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Introduced Holstein Breed Livestock in Georgia

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A B S T R A C T

The current work represents the adaptation perspective of Holstein Breed Livestock introduction in Kakheti intensive agricultural zone of Georgia and the phenotypical, exterior and interior peculiarities of the milk/cash cows researched by us. Besides the above we conducted the analysis of the scientific research on important factors which will contribute to successful breeding of Holstein Livestock in local natural and climate conditions. The study of acclimatization process of Holstein Livestock demonstrated that the heat resistence index in newly born cows is 2,2-3,3 units lower than in non-parturient cows. Following the recommended quality and amount of nutriment ration ensured the normal health condition and maiantained the level of reproductivity ability. As a result we have 2-3% of livestock type standard live weight retardation and withers height. It should be mentioned that the received data can be considered acceptable dynamic in the conditions of Georgia. As for bringing arterial pulse and breathing rate to norm – it became possible after installing recirculating fans in cow stolls. Thus, the clinical analysis as well as live weight growth and development dynamic of the tested Holstein type heifers demonstrated that the tested indices are within the physiological norms.

Keywords: Holstein, adaptation, heat resistance, productivity, nutriment ration, growth and development

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Introduction

Natural milk production has been the most urgent problem in Georgia for a long time which in the conditions of existing extensive systems in stock breeding requires immediate intensification, implementation of various necessarry activities in line with breeding and adaptation of intensive breeds of livestock.

Today in most of the countries where the natural milk production problem is solved there is Holstein stock bred. It is not occasional that the Holstein breed cattle is in the center of attention, it is the most popular breed in milk production sector which is also distinguished for its live weight, distinct milking forms, with the special form and location of udders which despite the capacity is located higher and spreads in width when filled up. Besides the above, the Holstein breed of cattle has peculiar quality of its intensive growth and development as well as big capacity of milking which is achieved through healthy and balanced food [1-2].

In the USA more than 80% of livestock is Holstein breed and the milking capacity of each is more than 9000 kg. The Holstein Association has registered 19 million of cattle in the country [3-5]. In Germany the Holstein share in the population is 60% in 28500 livestock famrs; more than 1,7 million of cattle of high capacity. In Europe the improvement of the breed is implemented according to the plan and the process is managed by EAAP (European Federation of Animal Science)[4]. If we review East and, in particular, Israeli experience today there is approximately one hundred thousand cattle which produces around 1 billion kg of milk annually which fully meets the needs of local population on milk and milk products and a part of the products is exported [5].

Over the last years farmers import European breed cattle in Georgia. Due to the peculiarities

of homeostatic capacities the set of physiological disorders causing negative results is revealed. It is identified that apart from other breeds, the Holstein breed more easily adopts to environmental conditions and to achieve the maximum of its genetic capacity it is necessary to create conditions which best correspond to its genotype. Consequent from the above breeding of Holstein cattle in untypical natural environment is very important. In general the genetically predetermined norm of reaction of animals defines its environment adaptation capacity limits. It is noteworthy that in some cases the ignorance of adaptation peculiarities impeded the adjustment to extreme environmental conditions [6-10].

Today there are 4250 cows (industrial breeds) imported in our country. Out of this number 2170 is Hosltein breed and the most of them (1570) are in Kakheti region. It should be mentioned that the breeding of Hosltein cattle in Kakheti intensive agrarian zone has not been scientifically studied and there are no corresponding recommendations developed. It is urgent to study the peculiarities of Holstein cow productivity potential realization as well as to study the economic and biological peculiarities of it in the new environmental conditions which is of significant national economic importance (development of intensive farming and increase of raw milk production), while on the other hand, in order to reveal the high genetic qualities of this breed, it is necessary to create such conditions which fully correspond to its genotype.

Goal and Methodology of the Research

The goal of our research was scientific justification of Holstein cattle breeding in the conditions of Kakheti region. To accomplish the research we observed 25 breeds of 5-6 months pregnant nonparous Holstein cattle imported from Estonia by Norshi Ltd. on March 15, 2016. Consequent from the research goal the observation was conducted over the whole herd as well as over the breeding and development of locally reproducted calves (studied 12 heifers from their birth till the age of copulation). In parallel with the above we accomplished zoo technical analysis of the food.

Consequent from the mentioned goals the following results were obtained in the period of the research:

- Description of the clinical status indicator of the cattle in different periods of procreation;
- Register of the received nutriments;
- Study of the nutritiousness of the nutriments;
- Dynamics and calculation of average daily weight gain of heifers;

Results and Analysis

Development of peculiarities of an organism depends on heredity (genotype) and environmental conditions. When we are talking about the adaptation of animals to these or those extreme conditions we agree to take into consideration the fact that any dislocation of animals is accompanied by negative results. Environment is the basic limiting factor of revealing genetic capacities of an organism. In the condition of extremely high air temperature influence European milk cow breeds are characterized by limited homeostatic capacity which results in the whole set of physiological disorders causing decrease in reproductivity, growth intensity, milking productivity, period of agricultural exploitation and other undesirable results. It is obvious that considering the existing natural and economic conditions and biological peculiarities of cattle predefines the selection of relevant technological methods in cattle farming [11-15].

