Can phytogenic additives in finishing fattening period improve beef meat quality?

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Introduction

The high quality of beef meat depends on many factors, such as appropriate animal nutrition, transport before slaughter, and proper handling of the meat during technological processes.

To obtain high-quality meat, it is necessary to calm the animals before slaughter, which will improve carcass and meat parameters and provide health-promoting compounds that can affect the technological and nutritional value of the meat.

The study aimed to assess the effect of 45-day before slaughtering utilisation of two levels of herb and fruit mixtures on animal activity, carcass evaluation, and meat quality.

Materials and methods

Experimental animals

60 Limousin bulls were divided into five experimental groups receiving the same basic feed ration and various supplements as shown in Table 1. Group H100/150 were supplement by herbal mixture, group F120/240 were suplemented fruit mixture

Table 1. Composition and nutrition value of experimential diets.

	CON	H100	H150	F120	F240
Basic TMR g/kg					
Hay	105				
Maize silage	420				
Barley	200				
Triticale	200				
Rapeseed meal	50				
Urea	4				
Feed limestone	5				
Sodium bicarbonate	8				
Premix	8				
Nutritive value g × kg DM^{-1} of TMR					
EM MJ/kg	11.70				
Crude Protein	137				
Crude fat	38				
NDF	299				
Crude ash	72				
Calcium	5.50				
Phosforus	4.47				
Additives to the diets g/animal/day					
Herb mixture[1]	-	100	150	-	-
Fruit mixture[2]	-	-	-	120	240

1 – mixture contaning 35% fenugreek seeds, 35% lemon balm, 15% hops, 15% valerian
2 – mixture contanig 25% dried blackberry, 25% dried chokeberry, 25% dried briar, 25% dried white mulberry

Tested parameters

During the trial, animal activity was measured (feed intake, ruminating and inactivity). After slaughter, the slaughter yield was calculated, and carcasses were evaluated according to the SEUROP and fattiness scales. 24 hours after slaughter, meat samples were taken from the chilled carcasses of *Longissimus Dorsi* (LD). Basic chemical composition, water-holding capacity (WHC), and cutting force (CF) of meat were measured. The pH and TBARS of the collected samples were also tested 24 hours after slaughter and on the 3rd and 10th day of aging.

