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Study on the temperament of cows of the Limousin cattle breed

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Abstract

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The temperament of 322 cows of the Limousin cattle breed reared in 10 farms on the territory of Bulgaria was studied. The data used comprise the period from 2017 to 2022. The animals in the study were between the age of 3 and 7 years. The temperament of cows reared under two different technologies was compared, and the influence of the age was also taken into account. The cows reared under one of the technologies were mostly pasture-bred and had no frequent interaction with people. The cows reared under the second technology were mostly kept in the farm and had frequent interaction with their handlers. An analysis of the temperament was performed, through a scoring system from 1 to 5, based on a visual assessment of the behavior during a manipulation in a cattle crush. The temperament of the Limousin cows received an average score of $3,22 \pm 0,06$. The age group, within the method of rearing, did not have a significant influence on the parameter display. There was a tendency towards a calmer temperament upon walking along a cattle alley and a crush observed with the age increase of the Limousin cows. The temperament of the cows reared in herds which had no interaction with people was evaluated with the average score of $3,43 \pm 0,11$, and that of the cows reared in an environment in which they had frequent interaction with people was assessed with an average score of $2,91 \pm 0,08$.

Keywords: Limousin; temperament; behavior; rearing; beef cattle

Introduction

The temperament of the beef cattle has an overall effect on the production expenses, the animal welfare, the effectiveness of the herd rearing, the reproduction, the maternal behavior and the meat quality (Walkom et al., 2016; Haskell et al., 2014). The method and the model of temperament assessment must be reliable, precise, cheap, and easy to apply on field (Parham et al., 2019). The visual assessment methods meet the aforementioned criteria, however, they may be subjective sometimes due to potential errors made by the observer (Curley Jr et al., 2006).

One of the main methods used in the beef cattle temperament assessment practice is performed by means of a protocol for rating the behavior upon moving through a chute, orientation towards the cattle alley and entry, reaction to the manipulation and a manner of exit from the crush (Wyatt et al., 2013; Vedovatto et al., 2021). Indexes for temperament assessment (Sant’Anna and Costa, 2013), or sensors for objective recording of the speed upon entry and exit from a crush (Vetters et al., 2013) are being used and designed. The quantitative behavioral registration (visual) protocol has a high repeatability and reliability with different appraisers, and at the same time

it is influenced by their experience (Parham et al., 2019). In the recent years there have been more in-depth studies for the purpose of beef cattle temperament phenotyping and finding the connection with the genotype, with reference to which the studies are even more insufficient (Friedrich et al., 2015). The temperament is an important parameter facilitating the cattle adaptation, their tolerance to stress and manipulations, and promoting the welfare in different environments (Parham et al., 2019; Del Campo et al., 2021; Lee et al., 2018). The influence of the temperament on the stress reactions and its effect on the productivity and the reproduction have been a subject of ongoing studies aimed at ensuring effective pasture use and producing high-quality meat (León-Llanos et al., 2022; Paredes-Sánchez et al., 2020; Jaśkowski et al., 2023). In this study, we have set ourselves the goal to analyse the temperament of different-age Limousin cows reared in Bulgaria under different rearing technologies.

Materials and Methods

The temperament of 322 cows of the Limousin cattle breed reared in 10 farms on the territory of Bulgaria was studied. The data used comprise the period from 2017 to 2022. The animals in the study were between the age of 3 and 7 years (between their first and fifth lactation, respectively). The cows subject to the assessment had a minimum calving age of over 30 months. The temperament of cows reared in two different ways was compared. The main parameter which was indicated as different in the study of the two methods of rearing was the presence or the absence of frequent interaction between animals and people during the year. The assessed cows which had frequent interaction with people were N-208 from 7 farms, and those with irregular contact were N-114 from 3 farms. During the study, the temperament was evaluated once, outside the suckling period, when there were no calves with the cows so as the display of maternal instinct to be eliminated. The temperament analysis was performed based on a scoring sys-