On the first stage of cattle farming of the nulliparous and primaparous cows the whole set of problems related to feeding and breeding arose. Though the revealed mistakes were eliminated and the technological process was improved.

It is particularly important to define clinical indicators (changes in the indicators according to various factors) of cattle in the process of adaptation to new environmental conditions which enables to define its health condition. Therewithal the important criteria which characterize the quality of adaptation and its maintenance in the given environment are growth and development, productivity and reproductivity [16-17].

Visual observation of the animals demonstrated that the imported animals are less adapted to the summer heat. We studied the resistence to the high temperatures by nonporous speices by calculating the heat-resistence index according to I.A.Rauschenbach [18]. The first test was done in the morning (8-9 o'clock) when air temperature was 16-20^{o}C; the second test was done during the hot daytime period at 15-16 o'clock when the temperature was 28-32^{o}C. The heat resistance

index of nonporous cows was lower than of prim parous cows. The body temperature of nonporous cows in the morning under the condition of 20^{0}C air temperature was 38,8^{0}C, while the body temperature of prim parous cows varied from 38,2 to 38,4^{0}C; under the condition of 30^{0}C air temperature the body temperature of nonporous cows increased by 0,8^{0}C and in prim parous cows it increased by 0,2 -0,3^{0}C. Correspondingly the index of heat-resistance of prim parous cows was 2,2-3,3 units less than that in nonporous cows.

In line with it we revealed the number of visually observed problems such as saliva foam formation during the chewing process, inflammation of joints and cloven hoofs, liquid stool and in some cases loss of the cattle The conducted zoological analysis of the feed and its ingredients revealed:

- The protein content is low;
- The portion of nutritiousness in the feed is 30-40%
- The concentrated feed content in corn silage is 60-70% consequent from its nutritiousness though it should not exceed 38-40%;
- The ration contains big number of carbohydrates (sugar+starch) while according to the norm the ration of a milking cow must contain 62-108 gr. of sugar per 1 FU (290 gr. DM. per kilo) and 93-100 gr. of starch;
- The use of 0,7 kg of soda as a buffer reduces the energy content in the ration which in turn causes the reduction of the milking;
- The corn grains in silage is not powdered which hinders its digestion;
- The nutrient mixture is over-grinded (Fig.).

Unbalanced feed of cows, the use of concentrates including carbohydrates in big amount demonstrated negative effect on PH of first stomach on generation of evaporating fatty acids and their correlation. As a result of it the ethanoic acid decreases to 40%, propionic acid is increased by 40%. The decrease of ethanoic acid in its turn causes the following: decrease of milk and fat formation, toughening of active champing, decrease in saliva formation. Insufficiency of buffer substance (neutralizer) results in increase of acidity which, in its turn, is a precondition of decrease of cellulose digestion [19]. As it was already mentioned in case that such process lasts it may cause fat reduction in milk, inflammation of joints and cloven hoofs, liquid stool. All the above caused disproportion of sugar-protein correlation (the norm is 0.8=1.0 which means that 100 gr. m/protein must contain 80 gr of sugar). It is known that the quality and volume of the feed component substances as well as their correlation defines the effectiveness of the feed which ensures the productivity, health and reproductive capacity of animals [20,21].

In parallel we observed the breeding of the calves. We selected 12 units of the same age based on the analogy. It is known that the correct breeding of the calves defines the health and reproductivity of the mature cows at the same time the live weight of an animal at certain age and its exterior represents the indicator of the growth quality.

We used the breed standard for comparison [22]. Based on the capacity of the farm we tried to use the rational system of breeding which supports the normal growth and development, and ensures formation of high capacity and strong constitution. The feed ration was composed of the available feed components with the consideration of feeding norms which gave us the guarantee that we receive such desirable weight of the animals which will meet the requirements of the first class and higher standards during the first mating. All the above ensures that we get desirable live weight of cows in future.

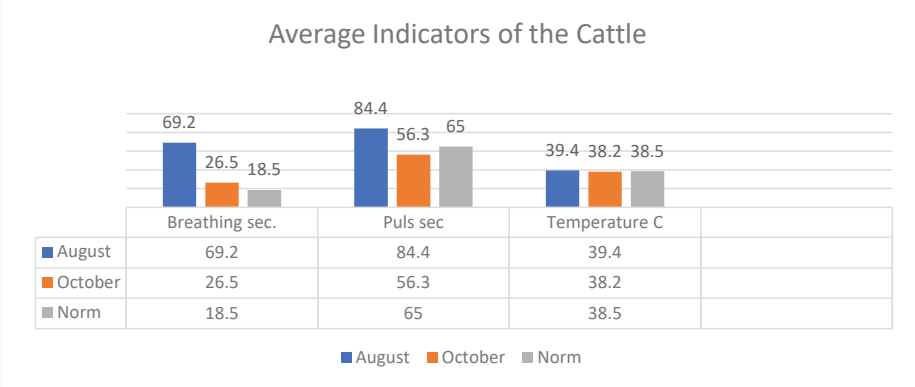

Fig. *The Average Clinical Indicators of the Cows*

Table 1. *Feed consumption from birth to the age of 15 months per one animal*

Feed	kg	Dry substance. kg	mgj	Feed unit	Digestable protein, kg
milk	410	32,0	1,11	123	13,5
concentrate	650	578,5	7,67	650	72,15
hay	720	597,6	5,04	324	36,7
Oat straw	430	356,9	2,45	94,6	5,59
Silage	2070	517,5	4,76	476,1	28,98
Green mass	3400	697,0	88,4	680	88,4
Total	7750	2779,5	109,4	2347,7	245,32