Results

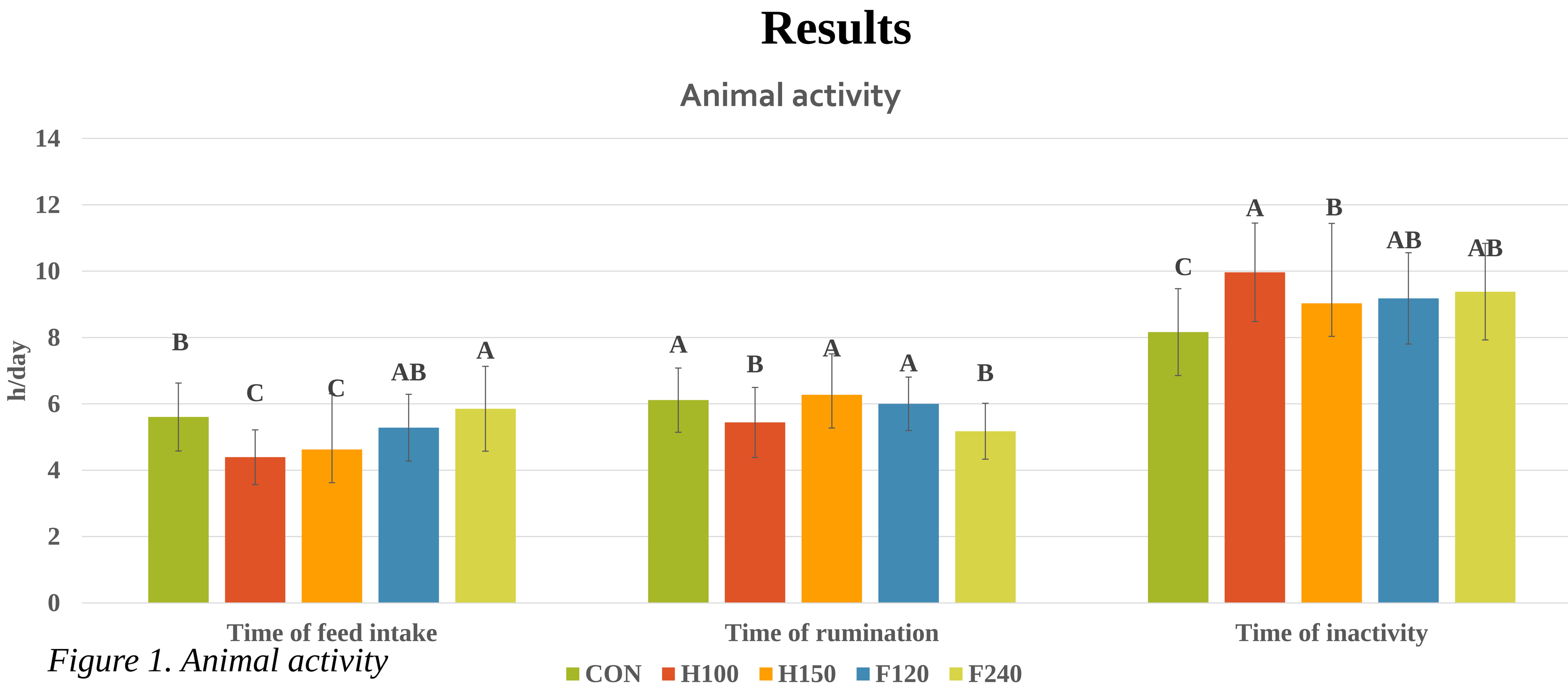

Figure 1. Animal activity

Animal activity

The longest time of feed intake was observed in F240 (5.85 h/day), followed by CON (5.60 h/day), F120 (5.28 h/day), H150 (4.62 h/day), and H100 (4.39 h/day) ($p \leq 0.01$). Rumination time was highest in H150 (6.27 h/day), followed by CON (6.11 h/day), F120 (6.00 h/day), H100 (5.44 h/day), and F240 (5.18 h/day) ($p \leq 0.01$). Inactivity time was longest in H100 (9.97 h/day), followed by F240 (9.38 h/day), F120 (9.18 h/day), H150 (9.03 h/day), and CON (8.16 h/day) ($p \leq 0.01$).

Production outcomes

Table 2. Slaughter yield and caracass evaluation

Grupa	CON	H100	H150	F120	F240
Slaughter yield	61.86^{a}±2.25	59.99^{ab}±1.83	61.50^{a}±0.69	57.55^{b}±2.27	60.63^{ab}±1.68
Class*	4.10±0.14	4.25±0.47	4.40±0.45	3.85±0.38	4.25±0.43
Fattines	2.15±0.48	2.05±0.62	2.15±0.72	2.55±0.62	2.00±0.71

* - For system SEUROP point scale were used, where S=6, E=5, U=4, R=3, O=2, P=1

Slaughter yield was highest in CON (61.86%) and H150 (61.50%), and lowest in F120 (57.55%) ($p \leq 0.05$). Carcass classification (SEUROP system, fattiness classes) did not differ among groups ($p > 0.05$).

Meat quality

Table 3. Basic composition of meat

	CON	H100	H150	F120	F240
Dry matter	25.57±0.63	25.35±1.37	25.13±0.48	26.05±1.13	26.36±0.20
Crude protein	20.74±0.35	19.89±0.26	21.01±0.54	20.77±0.70	21.85±0.57
Crude fat	2.51±0.62	3.08±1.14	1.65±0.25	2.79±0.29	2.28±0.62
Crude ash	1.15±0.02	1.08±0.03	1.21±0.07	1.12±0.21	1.14±0.03

Basic composition of meat did not differ among groups ($p > 0.05$).

