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AGE VARIABILITY OF ETHOLOGICAL PARAMETERS OF CATTLE

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Abstract. *It was found that ethological traits and indicators of milk production of cows are characterized by a medium and high degree of phenotypic variability. With age, cows rested less time lying down, but spent more time eating feed. Analyzing the factor dependence of the level of milk yield per lactation in cows, it was found that the greatest influence on the formation of this trait is age, the strength of which is 74.5%, and the share of the influence of unaccounted factors was 25.5%.*

With the increase in milk production, there is a tendency to reduce their reproductive function. This feature should be used in the breeding process with livestock. An in-depth study of the causes of variability in farm animals will allow us to assess the adequacy of their habitat and develop the most rational and economical systems of interaction between the organism and technical means, feeding factors and other realities of industrial technology. Ethological research will make it possible, first of all, to create optimal conditions for keeping both in industrial livestock farms and on traditional farms, to find ways to increase cow productivity in specific feeding and housing conditions.

Animals bred with ethology in mind have a calm disposition, their behavior can even be controlled, and they are usually characterized by high milk and meat production and efficient feed use. Skillful application of ethological techniques in animal husbandry can increase the productivity of cattle.

The reaction of high-yielding cows to paratypical factors is ambiguous and is always accompanied by behavioral changes, reduced milk production, deterioration in product quality, increased morbidity, reduced duration of productive use, and premature culling from the herd. Finding out the behavioral characteristics of high-yielding cows will make it possible to optimize the methods of their maintenance, feeding, and operation and ensure high milk production with high milk quality and herd safety.

Keywords: *behavior, variability, age, productivity, cattle*

Dependence of ethological traits on genotypic and paratypic factors.

Factors affecting milk production can be divided into genotypic and paratypic, or environmental factors.

Animals of modern specialized dairy breeds (Holstein, Red and White Dairy, Black and White Dairy, Black and White, Angler, etc.) are characterized by the highest milk production. The annual milk yield of dairy cows is 4000-6000 kg with a fat content of 3.6-4.1% and a protein content of 3.2-3.7% [8].

The fat and protein content in milk of different breeds is not the same. Holstein cows (on average) have 3.68% fat, 3.31% protein; Black-and-White cows, respectively, 3.70 and 3.24; Simmental cows, 3.91 and 3.48; Swiss cows, 3.75 and 3.41; Red Steppe cows, 3.73 and 3.32; and Swan cows, 3.90 and 3.56%. In milk of Ayrshire and Jersey breeds with milk yields of 3500-4000 kg, the fat and protein content in milk reaches 5.0-6.5 and 3.9-4.3%, respectively. Among the dairy breeds, there are more productive ones (Holstein, Black-and-White dairy, Red-and-White dairy) and relatively low-productive ones (Ukrainian Whitehead, Polish Red). Among

the dairy and meat breeds, the most productive are the Shorthorn, Lebedinsky, and Simmental. They are significantly inferior to such breeds as Brown Carpathian and Pintzgau [35].

One of the main environmental factors that significantly affects the level and quality of milk production is proper feeding and keeping of animals according to zoohygienic standards. Optimal nutritional feeding helps to maintain a high level of lactation for a long time. Proper and standardized feeding affects not only milk yield but also milk composition. With insufficient energy nutrition, cows first have a decrease in milk yield, and then the fat content in milk decreases. It is known that the higher the milk production of cows, the stricter the requirements for balancing diets. If earlier the insufficient quality of own basic feed could be compensated for by using special feed additives with micro- and macronutrients and vitamins, now we need to worry about transit protein, which is not broken down in the rumen [22].

The intensity of the decrease in milk yield after cow insemination is inversely related to the length of time between calving and new pregnancy (service period). By mating cows in the first estrus after calving, the prerequisites are created for a rapid decline in lactation, and sometimes its reduction. When the service period is extended, i.e., when cows are mated during the fourth estrus, the foundations are laid for obtaining maximum milk yield and a uniform course of lactation [23].

