Fatty acid composition of intramuscular fat of Holstein bulls fed exclusively on grass or finished with ground maize

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Introduction

- Diets rich in n-3 polyunsaturated fatty acids (n-3 PUFA), such as EPA (C20:5n3) and DHA (C22:6n3), reduce incidence of cardiovascular diseases.

- Fatty acids - recommended values for human diet:
  - Ratio n-6/n-3 <4.0
  - Ratio PUFA/SFA >0.4

- Conjugated linoleic acid isomers (CLA) have received much attention due to their health promoting biological activities in animals, including anticarcinogenic, antiatherogenic, antidiabetogenic and immunomodulatory effects.

Introduction

Beef fat can be a significant provider of n-3 polyunsaturated fatty acids (PUFA) to human diet and it is also among the richest sources of conjugated linoleic acids (CLA).

Introduction

Previous studies have show that beef from grazing bulls:

- had lower n-6/n-3 ratio (n-6/n-3 = 1.46)
- had more CLA (0.59% in total fatty acids)

than bulls fed grass and maize silage plus concentrate.

Introduction

The Azorean archipelago has excellent climate conditions for the growth of pasture allowing beef production to be heavily based on all-year-round grass grazing systems.

Hypothesis

Does an increment in dietary energy intake of grazing bulls through a short finishing period with ground maize, alter fatty acid nutritional quality of beef?

Materials and Methods

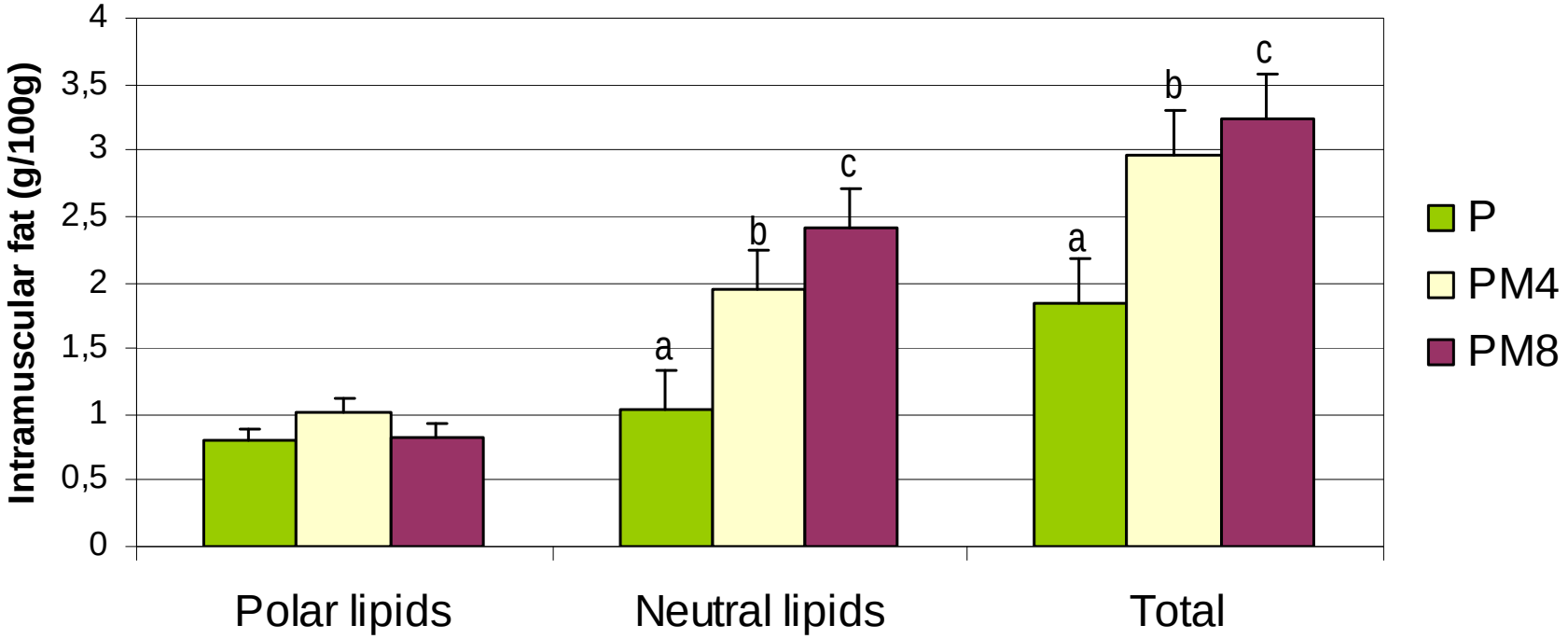
P	PM4	PM8
		
11 Holstein bulls	11 Holstein bulls	11 Holstein bulls
Finished exclusively on grass pasture	Finished on grass pasture supplemented with 4 kg ground maize/head/day	Finished on grass pasture supplemented with 8 kg ground maize/head/day

