

## EXTERIOR OF HOLSTEIN COWS OF DUTCH AND GERMAN BREEDING

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### Abstract

*We investigated the exterior features on the basis of sampling and the calculation of the physique indexes of Holstein cows of Dutch and German breeding in the herd of Joint-Stock Company „Aydyn”, Comrat, Administrative and Territorial Unit Gagauzia, Republic of Moldova. Cows of German breeding in many measurements had superiority in comparison with contemporaries. A cow of Dutch breeding were significantly inferior to the peers of the German selection for high-altitude measurements - the height at the withers and in the sacrum was 2.6 cm ( $P<0.05$ ) and 2.0 cm ( $P<0.01$ ), respectively. The body in length was better developed at cows of Dutch breeding - according to the index of stretching; they exceeded the peers of German breeding by 2.1 %.*

**Key words:** exterior, measurements of exteriors, body indexes.

### INTRODUCTION

In recent years, in the breeding of dairy cattle, an enormous role is given to the exteriors of animals. The exterior is one of the necessary elements of an integrated assessment of animals, in particular cattle. Animals with good exteriors are less exposed to diseases of the udder, limbs, they have less difficult calving, they are able to eat more forages needed to ensure high milk yields (Kochetkov et al., 2003; Pereverzev et al., 1990; Hamoen, 1995). Assessment of the exterior is important and necessary for understanding the biological and economic characteristics of animals. The study of appearance, external forms of the animal's constitution is important, as the exterior serves as an external expression of the constitution of animals, characterizes the state of their health, determines the individual features of the build, predisposes to a certain type of productivity (Eisner, 1984; Liskun, 1949). Correct constitution and strong constitution can testify to the resistance of animals to unfavorable external influences, ability to prolong economic use (Abrampolsky et al., 2005; Sokolova et al., 2013). Many scientists (Ali, 1984; Misik, 2003; Sokolova, 2013) note that the assessment of the

exterior is necessary for judging the strength of the animal's constitution and the conformity of this body to the conditions in which the animal exists in that productivity for which it is bred. Underestimation of the exteriors in this attitude can lead to overdevelopment, weakening of health, and, consequently, to a decrease in the productivity and acclimatization abilities of animals. In modern selection, the assessment of the exterior and the constitution has acquired special relevance.

The complication of the selection process is accompanied by deterioration in the conditions of feeding and maintenance, as a result of which the role of animals with good stress resistance, strong health and the constitution is significantly increased (Spivak et al., 1987; Reshetnikova et al., 1995; Hamoen, 1994).

The genetic potential of Holstein cattle breeding of Dutch and German breeding allows receiving high milk yields in the herd of Joint-Stock Company „Aydyn”, which are quite comparable with the achievements of Holland, Germany and other countries.

The aim of the research was to study the exteriors of Holstein cows of different breeds in the herd of the Joint-Stock Company „Aydyn”.

## MATERIALS AND METHODS

The objects of research were Holstein cows of Dutch and German selection of the third lactation. The studies were conducted in Joint-Stock Company „Aydyn” (J.S.K. „Aydyn”), Comrat, Administrative and Territorial Unit Gagauzia, where the animals were in the same conditions of feeding and keeping in accordance with the accepted technology in the farm.

Exterior-constitutional features of cows were studied using the method of taking measurements and calculating the indices of their physique.

The belonging of cows to various breeding was determined on the basis of analysis of the genealogical structure of the herd, using pedigree certificates, pedigree cards, artificial insemination logs and other documents of primary zootechnical accounting.

Measurements of animals were taken on the second, third month of a lactation. The milk ratio was determined by the formula:

$$MR = M/LW,$$

where: MR - milk ratio, kg; M - milk for 305 days or a shortened lactation, kg; LW - live weight, kg.

The genetic potential of the productivity of heifers was determined on the basis of the parental index of cows (PIC) according to the formula:

$$PIC = (2M + MM + MO):4,$$

where: M - the productivity of the mother; FM - the productivity of the father's mother; MM - the productivity of mother's mother.

Statistical processing of the results of the data was carried out by the method of Merkurieva (1983), Plokhinsky (1978) on a PC with the use of software.

## RESULTS AND DISCUSSIONS

When studying the exterior-constitutional characteristics of cows of Dutch and German selection on the third lactation in J.S.K. „Aydyn”, it was found that they were generally characterized by a relatively strong constitution, proportionally developed and slightly elongated trunk (Table 1, Figures 1, 2).

