

Session 16: Product quality(milk, meat) in small ruminants

Meat quality and lipid composition of four sheep breeds reared by the traditional Greek sheep farming

Bizelis, I.¹, Koutsouli, P.¹, Sinanoglou, V.², Symeon, G.¹, Mantis, F.²

¹ Laboratory of Animal Breeding and Husbandry, Department of Animal Science, Agricultural University of Athens, Greece, e-mail: jmpiz@aua.gr

² Department of Food Technology, Technological Educational Institution (T.E.I.) of Athens, Greece

Introduction (1)

- Sheep and goat meat is very important for many countries of southern Europe. Lambs and kids are widely produced and consumed in Greece.
- According to the traditional Greek farming system, lambs are slaughtered very young, just after weaning (between 30 and 60 days) or after a small period of fattening.

Introduction (2)

- The characteristics of lamb carcasses and quality of meat produced in Greece are very specific and different from most other countries.
- Carcass evaluation has been dominated by size and shape. Recently, there is a growing interest in meat and fat quality, as proteins, total lipids and fatty acids contribute to various aspects of meat nutritional and health value.

Aim of the study

- The evaluation of meat quality from lambs of different sheep breeds, reared in Central Greece under traditional farming practises.
- Identification of the lipid content and fatty acid composition of perinephric and intramuscular fat.
- Comparison of the specific changes in fat content as well as in lipid and fatty acid profile between tissues and breeds with special emphasis on the contribution of ω -6 and ω -3 polyunsaturated fatty acids.

Examined breeds



Lacaune



Chios



Kalaritiko

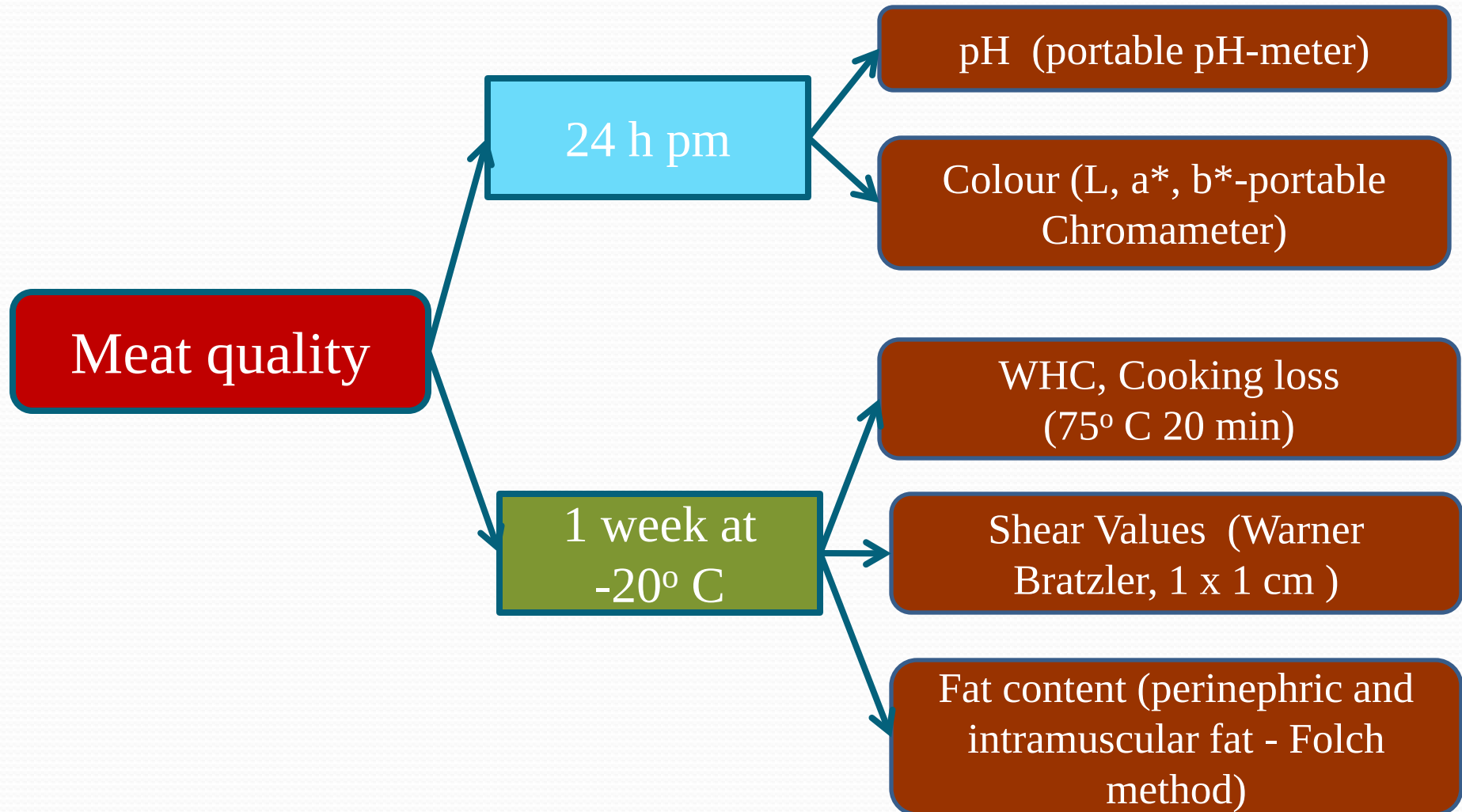


Karagouniko

Experimental Design

- Ten male lambs per breed (Chios, Lacaune, Karagouniko, Kalaritiko) fed with mother's milk and weaned at 42 days.
- Mother's diet : Alphalpha hay + standard concentrate mixture (corn, barley, wheat bran, soybean meal)
- After slaughter and overnight chilling *Longissimus dorsi* (*LD*) muscle and samples from perinephric fat were removed