Materials and Methods

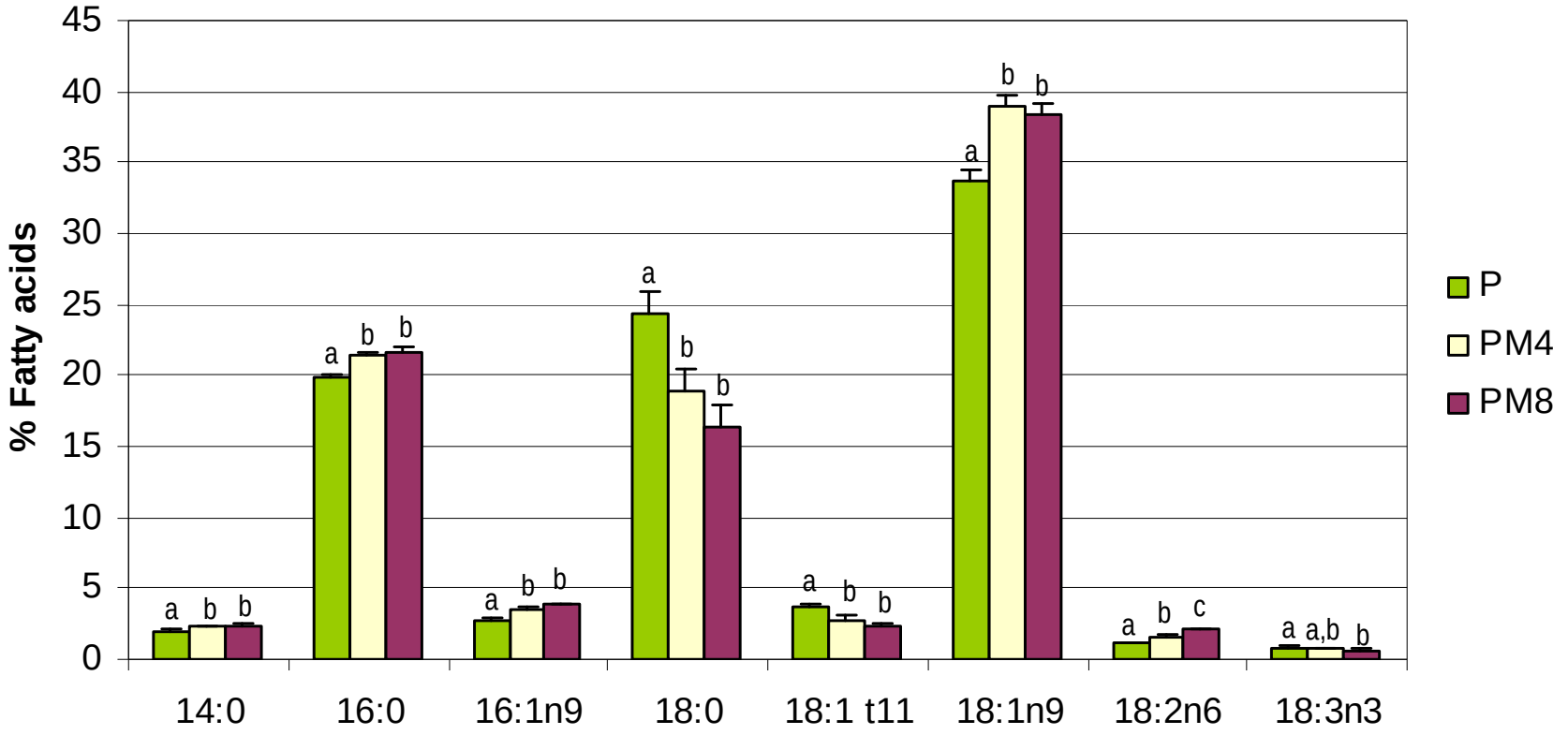
- Samples (2x50g) from *Longissimus dorsi* muscle were taken at the 10th and 11th rib, trimmed of all visible subcutaneous adipose tissue, vacuum-packed and frozen at -20º C for fatty acid analysis.
- Fatty acid analysis of neutral lipid (NL), polar lipid (PL) and total lipid (TL).

