

THE ANALYSIS OF PRODUCTION AND REPRODUCTION PARAMETERS OF HOLSTEIN COWS FROM HOLLAND AND GERMANY IN J.-S.C. „AYDYN”

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Abstract

The scientific paper presents the results of research of productive and reproductive parameters of cows of Holstein breed of Dutch and German origin in the herd J.-S.C. „Aydyn”, Comrat Administrative and Territorial Unit Gagauzia. For the analysis was used performance control for the year 2015: cows on the first lactation (n=122) and the second lactation (n=43) of Dutch origin and cows on the first (n=129) lactation – of German origin. It was established that from cows of the Dutch origin for the first lactation on average was received 7803 kg of milk, which is with 589 kg more than from the cows of German origin, a highly significant difference (P < 0.001). It is established by the analysis that 50,8% of the animals of Dutch origin had the productivity from 7501-8000 kg to 9001 kg, whereas 70,5% of the animals of German origin had the productivity from 6000-6500 to 7001-7500 kg and only 29,5% from 7501-8000 to 9001 kg of milk per lactation. The average length of the dry period at cows of Dutch origin was by 6.5 days less than at the cows of German origin, the difference is authentic at P < 0.05. Service period at cows of Dutch origin averaged 219.9 ± 12 days, the German origin – 168.2 ± 15.4 days. This affected the increase of the between calving interval at the animals of Dutch origin (483 days), the German origin (446 days), which exceeds the desired duration by 118 and 81 days, respectively.

Key words: lactation, milk index, the service period, Calving interval, the coefficient of reproductive ability.

INTRODUCTION

Homeland of Holstein, like and the other related groups of black white cattle, is Holland. It is known that for the first time to North America, black motley frisian cattle was brought by the first Dutch settlers still in 1621. Small parties of these animals were imported in the late XVIII - early XIX century, but the greatest number - more than 100 thousand heads - imported during the period of 1875-1885 years. Bred in the US cattle of this population in 1861 received the name of Holstein-Friesian (Trufanova, 2006, Ulimbashev et al., 2012).

Since 1983, in the US and Canada Holstein-Friesian breed is called Holstein. Currently, the value of this breed is very high, as it is characterized by the high milk yield and is used for improving dairy cattle worldwide. It is distinguished by good adaptability to different climatic and economic conditions, high payment of feed by milk, (Dmitriev et al., 1989)

In XX century the Holstain breed has become dominant in the global dairy cattle breeding. Holstein cattle has the highest genetic potential for milk yield and qualities of the complex, providing a better adaptation to industrial technologies, it is imported in more than 70 countries around the world (Gavrilenko et al., 1994; Kostomahin, 2011; Lazarenko, 1997; Madison, 2007). It is included in breeding programs for the improvement of many breeds of cattle in dozens of countries with developed dairy cattle (Robbins et al., 2000). The world population of Holstein cows is 25 million of heads, or 72% of the 8 most common dairy breeds in the world, (Jansen, 2009).

Holstein breed has high technological potential on further increase in productivity. The average milk yield of cows in the United States and Canada reaches 6500-7000 kg of milk, live weight 600-700 kg, bulls - 1000-1100 kg. Holstain cattle is characterized by strong limbs and aptitude for mechanical milking.

It is characterized by a large body length and considerable height at the withers, milk type addition, adaptable to different climatic zones, capable to high productivity at double milking and and free movement.

To holstein cows belong all world records for milking and yield of milk fat (Ulimbashev et al., 2012). In 1982 the champion on milking among mature cows of holstein breed was Holibenk Medalist 266 300, from which at the age of 8 years, 9 months is received 19245 kg per milk lactation fat content of 3.89%, and the total yield of milk fat per 305 days of lactation was 557 kg (Gavva, 1986). The world record of lifetime productivity is set by cow nr.289 (Calif.). She lived for 19.5 years, and for 5535 days of lactation from her was milked 211212 kg of milk at the output of milk fat 6543 kg (Freeman, 1984).

In 2010, the American Association for breeding of Holstein cattle (Holstain Association US) recorded on the farm Ever-Green-View, (Waldo, Wisconsin, USA.), A new world record: from the cow number 1326 for 365 days of the third lactation was obtained 32804 kg of milk obtained (average 89 kg per day) with 3.86% of fat and 3.12% of protein. Indicators of productivity of this cow in 1934 kg of milk (6.26%) higher than the previous world record (Yanchukov et al., 2011).