tem from 1 to 5, in compliance with the methods for assessment of the parameter in beef cattle established by 'ICAR' and the approved national Limousin breeding programs. The temperament assessment was performed on the basis of a visual observation of the behavior of the animals during a manipulation. The evaluation included orientation and passing through a cattle alley, entry in a crush (fixator) and reaction upon fixation as well as behavior during a manipulation and exiting the crush. The scores used to evaluate the parameter are characterised with the following meaning: 1- phlegmatic behaviour with marked calmness and slow movements; 2- excitable behaviour with faster movements and mild restlessness; 3- averagely excitable behaviour with quick movements and average restlessness; 4- strongly excitable behaviour with quick, sudden movements and high restlessness; 5- extreme excitability with unpredictable movements and sudden dashes in different directions as well as uncontrollable behaviour and restlessness. The data were processed via analysis of variance and the linear model had the following statistical expression: $Y_{ijk} = \mu + A_i + T_j + L_{ij} + e_{ij}(k)$ where Y_{ijk} -observation vector, μ - total average constant; A_i , T_j are fixed effects of the age group (5), cows at the age of respectively 3-7 years; and the method of rearing (2) with frequent and respectively infrequent human interaction; L_{ij} - random effect of the age group within the method of rearing; e - residuals. The statistical processing was performed via SPSS version 21.

Results and Discussion

In our study, we assessed the temperament of the Limousin cows with the average score of $3,22 \pm 0,06$ (fig. 1). The method of rearing ($p < 0,001$) had a significant influence on the parameter display, and the age group, within the method of rearing, did not indicate such an influence.

The cows which were most temperamental upon performance of manipulations were the three-year-old cows, while the cows at the age of six and seven years were the calmest and had developed the routine habit of passing through

a cattle alley and a crush. The tendency we observed during the temperament assessment was that with the increase of their age, the Limousin cows got a lower score. The cows from the oldest group included in our study had a temperament score which was 0.74 points lower than that of the first-calf heifers. A difference of 0.30 was observed in the parameter score of the three and four-year-old cows. There was a difference of 0.45 points within the age groups from four to seven years. We can conclude that the cows at three years old were the most temperamental ones. During the observation activities in the herds comprising animals of different ages, we ascertained that, upon manipulations, the older cows were the ones which passed through the cattle alley first and orientated better. The younger

cows lagged behind during their passing through the cattle alley. Some of the young cows orientated towards the cattle alley and the crush more calmly because they had observed the behavior of the older cows. In the cases in which the last cows to pass were mostly young animals, their orientation in the cattle alley was hindered: they circled the closure until they found the exit and when they orientated where to pass, they entered the crush and left it with accelerated movements. According to (Estévez-Moreno et al., 2021), the restless animals try to hide themselves, not to approach unfamiliar objects, or attempt to examine them after the others. The authors confirm that during manipulations, the restless animals follow the others and move more. Tolerating the passing of the older, calmer and accus-