The normal service period for dairy cows is 56-84 days. This duration makes it possible to annually receive a calf from each cow, maintain lactation for 300 days, and obtain the largest amount of milk for the entire period of economic use of the cow [33].

The calving season affects the level of productivity because it causes changes in feeding conditions and climatic factors. Practice shows that the most favorable time for calving is autumn and early winter. Summer is not quite as desirable. The literature shows that cows calving in November-December produce 300-700 kg more milk than those calving in May-June. Autumn-winter calves are usually in better health, more viable, and the lactation curve of cows is flatter, the animals are more productive [21].

During the day, milk is continuously synthesized in the mammary gland of cows. When it arrives, it fills the udder, creates pressure, and if the cow is not milked in time, the process of milk production stops and pregnancy begins. At the same time, milking is reduced. Cow milk production is closely related to udder capacity: the higher the milk yield, the greater the udder capacity. And vice versa. The capacity of the mammary gland is determined by a single milk yield [23].

Correct and timely milking is a normal physiological process for animals. Observations show that an experienced machine milking operator can get 20% more milk yield than an inexperienced one. One of them will start milking a cow a few months after calving, while the other will be able to milk it for a whole year. Too frequent unskillful milking is painful for the cow and leads to a decrease in its productivity [32].

The milk production of cows after calving increases for 3-4 months, reaching a peak at 4.5.6 months of lactation (depending on the breed, feeding, and housing), after which milk production decreases. The lowest amount of fat and protein in milk

is observed at 2-3 months of lactation, and then the fat and protein content in milk increases before the start of lactation. During this period, milk sugar content decreases and acidity decreases. Before the cows are launched, the technological properties of milk change, it is poorly curdled by rennet, and its viscosity increases. The decrease in rennet curdling of milk is mainly due to a decrease in acidity. Changes in milk during the day - the content of dry matter and fat in morning milk is lower compared to milk produced in the evening. Milk production of cows of the first and second calving is lower than that of adults. It has been established that the milk yield of cows in 1 lactation is 75%, and in 2 - 85% of the milk yield of adult cows. The highest milk yields are usually obtained in 5-6 lactations. The decline in milk production of cows due to aging begins in the 8-9th lactation. Under favorable feeding conditions, high milk yield can be maintained at the age of 12-15 years.

The development of a cow is most accurately determined by live weight. Large cows are characterized by better development of internal organs. They are able to consume more feed, and therefore produce more milk. In dairy cattle breeding, a positive correlation (up to a certain limit) has been established between the live weight and milk production [32].

Today, large dairy farms are implementing advanced milk production technologies based on untethered cows in boxes and milking in specialized parlors. These technologies help reduce labor costs for milking, lower costs and improve the quality of milk produced. However, an important criterion for evaluating existing and developing new technologies for keeping dairy cattle is the behavior of the animals, which indicates their biological needs. Since behavior is a heritable trait, it is possible to create animals of the desired type through selection. Such animals are characterized by high milk and meat production and efficient use of feed. It is known that the skillful application of ethological methods in animal husbandry can increase animal productivity by up to 20%.

Today, tetherless cow housing is considered one of the most proven technologies for intensive milk production. However, any technology for keeping dairy cattle must meet the animals' needs for rest, movement, free access to feed and water, body care, etc. Among the ethological indicators, an important place is occupied by feeding behavior, which indicates the satisfaction of the animals' need for feed, and also allows us to conclude on the degree of their adaptation to the applied industrial feeding conditions [6].

The presence of a correlation indicates the possibility of using the initial behavioral reactions of calves in practice to determine their viability. Thus, a positive medium and high degree of dependence was found between the live weight of newborn calves and ethological indicators. The values of the correlation coefficients are reliable, and therefore the identified relationship between the studied traits is a natural phenomenon and can be manifested not only in the sample but also in the general population. By the way, a high degree and positive direction of correlation ($r_s=0.77$ at $P>0.999$) was found between the live weight of newborn calves and adaptation to gravity. In heifers, behavioral reactions to the technological environment are characterized by positive medium correlation coefficients. Bulls are characterized by the fact that there is an inverse relationship between live weight and

the evaluated ethological indicators, with the exception of the correlation "live weight - adaptation to gravity" [24].

