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Study on the maternal instinct of Limousin cows

Svetoslav Karamfilov
Agricultural University, Department of Animal Science, 4000, Plovdiv, Bulgaria
Corresponding author: steven0531@abv.bg

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Abstract: The aim of the study was to examine the maternal instinct of 422 Limousin cows reared in 4 farms in Bulgaria. It comprised the period from 2020 to 2024. The cows included were from their first to their seventh lactation and had different origin in terms of country of birth - Bulgaria, France, Austria and Luxemburg. The animals were extensively farmed. The calvings were group ones on the pasture during the spring season in March and April. The maternal instinct was analysed by means of evaluation following a score from 1 to 5. The Limousin cows had a maternal instinct display score of 3.29 ± 0.14. They are nurturing mothers providing their calves with security, higher survival rates and help with reference to the faster pasture adaptation. The maternal instinct display was significantly influenced by the lactation number ($p<0.01$), the origin ($p<0.05$) and the sire ($p<0.05$). At their first lactation, 38% of the cows showed no anxiety when their calves were subject to manipulations. The cows exhibited a tendency to increase their maternal instinct from first towards third lactation, and afterwards the opposite trend was observed. The cows born in Luxemburg received the highest maternal behavior score, and those born in France: the lowest, with the difference being 1.82. The daughters of 40% of the bulls had scores between 3 and 4. The preferred parameter score is 3, which indicates that the cows have a strong maternal instinct and at the same time are not highly aggressive upon manipulations.

Keywords: Limousin; maternal instinct; pasture farming; bulls

INTRODUCTION

The behavior of the beef cattle and the display of maternal instinct during the suckling period has a direct influence on both the health and the survival rates of the calves as well as on the ability to wean more calves (Nevard et al., 2022). The postpartum maternal behavior in cows includes their ability to help the calf to start suckle, protect it from predators and aid it when adapting to the environment (Hoppe et al., 2008; Aitken, 2011). The maternal instinct display efficiency in cattle, can be seen namely in their calves rearing and survival, as well as the productivity in different conditions of the environment (Gonyou and Stookey, 1987; Pandey et al., 2024). The studies regarding the behavioral patterns during calving and afterwards contribute to the more effective management of the technological processes related to ensuring the humane treatment, lower stress levels and improvement of the animals' health and welfare (Galadima, 2024). The reaction in the cattle behavior is connected to physiological changes, and the major displays, the maternal behavior included, are innate instincts (Joksimović-Todorović et al., 2008). The cows with a more pronounced maternal instinct let their calves suckle more often (Lenner et al., 2021). The mother's aggression while nurturing the calf is considered a potential issue regarding the safety of the people, but at the same time, it is desired behavior upon extensive pasture breeding if protection of the calf from predators is necessary (Estévez-Moreno et al., 2021). An important and typical trait of the beef cattle is their ability to nurture their calves, and the maternal instinct is influenced by the breed, the individual and the manner of rearing (Lenner et al., 2022). One of the specialized beef breeds, which has proved its very good maternal instinct display and care

for the calf in different rearing conditions, is the Limousin (Pelmuș et al., 2023; Wisniewski and Kuczynska, 2023). In Bulgaria, the behavior related to the maternal instinct of Limousin cows is insufficiently examined. Maternal instinct is a trait of important practical importance, responsible for the well-being of maternal herds on pasture. It is associated with the economic efficiency of cows after calving adapt to the environment, healthy calves with high adaptation and survival rates. The present study aims to analyse the maternal behavior of pasture - farmed Limousin cows in the conditions of Bulgaria.

