HOUSING AND WELFARE OF HIGH PRODUCTION DAIRY COWS IN INTENSIVE BREEDING CONDITIONS

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ABSTRACT

Today more attention is paid on the housing and welfare of animals especially on high dairy cows.

The purpose of this research is to make a comparative analysis of housing and welfare of high dairy cows in intensive breeding conditions.

The research was conducted in 10 bovine farms of Holstein friesian breed in the territory of Pelagonia in Bitola, Republic of Macedonia. The research involves a total of 567 heads made up of 356 dairy cows, 123 heifers and 88 calves.

At 40% of the farms the average daily temperature was within the optimal temperature range, while in the remaining 60% the temperature was above the allowed maximum. In all the farms the relative humidity was within the allowed range. Only 40% of the farms had ventilation system. The dimensions of the feeding hallway were optimal for all farms, the dimensions of the stabels were compliant with standard in 90% of the farms. The remaining 10% that were smaller than the allowed minimum. The dimensions of the channels for fertilization were according to the standard in 70% of the farms. The dimensions of the corridors for manipulation are compliant with the standards in 50% of farms. The height of the ceiling as optimal in 40% of the farms. The length of the bearings as agreeable to the standards in 100% of the farms, while the width was according to the standard in 70% of the farms.

The microclimate and the zoohygienic indicators on the welfare of high dairy cows in intensive breeding conditions were met in only 30% of the farms.

Keywords: *High production dairy cows, housing, welfare, microclimate indicators, zoohygienic indicators.*

INTRODUCTION

Animals health is a fundamental prerequisite for animal welfare and condition for the food safety and human health. The welfare is a physical and social condition of animals which is achieved by reaching adequate conditions such as housing of animals, food, medical care and social contact.

Intensive livestock housing employs an environmental control system to maintain animal health and welfare and raise production efficiency. The thermal environmental within a livestock house can be defined in terms of the ventilation, heating and cooling of the houses following time variable temperature, humidity and air velocity requirements that vary as a function of the animal species and ages, the production process, the occupancy ratio, the outdoor conditions *(Fabirizo et al., 2015)*. An optimal thermal environment is usually defined for each species in terms of its effects on production. A stable microclimate is an important factor affecting the welfare of housing animals. From the microclimatic factors the temperature of air is the one that has the most affect on the animal organism. It is the most important factor, because it is very variable and at its change the animals respond immediately.

The cattle are able to withstand large fluctuations in air temperature. The thermal corridor should be between 10 and 20^{o}C although they can easily adapt to a temperature up to - 4 ^{o}C. Cattle

are more easily adapted to lower than at higher temperatures. If the temperature exceeds 31 ^{o}C an increase in the body temperature occures that results in changes in the diet regime which contributes to the occurrence of a phenomenon known as heat stress. Heat stress can have a very negative impact on milk production, reproduction and general health of cows. Highly yielding dairy cattle in lactation show the most sensitivity to heat stress *(Cincović,2010)*. Influence of negative climatic factors may cause a decrease in milk production of lactating cows from 3% to 10% *(Hristov et al., 2007). Bernabucci et al., (2010)* indicate that heat stress causes hormonal and metabolic changes in the body and therefore it is necessary to create ambient conditions that would reduce the consequences of heat stress. In this direction, *Shearer et al., (2009)* proposes a provision of good and quality natural ventilation, creation of natural or artificial cooling of the air, correction to the diet and provision of a sufficient amount of water. Animals must be cultivated in a way that fully respects their nature so that a satisfactory level of well-being can be achieved. The recommendations given by *Terrestrial Animal Health Care (2015)* for the improvement of the quality of well-being refer to:

- Farm design - thermal corridor in facilities, air quality, brightness, presence of noise, quality of accommodation, equipment in facilities, etc.
- Keeping and handling of animals - protection of the health and well-being (preventive measures, treatment, plan for emergency situations), nutrition, social environment, space, protection from predators, handling during calving, treating external animals, managing procedures that cause pain, training of breeders, supervision, plan for unpredictable events.

MATERIAL AND METHODS

The purpose of this research was to compare the housing and welfare of high dairy cows in intensive breeding conditions.

The research was conducted in 10 randomly selected bovine farms in the territory of Pelagonia region in Bitola, R. Macedonia during the month of September 2016. The research involved a total of 567 heads composed of 356 dairy cows, 123 heifers and 88 calves from the Holstein Friesian breed.