Table 1. Indicators of linear measurements of the body of cows of the herd J.S.K. „Aydyn” of various selections of Holstein breed

Measurements	Dutch Selection, n=31		German Selection, n=51	
	M± m, cm	Cv, %	M± m, cm	Cv, %
Height at withers	143.4±0.68*	2.64	146.0±0.78*	3.84
Height in sacrum	149.2±0.82**	3.08	151.2±0.87**	4.15
Depth of chest	76.1±0.63	4.65	77.4±0.58	5.42
Breast width behind the shoulder blades	46.5±0.82	9.87	48.3±0.71	10.6
Croup width at hips	57.2±0.67	6.52	58.5±0.69	8.48
Width in sciatic tubercles	37.4±0.61	9.2	36.4±0.41	8.2
Slanting length of body	171.0±1.02	3.32	170.4±1.17	4.9
Girth of chest behind the shoulder blades	206.3±1.45	3.93	209.3±1.34	4.6
Girth of the pastern	19.8±0.17	4.65	19.7±0.09	3.61

Note: \* - P<0,05; \*\* - P<0.01

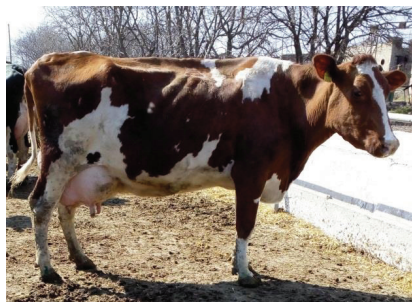


Figure 1. The cow of German breeding



Figure 2. The cow of Dutch breeding

Our studies have established that the cows of Dutch and German breeding proved to be quite large, as evidenced by the indicators of high-altitude measurements.

The height at the withers at cows of German breeding averaged 146 cm (a minimum of 136 cm, a maximum of 162 cm), the Dutch selection 143.4 cm (minimum 135 cm, maximum 152 cm).

Nevertheless, cows of German breeding in many measurements had superiority in comparison with contemporaries. Thus, the cows of Dutch breeding were significantly inferior to the peers of the German selection for altimetry measurements-the height at the withers and the sacrum was 2.6 cm ( $P<0.05$ ) and 2.0 cm ( $P<0.01$ ), respectively. By the depth and width of the chest behind the shoulder blades, croup width at hips and the girth of the chest behind the shoulder blades, of the cows of German breeding also had an advantage, the revealed difference was insignificant and unreliable.

On the width of the sciatic hillocks, the oblique length of the trunk and the girth of the pastern, the cows of German breeding, on the contrary, were inferior to those of the Dutch breeding by 2.7-0.4-0.5%, respectively. It is exposed a manifestation of a similar pattern of the basic exterior and constitutional features of the Holstein cattle, established by a number of authors (Katmakov et al., 2010).

For a more objective evaluation, the body index was calculated in Table 2.

Table 2. Indices of the constitution of Holstein cows of Dutch and German breeding

Index	Dutch Breeding	German Breeding	Standard
High-legged	46.9	47.0	46.5
Lengthiness	119.2	116.7	120.0
Pelvic thoracic	81.3	82.6	80.2
Thoracic	61.1	62.4	61.8
Consistency	120.6	122.8	118.0
Outgrown	104.0	103.5	100.9
Osseous	13.8	13.5	14.6

It should be noted that the body was developed in length better at cows of Dutch breeding – they exceeded the indices of German breeding by 2.1% in the index of stretching (Figure 3).

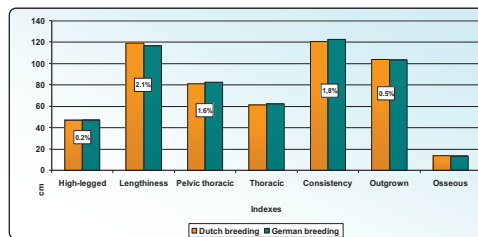


Figure 3. Indexes of the physique of the cows under evaluation

In most other indices, the superiority of German breeding cows is observed: high-legged - by 0.2%, pelvic thoracic - by 1.6% thoracic - by 2.1%, consistency - by 1.8% and outgrown by 0.5%. Thus, the cows of German breeding have a relatively better development of the chest in depth, respectively, of the chest organs.

Consequently, the more developed organs of the chest provide a higher metabolism, which causes higher milk production. This is confirmed by an analysis of the level of dairy productivity of animals.

The obtained values of the indices were also compared with the dairy-type standard. The values of the high-legged and thoracic indices for cows of both selections were within the standard for animals in the dairy direction of productivity.

The obtained values of the outgrown index indicate about a flat top line in all analyzed animals. The osseous index in comparison with the standard was 5.8 and 8.1% less, due to the high height at the withers of cows of Dutch and German breeding, in general, Holstein cattle. Our data are consistent with the results of studies carried out in the experiment on the study of the exteriors of Holstein full-aged cows of different breeds (Australian, Russian) by Shatalov et al. (2013) and studies of the exterior features of black and motley Holstein cows of Dutch and German breeding (Kibkalo et al., 2015).

Studies have established some advantage over the live weight of cows, depending on their origin. Thus, the cows of German breeding exceeded the cows of Dutch breeding by an average of 25 kg, the difference is highly reliable ( $P<0.001$ ) (Tables 3, 4).