MATERIALS AND METHODS

The maternal behavior of 422 Limousin cows reared in 4 farms in Bulgaria was analysed. The study was conducted within the period 2020-2024. The cows, which were examined, were from their first to their seventh subsequent lactation and had a minimum calving age of 25 months. The cows, whose maternal instinct display, was compared had different origin (country of birth) - Bulgaria (N-272), France (N-51), Austria (N-79) and Luxemburg (N- 20). The animals were extensively pasture bred during most of the year. The majority of them calved in groups in the spring during March and April. The parturitions were on the pasture. The pastures themselves were close to the farm and the main buildings. The maternal instinct was analysed by means of an evaluation following a score from 1 to 5 in compliance with the generally accepted parameter evaluation methods in beef farming established by ICAR and the approved breeding programs in the country. During the examinations, the maternal instinct was evaluated on the basis of visual observation of the animals' behavior upon delivery and during the first 10 days post calving. Assistance during calving was provided only if necessary. The scoring included: behavior of the mother around calving; maternal care display towards the calf immediately after calving- whether the newborn was licked and simulated to suckle; adaptation of the calf to the environment and the other animals; behavior of the mother when the calf was subject to manipulations performed by a handler. The scores given upon evaluation of the parameter are to be interpreted in the following way: 1- The cow is quiet and apathetic towards the calf. It does not lick it and does not help it to suckle. The mother allows the calf to be approached by other animals, and is apathetic when a handler performs manipulations on the calf. 2- The cow is quiet, but observes its calf and is tense. It makes attempts to lick it and helps it to suckle. It also shows excitability when the calf is subject to manipulations. 3- The cow shows signs of distress and occasionally sniffs around. It licks the calf after birth, to dry it and helps it to suckle. When the calf is subject to manipulations, the mother is restless and exhibits distress. 4- The cow nervously protects its calf when approached and tries to obstruct the manipulation procedures. It is both tense and very attentive when licking its calf and helping it start to suckle; 5- The cow is aggressive and highly excitable. It licks the calf extensively and protects it from any handler or animal, who might approach it. The data were processed via analysis of variance and the linear model has the following expression: $Yijk= \mu+ Li+ Oj+ Sk+ eijk$, where: Yijk- observation vector; μ- total average constant; Ai, Tj are fixed effects of the lactation number (I=7), country of birth- origin (j=4); sire (k=10); eijk- residuals. The data were statistically processed via the program SPSS, version 21.

RESULTS AND DISCUSSION

The Limousin cows in our study were given a maternal instinct display score of 3.29 ± 0.14. The maternal instinct display was significantly ($p<0.05$), affected by the origin, the sire and the lactation number ($p<0.01$) (Table 1).

The farm did not have a significant influence on the parameter examined. The most probable reason for the aforementioned is that the farms included in the study all provided equal conditions and rearing technologies, and the calvings and the maternal instinct evaluations were both

Table 1. Influence of some parameters on the maternal instinct of Limousin cows.

Parameter	F – criteria and degree of credibility
Farm	0.493
Origin	3.409*
Lactation number	3.117**
Sire	2.371*

****p<0.001; ** p<0.01; * p<0.05*

performed on the pasture, where the conditions were also similar. In this case, the differences in the use of particular technologies in the building or the different reproduction organization cannot have any influence upon reporting significant differences. The farm had no significant influence on the parameter examined. The results were indicative of the fact that the Limousin cows are good mothers with a typical maternal instinct. They allowed the handlers to perform manipulations on the calves post parturition and at the same time, while on the pasture, they exhibited a strong instinct to protect their calves from predators and other dangers for their lives, survival rates and strengthening during the first several days after birth. In a study of an autochthonous breed on a pasture, (Estévez-Moreno et al., 2021), ascertain that the maternal aggressiveness is individual behaviour of the respective animal, related to the protection of the calf, and when it comes to handling the mother, what is important is whether the cows know the handler or not. Most of the cows from our study separated themselves from the herd, so that they give birth at quiet and peaceful place. According to (Rørvang et al., 2018), such necessity to be isolated upon calving, is connected to the necessity of the cows to be away from any disturbances during the partum and postpartum process. (Von Keyserlingk and Weary, 2007) also report such isolation prior calving on a pasture, which is a sign of a free choice upon pasture bred cattle. Other cows did not exhibit any sign of distress to deliver on the pasture or in the group. In each of the herds we observed, there were cows displaying both types of calving behavior- giving birth in the herd, or in isolation. The cows, which calved in isolation from the herd, usually hid their calves in bushes, leaving it there during the first 3-4 days before introducing it to the group. The Limousin cows are good mothers with a very strong maternal instinct. After calving, the cow starts to immediately lick its calf and encourage its attempts to suckle the colostrum. During its first days, the calf is continuously encouraged to suckle and carefully guarded on the pasture. 98% of the cows we observed, licked their calves after calving. According to (Kour et al., 2021), the mother has an inclusive social role, it teaches the calf to recognize different types of food and how to protect itself from predators. Should the calf be endangered by predators, or other external influences, its mother's behaviour is characterised by the display of defensive reactions, aggressiveness and nervousness incited by its effort to protect the new born and keep it unharmed. All these makes us draw the conclusion that the cows are caring mothers, providing their calves with safety, higher survival rates and help for the faster adaptation to the outdoor conditions.