At the same time, under conditions of untethered housing, an increase in the duration of feed intake will have a positive effect on milk fat content (r = 0.655), milk yield, milk protein content and density will decrease (r = -0.655, r = -0.052, r = -0.579). With increasing water intake, nadir (r = 0.824) and density (r = 0.473) will increase and fat and protein content will decrease (r = -0.766, r = -0.210). The duration of standing and physical activity will not have a significant effect on milk yield, milk fat and protein content (r= -0.188...0.258) and will have a positive effect on milk density (r= 0.498, r= 0.701). A multifaceted relationship with an average degree of dependence was established between the duration of lying down and milk yield, milk fat, protein, and density (r= -0.463.....0.447). An increase in the duration of milking will lead to an increase in milk yield (r= 0.803) and milk protein content (r= 0.688), and will negatively affect the content of milk fat (r= -0.923) and density (r= -0.404) [7].

It has been established that cows of the same breed under the same feeding and housing conditions, but in different climatic zones, produce milk with different fat content. The highest fat content is observed in cows kept in mountainous regions. The milk production of cows depends on meteorological conditions. High and low temperatures, increased solar radiation, and changes in barometric pressure have an adverse effect on the animal body. It has been established that a decrease in milk production is observed with a decrease in barometric pressure, high relative humidity in the room (85-90%), and air movement at a speed of 1.5-2.0 m/s [8, 18].

A somewhat smaller range of daily fluctuations in relative humidity when kept on deep, long-lasting litter had an impact on the indoor temperature and humidity index, clinical parameters, and, as a result, on heat resistance, bioenergy, and respiratory effort. It was found that heat stress in cows kept on deep litter was absent from 23.00 to 09.00 hours, and from 09.00 to 22.00 was moderate. In box housing, the period of absence of heat stress was much shorter - from 01.00 to 08.00 hours, and moderate stress was observed from 08.00 to 00.00 hours, respectively. Timely introduction of high-quality bedding material in the proper amount (6 kg/head/day) promotes faster adsorption of moisture and contributes to the creation of more comfortable conditions for keeping animals in hot periods of the year [4].

It was found that low temperatures (from 12 to 18 C) became a stress factor for cows and caused a temporary decrease in productivity compared to the thermoneutral period. In tetherless box housing, the decrease in productivity (on average for 10 days) was 3.55 kg or 10.85%, and on deep litter this figure was 1.82 kg or 5.64%. During the period of low-temperature loading, the consumption of metabolic energy decreased by 4.68 MJ in tetherless box housing, while on the contrary, it increased by 1.50 MJ on deep litter [2].

The results of studies of the effect of ambient temperature during the thermoneutral period and during the period of low-temperature load on the productivity, daily behavior and bioenergetic traits of Ukrainian Red and White dairy cows under different variants of untethered housing in boxes and on deep litter in easily assembled premises showed that cows in both variants of housing technologies

reacted to changes in temperature by reducing productivity - by 10.86% (3.55 kg) in the case of untethered box housing and by 5.65% (1.82 kg) in the case of deep litter technology. At the same time, the mass fraction of fat in cow milk during this period increased by 0.09 and 0.08%, respectively. During the low-temperature period, cows in both variants of untethered housing spent somewhat less time eating feed, drinking and walking, but more time resting in a lying position compared to the thermoneutral period. In general, in both temperature periods, the duration of the main behavioral acts corresponded to physiological norms. Reducing the duration of feed intake during the period of temperature load led to a decrease in the number of feed reactions and the duration of chewing in cows under both housing technologies. The proportion of net feed energy consumption that is converted into milk energy (energy index) during the period of temperature load decreased by 2.69 % in the free-box housing and by 1.16 % in the deep litter [26].

The air velocity in prefabricated cowsheds is three times higher (P>0.999) compared to traditional cowsheds, which has a positive effect on air pollution, which is 8.07 times lower in the presence of ammonia compared to traditional premises. Under such conditions, bacterial air pollution is only 26.4 thousand cfu/m3, while in traditional barns it is 18.7 times higher and amounts to 493.6 thousand cfu/m3.