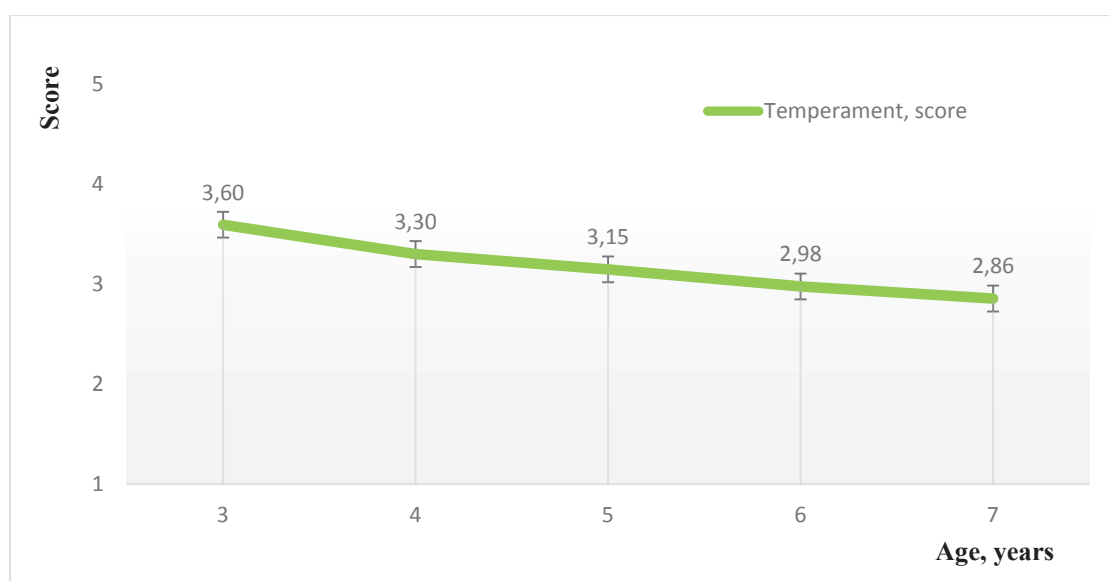


Figure 1. Temperament assessment of cows of the Limousin cattle breed aged between 3 and 7 years.

Table 1. Temperament of cows of the Limousin cattle breed within the age group. (%)

Age group	N	Temperament, score				
		1	2	3	4	5
3 years	103	5	15	32	30	18
4 years	33	8	19	34	24	15
5 years	76	5	25	39	21	10
6 years	44	14	27	32	18	9
7 years	66	16	29	37	15	3

tomed cows is probably not an appropriate approach when it comes to manipulations as this means that less experienced animals will remain the last ones which could potentially cause additional stress. According to (Fernandez-Novo et al., 2020), when reproduction biotechnologies are applied, the stress control and the provision of safe cattle alleys and chutes leads to better results. Within the separate age groups, the parameter exhibited similar variations. Around 48% of the three-year-old cows (at their first lactation) were given scores of 4 and 5 (table 1). Most animals at this age were assessed with scores 3 and 4, and a relatively low percentage of first-time heifers -20 %, received scores of 1 and 2.

During our observation, we ascertained that the group of the seven-year-old cows displayed a calmer temperament during manipulations in a crush. 45% of the animals in this category received scores of 1 and 2. The highly temperamental cows with scores of 5 were 3% which represented a 15% difference when compared with the animals which received the same score at the age of three years. The change of the temperament scores of 1 given at the age of five and six years was striking: the six-year-old cows which were given a score of 1 were 11% more. The rela-

tive share of animals which received the score of 3 remained relatively steady with reference to all age groups; it was within 32-39%. The scores change trend was observed mostly between the scores of 1 and 2 and those of 4 and 5. In this respect, the young animals which were assessed as more temperamental and highly excitable upon manipulation were more than the older cows which were assessed as more phlegmatic and calm. Overall, this change may be explained with the age group. Almost the same number of five-year-old cows were assessed with a score of 2 and a score of 4. A similarity could also be observed with reference to the cows aged five, six and seven years which were given a score of 2, awarded to the animals which are relatively calm upon procedures performed in a crush. (Vitorino et al., 2023) also reported a result analogous to ours by ascertaining that when compared with the young, the older animals leave the crush more calmly and are more docile when approached and during manipulations performed by people. However, we observed a different reaction and display of the parameter when we compared animals which were reared differently (fig. 2). During our study, we ascertained that the cows which were reared under a technology involving