Results

Intramuscular fat of *Longissimus dorsi*



Proportion of fatty acids in neutral lipids



14:0 Myristic

16:0 Palmitic

16:1*n-9* Palmitoleic

18:1 *t11* Vaccenic

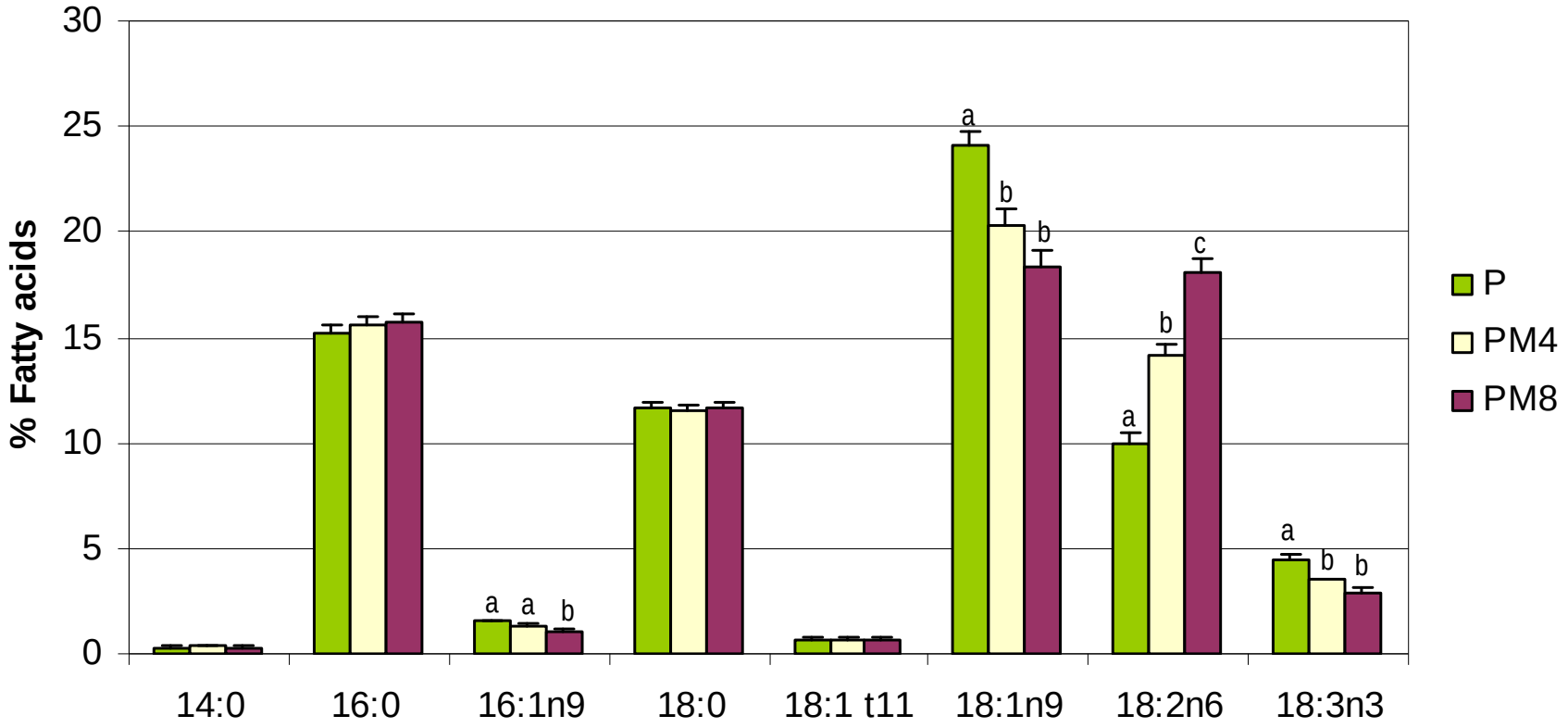
18:0 Stearic

18:1*n-9* Oleic

18:2*n-6* Linoleic

18:3*n-3* Linolenic

Proportion of fatty acids in polar lipids



