MONITORING OF VITAL ACTIVITIES IN FATTENING BULLS AS AN INNOVATIVE ELEMENT OF FEEDLOTS

Jeník David, Falta Daniel, Navrátil Stanislav, Večeřa Milan, Polák Ondřej, Chládek Gustav

Mendel University of Agriculture and Forestry Brno, Faculty of Agronomy
Department of animal breeding
613 00 Brno (CZ), Zemedelska 1
xjenik@mendelu.cz

Abstract

Monitoring of vital activities of cattle is increasingly used for welfare assessment. The situation is relatively complex for growing cattle populations as the performance response is usually manifested in months and there is practically no routine opportunity to assess it rapidly. Therefore it is important to monitor vital activities and quantify their relationship with body weight gain during fattening. It can be assumed that the positive trends between the vital activity performance and welfare of the animals described in dairy cows can also be monitored in fattened bulls. There are several systems in precision livestock farming which can monitor the actual helath and activity levels of the animals. One of these is the SCR HR tag.
The experiment was carried out on 14 bulls of the Czech Fleckvieh Simmental breed and lasted 84 days. We can conclude that there was a positive relationship between vital activities (eating and rumination) and daily weight gain of bulls between age 259 and 343. Activity „eating" had an average value of 263.4 min ($s_x = \pm 46{,}2$ min, $V_x = 17.5\%$) while average „rumination" lasted 508.6 min. The value of the correlation coefficients ($r = 0.378$ for „eating" and $r = 0.336$ for „rumination") together with the high variability especially in the „eating" indicates the need for further experiments in this area.
Keywords: meat production, Czech Fleckvieh Simmental, fattening bulls, neck responders

Introduction

The monitoring of vital activities of cattle is increasingly used for welfare assessment. Most applications are focused on dairy cows reporting significant changes in their activities (heat, fitness) in the order of tens of percent. The advantage of monitoring of dair cattle is the rapid changes in milk production. For growing cattle categories the it is more complicated to assess production traits as the changes in performance is not as immediate (in the order of months) and there is practically no routine possibility to detect it rapidly. Therefore monitoring of vital activities is important for these categories and quantifying their relationship with gain bodyweight. We assumed that the positive trends between vital activities, performance and welfare of the animals described in dairy cows could also be found in fattened bulls.

Material and methodology

The experiment was carried out on Czech bovine spotted breed (n = 14) housed loosely in a pen with straw bedding and lasted 84 days, during which the weight and age of the animals at the beginning and end of the experiment were measured. The private farm where the experiment took place is located in the village of Katov (49.332693N, 16.278761E) in the district of Brno-venkov in the South Moravian Region. Also daily vital activities represented by eating (State Animal Daily Eating) and rumination (State Animal Daily Ruminatoion) were monitored with the SCR system (SCR Global, Netanya, Israel). The feed ration was composed of feed common in the area (corn silage, meadow hay, alfalfa silage, bean silage, pressed barley and wheat grain, etc.) and a mineral premix was also included. The amount was optimized for the nutrient conservation need plus for a daily gain of 1400 g and the feed ration was administered in the form of TMR. (Zeman L., 2006). The results were evaluated according to common mathematical-statistical methods in MS Excel and Unistat and multi-factorial ANOVA was used.

Results and discussion

The results of the observed vital activities (eating, rumination) and meat production are shown in Table 1. Regarding the adequacy of age and weight, we can consider that weight as common for this age. The finding corresponds to a daily weight gain of 966 g, calf average weight was 40 kg. This level of body weight gain is considered adequate in these conditions, as shown by Kvapilik et al. (2018). The results suggest that during the experiment the animals reached an average daily gain of 1.558 kg. This performance can clearly be considered to be top, but in the highly developed countries, as commonly achieved, according to Geuder et al. (2012). This high level of weight gain is clearly positive; however, carries the risk of compensatory growth as a result of lower growth rates during rearing. Regarding the monitored activities, we found that the bulls monitored chewed on average 508.6 minutes a day and spent 263.4 minutes with eating on average. While variability in eating was unambiguously highest ($s_x = \pm46.2$ min., $Vx = 17.5$ %), variability in rumination was lower ($s_x = \pm55.6$ min., $Vx = 10.9$ %) and corresponded to the variability of other parameters such as weight at the beginning or end of the experiment, or body weight gain. To evaluate the observed activities of individuals and their body weight gain, data were sorted in ascending order of activity (graphs 1 and 2). In both cases, there are positive trends where longer eating and ruminating times were associated with higher daily body weight gain. This positive trend is also supported by the weak positive correlation coefficient values of $r = 0.378$ for eating and $r = 0.336$ for ruminating.

From the practical point of view of the breeder the SRC system is applicable for growing categories of cattle, especially from the perspective of early diagnosis or prediction of upcoming health problems. For example, the system can detect. Sometimes, rapidly increased eating activity may not result in increased feed intake (length of feed intake was measured, the amount of feed received was not measured). Sick animals standing with the head down, which may be falsh positive eating behavior, though it is not. This is also revealed by the reduced rumination value.

