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EFFECT OF SELF-WILLED CROWDING PERIOD ON STALL POSITION AND PERFORMANCE IN CZECH FLECKVIEH CATTLE

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Abstract

The aim of this research was to investigate cow's behaviour during crowding period and its influence on daily milk yield (DMY). Cows were self-willed crowded probably as a result of arthropod ectoparasites infestation and high summer temperatures. In this research 18 cows were divided in two groups based on the previous 5-day-observation of stall position. Our hypothesis was that the cows more frequently standing in feeding fence (FF) are higher ranked than those standing more frequently in dunging passage (DP). With green colour we marked 9 cows standing in feeding fence and named as GREEN group, and 9 cows standing in dunging passage with blue colour and named as BLUE group.

Cows were observed totally 3 consecutive days, from 12 midday to 16 p.m. in period of intensive crowding from August 6 to 8. Attendance of GREEN and BLUE groups in both parts was estimated 24 times (2 observations/hour). Cows were monitored by two network cameras of VIVOTEK technology. In this research it was found that GREEN cows spend more time in FF part, totally 57.5% compared to 42.5%. In BLUE group so high difference in attendance in FF or DP part was not found, but attendance in DP part was slightly higher (54.2% compared to 45.8%). GREEN group had the same milk production as another group (27.48 kg compared to 22.61 kg, $p>0,1281$).

Introduction

The intensification of animal production systems has resulted in groups of animals living in close proximity to each other and often competing for limited resources. Social competition between animals is often thought to be regulated primarily by dominance relationships (*Drews, 1993*).



Studies of social behaviour among intensively housed domestic animals often emphasize social competition and social dominance. However, sociality is an adaptive strategy evolved in many species of animals since it provides both benefits and disadvantages (*Boissy et al.*, 2007).

The concept of social dominance can be defined as ‘a priority of access to an approach situation (e.g. food) or away from an avoidance situation (e.g. frightening or painful condition/environment) that one animal has over another’ (*van Kreveld*, 1970; *Drews*, 1993). One position in society is established by regular communication used to maintain status and assess environmental changes (*Philips*, 2002).

The severity of stable fly infestation in dairies has been related to climatic factors that increase and decrease fly population throughout the season (*Kunz*, 1995; *Cruz-Vázquez et al.*, 2004; *Mullens and Peterson*, 2005).

Infestations of arthropod ectoparasites and heat stress have similar physiological effects on grazing cattle (*Frisch and Vercoe*, 1991; *Weiman et al.*, 1992).

Falta et al. (2009) found that high summer temperatures could affect daily milk yield (DMY) in dairy cows kept in free-stall barns.

Cows were self-willed crowded probably as a result of arthropod ectoparasites infestation and high summer temperatures (*Picture 1-2*).

The aim of this research was to investigate cow’s behaviour during crowding period and its influence on DMY.

Material and methods

Animals, cowshed and hypothesis. This study was carried out on a Czech Fleckvieh cattle farm, in South-Moravian Region of Czech Republic (49°12’32.4”N, 16°23’42.8”E, altitude 350 m). In the experimental barn there were stabled almost 400 dairy cows divided into four groups (about 100 heads per groups). It’s a modern free-stall type of barn. The experimental group (quarter) of cows (n= 98±2) was placed in 103 cubicles aligned in three lines on the south-east part of barn. Cows were littered on solid separated manure partly mixed with straw. In study quarter there was approximately 6 m² living space per cow. Animals were fed with TMR (total mixed ration) ad libitum, extended 5 times a day. Fodder was portioned two times per day at about 04:30 a.m. and 04:00 p.m. Cows had continual access to water.

In this research 18 cows were divided in two groups, based on the previous 5-day-observation of stall position. 9 cows standing in feeding fence were marked with green colour and named as GREEN group, 9 cows standing more frequently in dunging passage were marked with blue colour and named as

BLUE group (*Picture 3*). Our hypothesis was that the cows more frequently standing in feeding fence (FF) are higher ranked than those standing more frequently in dunging passage (DP).



Pictures 1 and 2: Example of self-willed cow crowding in one part of the stable



Picture 3: GREEN and BLUE cows crowding

Observation period and techniques. Cows were observed totally 3 consecutive days, from 12 midday to 16 p.m. in period of intensive self-willed crowding from August 6 to 8. Attendance of GREEN and BLUE groups in both parts was estimated 24 times (2 observations/hour). Cows were monitored by two network cameras of VIVOTEK technology.

Daily Milk Yield. Data used in this study were obtained from automatic milking parlour Farmtec Technology. We assessed DMY during the 3 observation days, additionally, during the period from 18th July to 8th August, in both groups.

Statistical analyses. Data were analysed by *MS Excel* and *Statistica 8.0.* programs. The average yield was calculated using DMY data for the mentioned period. The average attendance of both GREEN



and BLUE groups of cows was calculated using behavioral data in each part. The difference of attendance from expected attendance was calculated in both parts for both GREEN and BLUE groups applying Chi-square test.

Results and discussion

In this experiment it was found that GREEN group of cows spends more time in FF part, totally 57.5% compared to 42.5% in DP part. In BLUE group there was not found any significant difference between the attendance in FF or DP part, but the appearance in DP part was slightly higher (54.2% compared to 45.8%) (*Table 1*).

Table 1: Position, attendance and DMY

Groups	Green		Blue	
	DP	FF	DP	FF
Attendance, %	42.5	57.5	54.2	45.8
Avg. DMY (3 d.), kg	27.48		22.61	

24 observations were tested by Chi-square test. It was showed in 9 of those that the percentage of appearance of BLUE group in dunging passage was significantly different to expected ($p < 0.001$) and also in 9 observations the attendance of GREEN group in FF part was significantly different as what was expected ($p < 0.001$).