As indicators of welfare, three microclimate and seven zoohygienic parameters were taken.

From the microclimate parameters the average daily temperature in the stables, relative humidity and ventilation were researched.

From the zoohygienic parameters the feeding corridor, the cribs, the cannel for fertilization, the corridor for manipulation, the ceiling height, length and width of the slots were measured.

On the principle of comparative analysis, the obtained values for all tested parameters are compared with the optimal parameters obtained from an appropriate technical literature *(Radenković, 2010)*.

RESULTS AND DISCUSSION

Based on the conducted research the following results relating to the accommodation and welfare of dairy cows in intensive storage conditions were obtained.

Table 1 and Figure 1 show the total number of heads and lactation and the total number of calves and heifers on the farms in which the research was conducted.

Table 1. Number of heads and lactation in farms

Farms	*Number of dairy heads*	*Number of milked cows*	*Number of dried cow*	*Number of heifers*	*Number of calves*	*Total number of heads*
Farm 1	40	35	5	25	5	70
Farm 2	30	26	4	19	6	55
Farm 3	18	6	12	0	12	30
Farm 4	20	15	5	7	8	35
Farm 5	20	17	3	10	0	30
Farm 6	90	80	10	40	20	150
Farm 7	62	55	7	15	13	90
Farm 8	10	10	0	2	0	12
Farm 9	25	22	3	0	10	35
Farm 10	41	37	4	5	14	60

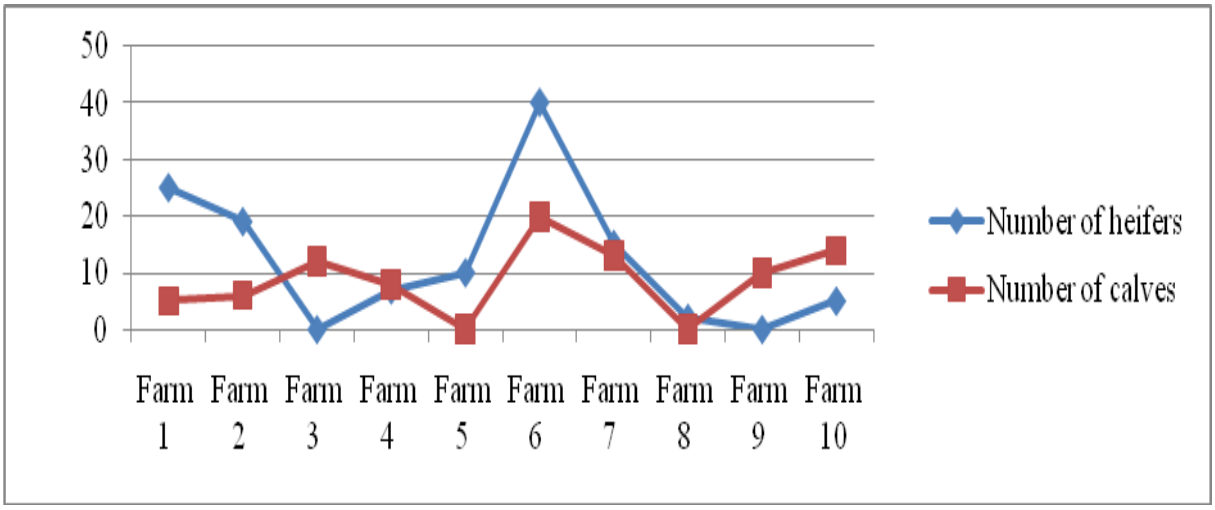

Figure 1. Total number of calves and heifers in farms

From the results presented in Table 1 it can be noted that Farm 6 had the most number of heads (150) followed by Farm 7 with 90 heads. The least number of heads were noted in Farm 8 (12).

In terms of the number of dairy cows it can be noted that Farm 6 had the largest number (90) while Farm 8 even though had the smallest number of heads (12) it had 10 lactating/milked cows.

In terms of the number of dried cows that number was highest in Farm 3 which had 30 heads where the number of dried cows was 12. This Farm had by far the largest number of dried heads compared to the other farms.

In the total number of calves and heifers which is presented in Figure 1 can be noted that the number of heifers and calves was highest in Farm 6 which had 40 heifers and 20 calves, while Farms 5 and 8 did not have a single calf, and Farms 3 and 9 did not have any heifers.