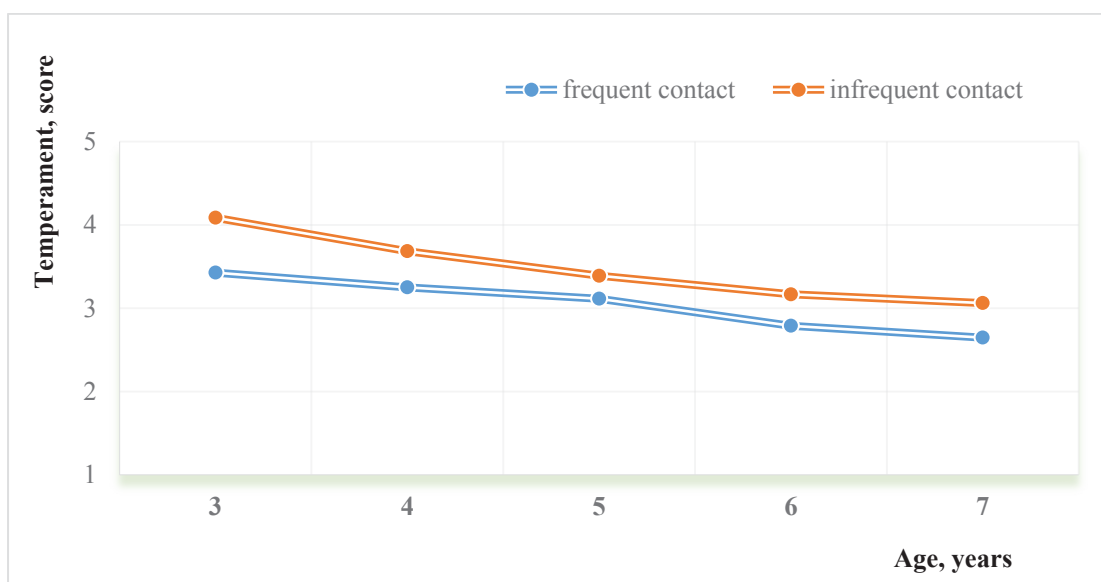


Figure 2. Temperament assessment of cows of the Limousin cattle breed aged between 3 and 7 years reared differently.

frequent interaction with people and machines as well as more frequent manipulations were assessed with an average score of $2,91 \pm 1,12$.

The temperament of the cows which were reared in herds which had no frequent contact with people was awarded an average score of $3,43 \pm 0,11$. According to (Alvarenga et al., 2023), the temperament in cows exhibits high heritability and repetition but also age differences. The authors consider that the complex features of the temperament are influenced by the respective rearing technology and that the animals chosen for selection purposes should be such which are easily trained due to their sufficient behavioral flexibility. Of the animals of all age groups observed in our study, those reared in the farm which were handled daily and had a frequent contact with people, showed a calmer temperament during manipulations requiring orientation in a cattle alley, passing through a chute, reaction in a crush and leaving it. The young 3-year-old animals reared in frequent contact with people and more frequent manipulations had a temperament score which was 0,66 lower than that of the cows reared without frequent contact with people. The score of the four- and seven-years old pasture-reared cows which had no frequent contact with people was 0,43 higher. Upon assessment of the

parameter in five-year-old animals, we reported almost similar results for both methods of rearing. The production scheme might have a direct effect on the behavior and the temperament of the beef cattle (Martin et al., 2021). Larger variation in the temperament scores was observed with reference to the animals reared with no frequent contact with people and this applied to all age groups. The largest variation in the parameter display with reference to rearing with infrequent contact with people was reported for the young animals aged three and four years. When it came to the animals reared under frequent contact with people, a larger variation in the parameter display was reported for the age group of six and seven years. Overall, irrespective of the method of their rearing, the majority of the animals were given a score of 3 (fig. 3).

The Limousin cows which were reared in farms with permanent access to handlers were assessed as calmer and more easily orientating in a cattle alley when compared with the animals which were reared upon infrequent contact with people. According to (Ceballos et al., 2016), the rotation rearing in cattle, combining pasture and barn rearing, facilitates the achievement of a calmer temperament during manipulations. When we assessed the rearing technol-

