

PE9.17 Effects of short term sunflower oil supplementation on meat quality of grazing steers in Argentina 111.00

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Abstract- Grain supplementation to grazing animals enhances growth rate but results in potentially negative consequences to human health such as lower conjugated linoleic acid (CLA) content and higher n6/n3 ratio in meat as compared to non supplemented grazing animals. This could be overcome by the use of vegetable oil. Two experimental groups, each comprising 20-months-old Angus steers (14 in each group) were used. One group grazed pasture (P) whereas the other grazed on the same pasture but was supplemented with cracked grain maize and sunflower oil (S). Both groups were slaughtered at comparable subcutaneous fat depth. Samples of Longissimus dorsi were obtained. Supplementation did not affect ($p > 0.05$): dry matter, ether extract, cooking losses, pH, colour parameters and content of individual fatty acids. Supplementation resulted in higher ($p < 0.01$) n6/n3 ratio ($P = 3.2$ and $S = 5.5$) and lower shear force ($p < 0.05$) ($P = 67.8$ N and $S = 56.5$ N). It can be concluded, from the human health point of view, that supplementary feeding did not result in beef of comparable quality as that from grazing animals.

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I. INTRODUCTION

In recent years there has been extensive research on the beneficial aspects for human health of consumption

of beef from grass fed animals as opposed to grain fed cattle [7]. This has been associated with enhanced levels of conjugated linoleic acid (CLA) and n6/n3 ratios below the recommended level of 4 [4]. However, it has been demonstrated that the use of grain in cattle diets is useful to ensure high weight gains, thus shortening the fattening period. In this context, supplementation of diets for ruminants, over long periods, with fat sources rich in C18:2n-6 such as sunflower oil or soybeans has led to increased levels of in CLA cis-9, trans 11 in muscle [5] [6]. Grigera Naón et al., 2007 reported lower levels of CLA cis-9, trans 11 when by-products of soybean harvest were supplemented over short periods to grazing yearlings. Therefore the objective of this study was to assess the effects of short term sunflower oil supplementation on meat quality of grazing steers.

II. MATERIALS AND METHODS

Twenty eight, 20 months old Red Angus steers (initial live-weight 397 ± 22 kg) were randomly assigned to either grazing a mixed temperate pasture based on red clover, tall fescue and brome-grass (P) or grazing the same pasture and offered daily a supplement made of cracked maize grain (0.85 % live-weight, on a dry matter (DM) basis) and 470 cubic centimetres of sunflower oil per head (S). Animals rotationally grazed a 16 hectares field divided in 2 hectares paddocks. On average steers remained a day on each paddock, which in some cases had to be subdivided with electric fences in order to ensure homogenous pasture growth and DM intake. Slaughter point was at comparable subcutaneous fat depth and in every case assessed by the same trained abattoir official. Samples of muscle Longissimus dorsi were obtained at slaughter. Fatty acids were extracted according to the technique described [1] and analyzed as methyl esters by gas chromatography. Tenderness was measured with an Instron 4442 Universal Testing Machine (Canton, MA,

USA) with a Warner| Bratzler shearing attachment on cooked samples (water bath heating at 70 °C for 50 minutes). Colour was measured according to the CIELAB System, L* (lightness), a* (redness) and b* (yellowness), using a Minolta Chroma Meter-CR300. Data were analyzed according GLM procedure SAS (1999).

III. RESULTS AND DISCUSSION

Steers in S (live-weight 470 ± 27 kg) were slaughtered 56 days before those in P which in their turn reached 495 ± 31 kg live-weight at slaughter. Sunflower oil supplementation did not affect ($p > 0.05$) content of the main fatty acids (Table 1)

Table 1. Fatty acid composition as percentage of muscle lipids

CLA¹ conjugated linoleic acid
SAT² saturated fatty acids

Treatment	P	S	Standard error
C14:0	2.4	2.3	0.36
C16:0	28.0	26.5	1.47
C16:1	3.5	3.7	0.49
C18:0	15.3	13.9	1.94
C18:1	37.8	39.9	1.89
C18:2 n-6	3.5	4.8	1.39
C18:3 n-3	1.2	0.8	0.26
CLA ¹	0.7	0.9	0.25
SAT ²	47.3	44.1	2.79
MUFA ³	45.2	47.3	1.78
PUFA ⁴	7.4	8.5	2.15
n6/n3	3.2 ^a	5.5 ^b	1.29
n3	1.6	1.2	0.43
n6	4.3	6.6	1.96

MUFA³ monounsaturated fatty acids

PUFA⁴ polyunsaturated fatty acids

^{a, b}. Means in the same row without a common superscript differ significantly ($p < 0.05$)

This suggests that sunflower oil supplementation mitigated the effects on fatty acid composition, particularly the low levels of CLA reported when maize grain was given as the only energetic supplement to grazing cattle [2]. It seems interesting to note that S showed higher ($p > 0.05$) values for CLA which may have been caused by the higher content of its precursor C18:2n-6.

However, oil addition resulted in higher ($p < 0.01$) n6/n3 ratio which arises from lower levels of n3 and higher of n6 thus resembling the results reported by [3]

with soybean by-products. It can be speculated that supplementation over a longer period would have resulted in similar n6/n3 ratios in the intramuscular fat (IMF) obtained from both diets. Dry matter, ether extract, cooking losses, pH and colour parameters also did not differ ($p < 0.05$) between treatments (Table 2). Meat from supplemented steers was more tender ($p < 0.05$), which cannot be attributed to age as steers in this group were less than two months younger at slaughter.

Table 2. Meat quality characteristics

Treatments	P	S	standard error
DM ¹ (%)	27.0	27.0	0.5
IMF ² (%)	3.8	3.8	0.3
pH	5.4	5.4	0.7
L*	41.3	42.0	1.10
a*	24.8	25.8	1.15
b*	13.7	14.9	0.85
Shear force, N	67.8 ^a	56.5 ^b	3.92

DM¹: dry matter

IMF²: intramuscular fat

^{a, b}. Means in the same row without a common superscript differ significantly ($p < 0.05$)

IV. CONCLUSION

From a strict point of view supplementary feeding did not result in beef of the same quality as that from grazing animals. However differences were minimal in n6/n3 ratio and shear force. It becomes relevant that the use of sunflower oil in cattle diets may result in meat with similar characteristics as meat derived from grazing animals, with the added benefit of reducing the fattening period and production costs. It is suggested that future research work should envisage longer supplementation periods.

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