Meat quality parameters



Perinephric (P) and intramuscular (IM) fat analysis

**Lipid extraction
by Folch method**

**Lipid content
determination**

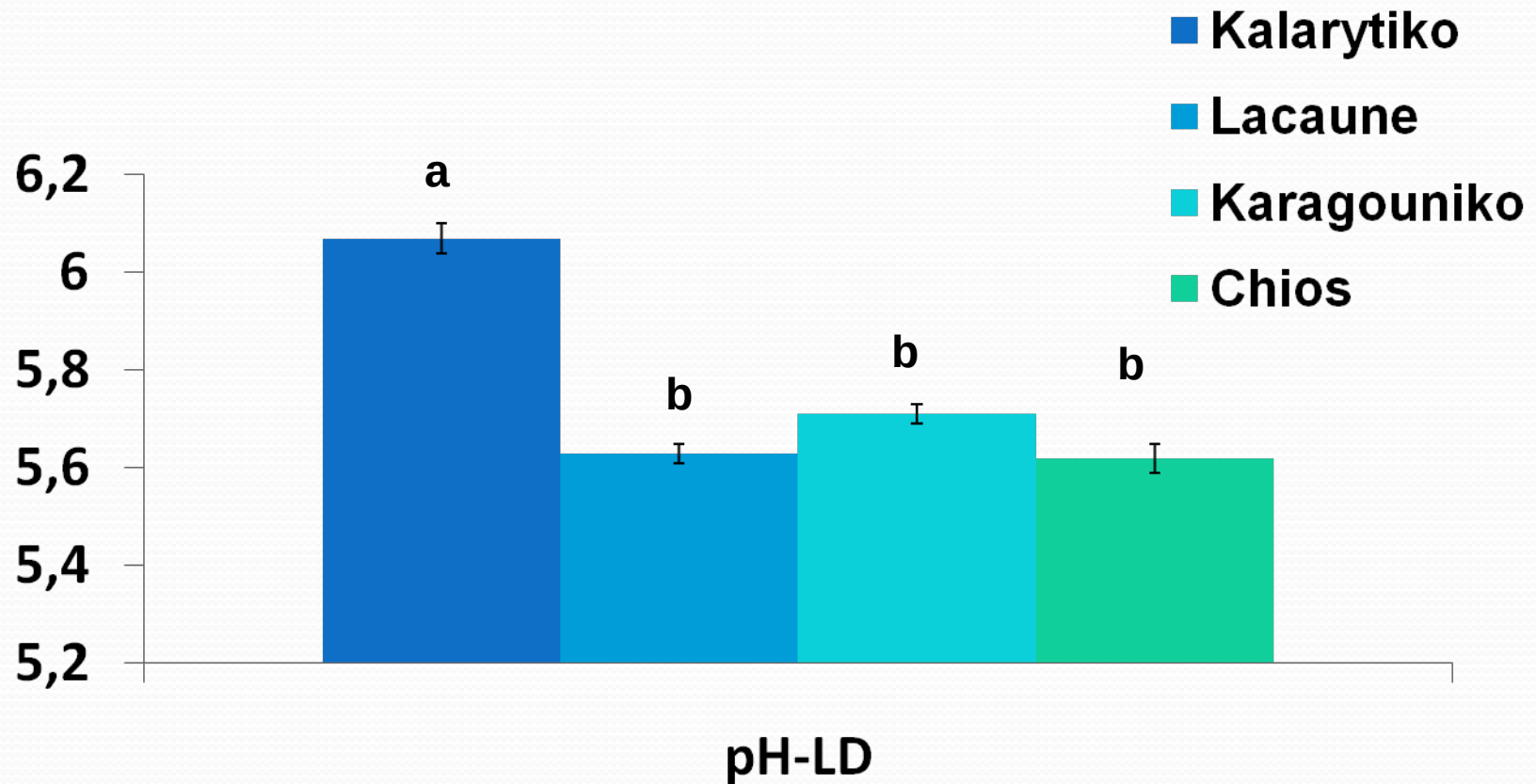
**Neutral and polar lipids analysis
by Thin-layer Chromatography -
FID system (Iatroscan)**