At an average sub-zero ambient air temperature, the indoor temperature in a prefabricated barn ranges from minus 1.8°C to minus 4.8°C. As the ambient air temperature decreases at night, the air temperature in the prefabricated barn decreases accordingly. That is, there is a proportional relationship between the ambient air temperature and this indicator in a prefabricated room [19].

The analysis of the herd showed that it contained cows from the 1st to the 6th lactation. The largest share was made up of cows of the first and second lactations - 43.45 and 37.7%, respectively. The share of cows of the third lactation and older was much smaller and amounted to 7.35% in the third lactation, 8.95% in the fourth, 2.23% in the fifth, and 0.32% in the sixth. On average, the daily milk yield from each cow was 27 kg with a range of deviations from 5.02 to 48.46 kg, the average number of milking times per day was 2.9 times with a range of fluctuations from 1.86 to 4.49. The average interval between two consecutive milking was 8.3 hours with fluctuations from 5.2 to 12.7 hours. In the technological groups, cows were different in terms of productivity and stage of lactation. Thus, in the first group there were cows with an average of 252 days (83-386 days) of lactation. Their average daily milk yield was 29.79 kg, and the frequency of milking was 2.98 times per day. In the second technological group, cows were kept with an average lactation day of 262 days (8-460), and their daily milk yield was 20.4 kg, with the lowest milking frequency of 2.77 times. In the third technological group of cows, the average milking day was 173 (112-225), daily milk yield was 28.73 kg, and the milking frequency was 3.24 times. In the fourth group, cows were kept, most of which were in the early stages of lactation - on average 93 days after calving, with fluctuations from 17 to 179 days; their average daily milk yield was 30.53 kg per cow, with 2.9 times of milking during the day. Ethological studies have shown that under conditions of voluntary milking, cows spent an average of 53.04% of the day on rest, 17.55% on eating fodder, and 2.12% on milking. The peak of feeding activity (feed

intake) occurred in the morning (8.00 am) and afternoon (17.00 pm). This is due to the fact that the majority of cows (more than 90%) rest in a supine position from 1-2 am to 4-5 am, after which they need to consume feed, water and milk. In the morning, feed mixtures are distributed so that animals can consume them freely and to their heart's content [3].

The health of the cows has a great influence on the level of milk yield. Healthy animals always have higher productivity than sick ones. For example, tuberculosis reduces milk yield by 20-35%, brucellosis by 40-60%, and foot-and-mouth disease by 35-50%. Mastitis and digestive disorders lead to a long-term decrease in milk production.

Impaired reproductive functions lead to cow leanness and reduced productivity. Acute infectious diseases also dramatically reduce milk yield. Influence of physiological condition. The decrease in milk yield, which is typical for cows in the 5-6th month of pregnancy, occurs under the influence of the action of ovarian corpus luteum hormones. They suppress the action of lactogenic hormones of the pituitary gland. The state of sexual excitement in cows affects milk yield. The decrease in daily milk yield is especially noticeable. During estrus, daily milk yields decrease by 10-20% within 2-4 days. The main reasons for this are the cow's loss of appetite during estrus and her growing anxiety. Cows with a good physiological condition and high fatness during dry season have a much higher chance of the next lactation than cows with insufficient fatness. It has been established that for every kilogram of live weight gain during the dry period, a cow increases the chance of the next lactation by 20 kg [37].

Dairy productivity is the main breeding trait and the purpose of economic use of cattle of dairy and dairy-meat breeds. Dairy productivity is characterized by the quantity and quality of milk obtained from cows over a certain period (one milking, day, month, lactation, year, life, etc.).

Milk is a product of the secretory activity of the mammary gland of mammals and is intended for feeding offspring. Female mammals that are not specifically milked produce as much milk as necessary to raise their young. Wild animals lactate only during the period of milk feeding of the offspring, while domesticated animals lactate much longer under the influence of constant irritation of the mammary gland during milking and as a result of increased feeding and artificial selection. It is considered normal for cows to lactate for 300 to 305 days, to have a dry period of 55 to 60 days, and to give birth to a calf annually.