Table 2 and Figure 2 present the zoohygienic parameters of housing cows and heifers in intensive breeding conditions.

Table 2. Bound manner of keeping cows and heifers

Farms	*Parameters*						
	Feeding corridor	*Cribs*	*Length of slot*	*Cannel for fertilization*	*Corridor for manipulation*	*Width of slot*	*Height*
	1,00-3,00m	*0,60-0,80m*	*1,50-1,90m*	*0,50m*	*1,20m*	*1,20m*	*2,70m*
Farm 1	2,00	0,80	1,89	0,50	1,20	1,20	2,70
Farm 2	3,00	0,80	1,90	0,50	1,20	1,00	2,70
Farm 3	2,50	0,70	1,80	0,50	1,10	1,00	2,60
Farm 4	3,00	0,70	1,85	0,35	1,10	1,20	2,50
Farm 5	1,00	0,50	1,50	0,40	1,20	1,20	2,60
Farm 6	3,00	0,80	1,80	0,50	1,20	1,20	2,70
Farm 7	2,50	0,70	1,90	0,50	1,20	1,30	2,70
Farm 8	3,00	0,60	1,60	0,45	1,00	1,10	2,50
Farm 9	2,60	0,70	1,70	0,50	1,10	1,20	2,70
Farm 10	2,10	0,80	1,90	0,50	1,10	1,20	2,70

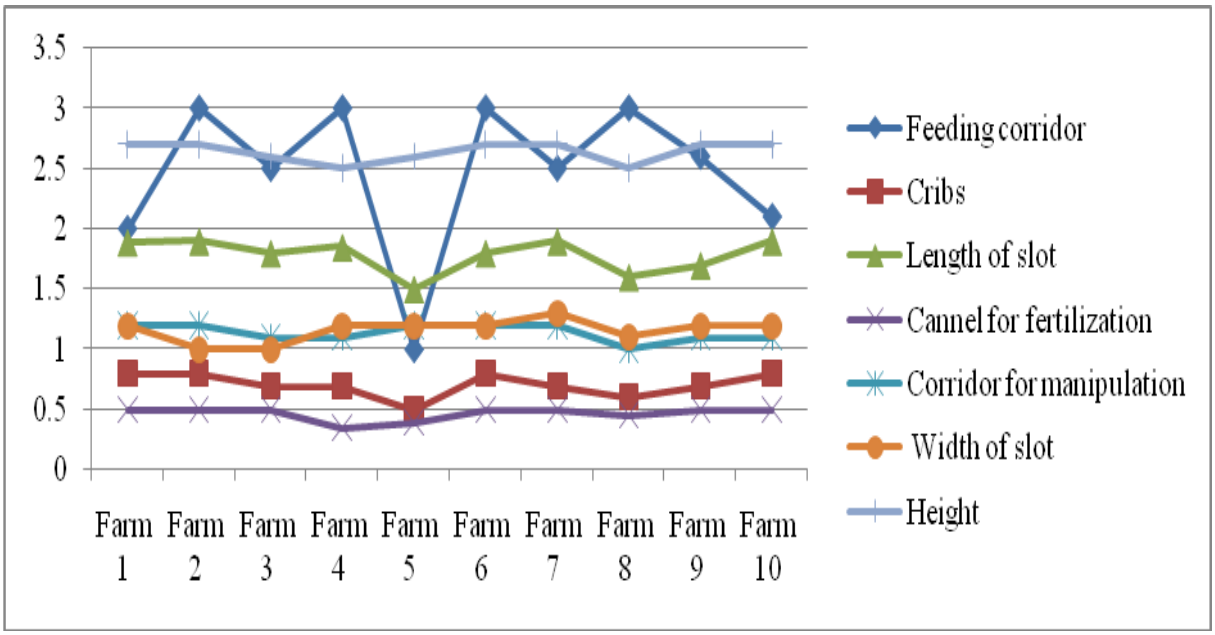

Figure 2. Ratio of the dimensions of various parameters in bound manner keeping cows and heifers

From the results presented in Table 2 and Figure 2 can be noted that each farm had different zoohygienic conditions. While some of the farms meet all the parameters (farm 1, 6 and 7), Farm 5 does not meet the given parameters. The remaining farms (Farm 2, 3, 4, 8, 9 and 10) meet most of the parameters with the exception of one or two.

Table 3 and Figure 3 present the microclimate parameters of housing cows and heifers in intensive breeding conditions.