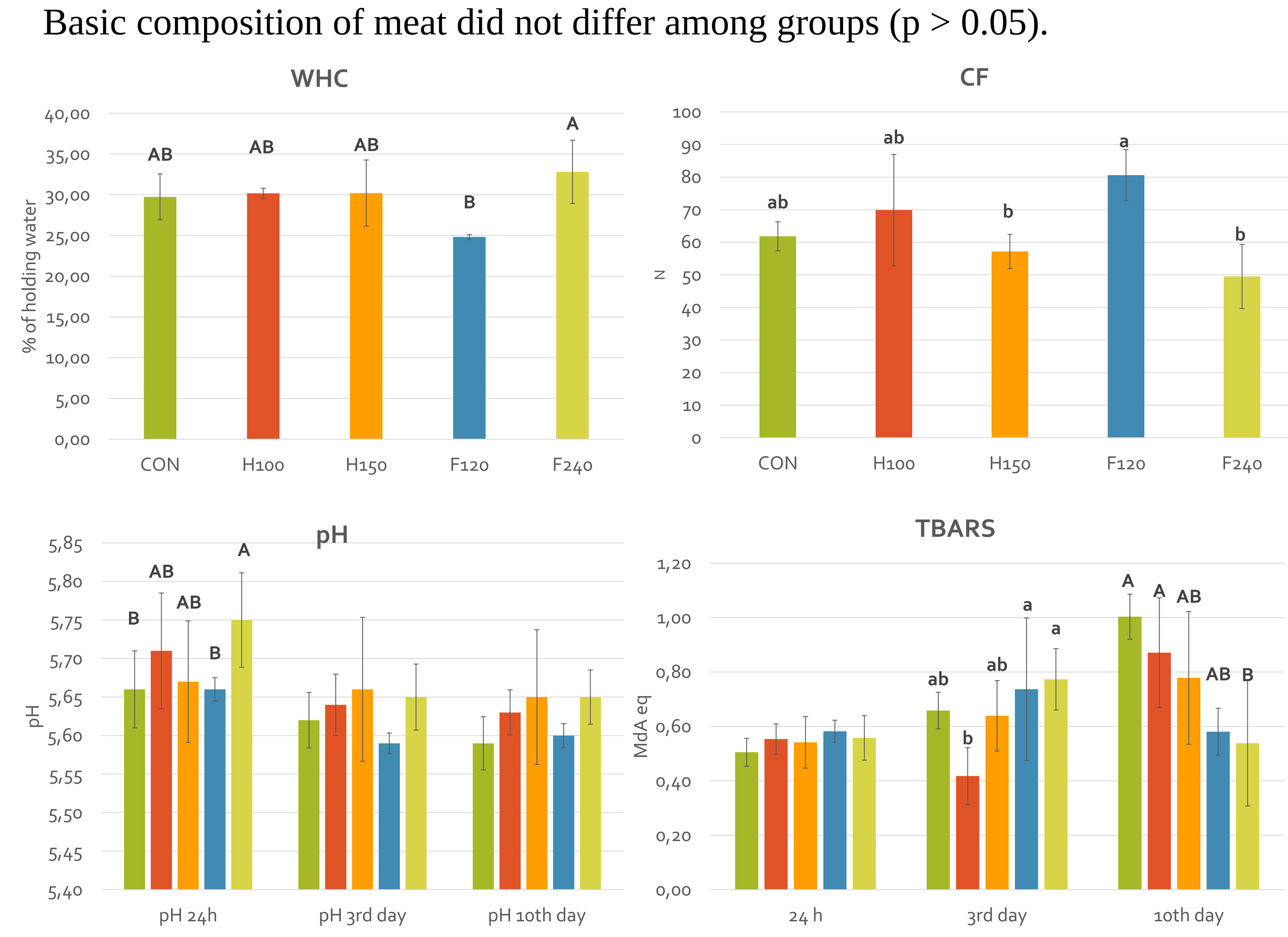

Figure 2-5 (from top left corner): Water holding capacity (WHC), Cutting force (CF),pH, Thiobarbituric Acid Reactive Substances *(TBARS)*

The highest WHC was recorded in F240 (32.82%), followed by H150 (30.20%), H100 (30.17%), and CON (29.75%), all significantly higher compared with F120 (24.80%) ($p \leq 0.01$). Cutting force was highest in F120 (80.60 N), significantly greater than in H150 (57.17 N) and F240 (49.50 N) ($p \leq 0.05$). After 24 h, pH was highest in F240 (5.75), significantly higher than in CON (5.66) ($p \leq 0.01$). On day 3 of aging, the highest pH values were in H150 (5.66) and F240 (5.65), while after 10 days, the highest values were in H150 (5.65) and F240 (5.64), although these differences were not significant. TBARS values after 24 h were highest in F120 (0.58 MDA eq.), followed by F240 (0.56), H150 (0.56), H100 (0.54), and CON (0.50). On day 3, TBARS were highest in F240 (0.77), followed by F120 (0.74), both significantly higher than H100 (0.42) ($p \leq 0.05$). On day 10, TBARS were highest in CON (1.00), followed by H100 (0.87), both significantly higher than F240 (0.54) ($p \leq 0.01$).

Conclusion

The introduction of additives in the proposed amount positively impacted bulls activity and meat quality of animals.