Milk is synthesized in the cells of the secretory epithelium of the alveoli and mammary ducts by absorption from the blood and biosynthesis of its components (fat, protein, sugar) or direct transfer of vitamins, enzymes, hormones and minerals from the blood. Proteins, fats and sugars synthesized in the mammary gland differ significantly in composition and properties from the corresponding substances in the blood. To synthesize 1 kg of milk, 400-500 liters of blood must pass through the udder. On average, cow's milk contains 12.5-13.0% dry matter, including 3.8% fat, 3.3% protein, 4.8% milk sugar, and about 1% minerals.

The most common criterion for evaluating cow milk production is milk yield for a standardized lactation of 305 days or a calendar year. The milk yields of cows of

different ages, breeds and herds per lactation range from 1000 to 25000 kg or more.

Numerous studies convincingly prove the influence of age, herd, year, season and other paratypic factors on cow milk production. However, sometimes there is a significant contradiction in the degree and even direction of this influence, as well as the need to study it under slightly changed modern management conditions, on animals of new domestic dairy breeds and at the population level, necessitates additional research in this area. The maximum profitability of dairy farming is ensured not only by increasing the milk productivity of livestock, but also by the long-term economic use of cows. Given the evolutionarily fixed inverse correlation variability, the result of successful selection for dairy productivity is primarily a noticeable decrease in reproductive capacity, health and duration of economic use of cows.

Recently, in scientific research and practical breeding, considerable attention has been paid to substantiating the feasibility, possibility and search for ways to select dairy cattle to increase the duration of their use and lifetime productivity. It has now been established that the duration of use and lifetime productivity of cows is determined by both genotypic and paratypic factors, ontogenetic parameters of the animal's body formation.

Consequently, the formation of cows' milk production is influenced by many factors that must be taken into account when managing the dairy cattle industry.

Methods of the work.

The research was carried out in the private agricultural enterprise "AF Batkivshchyna" in Stryzhavka village, Vinnytsia district, on cows of the Ukrainian black-and-white dairy breed.

To study the manifestation of behavioral reactions, experimental groups of cows of the Ukrainian Black-and-White dairy breed were evaluated and formed by the ordinal number of lactation, among which there were 15 cows of the first lactation, 21 cows of the second, 29 cows of the third, 16 cows of the fourth and 16 cows of the fifth, 26 cows of the sixth lactation and older.

The cows were kept in a stall-pasture system at the same level, type of feeding and diet structure.

The behavioral response of cows was studied for 720 minutes (excluding the time spent on milking - 180 minutes) using the method of visual observations with the help of the alphabet of elements and acts of behavior in accordance with the method of M.V. Zubets (1996).

The biometric processing of the results was carried out by the method of variation statistics according to the method of M.O. Plohinsky (1969).

Research results. Ethological traits of cows depending on age. It was established that ethological traits and indicators of milk production of cows are characterized by a medium and high degree of phenotypic variability (Table 1).

Cows of the second lactation lay down 2.7% longer ($P<0.99$) compared to cows of the first lactation, animals of the third lactation 25.0% less compared to the first lactation, fourth-fifth lactation - 23.8%, sixth lactation and older - 28.5%, respectively. Thus, with age, cows spent less time lying down, but more time eating feed.

The duration of feed intake in cows of the first lactation was 208 minutes, which is 3.8% less than in animals of the second lactation, 14.4% in the third, 24.5% in the fourth and fifth (P<0.99), and 29.8% in the sixth and older lactations (P<0.999), respectively.