The lactation number had a significant ($p<0.01$) influence on the maternal behaviour (Table 2). The cows at their first lactation were inexperienced in nursing a calf after delivery. However, even at that age, they displayed very good maternal approaches when nursing their calves.

A similar behavior exhibited by Braman first-calf heifers was confirmed in a study performed by Riley et al., 2004, where the age of the mother had an influence ($P<0.05$) on the calves' survival rates after birth. Most of the first-calf heifers - 62% were designated scores from 3 to 5. Within the particular lactation examined, 38% of the cows did not display any restlessness when their calves were subjected to manipulations. The mothers also did not exhibit strong excitability, when their calves were approached by people or other animals. The share of the first-calf heifers, which received scores 2 and 5 was the smallest. Such particular behavior most probably stems from the fact that the young mother is inexperienced. The cows within this category, which had

Table 2. Maternal instinct relative share in Limousin cows within the lactation number

Lactation Number	N	*Score, maternal instinct (%)*				
		1	***2***	***3***	***4***	***5***
I	95	26	12	23	26	13
II	37	19	11	11	22	38
III	47	11	6	13	30	40
IV	62	18	10	18	16	39
V	58	12	17	28	19	24
VI	48	19	23	35	8	15
VII	75	27	31	24	7	12

high scores displayed a pronounced innate maternal instinct, and those which had scores 1 and 2, demonstrated both lack of restlessness when their calves were subject to manipulations and absence of regular care for them. In a study of Hogan et al., 2022, 39% of the beef cows at their first lactation were classified as 'good' mothers, providing optimum care to their calves before, during and post parturition. As early as during their second lactation, the mothers displayed significantly stronger maternal behavior, and the cows, which had scores from 3 to 5, were 71%. When compared with the cows at their first lactation, 25% more cows at their second lactation had a score of 5, and 7% less had a score of 1. 83% of the animals observed at their third lactation had scores from 3 to 5, and more than half of them - 40%, were given a score of 5. Only 17% of the cows at this particular lactation had a maternal instinct score 1 and 2. These results come to prove that the breed is perfectly capable of raising their calves under pasture conditions. When it comes to the rearing technology, the maternal instinct display can be taken into consideration and seasonal tour calvings on the pasture may be performed. On the pasture, the mothers will ensure the survivability and the high survival rates of the calves, as well as their adaptation to the environment. We can claim that in line with reaching maturity, the Limousin cows exhibited a pronounced maternal instinct connected to aggressiveness, restlessness and excitability, when their calves are approached. All of the former reactions were displayed with caution towards the handler. 58% of the cows at their seventh lactation had a score of 1 and 2, and 19% had scores 4 and 5. When compared with the cows at their first lactation, those at their seventh, which were designated a score of 4 were 19% less, and those which had a score of 2 were 19% more. In a study of (Stěhulová et al., 2013) it has been ascertained that the beef cows adapt their maternal instinct in accordance with their own bodily and physical condition, gender and bodily condition of the offspring. The authors expressed the opinion that 'maternal styles' of maternal behavior, are created depending on the lactation number. The influence of the lactation number on the maternal qualities of the Limousin was also ascertained by (Schnaider et al, 2022; Beckman et al., 2007). There has been a tendency observed that the maternal instinct becomes stronger from the first towards third lactation, and after that it gradually diminishes. (Fig. 1).

