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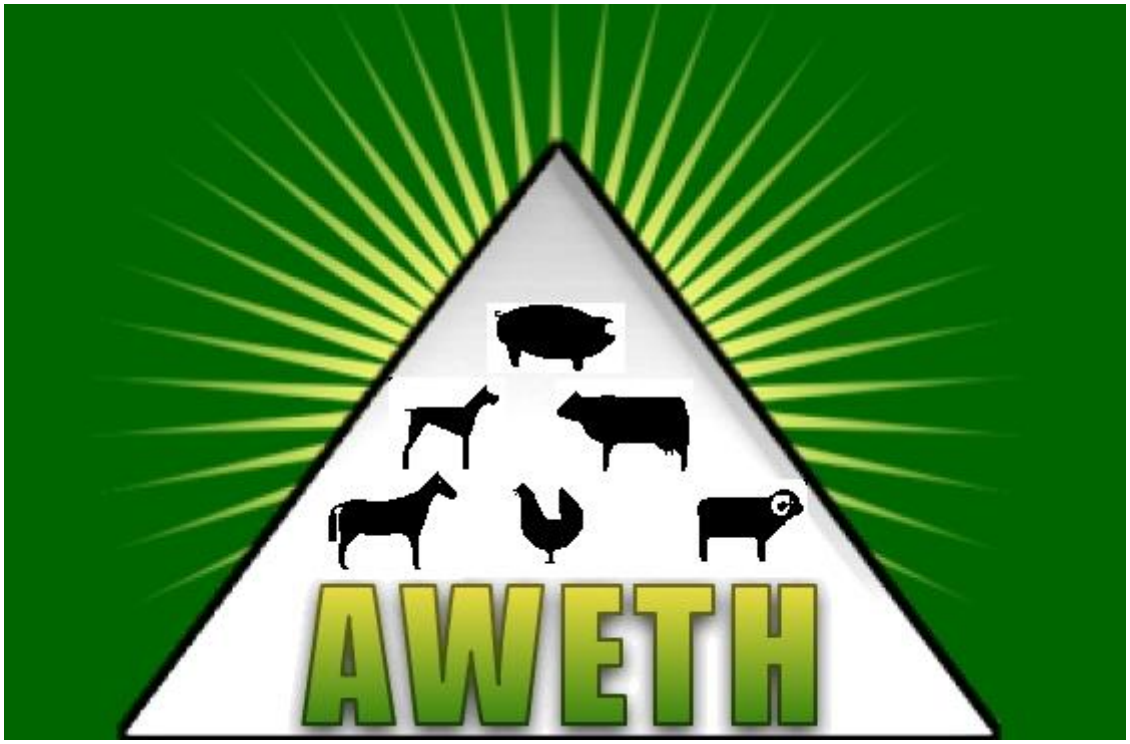

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GROWTH DYNAMICS OF YOUNG FATTENED BULLS MEASURED BY NON-STRESS METHODS AT THE COMMERCIAL FEEDLOT

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Abstract

The experiment aimed to evaluate the growth ability of Czech Fleckvieh Simmental bulls at the beginning of fattening in the conditions of a modern commercial stable on a private farm. A total of 40 bulls were included in the experiment, which were moved to the stable at the age of 2 months, and the measurements were carried out up to 8 months of age. The bulls were measured at regular intervals of 14 days using a device that eliminates the stress of the animals and thereby increases their welfare. The measurement was carried out using a non-stress device, the live weight of the animals and the withers height were recorded. The net weight gain was determined from the measured data, which reached an average of 1.14 kg/day during the entire experiment. In addition, the growth curve was evaluated using the measured values of live weight and height at withers. The animals at 60 days had an average weight of 106 kg and a height at withers of 86.3 cm. At 120 days, the average weight was 167.3 kg and the height was 95.3 cm. At the age of 210 days, the average weight of the bulls was 283.6 kg and the height was 109.7 cm. The correlation coefficients between measured live weight and height at withers was 0.94 ($p<0.05$) and between live weight and daily weight gain was 0.35 ($p<0.05$).
Keywords: Czech Fleckvieh Simmental, bull, fattening, non-stress method, withers height, feedlot