Many of the European countries, such as Germany, the Netherlands, Denmark, Switzerland, and others, in the result of long and purposeful use of Holstein, today turned themselves into exporters of high-value genophond of Holstein breed.

The basis of the creation of the German Holstein breeding was also the Dutch Friesian breed of black motley cattle in northern Germany. On the beginning, the selection was carried out by milking, and from the second half of the 19th century - on the content of fat and protein in milk. At the same time, great attention has been paid and to meat productivity, (Suleymanov, 2012; Khakimov et al., 2014). As a result, virtually all black motley cattle in Germany, about 95% of previously submitted ostfrizsk breed, was transformed into a Holstein (Shichkin, 2002). During the period from 1984 to 1994 in the western part of Germany milk yield of hybrids of black motley cattle increased from 6082 to 7107 kg, the fat

content in the milk increased from 4.02 to 4.29%. German scientist Kalm (Kasperska et al., 1991) notes that due to crossbreeding with Holstein breed happened an increase of genetic variation and genetic progress of black motley cattle. Tozliyan (2007) reported that for 12 years of Holstein cattle in Germany, its productivity has increased significantly: milk yield - 1.4 times, the fat and protein content in milk - by 0.12 and 0.08%.

It should be noted that in the breeding of the Moldovan motley cattle, and then and its improvement was carried out with the use of global genophond of animals of Holstein breed imported from Canada, USA, UK, Germany and other countries (Smirnov et al., 2007).

Holstein cattle breed is characterized by a satisfactory reproductive capacity, due to the physiological characteristics of highly productive animals, which is characterized by early maturity, good fertility and easy calving. With good feeding and keeping of heifers to 15 months of age reach a live weight of 350-380 kg and can be inseminated. Taking into account a high level of milk yield of cows of this breed, the calving period at them most often is 13-14 months.

Currently (beginning with 2010) to the Republic of Moldova are imported Holstein heifers, mainly of Dutch and German origin. According to bonitation for y. 2015, in the republic were 1421 heads of Holstein cattle, including 932 cows. Milk yield per a cow averaged 7612 kg of milk with a fat content of 3.81%.

The aim of the work was to study the productive and reproductive qualities of Holstein cows in the herd J-S.C. "Aydyn".

MATERIALS AND METHODS

The material for the research was a purebred Holstein cattle imported to J-S.C. "Aydyn", Comrat ATU Gagauzia from Holland and Germany. For the analysis were used data parameters for y. 2015: cows on I-st (n=122) and the II-nd (n=43) of Dutch lactation origin and cows on I-st (n=129) lactation – of German origin.

The assessment and analysis of animals for milk yield was carried out according to conventional techniques based on: milk yield

for 305 days of lactation, the fat content of milk, production of milk fat per lactation. The magnitude of milking cows were divided into The obtained results were processed biometrically (Merkuryeva, 1983; Plohinsky, 1978) with the use of Microsoft classes. Milk index (MI) - the amount of milk based on 100 kg of live weight Reproductive ability was evaluated by indicators: the duration of the service period, the dry and calving (CP) periods, while the animals were divided on the level of milk production. Reproductive capacity coefficient (RCC) was calculated according to the formula of Kramarenko (1974): $RCC = 365/CP$.

The obtained results were processed Word 2007, Excel 2007, the accuracy of the performance was determined by Student's.

RESULTS AND DISCUSSIONS

In the analysis of milk production of cows of different selection is established that cows from the Dutch origin for the 1st lactation on average is received 7803 kg of milk, which is with 589 kg more that from the cows of the German origin, a highly significant difference ($P < 0.001$) (Table1).

Table 1. Characteristics of cows on milk yield of Dutch origin (1st lactation)

The level of productivity	Milk, kg		Fat		Coefficient of milking
	Per day	total	%	kg	
6000-6500, n=9	21.3±0.34	6360.8±42.6	3.97±0.04	253.1±7.50	1010.7±12.4
6501-7000, n=21	22.9±0.32	6805.3±24.1	3.81±0.01	259.2±3.57	1081.0±50.5
7001-7500, n=28	23.8±0.23	7163±17.1	3.76±0.01	269.1±2.80	1146.1±7.1
7501-8000, n=6	26.1±0.71	7641.8±74.6	3.60±0.10	276.3±7.05	1202.3±18.4
8001-8500, n=19	27.7±0.30	8251.4±32.2	3.65±0.06	301.0±4.60	1304.9±14.1
8501-9000, n=19	29.1±0.28	8796.4±38.4	3.73±0.04	328.05±3.50	1368.3±17.6
> 9000, n=18	30.5±0.17	9291±54.3	3.75±0.04	348.4±4.12	1436.9±18.6
Average	25.6±0.30	7803.2±90.1	3.76±0.02	292.5±3.44	1228.3±13.9