**GC-FID analysis
of fatty acid methyl esters**



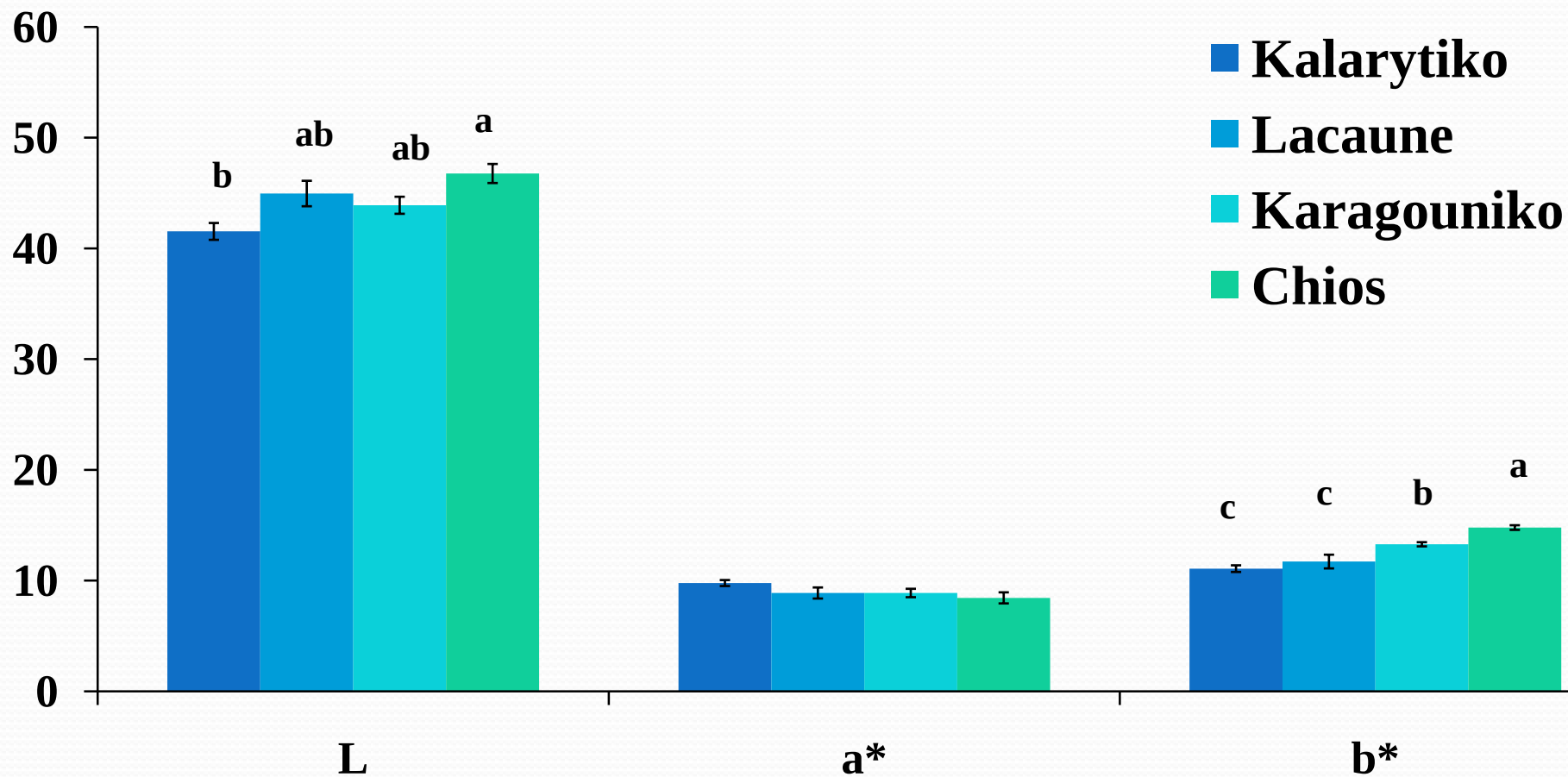
Results

pH₂₄



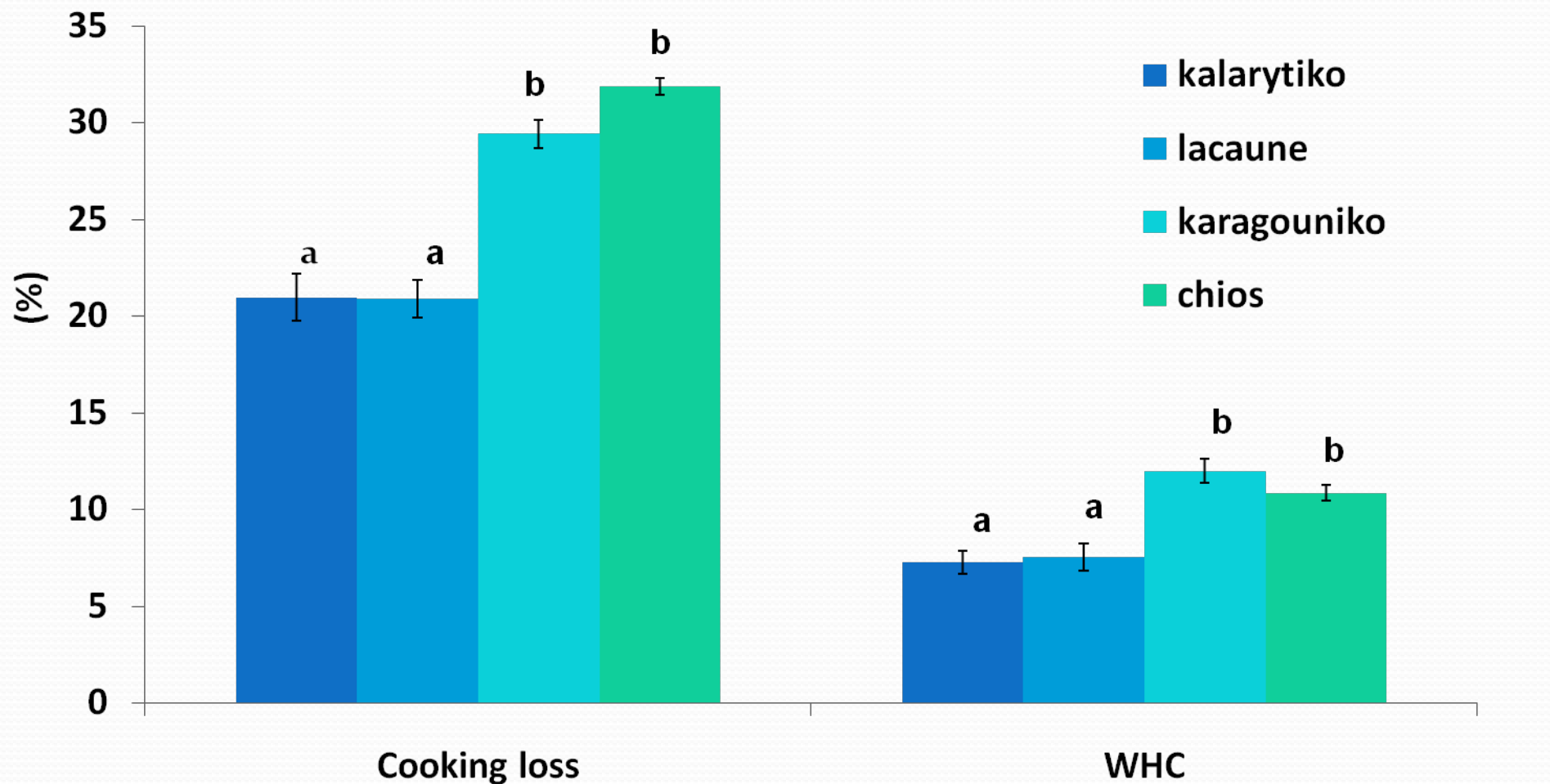
a, b: Means with different letters differ significantly (P<0.05)

Colour



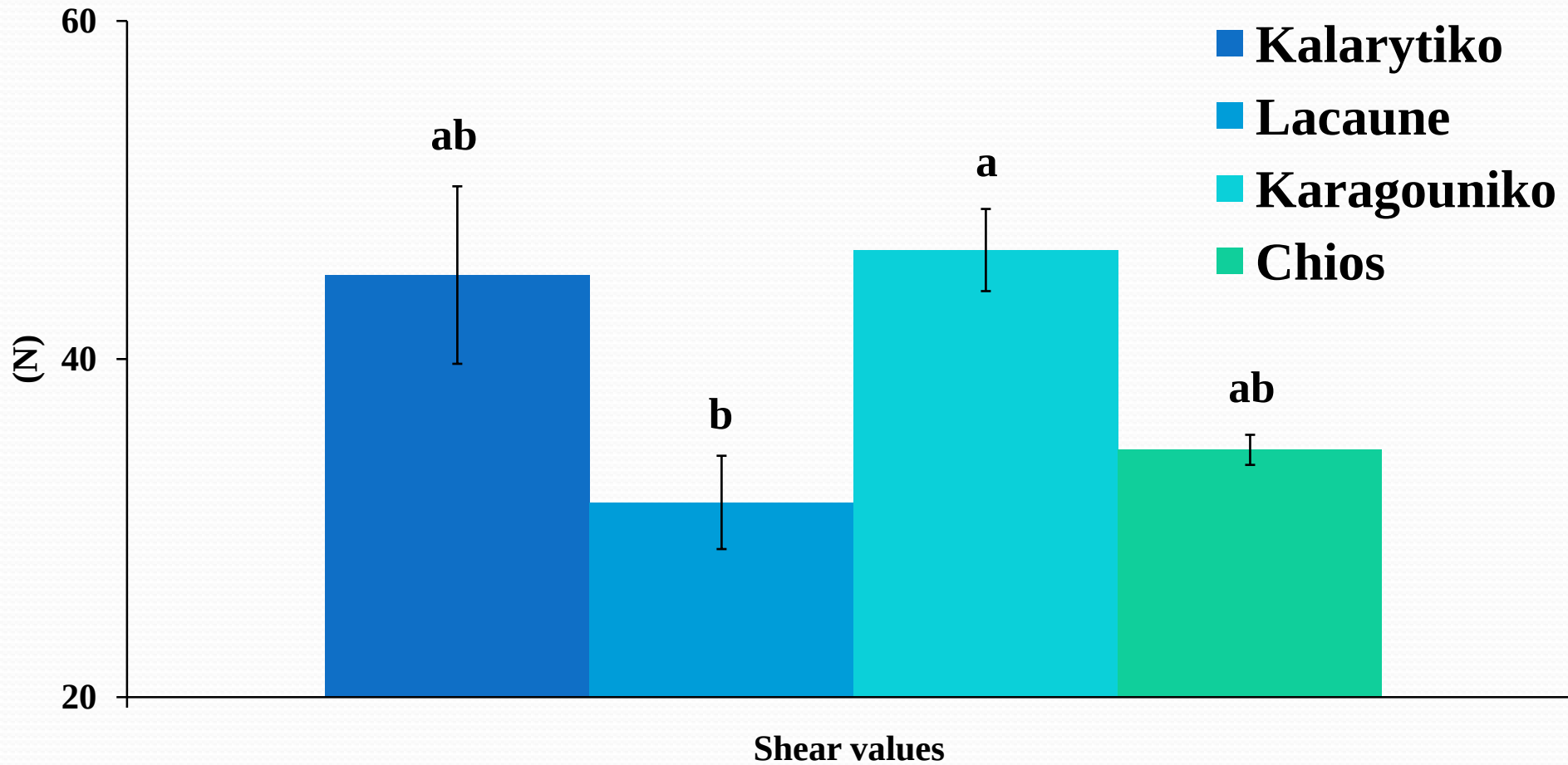
a, b, c: Means with different letters differ significantly ($P<0.05$)