Introduction

Czech Fleckvieh Simmental as a dual-purpose cattle breed, is valued not only for its relatively high milk yield with a breeding target of 7.500-8.500 kg milk for an adult cow but also excels in its beef production, where the breeding target for fattened bulls is 1.300 g and higher with slaughter yield 57–59% (*Czech Fleckvieh Assoc.*, 2022). The main indicator of meat production is growth during the fattening period. Growth ability is characterized primarily by daily weight gain, which has been proven to be one of the most significant influences on the profitability of cattle fattening (*Syrůček et al*. 2017). For comparison, we can use as an example the most common dairy breed, which is Holstein cattle, where a daily gain of around 1094 g was determined for bulls up to 412 days of age (*Chládek et al.* 2011), while the Czech Fleckvieh Simmental reached 1.558 g/day gain according to a previous experiment (*Jeník et al*. 2020). This comparison shows the suitability of Simmental breed for both milk and meat production under certain conditions and farming systems, where profit is made not only by the sale of milk but by the secondary production such as fattening and the subsequent sale of beef.

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The growth ability is influenced by several factors, such as breed, genetic predisposition (*Pesonen et al*. 2015), nutrition (*Funnell*, 2015) and microclimatic conditions. In addition, the biggest problems faced by cattle breeders are too low slaughter weight and the use of feeding systems that are not suitable for utilizing the fattening capacity of animals, with negative consequences for the quality of carcasses and meat (*Basarab et al*. 2007; *Węglarz*, 2010). The slaughtering age is also an important factor. Daily weight gains can be visualized by a growth curve. Uneven weight gains during fattening are described in the work of *Chládek et al.* (2011) when they observed fluctuations in daily gains at the end of the fattening period in Czech Fleckvieh Simmental cattle, which subsequently caused large economic losses for breeders.

Differences in growth ability necessarily exist between breeds, but also between individuals of the same breed, which highlights the influence of body size on slaughter age and slaughter weight (*Mazzucco et al*. 2016). It can be deduced from this that the length of fattening significantly affects the growth parameters and the quality of carcass. This statement is also supported by the work of *Ustuner et al.* (2020), who confirmed that both initial weight at the beginning of fattening and timing of the end of the fattening period is important in the final efficiency of meat production. As stated by *Filipčík et al.* (2020), on average, Czech Fleckvieh Simmental bulls are fattened up to 646 days of age. Given the constant advances in cattle genetics, it is necessary to periodically recalculate the genetic parameters (*Svitáková et al*. 2014). The next step to intensify and increase the efficiency of fattening is to monitor the vital signs of animals using automatic systems (e.g. neck responder), which greatly facilitate herd management. This is very important for today's cattle breeds, which focus on highly intensive production, thus require constant care and monitoring of health and welfare (*Chládek et al*. 2006, *Jeník et al*. 2020)

Materials and Methods

The experiment took place on a private farm in Katov (468 m above sea level), South Moravian Region, Czech Republic (49°19.914811'N,16°16.568953'E), specifically in a newly built commercial feedlot with the capacity of 300 individuals.

Measurements were carried out on 40 young Czech Fleckvieh Simmental bulls, which were housed freely in a pen with deep bedding (straw). The live weight and height at withers were measured every 14 days between 33 and 272 days of age using a non-stress method, the Agroninja system. The weight at birth was determined to be 33.29 kg. (*Bene et al*. 2013). The animals were fed ad libitum with mixed feed ration two times a day. Feed was regularly got out every hour using an automatic feed distributor from Lely. Composition of the feed ration is long-term set to an average daily gain of 1.5 kg/day and is compiled and checked by the farm's independent nutritionist. Main components of the feed ration are maize silage, grass haylage, alfalfa haylage, hay, straw, grain fodder and mineral mixture.