Table 3. Microclimate in facilities for keeping cows and heifers

Farms	***Parameters***		
	Temperature	***Relative humidity***	***Ventilation***
	4-22 °C	***max 80%***	***50-250m^3***
Farm 1	22	65	No
Farm 2	24	67	Yes
Farm 3	22	70	Yes
Farm 4	17	70	No
Farm 5	23	78	No
Farm 6	20	68	Yes
Farm 7	19	65	Yes
Farm 8	22	77	No
Farm 9	24	68	Yes
Farm 10	19	70	Yes

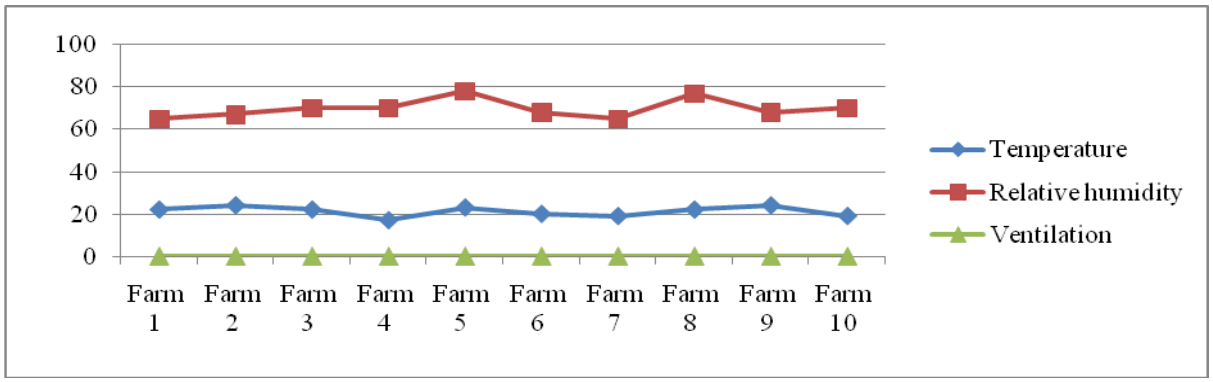

Figure 3. Ratio between microclimate parameters in facilities for keeping cows and heifers

From the requested variable concerning the temperature in the investigated farms can be concluded that there is no statistically significant difference (x^2 = 2,335). Despite the existence of certain fluctuations in temperature from the aspect of the statistical analysis, the observed differences in terms of the measured temperature in the ten farms are not statistically significant ($p < 0,05$). Namely, the average measured temperature is 21,20^{0}C.

From the requested variable concerning the relative humidity temperature in the investigated farms can be concluded that there is a statistically significant difference (x^2 = 19,756), i.e. the relative humidity of the air is lower than the maximum allowed 80%. The average measured relative humidity is 69,80 %. Temperature and humidity of the air are inseparable factors that relate to the microclimate conditions in the cattle storage facilities.

In addition to the listed microclimate factors (temperature and humidity), the air quality plays an important role as well. With the use of proper ventilation the air quality can be improved. The improved air quality contributes to a significant reduction in respiratory diseases in cows *(Lago et al., 2009)*. Irregular ventilation leads to the accumulation of ammonia and other harmful compounds as well as an excess of dust and unpleasant smells.

From the conducted research it can be noticed that there is an installed a ventilation system in six farms while in the other four farms there is natural ventilation.

CONCLUSION

The cattle breeding as a branch of animal husbandry has experienced a rapid rise over the last few decades. New breeds of cattle and new regimes for their breeding are introduced. The newly obtained crossbreeds should have excellent production qualities with minimal pathology. In the name of that minimal pathology, the prevention of problems is of great economic benefit to the farmers.

The ultimate goal of this multi-decade work is more precise meeting of the needs of the new hybrids with high genetic assisting production potential and solving problems that are constantly in the focus of the scientific and professional public. Today, some of current problems centered in the focus of the scientific and professional public are stress and animal welfare.

The fast development of numerous interdisciplinary scientific branches of veterinary medicine over the last years in the world and in our country, contributed to the rapid and comprehensive understanding of the essential manifestations of stress reactions in animals.

Because of that the science of animal welfare as an interdisciplinary branch of veterinary medicine must stand accountable over its problems. Its offers should mean not only better quality of life for the cow as a unit but also the promotion of vocations veterinarian and farmer and wider economic uplift of the mother country.

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