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18:1 *t11* Vaccenic

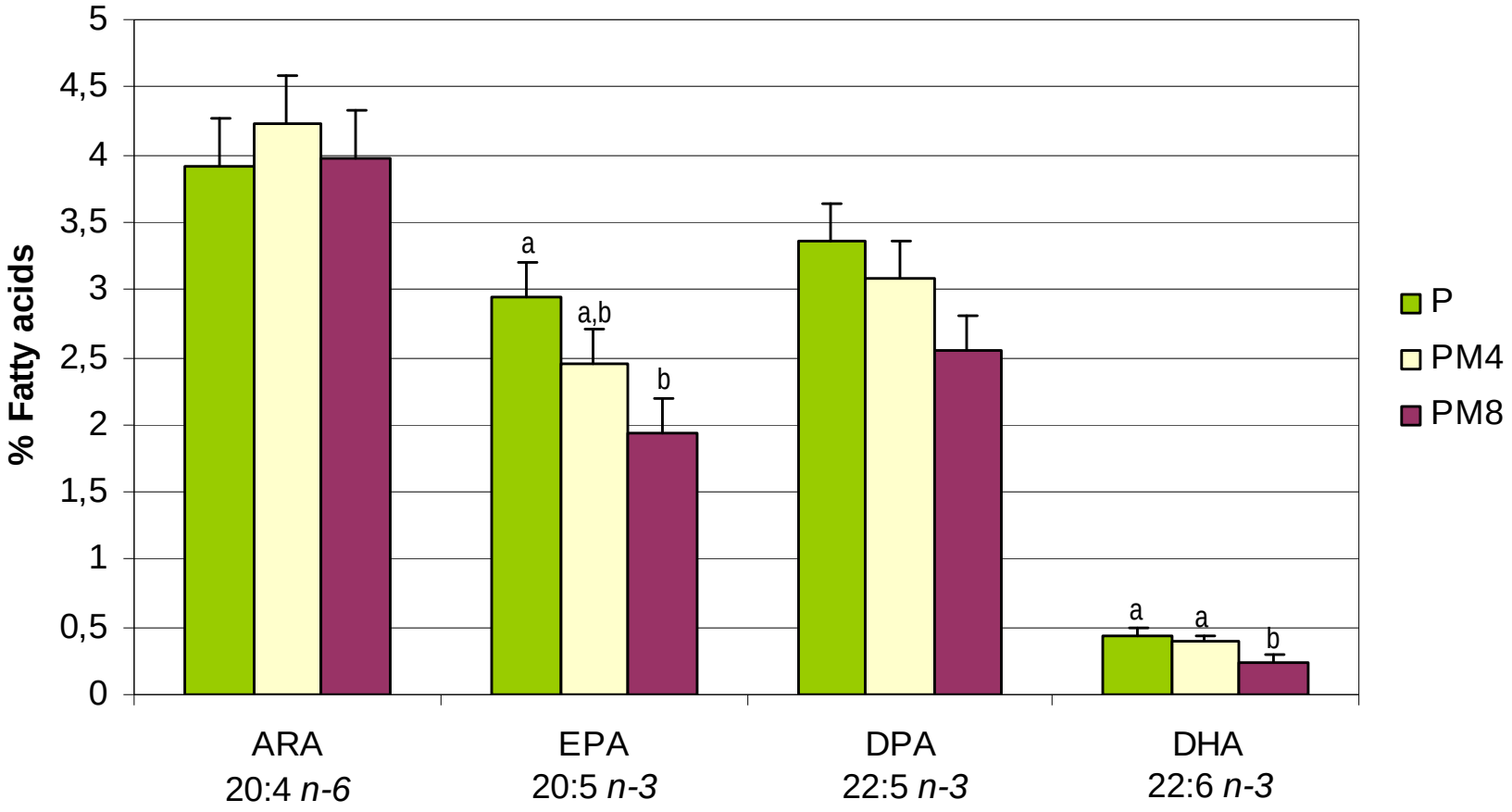
18:0 Stearic

18:1*n-9* Oleic

