

Conference Paper

Indicators of Food Activity As Breeding Dairy Cattle Characteristics

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Abstract

The article presents the data of ethological studies on dairy cows of the Ayrshire breed of the second lactation under conditions of stall-tethered keeping in the spring. Animals with increased nutritional activity have milk yield per 305 days of lactation higher by 1662 kg ($P > 0.999$) compared with animals with reduced nutritional activity. The amount of milk fat in animals with increased food activity is 72.8 kg more ($P > 0.999$), and the total amount of milk protein is 47.8 kg more ($P > 0.999$) than in animals with reduced food activity. An increased index of food activity characterizes Ayrshire cows. Comparison of milk yields obtained from Ayrshire cows with milk yields of cows with reduced food activity leads to the establishment of the following results: there is a difference in milk yield for the first lactation of 1179 kg ($P > 0.999$), a difference in the amount of milk fat 53.2 kg ($P > 0.99$), and by the amount of milk protein -- 36.4 kg ($P > 0.99$). Comparison of the total activity index led to the following results: the difference in milk yield per 305 days of lactation is 1386 kg ($P > 0.999$), in the amount of milk fat 61.3 kg ($P > 0.999$), milk protein 40.0 kg ($P > 0.999$). The highest correlation is observed between the index of food activity and milk productivity in ultra-active animals. In infra-passive cows, the correlation between the index of food activity and milk productivity is negative. Therefore, an effective means of increasing milk productivity is the selection of animals of Ayrshire breed by ethological individuality, taking into account indices of food, motor, and general activity. The studied indices of ethological activity are inherited by cows and can be effectively used in breeding and breeding with highly productive cattle of the Vologda selection.

Keywords: indices of ethological activity, behavior, ethological selection.

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1. Introduction

At the present stage of development, dairy farming has grown, the use of industrial methods of milk production is impossible without making changes to breeding methods

to increase the adaptive properties of the animal organism. Breeding work allows livestock breeders to adapt to modern breeding conditions [2].

During the operation of industrial complexes, the maximum production of high-quality products can be obtained only in cases where the biological characteristics of animals, their behavioral activity and the influence of external conditions on them are decisive when choosing existing techniques and methods for raising and keeping animals [14].

One of the functions of studying the behavior of farm animals is the formation of a herd or group of animals adapted for exploitation in modern animal husbandry.

A relationship has been established between the types of higher nervous activity of animals and their milk production [8, 10, 11].

Cows of different types of nervous activity are characterized by different levels of milk productivity and unequal concentration in the blood serum of total protein and protein fractions. In comparison with other types, animals of an active, balanced mobile type of higher nervous activity have the highest indicators of milk productivity and the content of serum proteins in the blood. This circumstance testifies to the more excellent biological and economic value of the balanced type cows [2, 10].

There is a significant increase in the load on the nervous system of animals in conditions of intensive industrial technologies; as a result, the aggressiveness of animals increases [3, 5].

According to the observations of Yu.Ya. Kravainis, the behavioral reactions of cows to machine milking differ depending on the type of higher nervous activity. Animals with a robust and balanced type (mobile and inert) are not dangerous during milking throughout their lives. Individuals with a robust unbalanced type are especially dangerous in the 1st month after calving, cows with a weak type -- until the 4th month after calving. In subsequent lactation, these animals remain a potential source of injury since they are more or less anxious during milking [9].

2. Methods and Materials

59 milk cows of the second lactation were observed in the best breeding plant for breeding Ayrshire cattle in the conditions of a year-round stall -- tethered keeping in the spring. This study was implemented in the Agricultural Production Cooperative Agrofirma "Red Star" of the Vologda region. The behavior of animals was studied according to the method of V.I. Velikzhanin (2000) by timing simple acts for three next days according to a twelve-hour program. Cows were analogous in the breed, live weight, and lactation stage. The main criteria by which animal behavior was assessed were the food activity

index (FAI), the motor activity index (MAI), and the general activity index (GPI). Functional activity indices were calculated using the formulas:

$$\text{IPA} = \text{time spent on eating food and chewing gum} / 720$$

$$\text{IDA} = \text{time spent standing, moving, eating food, and chewing gum} / 720.$$

$$\text{IOA} = \text{time spent standing, moving, eating food, chewing gum, and milk yield} / 720.$$

In each of the formulas, time was expressed in minutes.

In terms of milk productivity, the group of active cows with increased functional activity was compared with the group of passive cows with reduced functional activity.

Animals were divided into four classes: infra-passive (IP), passive (P), active (A), and ultra-active (UA), taking into account food activity.

By using the quadruple correlation coefficient between half-sisters on the father, the degree of inheritance of ethological features is calculated.

Digital material is processed biometrically based on generally accepted statistical methods on a personal computer using the appropriate programs (Microsoft Excel).

3. Results

The research results presented in table 1 show that animals with increased food activity, compared with reduced, have milk yield per 305 days of lactation higher by 1662 kg ($P > 0.999$). The amount of milk fat increases by 72.8 kg ($P > 0.999$). The total amount of milk protein is increased by 47.8 kg ($P > 0.999$).

A feature of the Ayrshire breed cows is an increased index of motor activity, in comparison with analogs in which it is reduced. During the study, the difference in milk yield for the first lactation was 1179 kg ($P > 0.999$), the difference in the amount of milk fat was 53.2 kg ($P > 0.99$), and the amount of milk protein was 36.4 kg ($P > 0, 99$) in the bark of the Ayrshire breed and other cows.

According to the index of total activity, including the nutritional and motor activity of Ayrshire cows, the following results were obtained: the difference in milk yield per 305 days of lactation is 1386 kg ($P > 0.999$), in the amount of milk fat 61.3 kg ($P > 0.999$), milk protein 40 0 kg ($P > 0.999$).