From the measured values, the average daily gain was subsequently calculated and the growth was evaluated, which was influenced by two indicators. The first indicator was changes in live weight and the second indicator was represented by changes in height at withers. The data were processed in MS Excel. The software Statistica 14. was used to perform the statistical analysis: one-way ANOVA (post hoc analysis using the Tukey test) and Pearson correlation test. The differences between means were considered statistically significant at $p<0.05$.

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Results

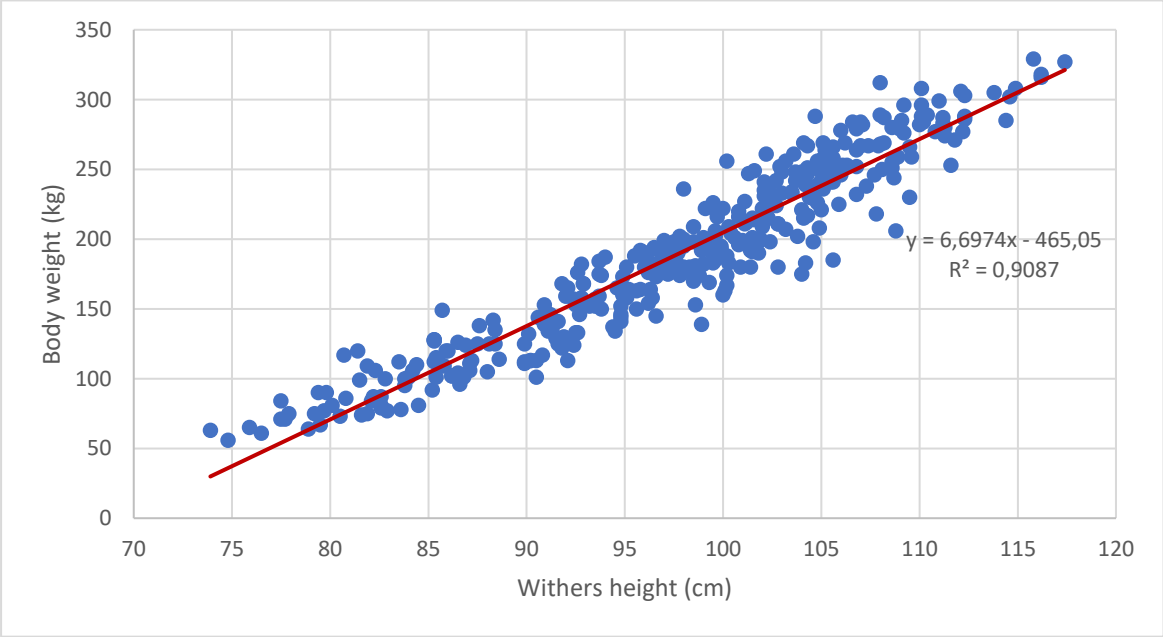
The average weight of the bulls was 196.73 kg (standard error of the mean, SEM, 3.82 kg), the average height at withers was 98.86 cm (SEM 0.52 cm) and the average daily gain was 1.14 kg/day (SEM 0.01 kg). Measurements using the Agroninja device were carried out at an average distance of 3.23 m, a minimum distance was 2.48 m and a maximum of 6.65 m. The average age of the animals was 142.86 days (SEM 3.03 days).

***Table 1*: Pearson correlation coefficients among observed traits**

	Body weight (kg)	Withers height (cm)	Average daily gain (kg/day)	Age (days)
Body weight (kg)	1.0000	0.9396	0.3446	0.9311
Withers height (cm)		1.0000	0.3466	0.8898
Average daily gain (kg/day)			1.0000	0.0062
Age (days)				1.0000

The correlation between the estimated weight of the bulls and the estimated height at withers was 0.94. The strong correlation is also confirmed by *Figure 1*, where the regression relationship between live weight and height at withers is shown. The weight of bulls can be predicted based on the height of the withers. If the height at withers increases by 1 cm, the average live weight increases by 6.70 kg. A strong correlation was also observed between age and live weight and between age and height at withers. On the contrary, there was a low correlation (0.35) between average daily gain and both estimated traits, height at withers and live weight of bulls.