Table 3. Dairy productivity of cows of Dutch breeding

Body weight, kg	Milk, kg / day	Milk, kg	Fat, %	Fat, kg	Coefficient of milk, kg
First lactation, n=65					
641.7±7.8	26.4±0.37	7853.8±117.5	3.79±0.05	296.3±3.97	1225.9±23.6
Second lactation II, n=59					
637.4±6.7	27.6±0.50**	8612.2±146.2***	3.77±0.02	325.2±5.2***	1354.6±27.6
Average					
639.7±5.1	26.9±0.31	8228.0±100.9	3.78±0.02	310.1±3.5	1294.1±18.8

Note: \*\* P<0.01 \*\*\* P<0.001

Table 4. Milk productivity of cows of German breeding

Body weight, kg	Milk, kg / day	Milk, kg	Fat, %	Fat, kg	Coefficient of milk, kg
First lactation, n=91					
666.9±3.1	23.8±0.03	7261.3±93.8	3.80±0.02	275.5±3.0	1092.7±14.4
Second lactation, n=28					
657.9±6.8	28.7±0.62***	8740.9±188.9***	3.74±0.04	325.6±5.5***	1330.9±17.3
Average					
664.8±2.9	24.3±0.32	7594.4±104.2	3.79±0.02	287.2±3.28	1144.1±16.4

Note: \*\*\* P<0,001

Analysis of milk productivity of cows of different breeding in the herd J.S.K. „Aydyn” showed that from the cows of Dutch breeding for the first lactation was received on average 7853.8 kg of milk, which is by 592.5 kg more than from the cows of German breeding, the difference is highly reliable (P<0.001).

A comparative analysis of daily average milk yield for a number of lactations showed that cows of Dutch selection for the second lactation had an average of 1.11 kg of milk/day more than on the first by P<0.01. Compared with the first lactation, the increase of milk productivity for the second lactation was 758 kg of milk; the difference is highly reliable at P<0.001. A similar increase occurred in the amount of milk fat - by 28.9 kg at P<0.001. It should be noted a significant increase in milk yields at cows of German breeding - the milk productivity for the second lactation was 8740.9 kg of milk, which is by 1479.6 kg more milk than at the first lactation, the difference is highly reliable (P<0.001), while daily milk yield increased by 4.9 kg of milk (P<0.001). According to the second complete lactation, cows of German breeding on average, exceeded peers of Dutch breeding by 128.7 kg of milk, the difference is not reliable.

On average, cows of Dutch breeding significantly exceed their peers of German breeding by milking for 305 days of lactation by 633.6

kg of milk (P<0.001), average daily yield of milk for 2.7 kg, milk fat yield for 22.9 kg at P<0,001.

The coefficient of milk yield at cows of Dutch breeding averaged 1294.1 kg of milk, which is more by 150 kg than at cows of German breeding, the difference is highly reliable (P<0.001). A higher coefficient milking was found at animals of Dutch and German breeding in the second lactation, which amounted to 1354.6 kg and 1330.9 kg of milk, respectively, with a difference of only 23.7 kg of milk.

The indicators of the genetic potential of the descendants of cows of Dutch and German breeding are given in Table 5.

As it can be seen from the data in table, the 5 parental index of cows (PIC) for milk yield was the highest at German heifers (10416.9 kg) - the superiority was 369 kg of milk, the difference is reliable (P<0.01), and on fat, on the contrary, Dutch breeding significantly exceeded the peers of German breeding by 0.23% (P<0.001).

Realization of the genetic potential (RGP) for 305 days of lactation was higher at heifers of Dutch breeding and amounted to 78.15%, which is by 8.45% more than the average of German heifers. The realization of the genetic potential for fat was higher at heifers of

German breeding - 93.4% or 5.3% more than at their peers of Dutch breeding.

Thus, the evaluation of the physique according to the values of the indices indicates, on the whole, that at the analyzed animals the type of dairy cattle is expressed. They have proportional forms of physique, large, elongated head, light bones, long thin neck, deep long chest,

body stretched, muscles are moderately developed. The back of the cows is long, wide, straight. The limbs are straight, strong, short hoofs, pasterns strong, flexible hocks. Realization of the genetic potential of the heifers of Dutch and German breeding for 78.1 and 69.7% respectively confirms their high level of milk productivity.

Table 5. Realization of the genetic potential of the calves

Indicators		Breeding	
		Dutch	German
Parent index of cows	milk yield, kg	10047.9±134.3	10416.9**±128.6
	fat, %	4.30***±0.037	4.07±0.039
Own productivity	milk yield, kg	7853***±117.51	7261±93.8
	fat, %	3.79±0.05	3.80±0.02
Realization of genetic potential, %)	milk yield	78.15	69.70
	fat	88.10	93.40

Note: \*\* - P <0.01; \*\*\* - P <0.001

## CONCLUSIONS

The height at the wither for cows of German breeding averaged 146 cm (a minimum of 136 cm, a maximum of 162 cm), the Dutch selection was 143.4 cm (minimum 135 cm, maximum 152 cm).

In most other indices, the superiority of German breeding cows is observed: high - legged by 0.2%, tight chest by 1.6%, thoracic by 2.1%, consistency by 1.8% and outgrown by 0.5%.

Milk productivity for the second lactation at cows of German breeding was 8740.9 kg of milk, which is by 1479.6 kg more milk than the first lactation, the difference is highly reliable (P<0.001). According to the second complete lactation, cows of German breeding on average exceeded the peers of Dutch breeding for 128.7 kg of milk, the difference is not reliable.

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