Conclusion

We can conclude that during the intensive growth and age, there is potential for upgrading the fattening by monitoring vital activities in bulls. Positive results were found both in relationship of daily body weight gain to the monitored length of eating and to the monitored length of

ruminating. The correlation coefficients were only at an intermediate level which together with high variability especially for eating activity suggests the need for additional experimental monitoring aimed to expand our knowledge in the production system of stable fattening bulls.

Table 1: Mean values of "eating" and „rumination" activities and fattening characteristics

	Number of animal (n)	The weight at the beginning (kg / head)	Age at start (days)	The weight at the end (kg / head)	Age at the end (days)	Eating (min)	Rumi nation (min)	Weight gain (during the experiment) (kg / head day)
Total / average	14	290.4	259.1	421.3,	343.1	263.4	508.6	1.558
Sx	14	30.9	10.6	32.5	10.6	46.2	55.6	0.140
Vx (%)	14	10.6	4.1	7.7	3.1	17.5	10.9	9.000
SEM	14	8.3	2.8	8.7	2.8	12.4	14.9	0.037

Graph 1: Increase in live weight of bulls in dependence on the eating indicator
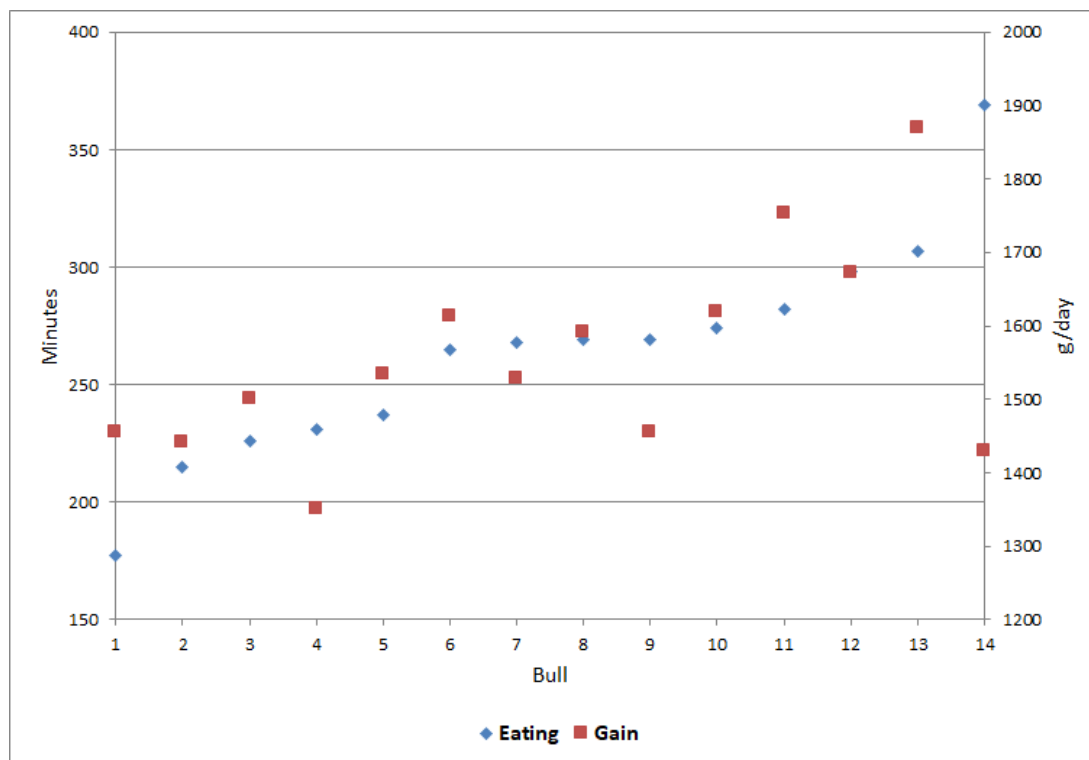
***Graph 2*: Live weight gain of bulls depending on ruminant index**
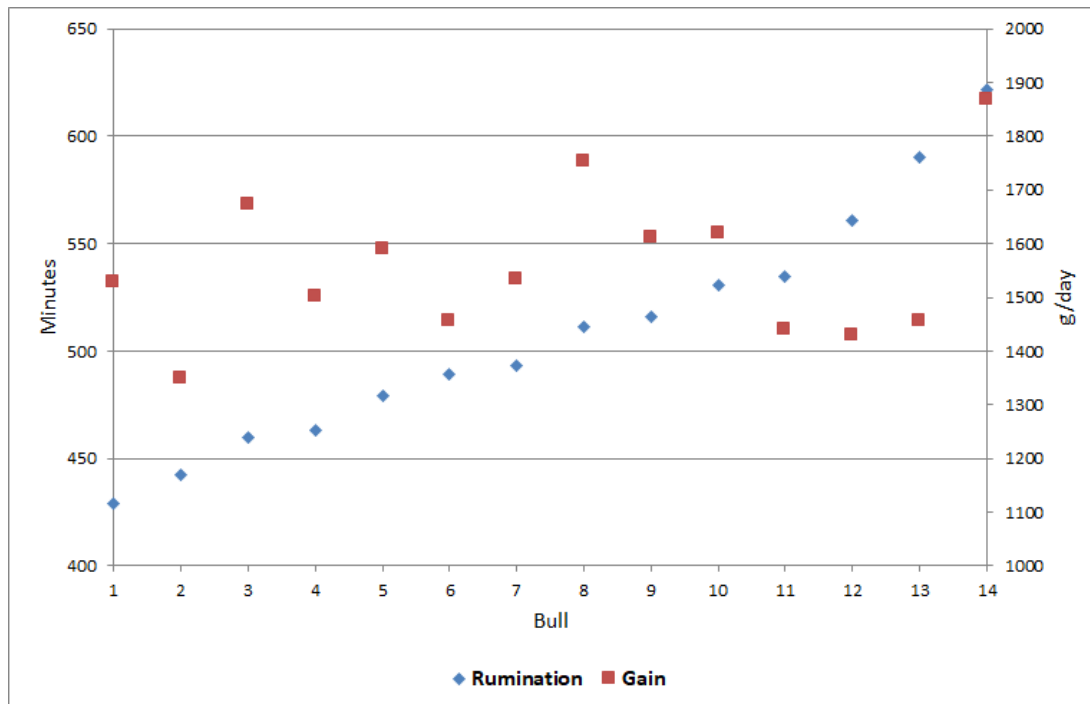
References