Our results coincide with studies (Lyashenco, 2013) – under the conditions of the Penza region from the Holstein cows of different selection are received high levels of milk production, the best indicators were characterized the animals of Dutch origin.

It should be noted that the variation of milk yield per lactation (305 days) turned out essential for what was conducted the distribution of cows by classes or productivity level.

The analysis of milk production by magnitude of milk yield between cows of different selection showed that in 6 groups of 7 superiority mainly of cows of Dutch origin over the cows of German origin (Table 2). However, by the the magnitude of the productivity 7501-8000 kg of milk of cow of German origin surpassed contemporaries of the Dutch origin over 163 kg of milk at $P < 0.001$.

Table 2. Characteristics of cows on milk yield of German origin (1st lactation)

The level of productivity	Milk, kg		Fat		Coefficient of milking
	Per day	total	%	kg	
6000-6500, n=30	20.8±0.11	6289.5±26.9	3.86±0.04	243.03±2.56	988.2±9.02
6501-7000, n=26	22.3±0.11	6777±29.7	3.88±0.04	263.1±2.70	1044.4±9.9
7001-7500, n=35	23.5±0.05	7162.3±16.1	3.76±0.03	269.6±2.1	1119.5±6.9
7501-8000, n=9	25.6±0.14	7804.6±41.9	3.76±0.06	293.1±4.6	1232.8±14.3
8001-8500, n=12	26.9±0.13	8222.7±37.9	3.6±0.03	296.7±3.34	1275.2±18.1
8501-9000, n=14	28.9±0.1	8812.4±30.8	3.65±0.04	321.7±3.95	1372.9±14.8
> 9001, n=3	29.8±0.08	9089±30.5	3.67±0.09	333.3±8.3	1418.2±27.7
Average	23.6±0.32	7214±96.3	3.77±0.04	272.3±3.86	1125.4±25.7

Cows of Dutch origin outperform their peers of German origin by comparing the average daily milk production on average of 2 kg of milk ($P < 0,001$).

When comparing the average daily milk yield at a magnitude of productivity 6501-7000 kg of milk the difference was 0.6 kg in favor of Dutch cattle origin, with $P < 0.1$.

By comparative detailed analysis of the milk production of cows of different selection is established that 50.8% of the animals of Dutch origin had the productivity from 7501-8000 kg to 9001 kg, whereas 70.5% of the animals of German origin had the productivity from 6000-6500 to 7001-7500 kg and only 29.5% from 7501-8000 to 9001 kg of milk per

lactation. Similar results were obtained on cows, heifers of Holstein breed of Australian origin (Khisamov et al., 2012) - most animals are concentrated in classes that have a heightened productivity - 7501 and more (70.6% of the population).

The fat content in the milk is almost the same in the compared populations of cows (3,76-3,77%), but at the exit of milk fat of cow of Dutch origin surpass the cows of German origin by 20.2 kg, ($P < 0.001$).

Considerable importance in dairy cattle breeding has the amount of milk received per each 100 kg of live weight of cow (dairy coefficient). Milk index at cows of Dutch origin on average constituted 1228.3 kg of

milk, which is more by 102.9 kg than that of peers – cows of German origin, at $td = 3,5$, a highly trustworthy difference ($P < 0.001$). Higher coefficient of milk yield was detected at animals of both analyzed populations at the value of productivity > 9001 kg of milk, which amounted to 1436.9 kg and 1418.2 kg of milk for cows of the Dutch and German origin, respectively.

It should be noted that the heifers of German origin were acquired later in 2014 and the calving from them started with 8-9 months later than from heifers of Dutch origin. Hence, the preliminary results for the IInd lactation we present only on animals of Dutch origin (Table 3).

