# THE EFFECT OF FINISHING DIET ON BEEF QUALITY TRAITS

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## Introduction

Beef quality in terms of chemical composition and sensory aspects is affected by many factors, including breed and diet. The ratio of *n*-6 and *n*-3 fatty acids of beef from grain-based-diets is shown higher than the beef from forage fed animals (Enser *et al.*, 1998, cit. Elmore *et al.*, 2004). The reason for this is the high level of linoleic acid (C 18:2 *n*-6) in the grain but the forages are rich in linolenic acid (C 18:3 *n*-3) the base of the long chain *n*-3 fatty acids. The widespread fattening system used in Hungary (the indoor production system), is based on maize silage, hay and high concentrate diets. Beef produced from this feeding regime has undesirable fatty acid composition from a human nutritional point of view (Holló *et al.*, 2001). Therefore different methods should be aimed to modify the fatty acid profile. The objective of this study was to compare the beef quality traits and fatty acid profile of intramuscular fat from Hungarian Simmental (HS) and Holstein (HF) bulls fed two concentrate types in the final finishing period.

## Materials and Methods

The experimental design and the nutrient content of different feedstuffs is shown in Table 1 and Table 2. Concentrates for groups III and IV were supplemented with 20% linseed meal containing 44.77 % linolenic acid and fed in the last 67 days of growing-finishing period. The animals were slaughtered at the target live weight of approximately 550 kg. After a 24hrs chilling, *longissimus* (LD) muscle samples were taken at the 12$^{th}$ ribs from the right half carcasses. The right half carcasses were dissected for carcass composition. The fatty acid composition of samples was determined according to method of Nuernberg *et al.*, (2002). SAS package was used for statistical analysis.

**Table 1:** Experimental design.

| Group | Breed | n | Feeding |
|---|---|---|---|
| I. | HF | 6 | Maize silage, hay, 2-4 kg concentrate |
| II. | HS | 5 | |
| III. | HF | 6 | Maize silage, hay 2-4 kg concentrate with linseed |
| IV. | HS | 5 | |

**Table 2:** Chemical composition of feed.

| | Maize silage | Hay | Concentrate | Concentrate with linseed |
|---|---|---|---|---|
| Dry matter | 29.73 | 91.6 | 89.36 | 90.19 |
| Crude protein | 6.27 | 7.1 | 15.27 | 14.80 |
| Crude fat | 1.87 | 1.7 | 3.53 | 11.98 |
| Crude ash | 4.86 | 5.1 | 6.93 | 6.13 |

## Results and Discussion

The fattening and slaughter records are shown in *Table 3*. The HS bulls and the linseed supplemented groups had significant higher ($P<0.05$) daily weight gain. No significant differences between the two diets were found for the slaughter and dressing data. The dressing percentage and lean meat as well as fat content of HS were significantly higher than that of HF bulls. The meat quality traits of the intramuscular fat content of LD for HS and HF bulls were 1.57 and 1.45, respectively. The intramuscular fat of HS contained significantly higher C 20:0, C 18:1 *trans*-9 and C 22:2 *n*-6 compared to HF bulls (Table 4). In the linseed supplemented groups the CLA content in LD was 1.5 times higher, however the meat of HS contained about 0.1% higher CLA percentage. The proportion of linolenic acid increased by linseed supplemented concentrate. The long chain *n*-3 PUFA (C 20:5 C 22:5) are significantly increased by linseed feeding. The amount of *n*-6 fatty acids were not affected. The ratio of *n*-6/*n*-3 fatty acids can be altered from 14:1 and 13:1 with linseed supplementation 5.2:1.

**Table 3:** Animal performance and carcass traits.

| Traits | Without linseed suppl. | | With linseed suppl. | |
|---|---|---|---|---|
| | HF (I) | HS (II) | HF (III) | HS (IV) |
| Initial age, d | 170,83±13.04 | 191.80±27.52 | 178,17±10,78 | 168.40±14.28 |
| Initial weight, kg | 205,17±24.77 | 208.60±40,25 | 205.25±26.35 | 207.10±22,53 |
| Final age, d | 443.83 ±13,04 | 437,80±27.52 | 451,17±10,78 | 414.40±14,28 |
| Final live weight, kg | 528,50± 29.32 | 556.80±49,69 | 538.67±56.10 | 584.20±25,12 |
| Daily gain, g/d | 1184±92 | 1415±183 | 1221±167 | 1533±123 |
| Dressing percentage, % | 57,13±0,92 | 58.20±0.60 | 56.66±1.09 | 59.64±1,54 |
| Lean meat in right half carcass, kg | 92.67±7.20 | 105.90±6,09 | 94.19±10,57 | 114.20±5,85 |
| Bone in right half carcass, kg | 30,81±3.95 | 26.68±2,90 | 29.25±2,21 | 26.44±1,37 |
| Fat in right half carcass, kg | 8.40±3.12 | 11.70±2,52 | 9.58±2.82 | 11.80±3,98 |
| Tendon in right half carcass, kg | 5.15±0.81 | 4,53±1.32 | 5.44±0.74 | 6.42±2,19 |