Beauchemin, K. A., 1991: Ingestion and mastication of feed by dairy cattle. Veterinary Clinic of North America - Food Animal Practice, 7. 2. 439-463.

Brehme, U., Stollberg, U., Holz, R., Schleusener, T., 2008: ALT pedometer- A new sensor-aided measurement system for improvement in oestrus detection. Computers and Electronics in Agriculture, 62. 1. 73-80.

Couderc, J. J., Rearte, D. H., Schroeder, G. F., Ronchi, J. I., Santini, F. J., 2006: Silage chop length and hay supplementation on milk yield, chewing activity, and ruminal digestion by dairy cows. Journal of Dairy Science, 89. 9. 3599-3608.

De Ondarza, M. B., 2015: Prežúvanie je oknom k zdraviu kravy. *Slovenská hoštajnská asociácia - Maxi info*, August, 18-19.

Doležal O. ed.,1996, Technologie a technika chovu skotu, Praha: SCHČSS, 184 s.

Du-Ming, T., Ching-Ying, H., 2014: A motion and image analysis method for automatic detection of estrus and mating behavior in cattle. Computers and Electronics Agriculture, 104. 25-31.

Geuder, U., Pickl, M., Scheidler, M., Schuster, M., Götz, K.-U. 2012. Mast-, Schlachtleistung und Fleischqualität bayerischer Rinderrassen. Züchtungskunde. 84. 6. 485–499.

Grafenau, P., Pivko, J., Grafenau P. 2005: Starostlivosť netreba nechávať na náhodu. Slovenský chov, 10. 10. 46-47.

Chládek, G., Falta, D.: Beef performance of Holstein calves slaughtered at 300 kg of live weight. Acta univ. agric. et silvic. Mendel. Brun., 54. 4. 13-20.

Chládek, G., Ingr, I.: Meat production and quality of Holstein bulls fattened to 405 – 480 kg of live weight. Czech J. Anim. Sci., 46. 8. 370-374.

Chládek, G., Soutor, J., Ingr, I., Krása, A.: Meat Efficiency of bullocks of the Black Pied breed Fattened to a lower slaughter weight. Czech J.Anim.Sci., 43. 10. 537-540.

Kvapilík J. ed., 2017, Ročenka „Chov skotu v České republice, Hlavní výsledky a ukazatele za rok 2017, Praha 2018, 91s.

Matsui, K., Okubo, T., 1991: A method for quantifi cation of jaw movements suitable for use on free ranging cattle. Applied Animal Behaviour Science, 32. 2-3. 107-116..

Soriani, N., Trevisi, E., Calamari, L., 2012: Relationships between rumination time, metabolic conditions, and health status in dairy cows during the transition period. Journal of Dairy Science, 90. 12. 4544-4554.

Strapák, P., Tančin, V., Vavrišínová, K., Graneu, P., Bulla, J., Chrenek, P., Šimko, M., Juráček, M., Polák, P., Ryba Š., Juhás, P., Huba, J., Krupová, Z., 2013: Chov hovädzieho dobytka. 1. vyd. Nitra: Slovenská poľnohospodárska univerzita. 607 s. ISBN 978-80-552-0994-4.

Zeman, L.Výživa a krmení hospodářských zvířat. Praha: Profi Press, c2006. ISBN 80-86726-17-7.