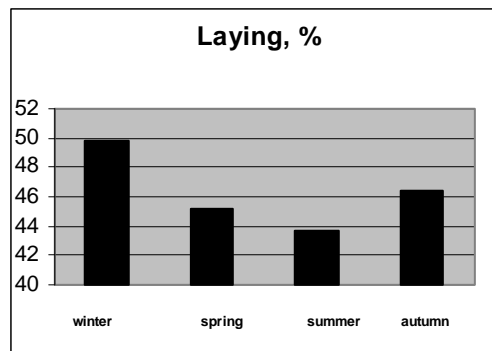


Figure 1. Laying, %

Slika 1. Ležanje, %

The average yearly the animals were staying 28.52% or 410.69 min. Cows staying maximum 34.63% or 498.67 min during the summer; during the winter they staying least 327.19 min or 22.72%. In another two seasons the animals staying 390.53 min or 27.12% during a spring, and 425.09 min or 29.52% - autumn.

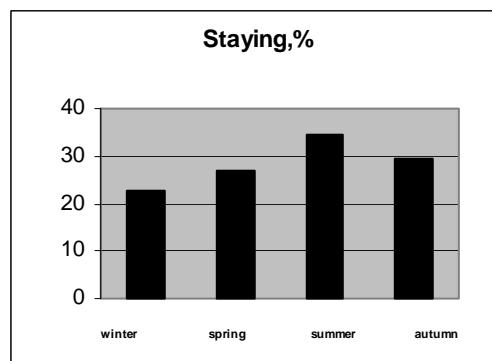


Figure 2. Standing, %

Slika 2. Stajanje, %

Dairy cows were fed average 295.83 min or 20.55%, where summer- 249.26 min or 17.31%, winter- 334.58 min or 23.25% (Figure3.).

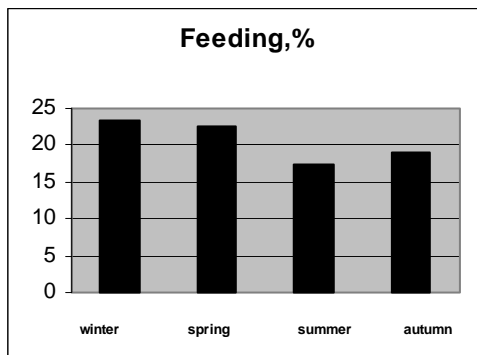


Figure 3. Feeding, %
Slika 3. Hranjenje, %

The average of milking was: 2.68% or 38.59 min of the day-night; winter- 40.60 min or 2.82%; spring-40.18 min or 2.79%; summer-31.39 min or 2.18%, in the autumn- 42.19min or 2.93% (Figure 4.).

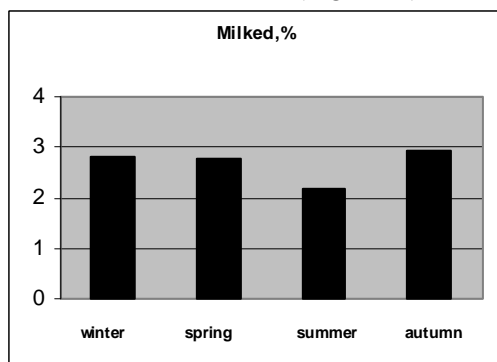


Figure 4. Milking, %
Slika 4. Muža, %

The animals were water drinking average of 1.01% or 14.58 min, in the winter- 12.96 min or 0.90%, in the spring-14.11 min or 0.98%, in the summer- 16.56 min or 1.15% in the autumn- 14.69 min or 1.02% (Figure 5.).

Cows expended on other activity the average yearly 0.98% or 14.11 min, as from them during the winter- 7.20 min or 0.50%; during the spring- 19.15 min or 1.33%; during the summer- 14.11 min or 0.98%; during the autumn- 15.98 min or 1.11% (Figure.6.).

Following results are evidence that the abiotic factors: temperature, relative humidity and wind relative in the production facility, determine of season dynamics on the parameters of ethological status to milky cow. Increase

time for staying and decrease time for fed, any longer water drinking during the summer are in the bounds with release heat from animals body.

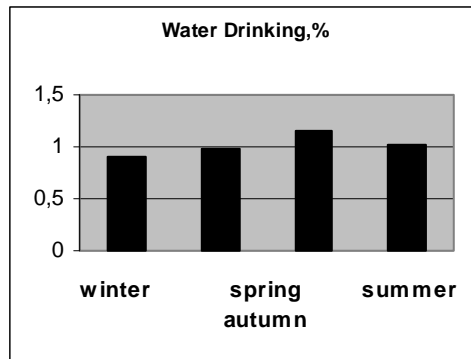


Figure 5. Water drinking, %
Slika 5. Pijenje vode, %

Behavior on the cows during the winter is in contrast in comparison with the same monitoring parameters during the summer. This is connection with increase physical thermoregulation in condition on the constant temperature.

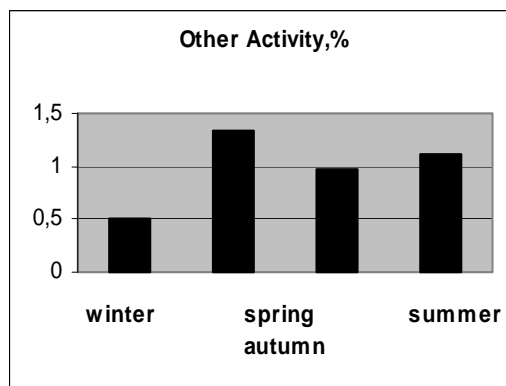


Figure 6. Other activity, %
Slika 6. Ostale aktivnosti, %

Conclusion

The observation on the ethological status of dairy cows was carried in closed covered brick barn during the year. It was found that the basic behavior reactions of the cows from the Black-and-White breed (feed, laying and staying) depend on ecological factors and seasons of the years, particularly during the winter and the summer.

Uslovi gajenja crno-belih krava u zatvorenom objektu i neke etološke reakcije

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Rezime

Cilj ovog ispitivanja je bio da se utvrdi dinamika etoloških indikatora tokom različitih godišnjih doba: ležanje, stajanje, hranjenje, muža i pijenje vode mlečnih krava pod uticajem abiotskih faktora kao što su temperatura, relativna vlažnost vazduha i brzina vetra u proizvodnom objektu.

Životinje su odgajane tokom godine u zatvorenom objektu od cigala sa prirodnom ventilaacijom. Analizom dobijenih rezultata došli smo do zaključka da se parametri etoloških reakcija menjaju ciklično tokom godišnjih doba u godini. ovo je reakcija na uticaj abiotičkih faktora sredine.

Ključne reči: mlečne krave, ležanje, stajanje, hranjenje, muža, pijenje, abiotički faktori.

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