Cooking loss and WHC



a, b: Means with different letters differ significantly ($P < 0.05$)

Shear values



a, b: Means with different letters differ significantly ($P < 0.05$)

Total fat (g/100g wet tissue) in perinephric (P) and intramuscular (IM) fat

	Kalaritiko	Lacaune	Karagouniko	Chios
P	78.94 ± 3.81 ab	74.29 ± 4.69 a	78.15 ± 4.54 ab	72.24 ± 3.89 a
IM	2.21 ± 0.15 b	1.77 ± 0.11 a	1.84 ± 0.14 a	1.55 ± 0.07 c

a, b: Means with different letters differ significantly (P<0.05)

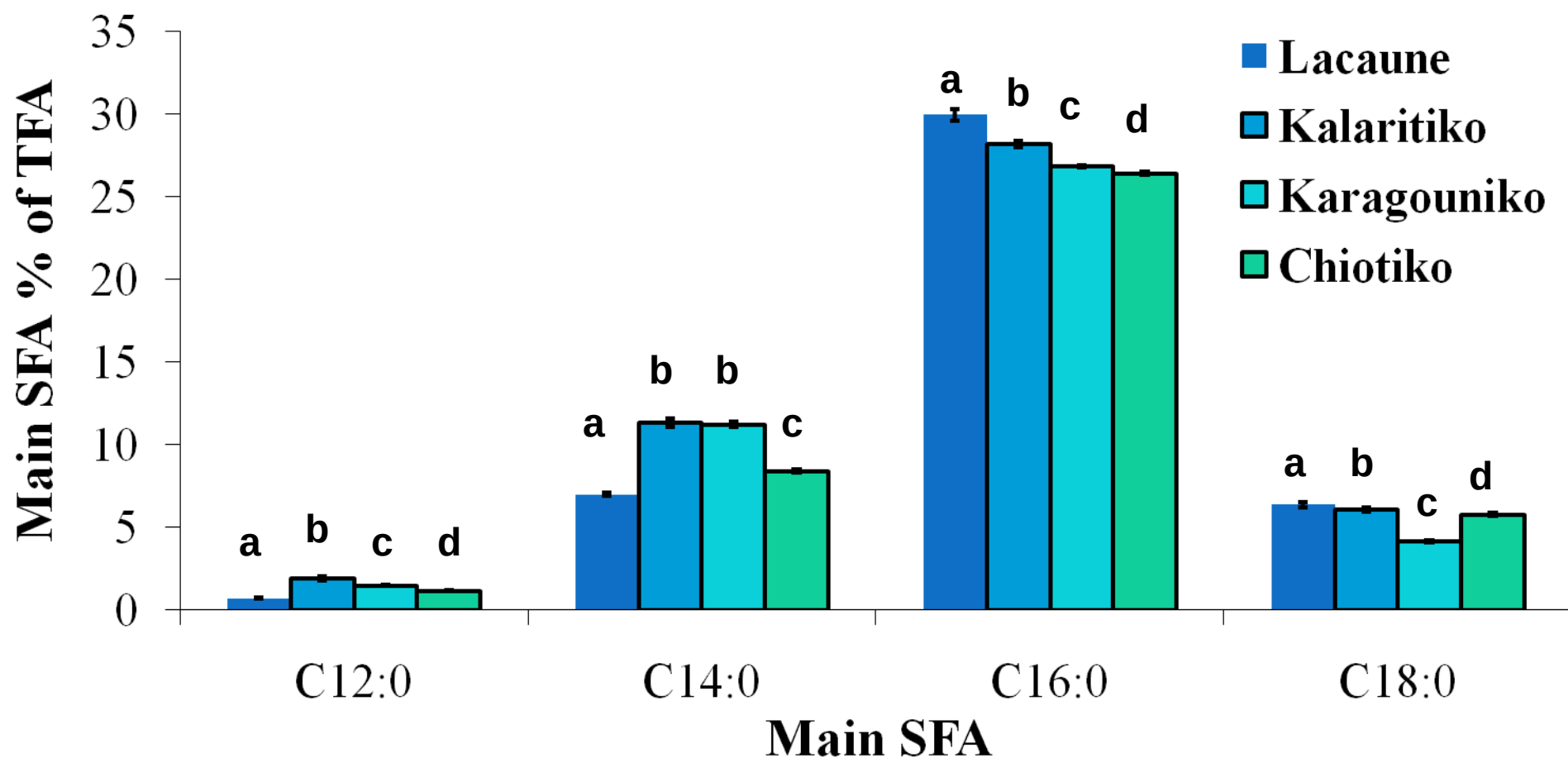
Neutral and polar lipids profile (% of TL) in P fat

	Kalaritiko	Lacaune	Karagouniko	Chios
TG	98.66 ± 0.18 a	99.12 ± 0.11 b	97.35 ± 0.14 c	97.82 ± 0.16 d
FFA	0.25 ± 0.02 a	0.08 ± 0.01 b	0.19 ± 0.02 c	0.25 ± 0.02 a
Chol	0.61 ± 0.03 a	0.38 ± 0.03 bc	0.41 ± 0.02 b	0.35 ± 0.02 c
DG	0.14 ± 0.02 a	0.02 ± 0.01 b	0.10 ± 0.01 c	0.09 ± 0.01 c
MG	0.06 ± 0.01 a	0.03 ± 0.01 b	0.05 ± 0.01 a	0.07 ± 0.02 a
PE	0.08 ± 0.01 a	0.09 ± 0.01 a	0.56 ± 0.03 b	0.63 ± 0.03 c
PC	0.20 ± 0.02 a	0.28 ± 0.02 b	1.34 ± 0.13 c	0.79 ± 0.03 d