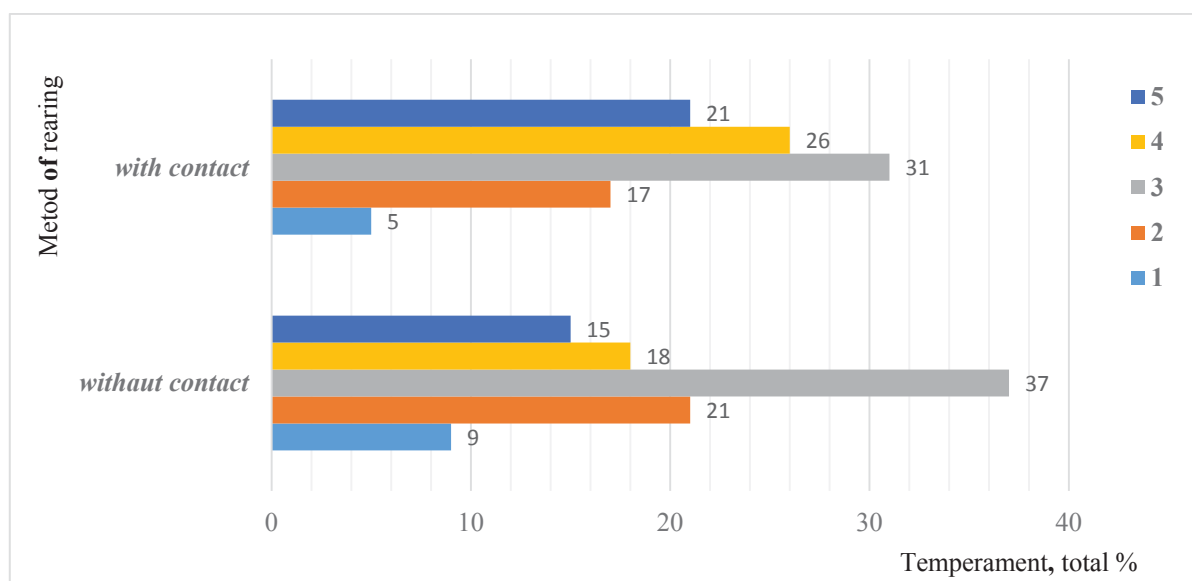


Figure 3. Assessment of the temperament of cows of the Limousin cattle breed reared in different ways.

ogy allowing daily interaction with handlers and more frequent manipulations, we evaluated 6% more animals with a score 1 and 8% more animals with a score of 2. It was observed that upon infrequent or lacking interaction, the animals registered with scores 4 and 5 were 4% more when compared with the evaluated cows which had frequent interaction with the handlers in the farm. When the cows were reared in the farm all year round or when the pastures were in close proximity, the animals got accustomed to manipulations, passing through alleys and orientation towards an exit or a particular direction more quickly. Prior the orientation in the alley towards the crush, it was ascertained that the temperamental cows evaluated with the scores of 4 and 5 found it more difficult to orientate and find the entrance of the cattle alley. At the same time, if they were in the alley, they were trying to leave it before entering the crush. This led to extra stress and their behaviour disturbed the rest of the animals in the group or in the alley leading to the crush. The building technology as well as the method of rearing can be connected with the temperament of the animals. The authors share the opinion that calmer animals are preferred when it comes to rearing under any technology due to the fact that the more restless animals have poorer health, lower milk yield, lower meat quality and reproduction problems (Jaśkowski et al., 2023). Not all animals which were evaluated with scores 4 and 5 because they were highly temperamental during the performance of manipulations were such in the herd when they were on the pasture or in the farm. The method of rearing had a significant

influence ($p < 0.001$) on the temperament of the Limousin cows (table 2).

The age group, within a different method of rearing, did not have a significant influence on the parameter examined. (Littlejohn et al., 2018), ascertained that there was a significant influence ($P < 0,001$) on the temperament of the cattle when models including age of the cows and the combination of season and year of birth were used. In another study regarding the Aberdeen Angus cows, (White et al., 2016) reported that the temperament correlates negatively with the age ($r = -0,14$, $P < 0,01$), and similarly to our results, theirs also indicated that the older animals usually had a calmer temperament.

Conclusion

The temperament of the Limousin cows reared in Bulgaria is evaluated with the average score of $3,22 \pm 0,06$. The method of rearing has a significant influence ($p < 0.001$) on the parameter display. The age group, within a different method of rearing, does not have a significant influence on the parameter examined. There is a trend observed indicating that with the advancement of their age, the Limousin cows show calmer temperament upon manipulations related to passing through an alley and fixation in a crush. The temperament of the cows reared in herds which have no frequent interaction with handlers is evaluated with the average score of $3,43 \pm 0,11$ and that of the cows reared with frequent interaction with handlers is evaluated with the average score of $2,91 \pm 0,08$.

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Table 2. Influence of some factors on the temperament of cows from the Limousin cattle breed.

№	Factor	Temperament
1	Method of rearing	14.316 ***
2	Age, years	2.869 *
3	Age, years* Method of rearing	1.844

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

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