With the increase of the lactation number, the cows gained more experience in the care for the calves and their adaptation after birth. It was observed that with the advancement of the age, the mothers became more docile towards the handlers, while at the same time, they did not overlook the dangers on the pasture and sharpened their behavioral reactions, so as to protect the calf if necessary. The older cows distinguished the dangers for the newborn more easily. They diligently cleaned the calf after its birth, helped it to start suckle and protected it in dangerous situations.

During the first days postpartum, the older cows encouraged the calf to suckle, estimated whether to socialize it in the group, or leave it alone until it got stronger. It was also observed on the pasture that groups of calves were formed and left to the safe care of one cow, while the rest of the mothers grazed. The formation of such calf 'nurseries' was also reported by (Sato et al., 1987). The cows at their third lactation had the highest maternal instinct score of 3.82 ± 1.32. The cows at their seventh lactation had scores 2.46 ± 1.28, and were the calmest and not so explicitly aggressive upon attempts of manipulations to their calves. According to (Florcke, 2013), 13,2% of the Aberdeen cows which calved on the pasture, displayed aggression upon protecting their calves, however, the younger cows (at 3 years old) could be handled more easily when compared with older ones (at 5 years old) (P<0.05). The greatest parameter variation was exhibited by the cows at their second lactation SD- 1.55, and the lowest- by the cows at their sixth lactation SD- 1.27. The score of the cows at their third lactation was 0.95 higher than that of the cows at their first lactation. The cows at their seventh and sixth lactation had similar scores for the parameter display. The animals at their seventh lactation had a score, which was 1.36 lower than that of the cows at their third lactation. Within the country of birth, the cows with different origin had a significant (p<0.05) difference in the maternal instinct display (table 3). The Limousin cows born in Luxemburg had

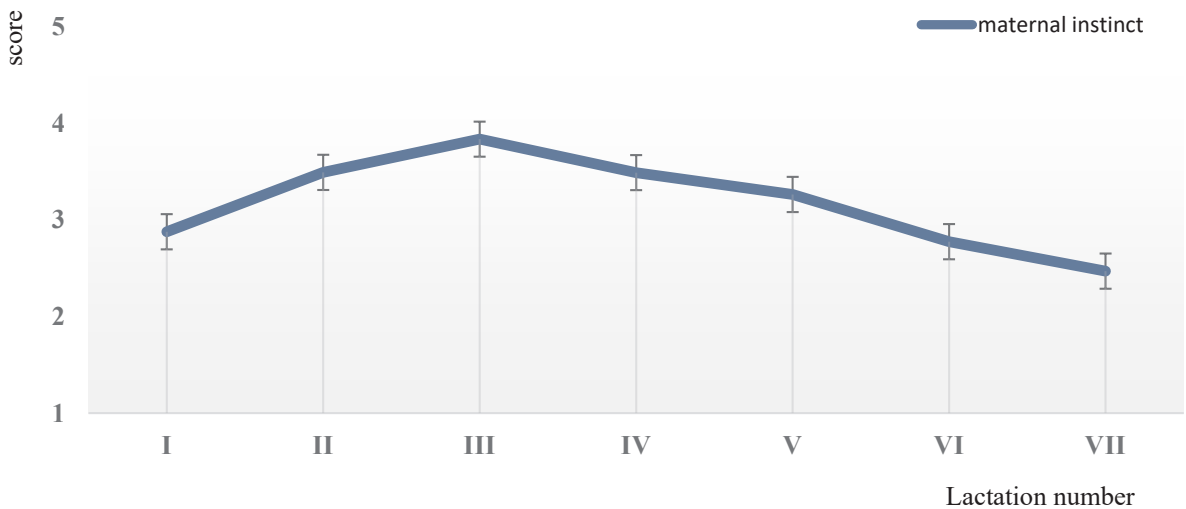

Figure 1. Maternal instinct of Limousin cows during different lactations.