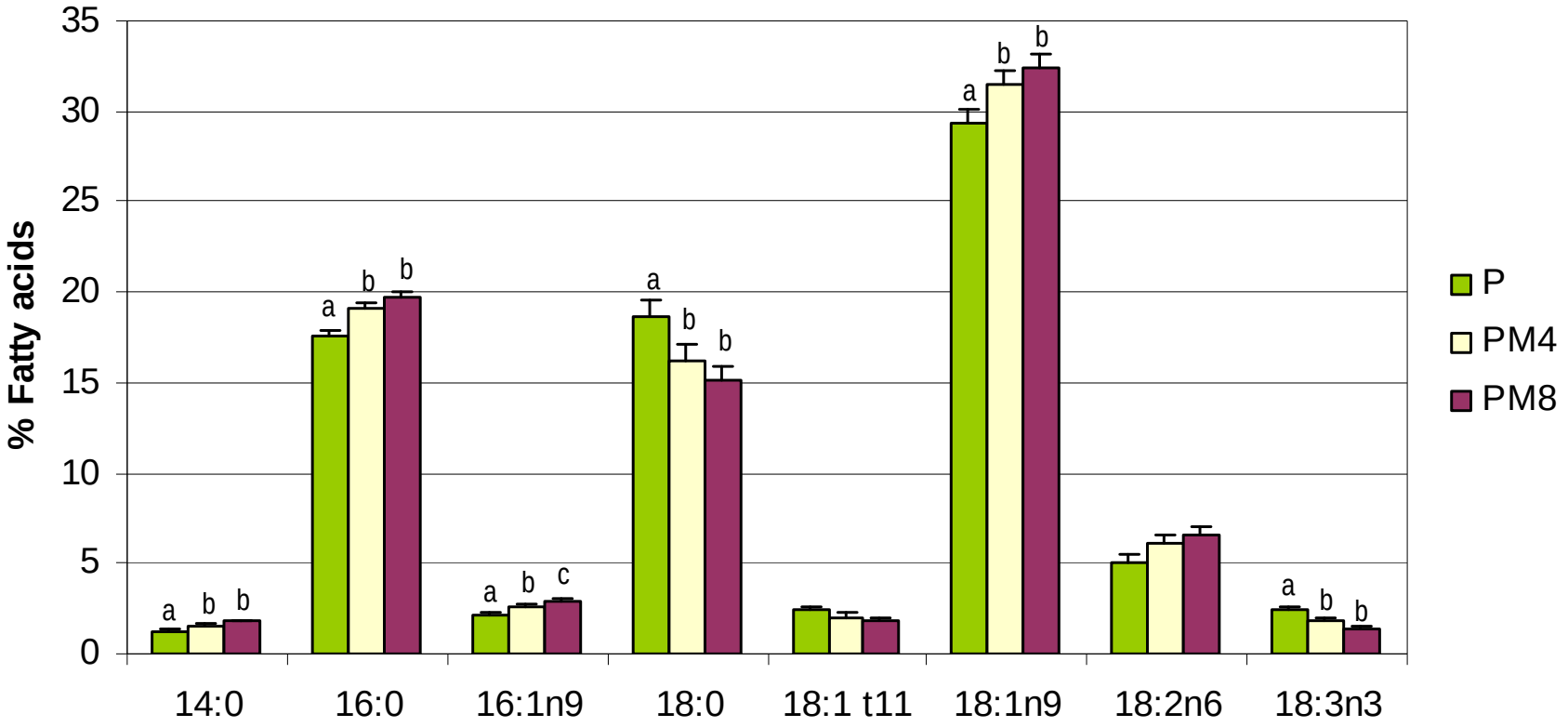
18:2*n-6* Linoleic

18:3*n-3* Linolenic

Proportion of fatty acids in polar lipids



Proportion of fatty acids in total lipids