Table 1. Characteristics of productivity and ethological traits of cows

Indicators	*Parameters*		
	X ±S x	***σ***	***Cv, %***
I lactation, n=15			
Milk yield per lactation, kg	4110±62,4	353,5	8,6
Eating, min.	208±7,9	23,4	11,3
Standing, min.	128±15,1	17,3	13,5
Lying down, min.	256±10,9	36,8	14,4
Chewing gum, min.	181±8,7	16,2	9,0
Moving, min.	130±5,8	9,5	7,3
II lactation, n=21			
Milk yield per lactation, kg	4862±49,3***	383,5	7,8
Eating, min.	216±19,8	13,4	6,2
Standing, min.	140±16,2	19,3	13,5
Lying down, min.	263±11,7	34,1	12,9
Chewing gum, min.	174±10,3	19,2	11,0
Moving, min.	101±12,0*	7,5	7,4
III lactation, n=29			
Milk yield per lactation, kg	5446±65,4***	450,7	8,2
Eating, min.	238±54,7	13,9	5,8
Standing, min.	134±8,1	19,4	14,5
Lying down, min.	192±7,1***	21,2	11,0
Chewing gum, min.	131±9,3**	23,9	18,2
Moving, min.	157±5,0**	26,9	17,1
IV-V lactation, n=16			
Milk yield per lactation, kg	6507±75,9***	402,0	6,2
Eating, min.	259±15,9**	18,9	7,5
Standing, min.	124±24,1	11,5	8,4
Lying down, min.	195±28,0*	16,4	9,9
Chewing gum, min.	156±17,6	22,8	17,9
Moving, min.	142±11,2	25,8	19,3
VI and older, n=26			
Milk yield per lactation, kg	6204±58,9***	335,0	5,4
Eating, min.	270±9,6***	17,7	6,5
Standing, min.	116±14,4	12,2	10,5
Lying down, min.	183±24,8*	10,4	5,7
Chewing gum, min.	146±17,3	24,8	17,0
Moving, min.	152±16,2	28,6	18,8

Notes: *P<0.95; **P<0.99; ***P<0.999, compared to the indicators of cows of the first lactation

It was found that in terms of chewing duration, there was also a significant difference between the index of cows of the first and second lactation by 3.9% less, with animals of the third lactation - by 25.0% (P<0.99), by 13.8% - of the fourth-fifth lactations, by 19.4% - of the sixth lactation and older.

Cows of the second lactation spent more time standing by 9.4% compared to cows of the first lactation, by 4.7% - with animals of the third lactation, by 3.2% less - of the fourth-fifth lactation, by 9.4% less - of the sixth lactation and older.

Thus, the dependence of productivity on feed activity was established, which confirms the main conclusion about the need to evaluate and take into account these parameters when forming technological groups.

The coefficient of variability of the duration of feed intake in cows of the first lactation was 11.3% (average variability of the trait), in cows of the second and older lactation - 6.2-7.5% (average variability of the trait), but the indicator was almost twice as low.

The index of variability of the trait of active movement in cows of the first and second lactations was characterized by an average variability of the trait (7.3 and 7.4%), with a strong variability of this trait in older animals (17.1-19.3%).

With age, the index of variability of the duration of supine rest decreased. The coefficient of variability of the index of lying down rest in cows of the first lactation was 14.4% (average variability of the trait), in cows of the second - 12.9%, in the third - 11.0%, in the fourth-fifth - 16.4, in the sixth and older - 10.4% (average variability of the trait).

Thus, the coefficient of variability of ethological indicators is not constant and is adjusted by the influence of housing conditions, environmental factors, and the intensity of selection.

The ratio of time spent on individual elements of cow behavior. Analyzing the ratio of time spent on individual elements of cow behavior, it was found that ethological indicators vary depending on the level of milk production. Cows with lower milk yields spent most of their time lying down, while animals with higher productivity levels consumed feed for the longest time and were more active.

Cows of the first lactation spent the largest share of daily time (37.5%) on feed consumption. At the same time, the animals spent an average of 25.4% resting in a lying position, 16.1% standing, and 21.1% moving.

As for the second lactation cows, the analysis showed that the act of eating feed lasted the longest and accounted for 36.0% of the total time. On average, the animals spent 27.1% of their time resting in a lying position, 17.2% standing, and 19.7% moving.

In dairy cows of the third lactation, the main time of daily behavior was spent on feed consumption and amounted to 33.1%. Cows of the third lactation spent 26.7% on resting in the supine position, 18.6% on standing, and 21.8% on movement.