Table 3. Maternal instinct of Limousin cows of different origin.

Origin	N	LS	Sx	SDev
Bulgaria	272	3.24	0.09	1.48
France	51	2.29	0.16	1.15
Austira	79	2.83	0.14	1.27
Luxemburg	20	4.11	0.23	1.02
Total	422	3.09	0.07	1.44

the highest maternal behavior score, and the cows born in France had the lowest, with the difference being 1.82.

The cows of Austrian origin had almost the same score as those, which were born in France. Perhaps this similarity within the country of birth stems from the common ancestral origin of the Austrian and the French cows. A large number of the Austiran cows had French parents in their pedigree. A significant difference ($p<0.001$) in the behavior of Aberdeen cows of different origin was also ascertained by (Kazhgaliyev et al., 2023) in Kazakhstan. The cows born in Bulgaria had a maternal qualities score, which was 0.95 higher than that of the cows born in France, and 0.87 lower than that of the cows born in Luxemburg. Our study established that the sire was a significant factor ($p<0.05$), with reference to the maternal behavior display by the daughters (Fig. 2).

The daughters of bull № 9 had the highest maternal instinct score, and the daughters of bull № 2 - the lowest. The difference in the scores of the daughters of these two bulls was 2.72. The daughters of 30% of the bulls had scores from 1 to 3. Such was the share of the bulls with daughters, who had scores above 4. The daughters of 40% of the sires had scores between 3 and 4. The lowest parameter variation (SD-0.82) was reported for the daughters of bull № 6, and the highest (SD-1.91)- for the daughters of bull № 8. Around 60% of the daughters of the sires examined were given scores between 2.5 and 3.5. This is indicative that the progeny of the bulls used had distinct maternal qualities, which were favourable for the safe and humane rearing, and at the same time suitable for protection of the calves upon extensive pasture calving conditions. (Kasimanickam et al., 2018) ascertained the influence of the sire ($p<0.05$) on the maternal behaviour of the daughters of beef cows. The reporting of the parameter and its score provide valuable data, which will complement the information available for the breeding value of the bulls and will lay the foundations of future more in depth studies on the maternal behaviour.

CONCLUSION

The Limousin cows had a maternal instinct display score of 3.29 ± 0.14. When they calve on a pasture and are reared extensively, the cows provide the calf with security. Immediately postpartum, they lick the calf, encourage it to stand and

