



Maternal instinct of imported meat direction cattle and ethology of their calves

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Abstract The examination of maternal qualities in the ethology of cows and their young offspring, derived from the study on adaptability and productivity of second and third-generation Aberdeen Angus cattle imported to Kazakhstan from Canadian and European selection, is presented in this paper. The findings indicate that Canadian heifers, belonging to the second generation, displayed extended feeding behavior throughout the day, dedicating 33.2 minutes or 2.2% more time to feeding compared to their European counterparts ($P < 0.001$). Similar disparities between groups were observed in the duration of the ruminant process. Moreover, Canadian heifers consumed water for an additional 2 minutes or 0.6%, which can be attributed to their higher daily feed intake. The calving process of Aberdeen Angus cows generally proceeded smoothly, demonstrating a well-developed maternal instinct towards their offspring. Notably, calves born from Canadian cows exhibited greater agility and achieved the ability to stand on their feet in a shorter time, with an average duration of 41.0 ± 1.60 minutes, which was 11.7% faster than European calves. Additionally, Canadian calves displayed a shorter time to locate their mother's breast, with an average duration of 68.0 ± 7.70 minutes.

Keywords: Aberdeen-Angus breed, ethology of calves, heifer behaviour, maternal instinct of cows

1. Introduction

The behavior of animals is determined by numerous factors within both their external and internal environments. Indeed, behavior constitutes a manifestation of the animal's response to various environmental factors that dictate its activity. In the event that cattle are exposed to unfamiliar new environments, their behavioral reactions, to some extent, manifest as a desire to adapt to the novel conditions. The success of the adaptation process primarily hinges upon the degree of compliance exhibited by behavioral reactions with external factors. Conversely, the individual reactions of the animal are predominantly determined by genetic factors. This primarily applies to the duration of the body's life cycles, including feeding, water consumption, functional activity, and sleeping. Moreover, these types of functional activity are primarily attributable to innate instincts (Development of the export..., 2019).

The Aberdeen Angus breed possesses several vital maternal characteristics, one of which is light calving, which is closely associated with the relatively low weight of newborn calves. If cattle imported from overseas demonstrate high productivity within economic conditions, then the adaptation process can be deemed successful and comprehensive. In fact, the maternal trait serves as the foundation for "cow-calf" technology, directly influencing the efficiency of breeding and herd maintenance (Kalashnikov 2010).

The term "maternal trait" refers to the acquisition of healthy and purebred offspring from a cow, encompassing a range of performance indicators and behavioral reactions that contribute to their well-being and development during the milking season. Generally, the inheritance of the cow trait is considered to be relatively weak, yet the cow trait of Aberdeen Angus cattle is estimated to be highly favorable compared to other cattle breeds (Kazhgaliyev 2010).

The degree of success achieved in the adaptation process largely relies on the alignment of behavioral reactions with external factors. Conversely, the individual reaction of the animal is largely dictated by genetic factors. This primarily pertains to the duration of the body's life cycle, including feeding, water consumption, functional activity, and periods of sleep. Such types of functional activity primarily stem from innate instincts. Moreover, the extent to which these instincts align with the conditions of the new habitat depends on the adaptive properties of the animal. Consequently, it can be asserted that the greater the contribution made by physiological and behavioral reactions to the rapid adaptation process, the higher the animal's adaptive potential. By effectively documenting specific animal behaviors, we can assess the degree of their behavioral adaptation. Within the context at hand, practical interest lies in the animal's functions such as activity, sleep, feeding, water consumption, and movement (Kazhgaliyev 2016; Shevkhuzhev 2012).



2. Materials and Methods

The research work was conducted at "Zholdasbay-Agro" farm, situated in the village of Kishkenekol, Ualikhan District, North Kazakhstan region, which currently specializes in breeding imported Aberdeen Angus breeds from Canada and Europe.



Figure 1 Calf of the third generation of the Aberdeen-Angus breed in the "Zholdasbay-Agro" farm.

