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THE EFFECT OF THE FLAX SEEDS NUTRITION OF CATTLE ON PRODUCTION AND SLAUGHTER PROPERTIES

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Invited paper

Abstract: The aim of the present study was to investigate the effect of adding flax seed to nutrition of cattle in the final stage of fattening. The sample included a total of 30 young bulls of Simmental breed of uniform initial weight, divided into 2 groups (control and experimental). The control group had no flax seed in the diet, while the trial groups of cattle consumed flax seed in the amount of 8.75% of the concentrated part of the ration, i.e. 700 g per day. The study included the examination of the fattening performance, slaughter properties, the share of the slaughter by-products and the composition of the bovine carcass. Post slaughter, individual measurements of warm carcass sides, with and without kidneys, were performed. After cooling, the left carcass side was cut into the basic parts according to the Rulebook. The results of this experiment showed that flax seed as a food supplement did not have a statistically significant ($p>0.05$) impact on the weight of young bulls at the end of the experiment. It also did not have a statistically significant ($p>0.05$) impact on differences in average total yield (ATY) of cattle and food conversion ratio. By cutting the carcass sides into the basic parts it was established that the flax seed diet did not influence significantly ($p> 0.05$) the share of carcass parts or the share of the offals.

Key words: young bulls, Simmental breed, diet with flax seeds

Introduction

Farm animals represent an important resource for the economic development and nutritional security of a country (*Caput, 1994*). The world faces a constant increase of the population, which requires the production of enough food.

By selection and various methods of crossing, feeding, animal genetic resources have been promoted in the direction of higher and better production of animal products. Production conditions are increasingly controlled by man. In order to increase meat production in the Republic of Serbia, more productive breeds of cattle (Simmental, Holstein-Friesian) are favoured.

Meat is an important foodstuff of high quality in human diet. Beef has high nutritional value. It is a rich source of protein of high biological value, contains a low percentage of intramuscular fat, significant amounts of vitamin B complex and mineral substances *(Wyness et al., 2011).* Of the total consumption of meat in the world, beef with a share of 24% is in third place, behind pork (36%) and poultry (33%). Beef meat has a higher price compared to other types of meat, and the low competitiveness of beef is conditioned by the long production cycle and by the higher consumption of food per kilogram of gain *(Dokmanović et al., 2014).* According to FAO forecasts, by 2020, the production of beef will increase by 6.7% in developing countries and by 1.9% in developed countries *(Anon, 2011).*

Production factors (daily increase, food conversion ratio), physical and muscular development, as well as slaughter properties are cited as the main factors determining the efficiency and economy of production in beef cattle breeding. The quantity and quality of the final products depend directly on these factors. Based on data on body development, the total amount of meat can be determined with more or less accuracy *(Ostojić-Andrić et al., 2007).* Carcass yield is a very important parameter of the quality of the cattle. It is influenced by breed (genetic basis), pre-slaughter weight, animal nutrition, type of meal (roughage or concentrated diet), conditions of transport and resting of animals in the slaughterhouse *(Kralik et al., 2007).* On the other hand, the market is becoming an increasingly decisive factor determining the production of beef, especially in terms of quantity and quality. The market influences the direction of production of high-quality meat, certain taste and uniform structure and appearance for a product of defined quality, classified by the standards of individual countries. Nutrition, as well as the duration of fattening, are factors that significantly affect the quality of the carcass. The influence of nutrition on the nutritional aspect of beef quality has been gaining in importance in recent years.

Materials and Methods

The research was carried out on the experimental farm and in the experimental slaughterhouse of the Institute for Animal Husbandry in Zemun (Serbia). In the study, male cattle of Domestic Simmental breed were used. In the trial, 30 Simmental young bulls of uniform weights were selected, which consumed

the food of the same composition until reaching the age of 390 days. The feeding of cattle prior to trial was carried out according to existing diet composition norms for these cattle used on the farm of the Institute for Animal Husbandry (whole maize silage and concentrate mixture with 12% of the total protein). The fattening of young bulls was in the free system. In order to fulfil the trial objective, it was necessary to prevent the movement of the animals when consuming a concentrated portion of the meal, so that we can reliably claim that each animal consumed the predetermined amount of concentrate. At the age of 390 days, two groups of 15 cattle were formed: the control group (CON) in which the cattle did not consume heat-treated flax seed and the experimental group (LS) in which the part of the concentrate was replaced by heat-treated flax seeds, so that each animal consumed 700 g of flax seeds per day. The final pre-slaughter weights were about 580 kg. One day before slaughter, the bulls did not receive food, but they had free access to water. Slaughtering and primary processing were performed in the experimental slaughterhouse of the Institute for Animal Husbandry. Animals were measured immediately before slaughter and then slaughtered according to standard commercial procedures. After primary processing, the carcasses were placed in a cooling chamber at 4^0C for the next 24 hours. The weight of the warm carcass, the weight of the intestines (heart, lungs, liver, kidneys, spleen and tongue), head, tail and kidney fat was measured one hour post- slaughter and treatment. After chilling, the carcasses were measured and split along the vertebral column in two halves, and the left side was used for all measurements. The left side of each carcass was divided into twelve anatomical regions: round, beefsteak, loin, shoulder, back, neck, chest, short ribs, ribs, flank, fore shank and leg, using a standard technique.