Cows of the fourth and fifth lactations spent the largest share of daily time (36.5%) in the supine position. At the same time, the animals spent an average of 30.0% on feed consumption, 19.4% standing, and 14.0% moving.

The analysis of the duration of behavioral reactions of cows of the sixth lactation and older showed that the act of lying down lasts the longest and accounts

for 35.6% of the total time. On average, the animals spent 28.9% of their time eating feed, 17.8% standing, and 18.0% moving.

Analyzing the ratio of time spent on individual elements of cow behavior, it was found that ethological indicators vary depending on age. Older animals spent most of their time lying down and standing and spent more time eating feed, while younger animals were more active and spent more time in active movement.

Relative variability of ethological traits of cows and milk yield per lactation. The relationship between milk yield per lactation and ethological traits was characterized by the presence of a medium to strong correlation between traits in cows of different ages. A strong, direct correlation was established between the milk yield of cows of the first and second lactations and the time of feed intake (r=-0.82 - first lactation, r=0.88 - second lactation), an average direct correlation - in older cows (r=0.650 - third lactation, r=0.62 - fourth and fifth lactation, r=0.69 - sixth and older) (Table 2).

An average, inverse, statistically significant correlation (P≥0.999) was established between cow's milk yield per lactation and the duration of standing rest (r=0.41 - first lactation, r=-0.45 - second lactation, r=-0.35 - third lactation, r=-0.46 - fourth - fifth lactation, r=-0.51 - sixth and older).

Table 2. - Relative variability of cow ethological traits and milk yield per lactation, r±Sr

Correlating features	***Lactation***				
	I	***II***	***III***	***IV-V***	***VI and older***
n	15	21	29	16	26
Feeding time - hopes for lactation	0,82± 0,093	0,88± 0,147	0,65± 0,122	0,62± 0,024*	0,69± 0,122
Standing resting time - hopes for lactation	0,41± 0,034	-0,45± 0,089***	-0,35± 0,078***	-0,46± 0,031***	-0,51± 0,015***
Resting time lying down - hopes for lactation	-0,58± 0,024	-0,25± 0,217	0,15± 0,042***	0,25± 0,122***	0,29± 0,012***
Chewing time - hopes for lactation	0,54± 0,145	0,60± 0,247	0,21± 0,051*	0,34± 0,024	0,31± 0,044
Time of movement - hopes for lactation	-0,27± 0,111	-0,29± 0,242	-0,54± 0,137	-0,67± 0,122*	-0,34± 0,217

Notes: *P<0.95; **P<0.99; ***P<0.999, compared to the indicators of cows of the first lactation

An average, inverse correlation was observed between cow milk yield and the duration of active movement (r=-0.27 - first lactation, r=-0.29 - second lactation, r=-0.54 - third lactation, r=-0.67 - fourth - fifth lactation, r=-0.34 - sixth and older).

Thus, there is a mutual relationship between the trait of "milk yield per lactation" and ethological parameters, the regularities of which should be taken into account in the early assessment of productive and ethological qualities by these indicators that correlate with the characteristics of older cows.

Factorial dependence of cow milk yield on age. Analysis of variance is a set of statistical methods designed to test hypotheses about the relationship between a certain trait and the studied factors that do not have a quantitative description, as well as to determine the degree of influence of factors and their interaction.

The analysis of variance of the one-factor uneven complex and the analysis of the effect of age on cow milk yield per lactation showed that the greatest influence on the trait is the lactation number, which is 74.5%. The share of the influence of unaccounted factors in the study of the factorial dependence of milk yield on age was 25.5%.

Analyzing the factorial dependence of the level of average daily milk yield of cows depending on age, it was found that the greatest influence on the formation of this trait has age, the strength of influence of which was 61.6% When studying the factorial dependence of the level of average daily milk yield on age, it was found that the strength of influence of unaccounted factors was 38.4%.

The economic evaluation of cows' milk productivity was carried out by such indicators as average milk yield per cow, cost and selling price of one centner of milk, gross milk yield, profit per cow (Table 3).