The figure shows the change in milk yield for 305 days of cows lactation of different classes of their food activity (Fig. 1). The figure demonstrates that for active and ultra-active animals, compared with infra-passive animals, a gradual increase in the level of milk productivity from 22 to 57 % is characteristic.

We calculated the relationship between the milk yield for 305 days of lactation, the amount of milk fat, the amount of milk protein, and the index of nutritional activity (Table 2).

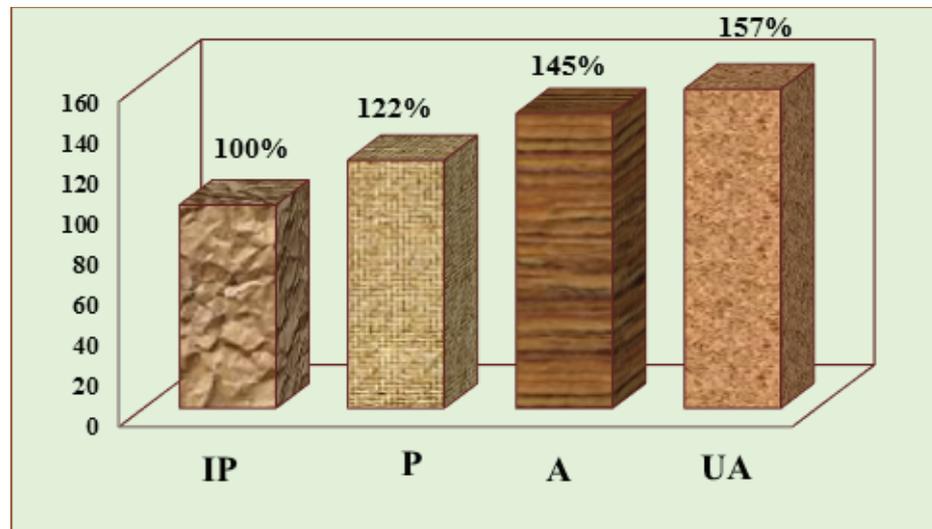


Figure 1: Milking cows activity of different classes of food activity for 365 days.

An analysis of the relationship between FAI and milk yield for 305 days of lactation, FAI and the amount of milk fat, FAI and the amount of milk protein revealed a positive relationship between these indicators in passive, active and ultra-active animals. The highest correlation is observed between the index of food activity and milk productivity in ultra-active animals. The correlation between the index of food activity and milk productivity of infra-passive cows is negative.

4. Discussion

Selection by ethological individuality (food, motor and general activity) is one of the directions of breeding and breeding, as their behavioral reactions largely determine the productivity of animals.

5. Conclusion

Thus, the selection of Ayrshire animals by ethological individuality, taking into account indices of food, motor, and general activity, is an effective means of increasing milk productivity. A successful experiment was staged at the Agricultural Production Cooperative Agrofirma "Red Star." Given that many elements are inherited, in the process of

TABLE 1: Milk productivity of Ayrshire cows the second lactation depending on activity indicators.

Indicators	Level	n	Indicators value		Milk yield in 305 days., Kg		Mass fraction of fat, %		Milk fat, kg		Mass fraction of protein, %		Milk protein, kg	
			x±m	Cv, %	x±m	Cv, %	x±m	Cv, %	x±m	Cv, %	x±m	Cv, %	x±m	Cv, %
FAI	reduced	35	0.485±0.01	14.1	7111±234	19.5	4.47±0.05	6.7	318.8±11.7	21.7	3.18±0.02	4.0	226.1±7.4	19.4
	elevated	24	0.685±0.01	10.0	8773±210	11.7	4.47±0.04	4.5	3916±9.6	12.1	3.13±0.02	3.5	273.9±5.9	10.5
	difference, ±		+0.2***		+1662***		--		+72.8***		-0.05		+47.8***	
	difference, %		+41.2***		+23.3***		--		+22.8***		-1.57		+21.1***	
MAI	reduced	29	0.613±0.01	12.7	7188±279	20.9	4.46±0.05	6.2	321.2±13.1	22.0	3.17±0.02	4.0	227.0±8.3	19.8
	elevated	30	0.822±0.01	9.2	8367±228	14.9	4.47±0.05	5.6	374.7±11.1	16.2	3.15±0.02	3.8	263.4±6.9	14.3
	difference, ±		+0.209***		+1179***		+0.01		+53.5**		-0.02		+36.4**	
	difference, %		+34.0***		+16.4***		+0.22		+16.6**		-0.63		+16.0**	
GPI	reduced	28	0.668±0.02	12.5	7059±278	20.8	4.47±0.05	6.3	316.2±12.8	21.5	3.19±0.03	4.2	224.5±8.7	20.5
	elevated	31	0.890±0.01	7.3	8445±213	14.1	4.46±0.04	5.5	377.5±10.9	16.0	3.14±0.02	3.5	264.5±6.2	13.5
	difference, ±		+0.222***		+1386***		-0.01		+61.3***		-0.05		+40.0***	
	difference, %		+33.2***		+19.6***		-0.22		+19.3***		-1.56		+17.8***	

Comment ***-P > 0,95; ** - P > 0,99; * - P > 0,999

TABLE 2: Correlation between the index of food activity and milking Ayrshire cows activity of the second lactation.

Activity Classes	Number of animals	Characteristics		
		305 days milk yield -- FAI	Milk Fat Amount -- FAI	Milk Protein Amount -- FAI
IP	6	-0.812	-0.830	-0.789
P	29	+0.210	+0.120	+0.14
A	21	+0.373	+0.329	+0.385
UA	3	+0.894	+0.943	+0.877

breeding, it becomes possible to breed calm and easily controlled herds of animals with high productivity.

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