The obtained data were processed by analysis of variance in one-way ANOVA program SPSS Statistics 20, and all results are displayed as the mean value ± standard deviation. The statistical significance of the difference between mean values was determined by t-test.

Results

The results for fattening and slaughter traits of young bulls are shown in Table 1. The use of flax seeds in the final stage of the fattening did not result in the difference between the groups in the average daily gain (ADG) and the food conversion ratio. Higher ADG as well as better food conversion were recorded in LS group, but the established differences were not statistically significant ($p>0.05$). The values of the TT carcass yield and the TT weight with and without fat, as well as the CC carcass yield and the CC weight with and without fat, were higher in the CON group, but for the established differences there was no statistical significance ($p> 0.05$). For the other parameters listed in Table 1, the young bulls of the LS

group had higher values compared to the CON group, but also the differences were not statistically significant (p> 0.05).

Table 1. Average values of fattening and slaughter traits of cattle/young bulls

	CON	LS	p
ADG[1] (kg)	1.59 ± 0.33	1.66 ± 0.19	ns
Feed conversion (kg)	7.23 ± 0.53	6.89 ± 0.29	ns
Weight PS [2] (kg)	576.25 ± 25.36	585.00 ± 6.24	ns
Weight WC [3] with fat (kg)	337.52 ± 19.83	336.00 ± 12.83	ns
Yield WC [3] with fat (%)	58.56 ± 1.53	57.30 ± 2.53	ns
Weight WC [3] without fat (kg)	333.50 ± 19.33	331.67 ± 11.93	ns
Yield WC [3] without fat (%)	57.85 ± 1.32	56.70 ± 2.10	ns
Weight CC [4] without fat (kg)	326.82 ± 18.96	324.87 ± 11.45	ns
Yield CC [4] without fat (%)	56.70 ± 1.27	55.54 ± 2.00	ns
MLD[5] Cross section surface (cm^2)	100.95 ±16.35	111.02 ± 12.28	ns
Kidney fat (%)	0.70 ± 0.24	0.74 ± 0,23	ns
CL Cooling loss [6] (%)	3.17±0.44	3.31±0.53	ns
Head (%)	2.59 ± 0.09	2.74 ± 0.20	ns
Tail (%)	0.17 ± 0.02	0.21 ± 0.02	ns

[1] ADG – average daily gain; [2] PS – Pre- slaughter; [3] WC – Warm carcass; [4] CC– cooled carcass; [5] MLD – *Musculus longissimus dorsi*; [6] CL – loss of weight during cooling; ns – not significant

The influence of the flax seed based diet on the intestine content in the pre-slaughter weight is shown in Table 2.

Table 2. The effect of the addition of flax seed in the cattle diet on the share of intestines**

(%)	CON	LS	p
Kidneys	0.17 ± 0.02	0,19 ± 0,01	ns
Liver	1.01 ± 0.11	1,27 ± 0,17	ns
Lungs	0.55 ± 0.08	0,60 ± 0,07	ns
Heart	0.30 ± 0.02	0,34 ± 0,03	ns
Spleen	0.18 ± 0.03	0,22 ± 0,01	ns
Tongue	0.24 ± 0.03	0,29 ± 0,03	ns

**Relative to the pre-slaughter weight; ns – not significant

Table 3 shows the share of the basic carcass parts. The shares of the carcass parts were not statistically significantly (p> 0.05) different between the groups. The shares of beef steak and round were approximately the same in groups, with the bulls from LS group having higher values for the mentioned parameters. The share of round ranged from 28.05% in CON to 28.44% in LS. The higher values of the share of loin and back parts were recorded in bulls of LS group, whereas a higher share of the shoulder was found in the bulls of the CON group under the influence of flax seed.

Table 3. The effect of the addition of flax seed in the feeding of cattle on the share of main carcass parts *

(%)	CON	LS	p
Beef steak	2.41 ± 0.45	2.64 ± 0.37	ns
Round	28.05 ± 1.21	28,44 ± 0,83	ns
Loin	4.84 ± 1.15	5,26 ± 0,44	ns
Back	5.48 ± 0.69	6,00 ± 0,32	ns
Shoulder	12.60 ± 0.73	11,41 ± 0,78	ns
Leg	3.66 ± 0.52	3,81 ± 0,25	ns
Fore shank	2.78 ± 0.26	3,03 ± 0,12	ns
Neck	10.14 ± 1.01	9,83 ± 0,48	ns
Chest	5.18 ± 0.64	4,56 ± 0,56	ns
Short ribs	11.90 ± 0.43	13,31 ± 0,69	ns
Ribs	6.75 ± 1.43	5,61 ± 0,56	ns
Flank	6.16 ± 0.77	6,05 ± 0,74	ns