***Figure 1*: The linear relationship of body weight to withers height**



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Figures 2, 3 and 4 show the effect of age on live weight, height at withers and average daily gain. For this purpose, bulls were divided into 9 age categories, so that there were bulls with age of +/-5 days in each category, and individual bulls appeared only once in each category. The average daily gain between the age categories did not differ significantly in neither case. The highest daily gain (1.19 kg/day) was recorded in the age category of 100 days, and on the contrary, the lowest (1.07 kg/day) was at 140 days. Bulls in the lowest and highest age categories achieved almost the same increase (1.18 kg/day).

***Figure 2*: Influence of age category on average daily gain**

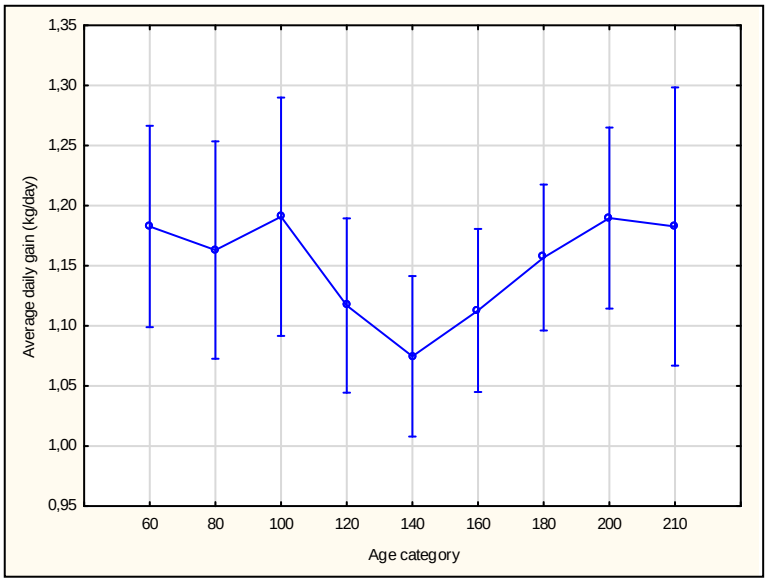

***Figure 3*: Influence of age category on withers height**

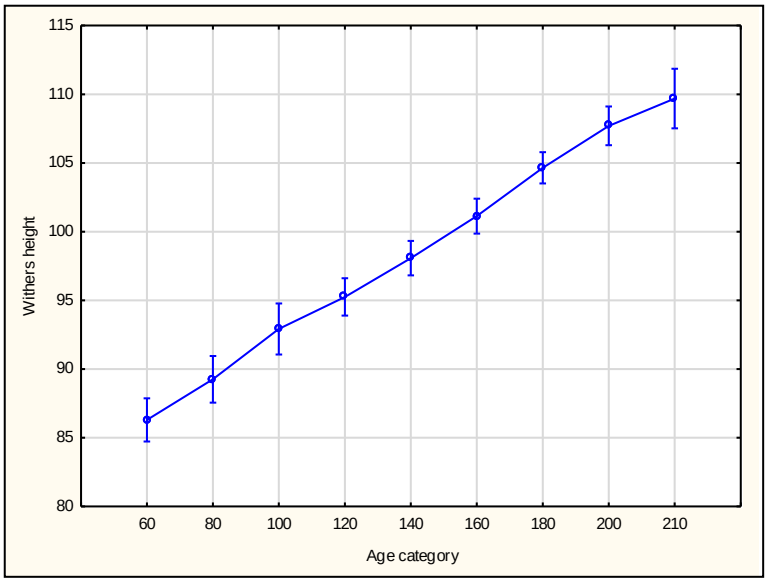

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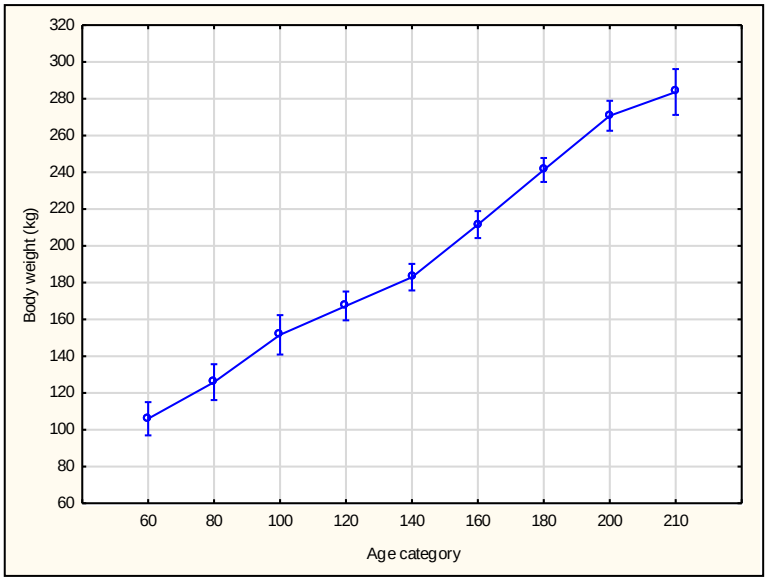
***Figure 4*: Influence of age category on body weight**



Conversely, in the case of live weight and height at withers, a highly significant effect of age was observed ($p<0.01$), and the differences between most age categories were statistically confirmed ($p<0.05$) (Figure 3 and 4). Continuous increase in live weight and height at withers with age was observed. The lowest live weight (106.00 kg) and at the same time the lowest height at withers (86.30 cm) was achieved by bulls aged 60 days. These values increased continuously with age, and the highest weight (283.64 kg) and height at withers (109.69 cm) were achieved by bulls aged 210 days. At 120 days of age, the bulls reached an average weight of 167.32 kg and a height at withers of 95.25 cm. At 180 days of age, the average weight of the bulls was 241.28 kg and the height at withers was 104.65 cm.

Discussion