Neutral and polar lipids profile (% of TL) in IM fat

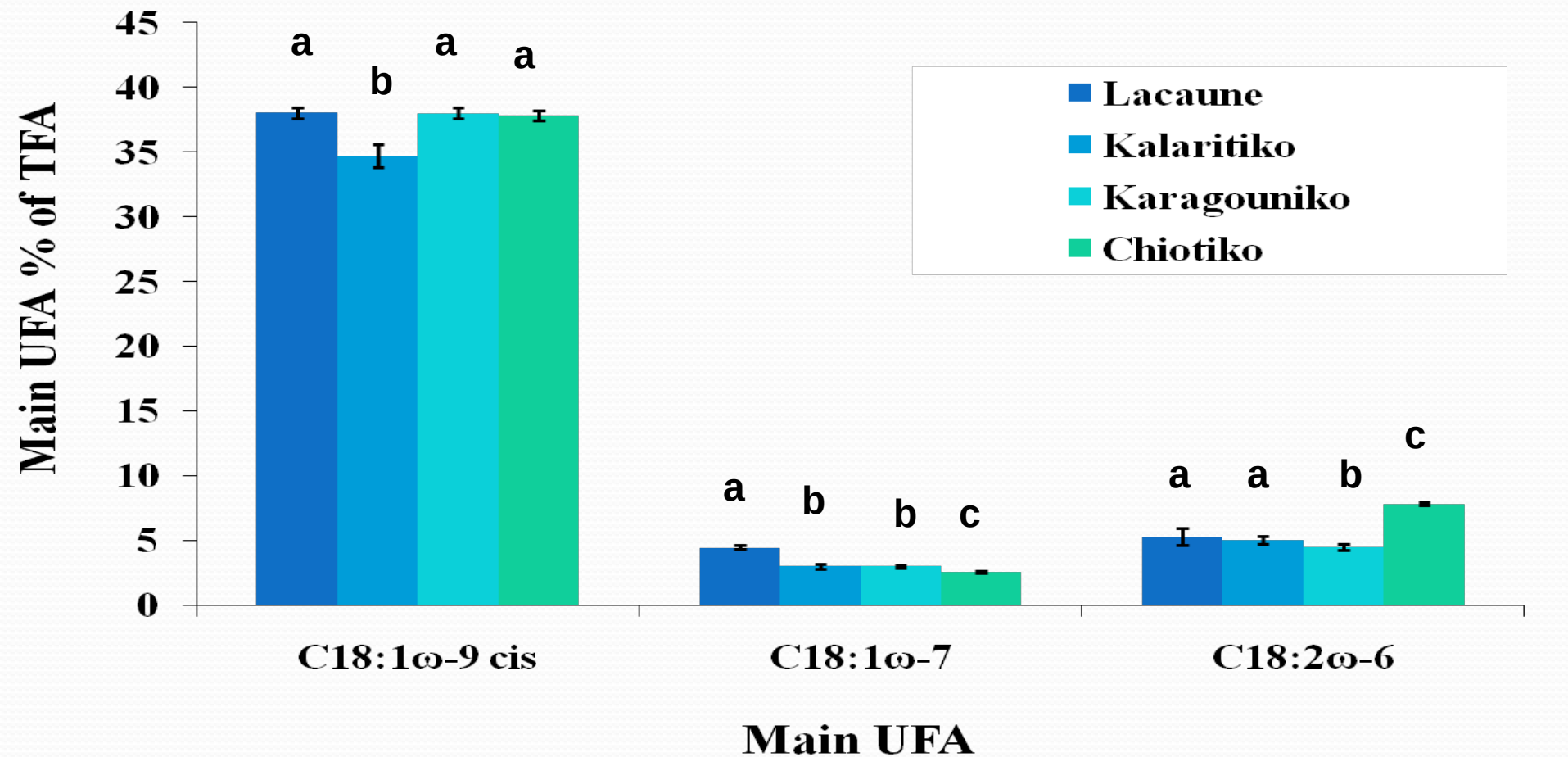
	Kalaritiko	Lacaune	Karagouniko	Chios
TG	38.60 ± 1.79 a	36.79 ± 1.43 ab	34.74 ± 0.84 b	35.57 ± 1.24 b
FFA	0.46 ± 0.05 a	0.51 ± 0.02 a	0.68 ± 0.02 b	0.48 ± 0.02 a
Chol	2.25 ± 0.17 a	4.10 ± 0.34 b	4.93 ± 0.23 c	3.64 ± 0.32 d
DG	0.15 ± 0.02 a	0.14 ± 0.02 a	0.15 ± 0.02 a	0.15 ± 0.02 a
MG	0.16 ± 0.02 a	0.18 ± 0.02 a	0.25 ± 0.02 b	0.16 ± 0.02 a
PE	14.93 ± 0.51 a	15.30 ± 0.90 a	14.43 ± 0.46 a	14.92 ± 0.92 a
PS	1.51 ± 0.09 a	1.03 ± 0.14 b	1.73 ± 0.15 a	1.19 ± 0.12 b
PC	38.24 ± 1.13 a	37.63 ± 0.99 a	39.38 ± 1.22 a	39.16 ± 1.27 a
Sphm	2.04 ± 0.11 a	2.36 ± 0.16 b	2.48 ± 0.04 b	2.74 ± 0.14 c
L-PC	1.66 ± 0.12 a	1.96 ± 0.15 b	1.23 ± 0.03 c	1.99 ± 0.11 b

Main saturated fatty acids (SFA) composition [% (w/w)] in total lipids of P fat



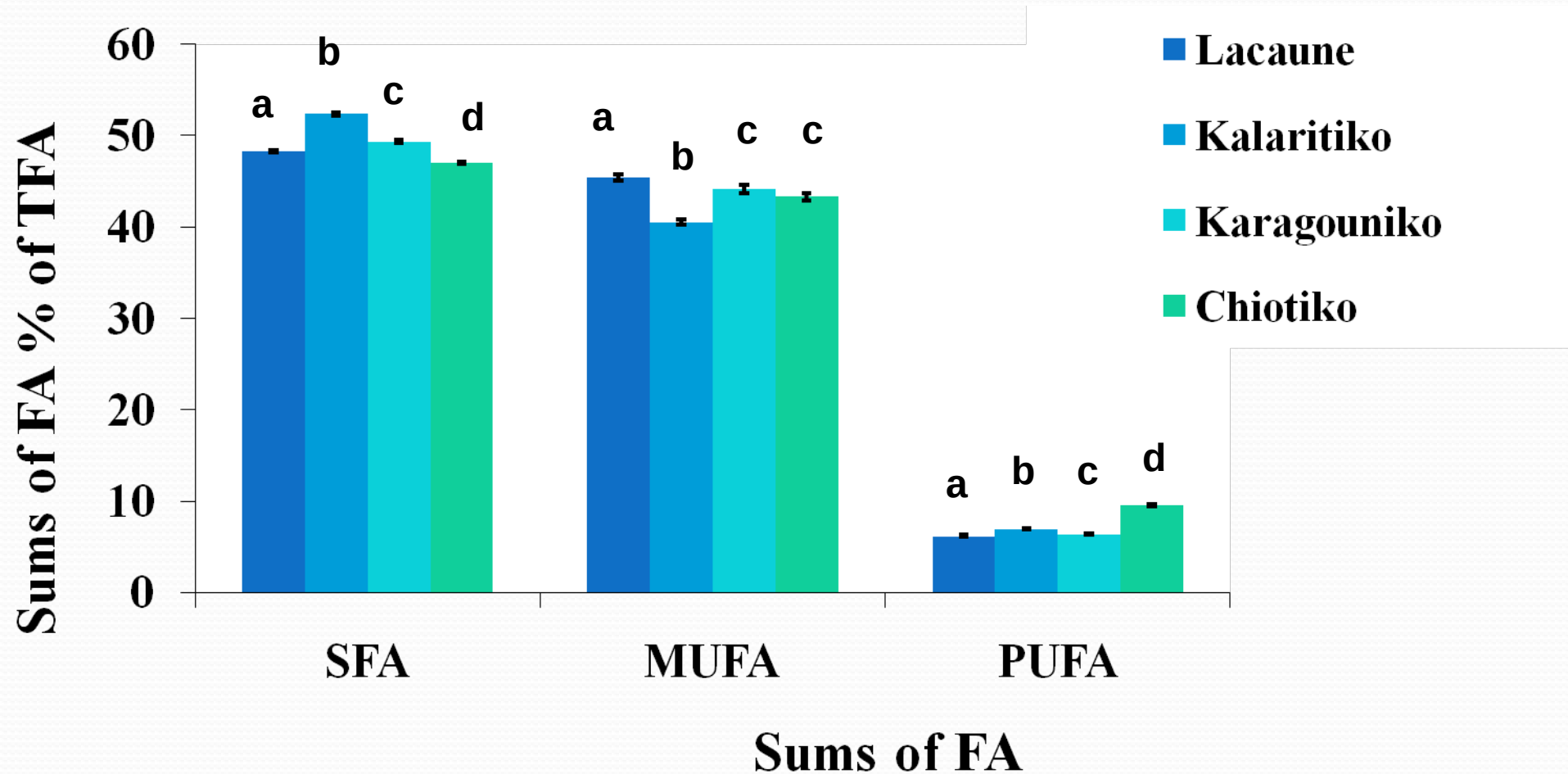
a, b, c, d: Means with different letters differ significantly ($P < 0.05$)