The formation of experimental animal groups followed the approach of balanced similar groups, taking into consideration the indicators outlined in the methods proposed by A. I. Ovsyannikov and P. I. Viktorov. In other words, heifers of the second generation in Kazakhstan, born from European and Canadian breeding animals imported from abroad, were grouped, and their third-generation offspring were included in the study ($n=15$).

Ethological indicators of the experimental animals were examined utilizing the methodology developed by V. I. Velikzhanin, employing visual observation and timing of behavioral elements throughout the day. Behaviors such as lying down, standing, water consumption with feed, and movement were duly recorded.

The data obtained during the study were subjected to statistical analysis using the Microsoft Office Excel computer program (Shakirov 2023).

The third generation offspring of Aberdeen Angus cattle, selected from Canadian and European (Irish) bloodlines, bred in the North Kazakhstan region, served as the subject of this study (Figure 1).

To accomplish the research goals and objectives, various zootechnical, timekeeping, and clinic-physiological research methods were employed.

3. Results and Discussion

The research work was conducted at "Zholdasbay-Agro" farm, situated in the favorable natural and economic conditions of the northern forest-steppe zone, ideal for breeding beef cattle.

To assess the animals' behavior during the adaptation period, their behavioral changes were monitored continuously using the method of daily observation. Behavioral changes were recorded at 30-minute intervals. As per the methodology, the duration of lying down, standing, feeding and water consumption, as well as movement, specifically walking, were documented. The obtained control results are presented in Table 1. It is worth mentioning that the adapted animals spent more than 33.2 minutes on feed intake.

Table 1 Behavioral changes in second generation heifers.

Behavior indicator	European($n=15$)		Canadian ($n=15$)	
	Duration (min)	Share of hours per day (%)	Duration (min)	Share of hours per day (%)
Feed consumption, minutes	329.8 ± 8.3	22.8	$363.0 \pm 10.3^{***}$	25.2
Rest, all	1049.8 ± 25.5	73.0	1020.6 ± 21.4	70.8
including: standing, minutes	394.4 ± 15.7	37.4	367.0 ± 16.5	35.7
Lying down, minutes	662.5 ± 17.3	62.3	655.4 ± 14.9	63.0
Ruminants, minutes	410.7 ± 8.3	38.9	420.3 ± 9.8	41.1
Activity, minutes	46.8 ± 1.7	3.2	$43.1 \pm 2.6^*$	3.0
Drinking water, minutes	9.1 ± 0.18	0.58	11.1 ± 0.21	0.78

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$

Based on the findings from studying the behavior of the second-generation livestock, it was observed that Canadian heifers dedicated more time to feeding.

Specifically, Canadian heifers allocated 33.2 minutes or 2.2% ($p < 0.001$) more time to feeding compared to their European counterparts. Similar disparities were noted in the time spent on rumination. In terms of water consumption, Canadian

heifers also demonstrated a 2-minute or 0.6% advantage. This discrepancy is likely due to their higher daily feed intake.

The maximum time spent on feeding reached up to an hour and a half. All groups of animals quickly adapted to the new daily feeding routine, including feed distribution and manure collection times, as well as grazing time during the summer. Throughout the day, the animals rested frequently, with at least ten to fifteen periods of rest.

Based on the data presented in Table 1, the European heifers exhibited the lowest level of adaptation. They had prolonged lying periods (662 minutes), reduced movement, and consumed less feed (46.8 minutes). Additionally, the activity level of Canadian heifers was 3.7 minutes lower than that of the European selection. This suggests that animals from Canadian selection demonstrate rapid adaptability to the cold climatic conditions of the North Kazakhstan region.

Consequently, in this study examining the adaptability and productivity of second-generation Aberdeen Angus cattle imported from abroad to Kazakhstan, the ethology of both the mother and the resulting offspring was investigated to evaluate their maternal qualities. Specifically, this research section focuses on the birthing process of cows, the maternal instinct of the cows towards their calves, and the instinct of the calves towards their mothers (Kazhgaliyev 2019).