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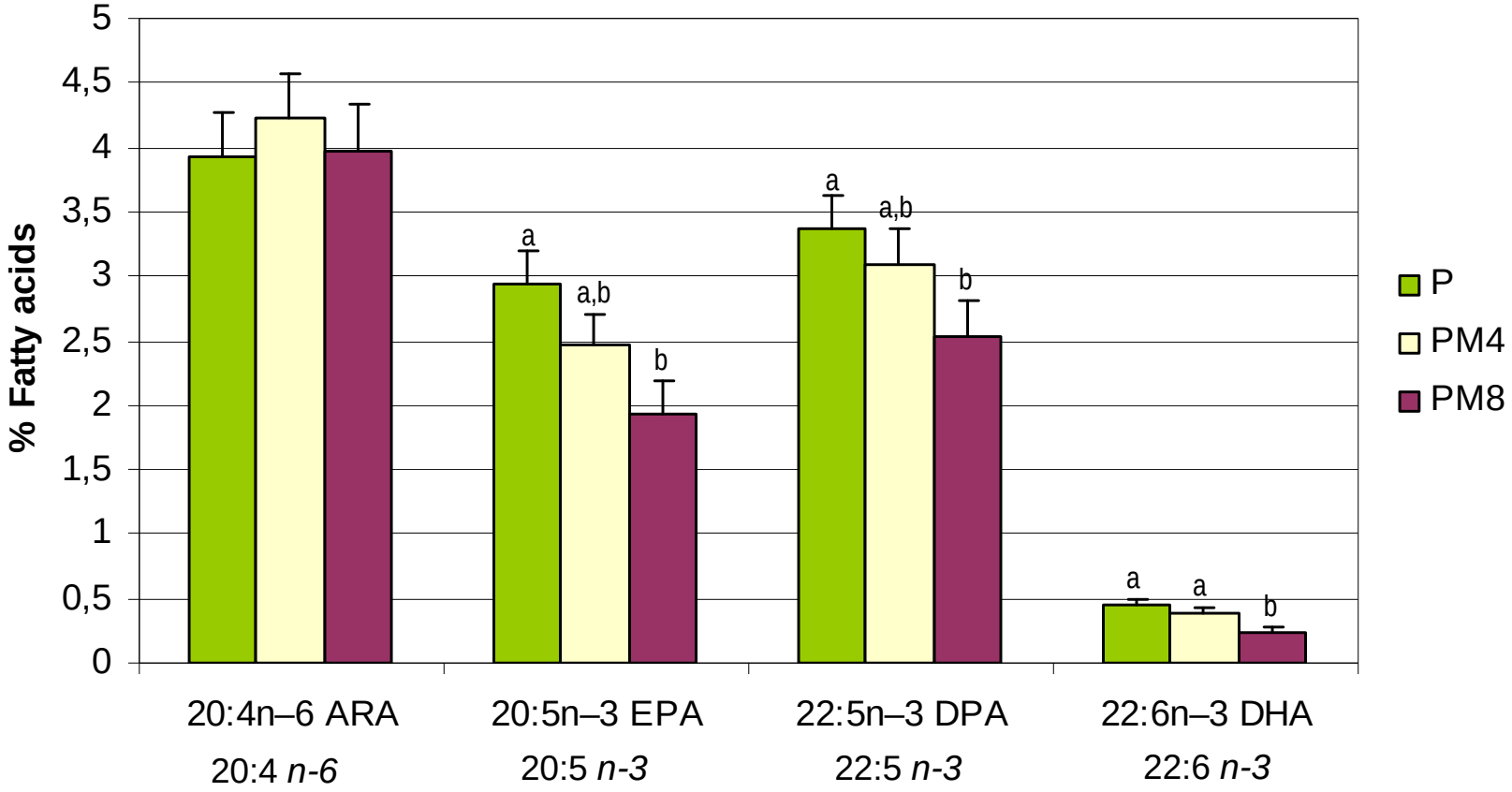
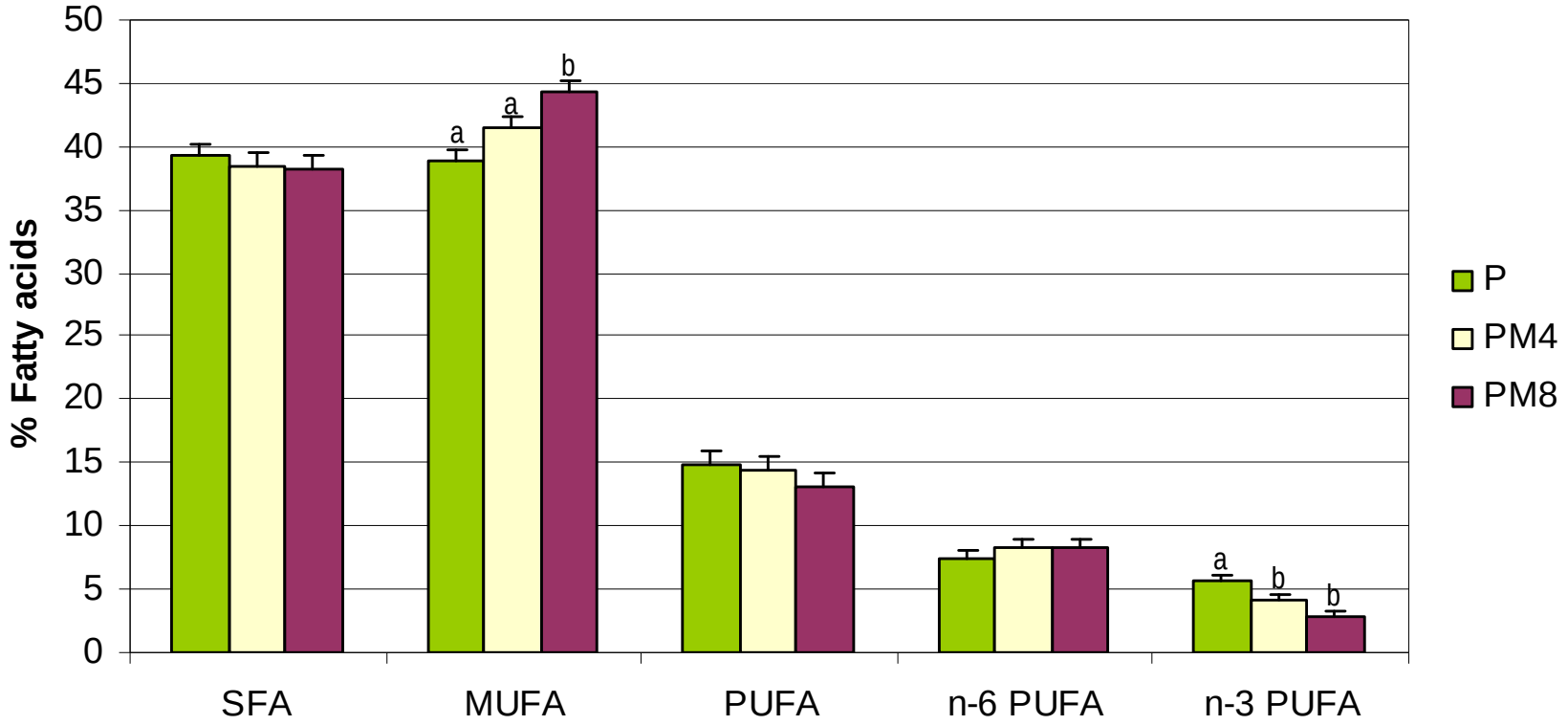
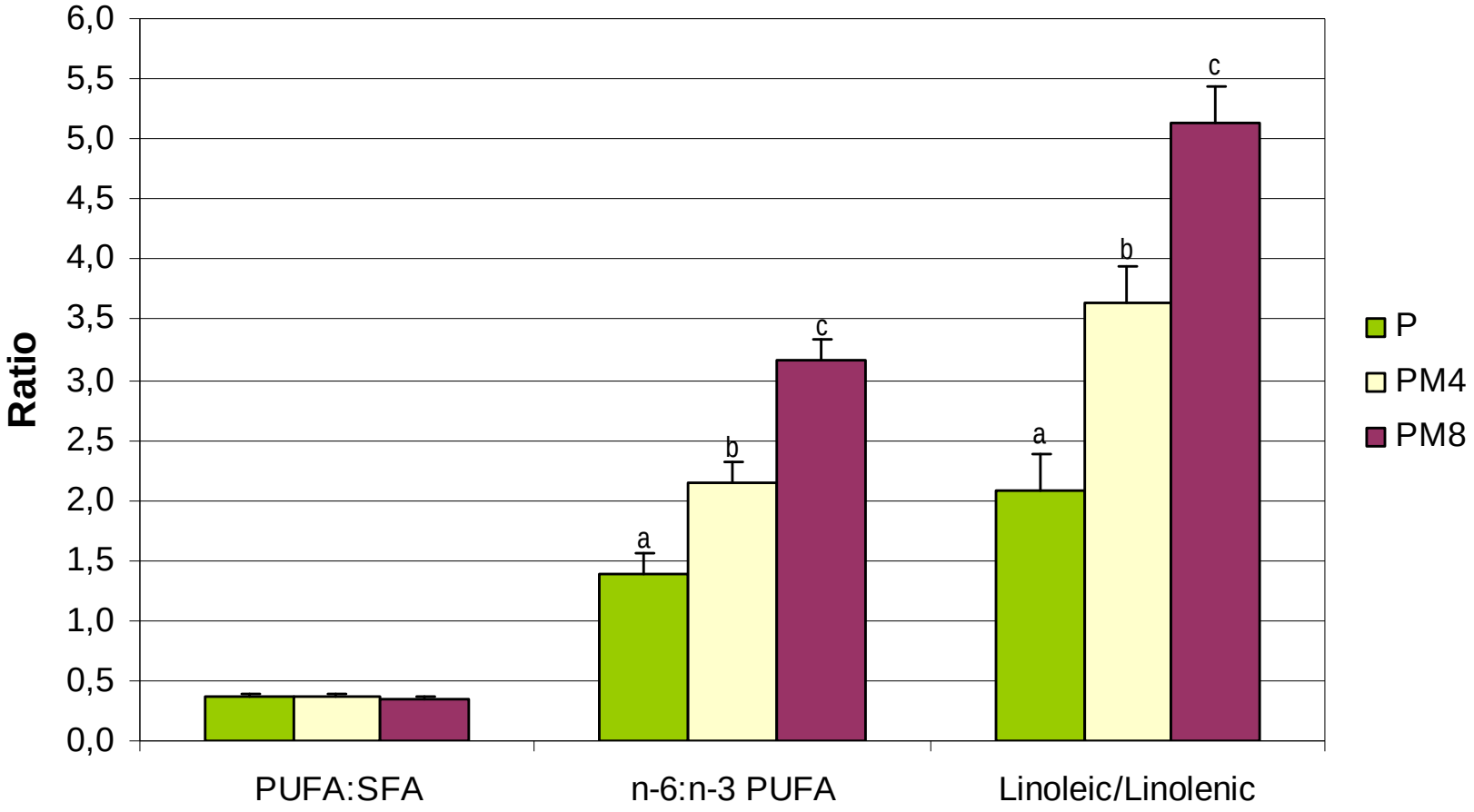