Table 3. Characteristics of cows on milk yield of Dutch origin (IInd calving)

The level of productivity	Milk, kg		Fat		Coefficient of milking
	Per day	total	%	kg	
6000-6500, n=4	21.1±0.05	6450.7±15.2	3.78±0.06	243.8±4.48	1006±26.3
6501-7000, n=7	22.2±0.09	6758.3±26.5	3.73±0.09	251.7±5.69	1085.9±12.6
7001-7500, n=9	23.2±0.07	7086.4±20.3	3.81±0.11	276.4±3.44	1136.8±18.1
7501-8000, n=2	26.1	7945.5	3.55	282.5	1251.9
8001-8500, n=10	26.8±0.12	8190.2±33.0	3.75±0.06	307.2±5.51	1303.9±16.7
8501-9000, n=6	29±0.53	8826.2±65.1	3.73±0.06	329.5±6.98	1386.3±31.9
> 9001, n=5	31.0±0.46	9455.2±140.6	3.72±0.08	351.6±5.81	1483.3±26.8
Average	25.5±0.49	7746.3±154.1	3.76±0.03	291.3±5.8	1229.8±24.4

As it is seen from the data table, milk production for 305 days of lactation decreased by an average for 57 kg of milk compared to the milk production of cows for the Ist lactation. The rest of the analyzed indicators are almost identical to cows of Ist lactation.

The analysis showed that 53.5% of the cows on the IInd lactation had a productivity of 7501-8000 kg to > 9001 kg of milk. Thus, by the level of milk production > 9001 kg of milk is observed a tendency of increase in comparison with the animals on the Ist lactation: milk yield per lactation increased by 164 kg of milk, the

quantity of milk fat by 3.2 kg and lactation coefficient by - 46.4.

As it is known, the achievement of an optimal milk production of cows is possible only with normal reproduction of the herd, in connection with which, by us were studied the reproductive qualities of the analyzed population of Holstein cows of different origin. In the studied groups of animals the average duration of the dried period of cows ranged within normal limits standards - 62.3 days. (Dutch origin) - 68.9 days. (German origin) (Tables 4, 5).

Table 4. Capacity indices of reproduction cows (Ist calving) Dutch origin

The level of productivity	Dry period	Service period, day	Calving interval	Reproductive capacity coefficient
6000-6500, n=9	60.4±0.60	268±61.4	538.4±61.0	0.68
6501-7000, n=21	60.2±0.42	219.0±34.5	475.9±29.8	0.77
7001-7500, n=28	60.2±0.42	219.0±34.5	475.9±29.8	0.77
7501-8000, n=6	65.8±6.70	272.0±52.9	519.5±68.3	0.7
8001-8500, n=19	61.2±1.09	205.5±33.0	493.5±33.2	0.74
8501-9000, n=19	63.8±2.20	195.0±30.0	465.3±31.6	0.78
> 9000, n=18	62.4±1.70	222.9±29.3	483.6±29.2	0.75
Average	62.3±0.70	219.9±12.3	483.6±12.4	0.75

It should be noted that the average length of the dry period at the cows of Dutch origin was with 6.5 days less than at the cows of German origin, the difference is significant at $P < 0.05$.

The greatest length of the dry period was at the level of productivity 8501-9000 at cows of German origin - 75.6 days or with 11.8 days more than at cows of Dutch origin at $P < 0.05$.

As it can be seen, the index rate of the average length of service period at cows of both selections exceeded permissible limits (90-100 days). It should be noted that a long service period was observed at cows Dutch origin (219.9 ± 12 days) that is with 129-119 more than the permissible limits. At the same time it was maximum with the level of productivity of 7501-8000 kg of milk (272 d.), and the minimum-at a rate of 8501-9000 kg (195 days).

Table 5. Capacity indices of breeding cows (Ist calving) German origin

The level of productivity	Dry period	Service period, day	Calving interval	Reproductive capacity coefficient
6001-6500, n=30	67.2±2.5	157.7±9.1	435.0±11.1	0.84
6501-7000, n=26	69.1±2.8	165.9±10.0	445.1±12.3	0.82
7001-7500, n=35	66.4±1.98	169.2±7.0	445.7±8.4	0.82
7501-8000, n=9	67.9±4.6	166.6±11.3	444.4±14.4	0.82
8001-8500, n=12	72±4.8	181.7±15.7	465.3±19.5	0.78
8501-9000, n=14	75.6±4.3	188.0±12.9	473.6±16.7	0.77
> 9000, n=3	70.7±9.7	165.3±17.9	446±27.7	0.82
Average	68.9±2.06	168.2±15.4	446.7±19.7	0.82