**Table 4:** The fatty acid composition of LD.

| *Fatty acids, %* | Without linseed suppl. | | | | With linseed suppl. | | | | *Sign* |
|---|---|---|---|---|---|---|---|---|---|
| | HF (I) | | HS (II) | | HF (III) | | HS (IV) | | |
| | mean | SE | mean | SE | mean | SE | mean | SE | |
| *Intram. fat* | 1,48 | 0,15 | 1.57 | 0,17 | 1.42 | 0.16 | 1.57 | 0.17 | |
| C12:0 | 0.08 | 0.01 | 0.06 | 0.02 | 0,09 | 0,01 | 0.07 | 0.02 | |
| C14:0 | 1.90 | 0.19 | 2.36 | 0.22 | 2,14 | 0,20 | 2.12 | 0.22 | |
| C16:0 | 21.66 | 0,90 | 23.53 | 1,06 | 23.12 | 0.97 | 21.85 | 1.06 | |
| C16:1 | 2.88 | 0.31 | 3.79 | 0.36 | 3,22 | 0,33 | 3.16 | 0.36 | |
| C18:0 | 15.61 | 0,79 | 15.07 | 0.93 | 15.29 | 0.85 | 14.76 | 0.93 | |
| C18:1*trans*-9 | 4.20 | 0.29 | 5.39 | 0.3 | 5.24 | 0,31 | 5.79 | 0.34 | B; D |
| C18:1*cis*-9 | 28.47 | 1.95 | 27,12 | 2,31 | 24.98 | 2,11 | 27,43 | 2.31 | |
| C18:2*trans* | 0,20 | 0.02 | 0.24 | 0.02 | 0,39 | 0,02 | 0.37 | 0.02 | D |
| C18:2*n*-6 | 11.43 | 1.06 | 9.33 | 1.26 | 10,11 | 1,15 | 10.23 | 1.26 | |
| C18:3*n*-6 | 0.06 | 0,01 | 0,07 | 0,01 | 0,04 | 0.01 | 0,03 | 0.01 | D |
| C18:3*n*-3 | 0,59 | 0.12 | 0.54 | 0.14 | 1,60 | 0,13 | 1.79 | 0.14 | D |
| C20:0 | 0.03 | 0.01 | 0.12 | 0.02 | 0.05 | 0.01 | 0,11 | 0.02 | B |
| C20:3*n*-6 | 0.71 | 0,07 | 0,63 | 0.08 | 0.71 | 0.07 | 0,49 | 0,08 | |
| C20:4*n*-6 | 3,79 | 0,42 | 2.92 | 0.50 | 3,67 | 0,46 | 2.83 | 0,50 | |
| C20:5*n*-3 | 0.14 | 0.02 | 0,10 | 0.03 | 0.26 | 0.03 | 0,22 | 0.03 | D |
| C22:2*n*-6 | 0.02 | 0.01 | 0,06 | 0,01 | 0.04 | 0.01 | 0,07 | 0,01 | B |
| C22:5*n*-3 | 0.33 | 0,04 | 0.28 | 0,05 | 0,47 | 0,04 | 0,35 | 0,05 | D |
| C22:6*n*-3 | 0.07 | 0.02 | 0.06 | 0,02 | 0.09 | 0.02 | 0.08 | 0.02 | |
| c-9,*t*-11CLA | 0,38 | 0.04 | 0.52 | 0,04 | 0,57 | 0,04 | 0.66 | 0,04 | B; D |
| SFA | 40.99 | 1,41 | 42,73 | 1,67 | 42,35 | 1.52 | 40,47 | 1,67 | |
| UFA | 59,01 | 1.41 | 57.27 | 1.67 | 57.65 | 1.52 | 59.53 | 1.67 | |
| PUFA | 18.10 | 1,68 | 15,02 | 1,99 | 18.55 | 1.82 | 17.34 | 1,99 | |

B-breed, D-diet

## Conclusions

With the linseed supplementation in concentrate at the finishing phase of the maize silage fattening, the *n*-6 and *n*-3 fatty acid ratio can be altered more beneficial whereas the slaughter and the carcass quality traits are not significantly changed.

## References


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