Fatty acid classes of the total lipids

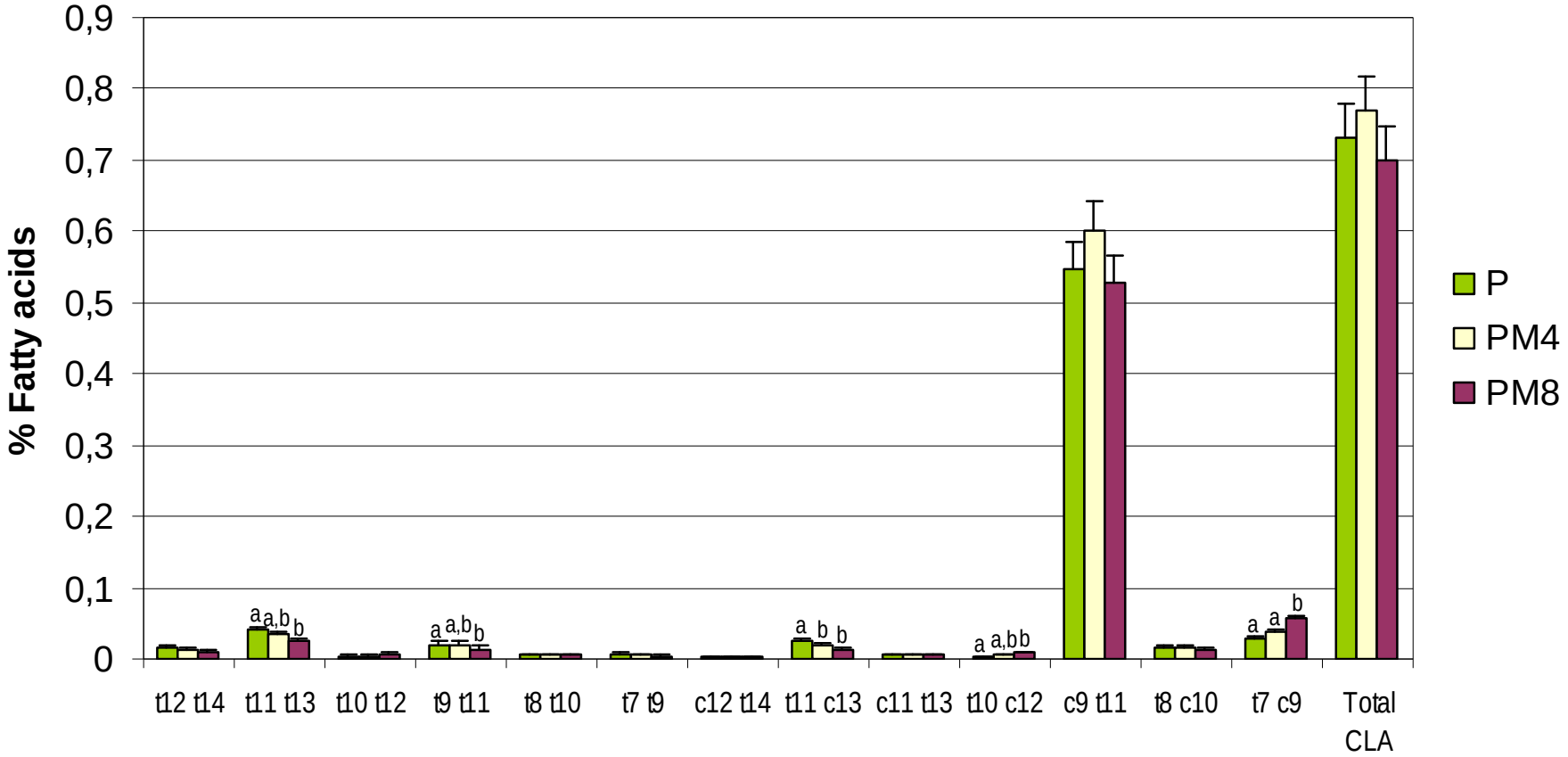


SFA – Saturated Fatty Acids
MUFA – Monounsaturated Fatty Acids
PUFA – Polyunsaturated Fatty Acids

Fatty acid ratios of the total lipids



Proportion of conjugated linoleic acids (CLA) in total lipids



Conclusion

Increasing the dietary energy intake of grazing bulls resulted in:

- ↑ intramuscular fat (increased 61% with 4kg maize and 76% with 8kg).
- The ratio PUFA:SFA was not affected by treatments.
- ↑ the n-6:n-3 PUFA ratio of total fat (although < 4).
- Total CLA or c9,t11 CLA content in total fat was not affected by treatments.

Conclusion

Supplementation of grazing bulls through a short finishing period with ground maize resulted in a substantial increase in intramuscular fat, therefore improving sensorial characteristics, without markedly affect the nutritional benefits of pasture-feed beef cattle.


Thank you for your attention!