Main unsaturated fatty acids composition [% (w/w)] in total lipids of P fat



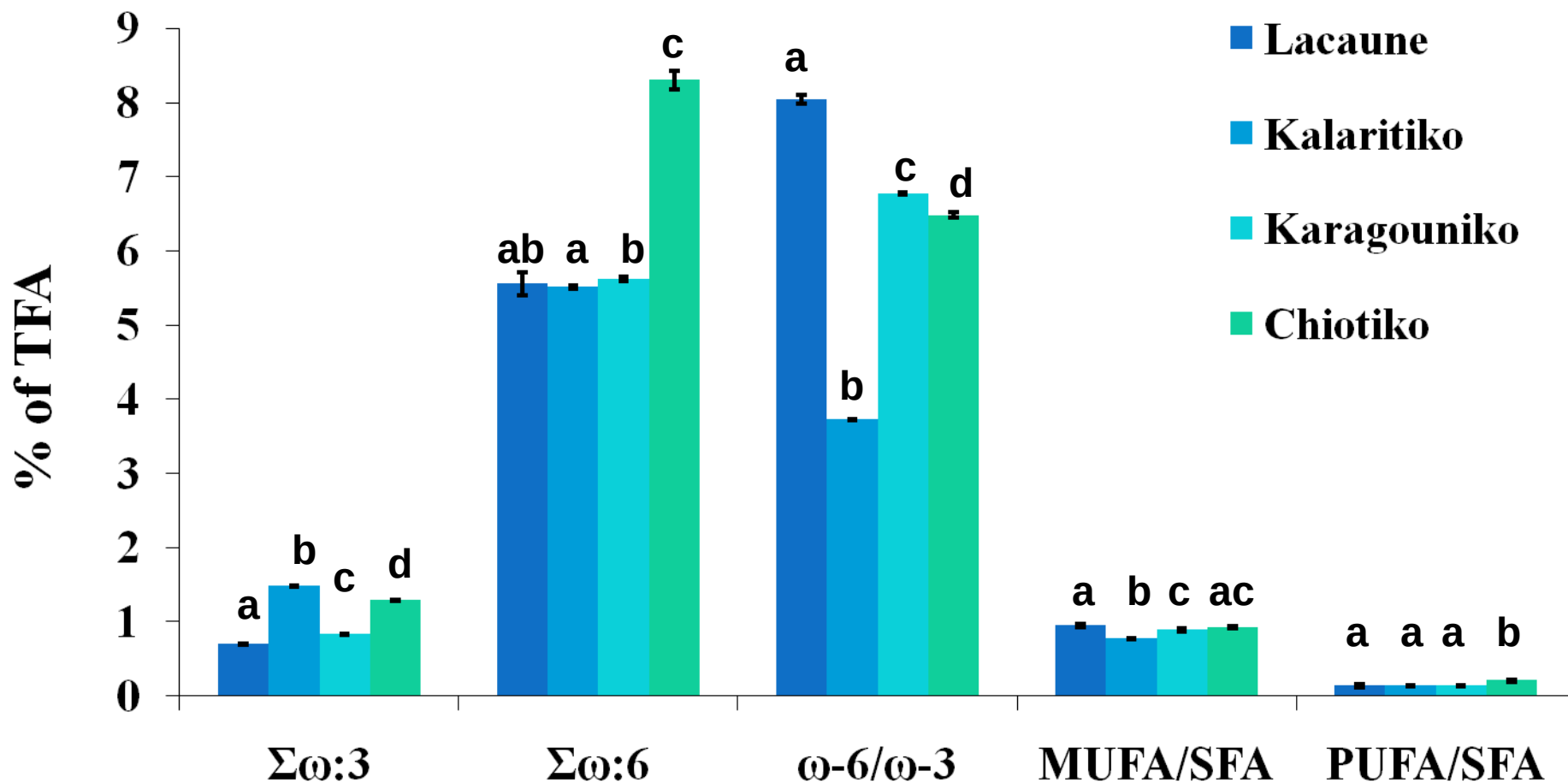
a, b, c: Means with different letters differ significantly (P<0.05)