*Relative to the processed carcass; ns – not significant

Discussion

Nutrition with flax seed did not have an effect on production performance and slaughter properties, which is consistent with research in which flax seeds were added at different concentrations (*Barton et al., 2007* and *Raes et al., 2004* (extruded linseed); *Scollan et al., 2001* and *Mach et al., 2006* (whole linseed) and *Choi et al., 2000* (whole linseed treated with formaldehyde)). It is obvious that, based on our research and research of Barton et al. (2007), flax seed can be included in feeding at levels up to 1200 g/day without adverse effects on production and slaughter properties. According to *Petričević et al. (2011)* young bulls of Domestic Spotted breed of the Simmental type of average weight of 500 kg had a yield of 55.31%, and a cattle of average weight of 600 kg yield of 56.30%. In another study, *Petričević et al. (2015)* have found that the yield/dressing percentage of the Domestic Spotted breed of the Simmental type was on average 58.07%. *Maddock et al. (2006)* have shown that the inclusion of 8% of flax seeds in the diet improves the carcass properties but it can lead to an increase in the amount of fat that negatively affects some of the parameters of meat quality.

Higher carcass yields (57.8% and 57.7%) of bulls fed with mixtures containing 10% and 15% of flax seeds in relation to the group that did not consume flax seed (57.1%) are reported by *Kim et al. (2004)* and *Drouillard et al. (2002).* These authors confirm with their research that flax seed is an acceptable source of lipids without adversely affecting the final fattening of the cattle. In general, the results of these studies are in accordance with the data presented in our study where

it has been established that flaxseed has no significant effect on the differences in the slaughter properties of the bulls' carcasses.

The area of the *M. longissimus dorsi* cross section (Table 1.) did not statistically significantly ($p > 0.05$) differ under the influence of the examined factor. Young bulls of group LS had a larger surface area of *M. longissimus dorsi*. The larger surface area of *M. longissimus dorsi* in the cattle that consumed the flax seed in the diet was determined by *Rotta et al. (2009)* and *Quinn et al. (2008)* in their research. The surface of the *M. longissimus dorsi* cross section was greater in cattle that consumed 8% of the ground flaxseed in the study by *Maddock et al (2006).*

The weight loss after 24 hours of cooling did not differ between the examined groups (Table 1). This is confirmed by *Hernàndez-Calva L.M. et al. (2011)* and *Petričević et al. (2019)* who state that weight loss during cooling did not significantly change under the influence of flax seed diet.

The consumption of flax seed in the final stage of cattle fattening did not have an effect on the share of intestines in the pre-slaughter weight. The shares of all intestines were higher in the LS group compared to the CON group, but the differences were not statistically significant ($p > 0.05$). *Petričević et al. (2019),* in their study, provide similar values for the shares of intestines in bulls fed diet with and without the addition of flax seeds.

In the research by *Petričević et al. (2015)* the share of basic carcass parts of the bulls that did not consume flax seed in the diet were: round (28.36%), shoulders (12.20%), lower legs (3.59%) and forearms (2.73%). *Petričević et al. (2019)* state that the share of the main carcass parts did not differ between groups regardless of the addition of flax seed in the diet.

Conclusion

The results of this study have shown that the substitution of a part of the concentrated mixture with flax seed did not have a negative impact on the production performance and slaughter properties of young bulls at a quantity of 700 g/day. The shares of the most valuable parts of the carcass (beefsteak and round) were slightly higher in the LS group, which indicates that the use of flax seed in the diet has a positive effect on the carcass composition.

Uticaj ishrane junadi sa semenom lana na proizvodne i klanične karakteristike

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Rezime

Cilj ovog istraživanja je da se ispita uticaj dodavanja semena lana u ishranu junadi, u završnoj fazi tova. Uzorkom je obuhvaćeno ukupno 30 junadi simentalske rase ujednačenih početnih telesnih masa, koja su podeljena u 2 grupe (kontrolna i ogledna). Kontrolna grupa junadi u ishrani nije imala seme lana, dok su junad ogledne grupe konzumirala seme lana u količini od 8,75% koncentrovanog dela obroka, tj. 700 g dnevno. Istraživanje je obuhvatilo ispitivanje rezultata tova, klanične karakteristike, udeo pratećih proizvoda klanja i sastava trupa junadi. Posle klanja izvršeno je pojedinačno merenje toplih polutki sa i bez bubrežnog loja. Nakon hlađenja leva polutka je rasecana u osnovne delove prema Pravilniku. Rezultati ovog ogleda su pokazali da seme lana kao dodatak ishrani nije imao statistički značajan ($p > 0.05$) uticaj na masu junadi na kraju ogleda. Takođe nije imao statistički značajan ($p > 0.05$) uticaj na razlike u prosečnom ukupnom prirastu (PUP) junadi i konverziji hrane. Rasecanjem poluki junadi na osnovne delove utvrđeno je da ishrana sa semenom lana nije značajano ($p > 0.05$) uticala na udeo delova trupa kao i na udeo iznutrica.

Ključne reči: junad, Simentalska rasa, ishrana sa lanom

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