Table 3. - Economic evaluation of cow productivity by lactation

Indicators	*Lactation*				
	I	***II***	***III***	***IV-V***	***VI and older***
n	15	21	29	16	26
Milk yield per cow, kg	4110	4862	5446	6507	6204
Gross milk yield, c	616,5	1021,0	1579,3	1041,1	1613,0
Cost price of 1 cwt of milk, UAH.	698	698	698	698	698
Realized price of 1 cwt of milk, UAH.	781	781	781	781	781
Profit, thousand UAH	51,2	84,7	131,1	86,4	133,9
Profit per cow, thousand UAH.	3,4	4,0	4,5	5,4	5,1

The calculations showed that, taking into account the serial number of lactation, the highest profit per cow was obtained from cows of IV-V lactation (5.4 thousand UAH) and VI lactation and older (5.1 thousand UAH).

The figure for IV-V lactation cows was 36.8% higher than the profit, compared to cows of the first lactation, 25.3% for cows of the second lactation, 16.3% for cows of the third lactation, and 4.6% for cows of VI lactation and older.

The indicator of cows of the sixth lactation and older was 33.1% higher than the profit, compared to cows of the first lactation, second lactation - by 20.9%, third lactation - by 11.4%, VI lactation and older - by 5.9%.

Conclusions. The milk yield of cows of the second lactation was higher than that of first-born cows by 18.3%, the third - by 32.5%, the fourth - fifth - by 58.3%, the sixth and older - by 50.9%.

It was found that ethological traits and indicators of milk production of cows are characterized by a medium and high degree of phenotypic variability. With age, cows rested less time lying down, but spent more time eating feed.

The duration of feed intake in cows of the first lactation was 208 minutes, which is 3.8% less than in animals of the second lactation, 14.4% in the third, 24.5% in the fourth and fifth (P<0.99), and 29.8% in the sixth and older lactations (P<0.999), respectively. Cows of the second lactation spent more time standing by 9.4% compared to cows of the first lactation, by 4.7% - with animals of the third lactation, by 3.2% less - of the fourth-fifth lactations, by 9.4% less - of the sixth lactation and older.

The coefficient of variability of ethological indicators is not constant and is adjusted by the influence of housing conditions, environmental factors, and the intensity of selection.

By analyzing the ratio of time spent on individual elements of cow behavior, it was found that ethological indicators vary depending on the level of milk production. Cows with lower milk yields spent most of their time lying down, while animals with higher productivity levels consumed feed for the longest time and were more active.

Ethological indicators vary with age. Older animals spent most of their time lying down, standing, and more time consuming feed, while younger animals were more active and spent more time in active movement. Cows of the first and second lactations spent the largest proportion of daily time (37.5% and 36.0%, respectively) on feed intake. Cows of the fourth and fifth lactations and the sixth lactation and older spent the largest proportion of daily time (36.5% and 30.0%, respectively) in the lying down position.

The relationship between milk yield per lactation and ethological parameters was characterized by the presence of a medium and strong correlation between the traits in cows of different ages. A strong, direct correlation was established between the milk yield of cows of the first and second lactations and the time of feed intake (r=-0.82 - first lactation, r=0.88 - second lactation), an average direct correlation - in older cows (r=0.650 - third lactation, r=0.62 - fourth and fifth lactation, r=0.69 - sixth and older).

Analyzing the factor dependence of the level of milk yield per lactation in cows, it was found that the greatest influence on the formation of this trait is age, the strength of which is 74.5%, and the share of the influence of unaccounted factors was 25.5%.

The highest profit per cow was obtained from cows of the fourth - fifth lactation (5.4 thousand UAH) and the sixth lactation and older (5.1 thousand UAH), which was 36.8% higher than the profit of cows of the first lactation, cows of the second lactation - by 25.3%, the third lactation - by 16.3%, the sixth lactation and older - by 4.6%. The figure for cows of the sixth lactation and older was 33.1% higher than the profit, compared to cows of the first lactation, 20.9% higher than the second lactation, and 11.4% higher than the third lactation.

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