Table 2. *Growth and development dynamic of heifers, n = 12*

Age/months	Standard/mass/kg	Result in correlation with the standard, kg	Standard/height, cm	Result in correlation with the standard, cm
2	75	71	83	82
8	235-240 (237)	237	112	110
15	390-400 (395)	386	128	125
22	550-560 (555)	520	137	134

Holsteiner breed standard considers: live mass of 75 kg in 2 months of age, by the end of milk feed period [23]. The indicators of the tested heifers was 5% less than the standard. At the age of 8 months the standard is 237 kg [23], which is 3% more than the tested heifer mass; and at the age of 15 months the standard is 395 kg while the locally bred heifers achieved 386 kg. This indicator is considered a good result in Georgian reality but it lagged behind compared to the European standard. The tested heifer also showed retardation by 3-4% in height growth compared to standard. The listed disadvantages need to be taken into consideration when planning the growth of heifers though usually these are ignored.

The observation over the dunamic of the growth and development of the animals demonstrated 2-3% of retardation from the breed standard – live mass and whithers height. Despite the above these indicators may be considered applicable in local conditions.

Breathing is an unintegrated sign of life. The volume of oxygen in the organism of cattle is limited thus it requires to get oxygen from the environment. The dynamic of respiratory movements demonstrated that the respiration frequency is directly related to the age. It is similar to puls frequency variability – the highest indicator is registered at birth and it dicreases with the age which varies within the norm.

According to the literature data the body temperature of animals is almost permanent and does not suffer significant changes (except sick animals). Apart to the temperature the puls of animals and especially the breathing frequency significantly changes.

Table 3. *Clinical Status of the Heifers*

Age, month	Temperature ^{0}C	Pulse (minute)	Respiration frequency
At birth	39,02	81,0	34,20
6 months	38,40	70,40	31,20
12 months	38,14	59,7	20,60
18 months	38,6	57,50	18,40
24 months	30,17	54,8	18,30

Table 4. *Clinical Status of Animals*

Test period	Frequency of Arterial Pulse	Breathing Frequency
Pregnancy 5-6 months.	66	26,0
Pregnancy 8-9 months.	79	29,0
First parturition	85	33

The puls frequency of the tested six to nine months pregnant nulliparous cows showed the puls frequency increase by 13 beats (11.9%). The puls increase to 85 beats per minute during the first parturation. Hence the pulse frequency was several times less in the first half of the pregnancy period than in the second half and especially compared to the parturition. The results of the respiration frequency data analysis are similar which can be justified by the hot summer days.

The summer heat became injurious for the newly imported animals. Due to the bad ventilation of the building the first symptoms of thermal stress were revealed (frequent breathing, concetration of animals at water places, saliva formation, foam at the mouth and etc.). In instant response to the mentioned the recirculation fans were montaged in the right and left sides of the farm in 12-14 m distance from the feed table.

The body temperature of an animal is the complex indicators of its thermal condition which gives clear picture of its organism condition. In hot weather the evening temperature of the cattle is 0.5-0.6 C higher compared to the norm which must not be considered a pathology [24]. 1-2 degrees increase of the body temperature is the sign of pathology. The body temperature during the parturition is particularly worthy attention. High temperature may be caused by the influence of thte environment on the body of a newborn calf, later the temperature may slightly change though it varies within the physiological norm limits. As for the heart contraction frequency, i.e. puls – it is periodic rythmal blood vessels widening which is connected to the dynamic of vessels filling during the one cycle of the heart. Particularly high puls was detected in claves during the parturition which later was decreased and in the age of six months it reaches 70, 20 beats a minute. Later it decreases more to 20 beats and changes significantly until the copulation. At the same time all variations of the indicators were within the physiological limits of the breed.

Conclusion

- Index of heat-resistence of primaparous cows was 2,2-3,3 units less than that in nonporous cows.
- The quality and volume as well as the correlation of nutriments in the animal feed daily ration defined the stabilization of the feed consumption ration for animals to maintain

production and normal health and reproduction capacity.

- 2-3% of retardation from the breed standard in live mass and whithers height can be considered an applicable dynamic in Georgian conditions.
- The clinical analysis and the live weight growth and development dynamic of the tested Holstein breed hifers demonstrated that the studied indicators are within the physiological norms which justifies good adaptation capacity of the animals in the hot climate conditions of Kakheti region.

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