Sums of fatty acids [% (w/w)] in total lipids of P fat

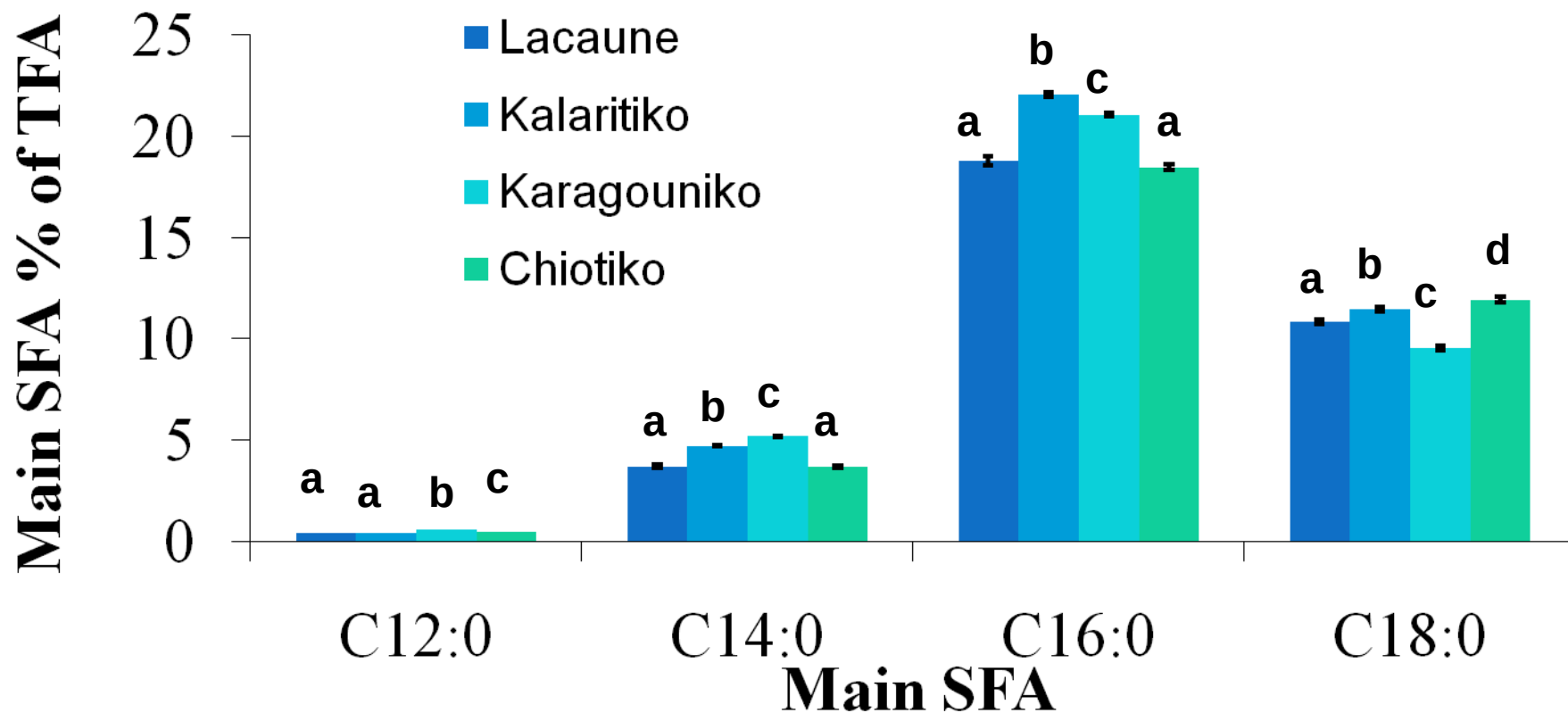


a, b, c, d: Means with different letters differ significantly ($P < 0.05$)