Bull fattening is influenced by several factors, such as genetic predisposition and age at the beginning and end of fattening (*Ustuner et al*. 2020). The bulls in the experiment showed an average daily gain of 1.14 kg/day, which can be considered a reasonable gain for that age period under such conditions, as *Kvapilík* (2017) has already reported. The observed 167.32 kg live weight of 120-day-old bulls and 283.64 kg live weight of 210-day-old bulls are slightly lower results than that of performance test reported by Czech Beef Cattle Association (2022). The reason for this is that only the top bulls can become breeding bulls based on the performance test. Among the bulls in our experiment twins also were included, whose growth rate is worse at the beginning of fattening, as also reported by *Cabrera et al.* (2021), and so they are economically more difficult for breeders.

As for the growth of the body size, which was determined by height at withers, the bulls showed a linear growth curve. At the end of the experiment, at the age of 210 days, the animals reached an average height at withers of 109.69 cm. This growth curve cannot be compared with

other results at the moment, as there are currently no other studies on this topic involving animals of such a young age.

Conclusion

Based on the experiment with fattening bulls of the Czech Fleckvieh Simmental breed, it can be concluded that during their intensive growth period it is possible to fatten them more efficiently and thereby increase their productivity. Efficiency can also be achieved by continuously monitoring the growth of bulls. For this purpose, the Agroninja system is suitable and beneficial for breeders and further research, because it increases work safety, in addition, it does not cause stress to animals, consequently, it supports their welfare. It is recommended to continue this research and compare with data obtained from other commercial feedlots. Based on the current results, it can be concluded that the measured live weight values correspond to the standards of the Czech Fleckvieh Simmental breed.

Acknowledgment

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