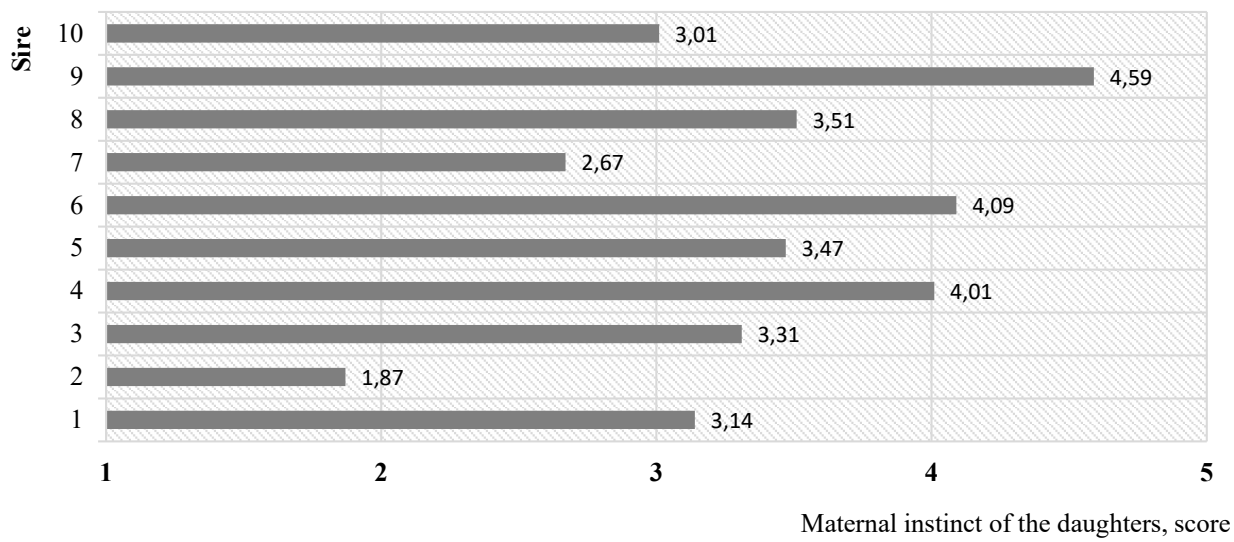

Figure 2. Influence of the sire on the maternal instinct of Limousin cows

help it to suckle. They also facilitate its faster adaptation. The lactation number ($p<0.01$), the origin such as country of birth ($p<0.05$) and the sire ($p<0.05$) had significant influence on the maternal instinct display. 38% of the cows at their first lactation experienced restlessness, when the calf was subject to manipulations. The trend observed pointed towards maternal instinct increase from first to third lactation, and afterwards it gradually diminishes. The cows born in Luxemburg had the highest maternal instinct display score, and those born in France - the lowest. The daughters of 40 % of the sires had scores between 3 and 4. The maternal instinct evaluation can complement the breeding value evaluation of the bulls used under the particular rearing conditions. The desired parameter value is 3 as the cows, which were given that score had a strong maternal instinct to protect the calf, and at the same time were not too aggressive upon handling. Maternal instinct can be used as one of the important functional traits in the selection of bulls. The trait can be introduced into breeding programs for the breed as one of the main for the selection of maternal breed and maternal qualities.

REFERENCES

Aitken, B. (2011). Predicting maternal behaviour of beef cattle using temperament tests (Doctoral dissertation, University of Saskatchewan), p. 94.

Beckman, D. W., Enns, R. M., Speidel, S. E., Brigham, B. W. & Garrick, D. J. (2007). Maternal effects on docility in Limousin cattle. *Journal of animal science*, *85*(3), 650-657.

Estévez-Moreno, L. X., Miranda-de la Lama, G. C., Villarroel, M., García, L., Abecia, J. A., Santolaria, P. & María, G. A. (2021). Revisiting cattle temperament in beef cow-calf systems: Insights from farmers' perceptions about an autochthonous breed. *Animals*, *11*(1), 82.

Florcke, C. (2013). Maternal behavior before and after parturition of red Angus beef cows and the investigation of wolf predation on livestock populations in the Northern Rocky Mountains. *Doctoral dissertation, Colorado State University*, (1), p. 3.

Galadima, A. M. (2024). The Behavior of Cattle During and After Parturition. *Periparturient Diseases of Cattle*, 29-38.

Gonyou, H. W. & Stookey, J. M. (1987). Maternal and neonatal behavior. *Veterinary Clinics of North America: Food Animal Practice*, *3*(2), 231-249.

Hogan, L. A., McGowan, M. R., Johnston, S. D., Lisle, A. T. & Schooley, K. (2022). Suckling behaviour of beef calves during the first five days postpartum. *Ruminants*, *2*(3), 321-340.

Hoppe, S., Brandt, H. R., Erhardt, G. & Gauly, M. (2008). Maternal protective behaviour of German Angus and Simmental beef cattle after parturition and its relation to production traits. *Applied Animal Behaviour Science*, *114*(3-4), 297-306.

Joksimović-Todorović, M., Hristov, S., Davidović, V., Relić, R. & Stanković, B. (2008). Most important types of cattle behavior. *Veterinarski glasnik*, *62*(3-4), 133-142.