Sums of ω -3 and ω -6 FA [% (w/w)] and FA ratios in total lipids of P fat

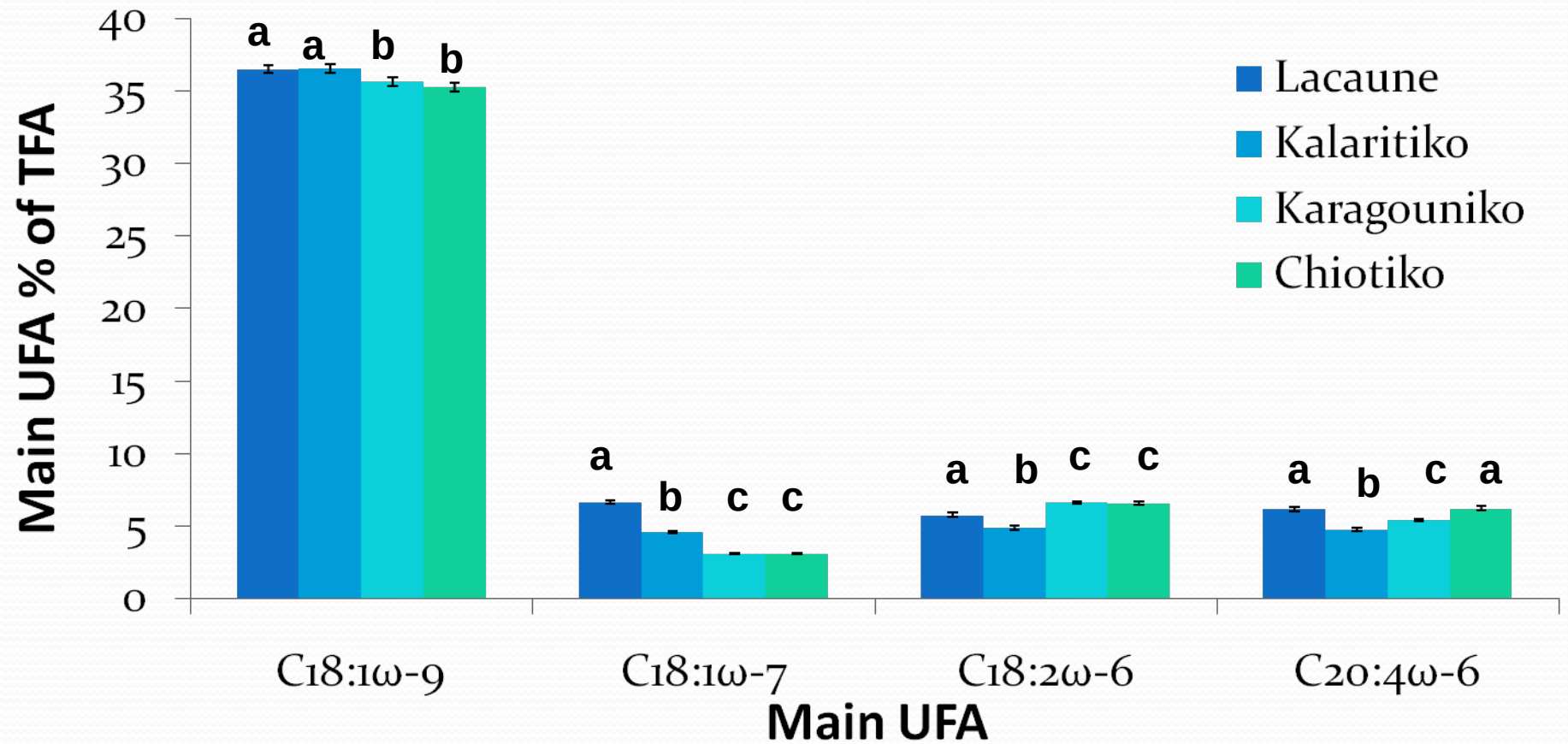


Main saturated fatty acids composition [% (w/w)] in total lipids of IM fat



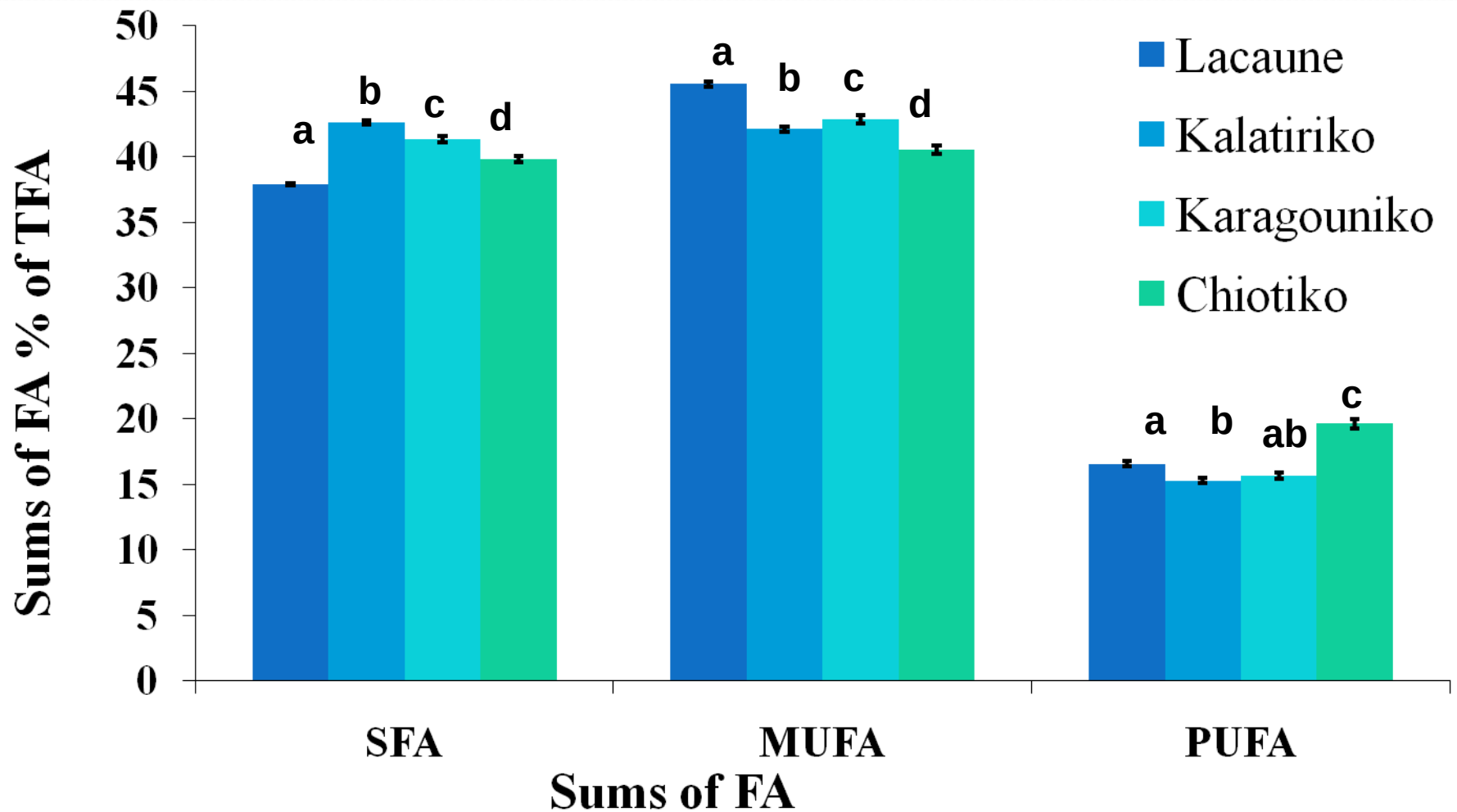
a, b, c: Means with different letters differ significantly ($P < 0.05$)

Main unsaturated fatty acids composition [% (w/w)] in total lipids of IM fat

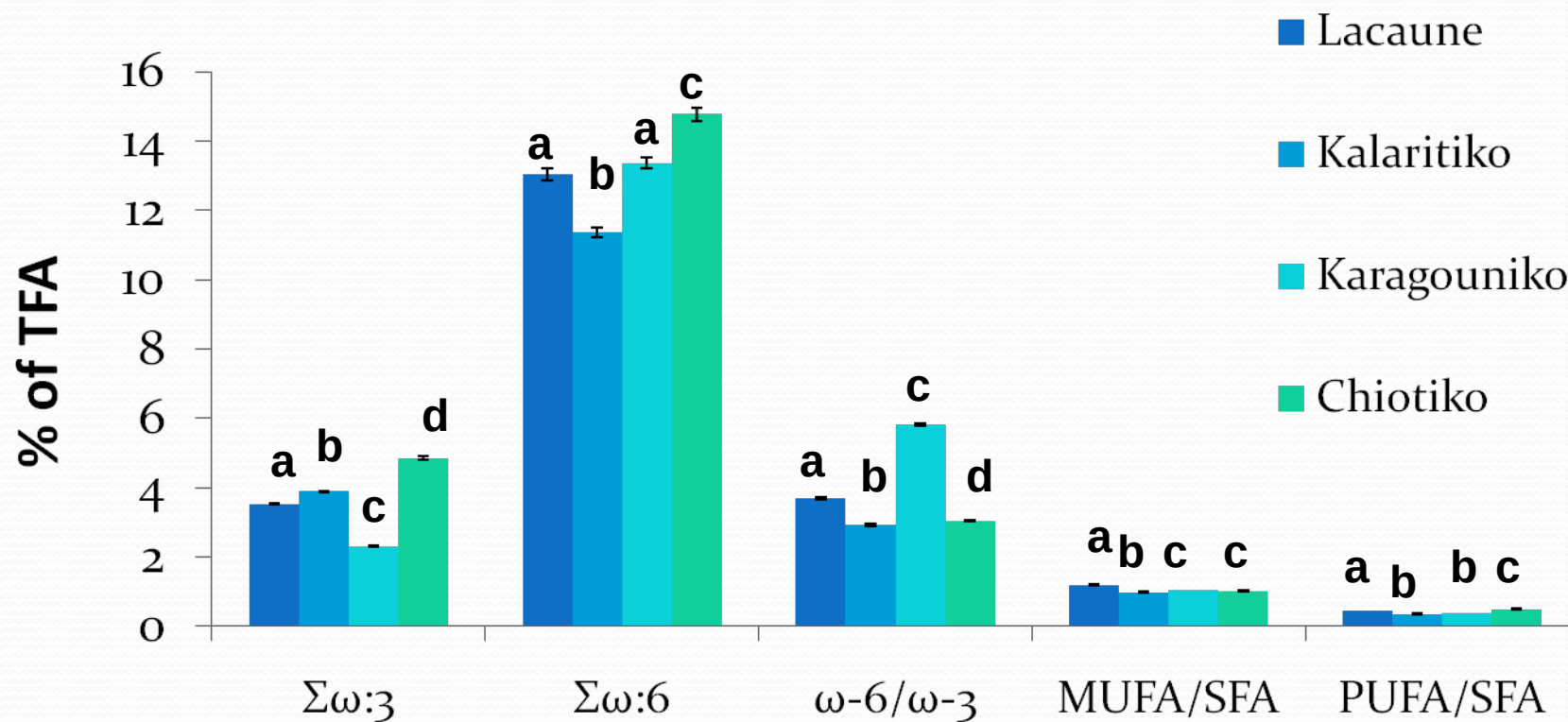


a, b, c: Means with different letters differ significantly (P<0.05)

Sums of fatty acids [% (w/w)] in total lipids of IM fat



Sums of ω -3 and ω -6 FA [% (w/w)] and FA ratios in total lipids of IM fat



a, b, c, d: Means with different letters differ significantly (P<0.05)

Conclusions (1)

- Breed affects meat quality and muscle fatty acid composition.
- The differences were more evident in P and IM neutral lipid content, since they presented significantly different fat content.

Conclusions (2)

- For example, Chios lambs had the lowest intramuscular fat, high levels of ω -3 fatty acids and high PUFA/SFA ratio. On the other hand, Kalarytiko lambs, which showed the highest intramuscular fat had the lowest cholesterol percentage as well as the lowest ω -6/ ω -3 ratios in both tissues.
- Further research is required to clarify the exact effect of breed and diet



Thank you for your attention