The ethology of the second-generation cows and their offspring, bred at this farm, is presented in Table 2. Overall, concerning the Aberdeen Angus breed, it was observed that cows actively moved in front of their calves, often in a sideways manner. The calving process within the herd was effortless, and the cows displayed a well-developed maternal instinct towards their offspring.

Table 2 Ethology of the cow and calves at birth and after birth.

Indicators	European selection	Canadian selection
Condition of cows before calving	active	active
Calving duration, minutes	157.0 ±1.78	152.0 ±2.10
Easy or difficult calving process	easy	easy
Cow's calflicking, minutes	16.0 ±0.30*	12.0 ±0.70
Time for the calf to get back on its feet, minutes	54.0 ±2.50*	41.0 ±3.60
Time to find the mother's breast, minutes	74.0 ±8.20*	67.0 ±7.70
Frequency of feeding for 1 day, times	4-5	4-5
Movement of the calf, fast and slow	fast-26 slow-4	fast-27 slow-3
Weight of newborn calves, kg	21.9±2.2	23.8±1.7

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$

The time when a calf is able to stand up is a crucial indicator that reflects its condition after birth. A shorter duration of this indicator is considered more favorable.

During the study, it was observed that calves born from Canadian cows exhibited a rapid ability to stand firmly on their feet and legs, with an average duration of 41.0 ± 1.60 minutes. This duration is 11.7% higher than that of calves

born from European cows. Furthermore, Canadian calves also displayed a shorter time to find their mother's breast, with an average duration of 68.0 ± 7.70 minutes (Titanov 2023).

Another significant productive indicator that characterizes the behavior of both mothers and calves is the amount of colostrum consumed during the first day. The ethology of one-week-old calves is presented in Table 3.

Table 3 Ethology of calf during the first week of life (n=30).

Group	Period duration, days	Behavioral response, minutes			
		lying	standing	walking	udder sucking
Canadian	The first day	968	192	73	75
	%	71.17	13.2	5.5	5.3
	The third day	956	210	81	78
	%	70.33	15.28	5.83	5.56
	The sixth day	947	234	74	83
	%	72.7	16.25	5.14	5.90
European	The first day	982	208	80	70
	%	75.14	14.44	5.56	4.86
	The third day	974	213	80	76
	%	74.58	14.58	5.56	5.28
	The sixth day	950	232	80	78
	%	72.92	16.11	5.56	5.42

The significance of this factor stems from the fact that mothers with poor instincts do not receive crucial enzymes and proteins necessary for building immunity in the body, as the calf does not consume a sufficient amount of colostrum on the first day. In our case, both groups of cows exhibited high maternal instincts, resulting in the calves nursing from their mothers 4-5 times a day (Kazhgaliyev 2020).

Table 3 indicates that the calves of European selection had the shortest suckling time, ranging from 70 to 78 minutes. Conversely, calves from cows selected through Canadian breeding exhibited more demanding behavior, with suckling durations lasting from 75 to 83 minutes. These calves demonstrated prolonged periods of lying, extended periods of standing, increased walking, and a longer duration of suckling (Titanov 2019).

4. Conclusions

The behavior analysis of the second-generation animals revealed that Canadian heifers dedicate more time to feeding. Similar discrepancies were observed in the duration of the rumination process. Additionally, Canadian heifers consumed water for an additional two minutes.

Calves born from Canadian cows exhibited rapid attainment of firm footing, 11.7% higher than calves born from European cows. Furthermore, Canadian calves achieved contact with their mother's breasts within an average time of 68.0 minutes.

Considering these findings, it is recommended to incorporate specific maternal qualities and indicators of ethology into breeding programs aimed at enhancing the genetic potential of imported Aberdeen-Angus cattle in the challenging climatic conditions of the North Kazakhstan region. Emphasis should be placed on breeding animals selected from the Canadian stock.

Ethical considerations

Conflict of Interest

Funding

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References