Concerning average DMY in experimental period, the GREEN group reached the same milk production as the other group (27.48 kg compared to 22.61 kg, $p > 0.1281$). However, it can be confirmed linear trends of average DMY for both groups before and during experimental period (*Figure 1*).

Val-Laillet et al. (2007) found that the dominance rank influences the milk production and compared to low-ranked cows, high-ranked cows produce more milk and spend more time at the feeder.

Results suggest that more high-ranked cows were involved in GREEN group. Consequently, they were easy for approach the feeder and produced more milk. The decreasing trend in DMY detects that both group suffer from the low level of environmental conditions. Our results also indicate that some cows could suffer much more. The reasons of this could be the inadequate environmental conditions and inter-herd social relations. Herd ranking could have an important role on DMY and feed intake under extreme environmental conditions.

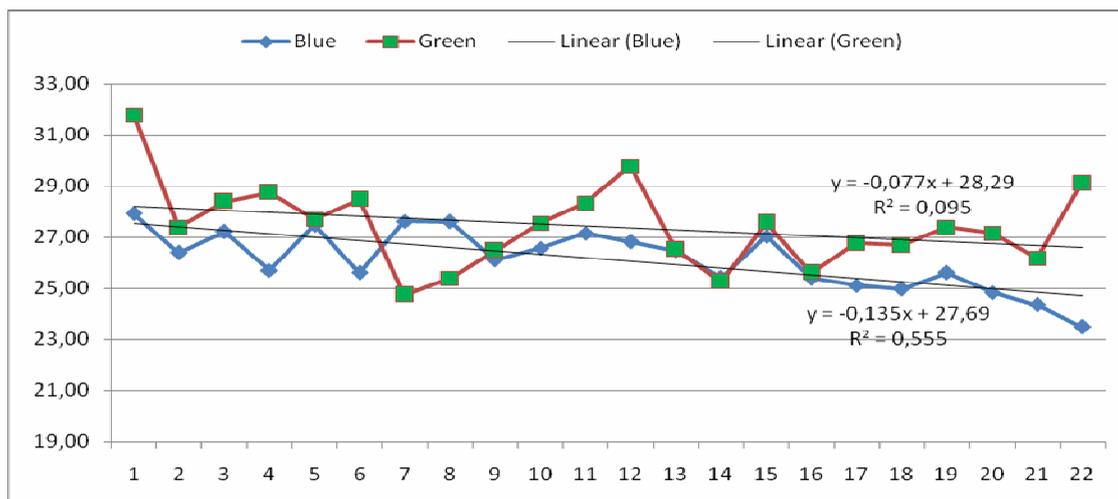


Figure 1: Trends of daily milk yield (kg) before and during experimental period (from July 18 to August 8)

Conclusions

- GREEN group of cows tended to stay for longer period at the feeder part.
- In BLUE group there was not any difference between the appearance in FF and DP part.
- GREEN group had the same daily milk yield as the BLUE group.

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Literature

Boissy, A., G. Manteuffel, M.B. Jensen, R.O. Moe, B. Spruijt, L.J. Keeling, C. Winckler, B. Forkman, I. Dimitrov, J. Langbein, M. Bakken, I. Veissier and A. Aubert (2007): Assessment of positive emotions in animals to improve their welfare, *Physiol. Behav.* 92, 375–397.



- C. Cruz-Vázquez, M.I. Vitela, P.M. Ramos and Z. García-Vázquez (2004): Influence of temperature, humidity and rainfall on field population trend of *Stomoxys calcitrans* (Diptera:Muscidae) in a semiarid climate in Mexico, *Parasitol. Latinoam.* 59, 99–103.
- Drews, C. (1993): The concept and definition of dominance in animal behaviour. *Behaviour* 125, 283–313.
- Falta, D., Erbez, M., Loukotová, J., Chládek, G. (2009): Effect of maximal micro-climatic values in stable on milk production of holstein cows on 2nd lactation. *Animal welfare, etológia és tartástechnológia*. [online]. In *Animal welfare, etológia és tartástechnológia.* 4, 59-63. URL: <http://www.animalwelfare.szie.hu/>.
- Frisch, J.E. and Vercoe, J.E. (1991): Factors affecting the utilization of nutrients by grazing beef cattle in northern Australia. Proceedings, Grazing Livestock Nutrition Conference, MP-133, 2-3, Steamboat Springs, Colorado, Volume 2. Oklahoma State University, Stillwater, OK, 198-212.
- Kunz, S.E. (1995): The influence of temperature on adult and immature stable flies. In: G.D. Thomas and S.R. Skoda, Editors, *The Stable Fly: A Pest of Humans and Domestic Animals*, Agricultural Research Division, Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln, 87–109 (MP64).
- Mullens, B.A., and Peterson, N.G. (2005): Relationships between rainfall and stable fly (Diptera:Muscidae) abundance on California dairies, *J. Med. Entomol.* 42, 705–708
- Phillips, C. (2002): *Cattle Behaviour and Welfare*, Blackwell Science Ltd.
- van Kreveld, D. (1970): A selective review of dominance-subordination relations in animals. *Genet. Psychol. Monogr.* 81, 143–173.
- Val-Laillet, D., de Passillé, A.M., Rushen, J., von Keyserlingk, M.A.G. (2007): The concept of social dominance and the social distribution of feeding-related displacements between cows, *Applied Animal Behaviour Science*, Volume 111, Issues 1-2, 158-172.
- Weiman, G.A., Campbell, J.B., Deshazer, J.A. and Berry, I.L. (1992): Effects of stable flies (Diptera: Muscidae) and heat stress on weight gain and feed efficiency of feeder cattle, *J. Econ. Entomol.* 85, 1835–1842.