A short service period mentioned in cows German origin (157 days.) at the level of productivity of 6001-6500 kg of milk. If to consider that the optimal service period should be 90 days, then in fact it exceeded this period on the average of 67 days. Similar results were obtained in research (Litvinenko et al., 2014) at the Holstein cows of German origin with duration of the service period 159 days, at cows of Dutch origin it was at the level of 205 days. In the analyzed population of cows of Holstein breeding the calving interval averaged 483 days (Dutch origin) and 446 days (German origin), which exceeds the desired length with 118 and 81 days, respectively. For cows of Dutch origin the smallest calving period was at the level of productivity of 8501-9000 kg of milk - 465 days for cows of German origin - at the level of productivity of 6001-6500 kg -. 435 days, exceeding the desired length to 100-70 days. Cows of Dutch origin on this indicator exceeded their peers by an average of 36 days, the difference is significant at $P < 0.01$. The results obtained by us coordinate with the data

(Nikulin et al., 2011), which point out that the reproductive function at the all imported livestock of Holsteins from Germany and the Netherlands was characterized by a prolonged calving and service periods, the low index of insemination and with the statement (Tekeev, 2015) that a high duration of calving interval at cows after the first calving carries a common pattern for dairy cattle.

The results obtained by us indicate a low coefficient of reproductive capacity of the analyzed livestock of animals of both selections as its optimal value should be within 1-0.95. It was established that the magnitude coefficient of reproductive ability of cows of Dutch origin differed from the cows of German origin that averaged 0.72 and 0.82, respectively. At the level of productivity of 6001-6500 kg of milk, this coefficient was the greatest at the cows of German origin - 0.84, the lowest - 0.68, at cows of Dutch origin.

The results of evaluation of the reproductive ability of cows of the IInd lactation are given in Table 6.

Table 6. Capacity indices of breeding cows (IInd calving) Dutch origin

The level of productivity	Dry period	Service period, day	Calving interval, days	Reproductive capacity coefficient
6000-6500, n=4	61.7±0.75	89.0±2	367.6±8.5	0.99
6501-7000, n=7	83.8±5.96	185.9±51.07	417.8±18.4	0.87
7001-7500, n=9	80.7±3.8	74.4±10.6	395.6±18.3	0.92

7501-8000, n=2	85.5	82.5	389.5	0.95
8001-8500, n=10	82.4±5.0	109.3±17.5	418.5±17.7	0.87
8501-9000, n=6	69.8±6.4	154.2±42.7	443.8±21.6	0.82
> 9000, n=5	66.6±6.37	172.8±52.3	473.7±59.4	0.77
Average	77.2±2.27	123.4±13.3	405.6±18.72	0.90

As it is seen from the data table, it has happened an increase in the dry period of almost 15 days (77.2 days) compared with cows of Dutch origin after the first calving, the difference is highly significant at $P < 0.001$; decrease of service period by 96 days. (123.4 days) at $P < 0.001$ and a decrease with 41 days of calving interval, the difference is unauthentic.

CONCLUSIONS

1. Dairy efficiency of cows of the Dutch origin for the 1st lactation averaged 7803 kg of milk, which is with 589 kg more than from the cows of the German origin, the difference is highly significant ($P < 0.001$).
2. A little more than half of the Dutch breeding animals are concentrated in classes with productivity from 7501-8000 kg to > 9001 kg of milk (50.8% of the population). Most of the animals of the German breeding - 70.5% are concentrated in the classes with the productivity from 6000-6500 to 7001-7500 kg and only 29.5% from 7501-8000 to > 9001 kg of milk.
3. The coefficient of milk yield at cows of Dutch origin averaged 1228.3 kg of milk, which is more by 102.9 kg than that of peers – the cows of German origin, a highly significant difference ($P < 0.001$).
4. The average length of the dry period of cows of both origins fluctuated between standards - 62.3 days (Dutch origin) - 68.9 days (German origin).
5. The service period of cows of Dutch selection averaged 219.9 ± 12 days, the German origin - 168.2 ± 15.4 days, which exceeded the maximum recommended duration with 90-100 days. This affected the increase of the calving interval at animals of Dutch origin (483 d.), the German origin (446 d.), which exceeds the desired duration with 118 and 81 days, respectively.

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