Kasimanickam, V. R., Abdel Aziz, R. L., Williams, H. M. & Kasimanickam, R. K. (2018). Predictors of beef calf temperament at weaning and its impact on temperament at breeding and reproductive performance. *Reproduction in Domestic Animals*, *53*(2), 484-494.

Kazhgaliyev, N. Z., Titanov, Z., Ateikhan, B., Sharapatov, T. S., Gabbassov, M. B., Seiteuov, T. K. & Temirzhanova, A. A. (2023). Maternal instinct of imported meat direction cattle and ethology of their calves. *Journal of Animal Behaviour and Biometeorology*, *11*(3), 2023019. https://doi.org/10.31893/jabb.23019

Kour, H., Patison, K. P., Corbet, N. J. & Swain, D. L. (2021). Recording cattle maternal behaviour using proximity loggers and tri-axial accelerometers. *Applied Animal Behaviour Science*, *240*, 105349.

Lenner, Á., Ragán, P. & Komlósi, I. (2021). Study of changes in the strength of connection between grey cattle cows and their offspring after weaning. *Acta Agraria Debreceniensis*, 1, 129-136.

Lenner, Á., Ragán, P. & Komlósi, I. (2022). Changes in the relationship between Hungarian Grey cows (Bos primigenius taurus Hungaricus) and their calves in the period from calving to four months of age. *Acta Agraria Debreceniensis*, 1, 85-90.

Nevard, R. P., Pant, S. D., Broster, J. C., Norman, S. T. & Stephen, C. P. (2022). Maternal behavior in beef cattle: The physiology, assessment and future directions - A review. *Veterinary Sciences*, *10*(1), 10.

Pandey, D., Govil, K., Das, B. C., Ojha, B. K., Niranjan, A. K., Singh, D. & Yadav, J. S. (2024). Inherited Instincts: Unravelling the Genetic Tapestry of Cattle Behaviour. *International Journal of Bio-Resource & Stress Management*, *15*(12).

Pelmuș, R. Ș., Grosu, H., Rotar, M. C., Gras, M. A. & Van, C. (2023). Genetic parameters for growth traits of Charolais and Limousine cattle breeds. *Acta fytotechnica et zootechnica: ISSN: 1336-9245*, *26*(4).

Riley, D. G., Chase Jr, C. C., Olson, T. A., Coleman, S. W. & Hammond, A. C. (2004). Genetic and non-

genetic influences on vigor at birth and preweaning mortality of purebred and high percentage Brahman calves. *Journal of Animal Science*, *82*(6), 1581-1588.

Rørvang, M. V., Nielsen, B. L., Herskin, M. S. & Jensen, M. B. (2018). Prepartum maternal behavior of domesticated cattle: a comparison with managed, feral, and wild ungulates. *Frontiers in Veterinary Science*, 5, 45.

Sato, S., Wood-Gush, D. G. M. & Wetherill, G. (1987). Observations on creche behaviour in suckler calves. *Behavioural processes*, *15*(2-3), 333-343.

Schnaider, M. A., Heidemann, M. S., Silva, A. H. P., Taconeli, C. A. & Molento, C. F. M. (2022). Vocalization and other behaviors as indicators of emotional valence: The case of cow-calf separation and reunion in beef cattle. *Journal of Veterinary Behavior*, *49*, 28-35.

Stěhulová, I., Špinka, M., Šárová, R., Máchová, L., Kněz, R. & Firla, P. (2013). Maternal behaviour in beef cows is individually consistent and sensitive to cow body condition, calf sex and weight. *Applied Animal Behaviour Science*, *144*(3-4), 89-97.

Von Keyserlingk, M. A. & Weary, D. M. (2007). Maternal behavior in cattle. *Hormones and behavior*, *52*(1), 106-113.

Wisniewski, K. & Kuczynska, B. (2023). Comparative studies of reproductive and meat performance of the local breed of Polish red cattle against the background of the Limousine breed of Polish and French heritage. Folia Pomeranae Universitatis Technologiae Stetinensis. *Agricultura, Alimentaria, Piscaria et Zootechnica*, *68*(4), 369.

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