Comparative Lipid Composition Study in Farmed and Wild Blackspot Seabream (*Pagellus bogaraveo*)

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Abstract: During the latest decades, the fish trade has accorded an increasing attention to aquaculture development as a source of marine food products. In this sense, blackspot seabream (*Pagellus bogaraveo*) has recently attracted a great commercial interest as a farmed product. This work provides a comparative lipid composition study between wild and farmed individuals. For it, three different edible zones (ventral, dorsal and tail white muscles) were considered. From a nutritional point of view, lipid composition of farmed and wild blackspot seabream showed valuable lipid parameters (total polyunsaturated fatty acids, total ω3/total ω6 fatty acid ratio and α-tocopherol values). Comparison between farmed and wild fishes led to a wide number of differences. Thus, farmed fish muscle showed a higher ($P < 0.05$) total lipid content than its counterpart wild one. In addition, farmed fish showed higher triglyceride contents but lower ($P < 0.05$) values in the remaining lipid classes and groups studied (phospholipids, sterols and α-tocopherol). Concerning the fatty acid analysis, farmed fish showed a higher ($P < 0.05$) monounsaturated fatty acids (ventral and tail zones) content but lower for polyunsaturated fatty acids (ventral and tail zones) and total ω3/ total ω6 ratio. No differences ($P > 0.05$) were detected between both kinds of fish for the saturated fatty acids proportion. For all parameters studied, both farmed and wild fishes provided very little differences ($P < 0.05$) among the different muscle zones considered, so that an inhomogeneous distribution in the actual species could not be concluded.

Keywords: blackspot seabrean; muscle zone; farmed; wild; lipid closses; fatty acids

INTRODUCTION

The lipid fraction of marine species has deserved a marked attention due to its high content on ω3-polyunsaturated fatty acids (Ackman & Ratnayake 1990), which have shown potential benefits to human health, but also negative effects on quality changes during the technological treatment (Kolakowska 2003).

In recent years, the fishing sector has suffered from dwindling stocks of traditional species. This has prompted the fish trade to pay more attention to aquaculture development as a source of marine food products. Among marine species, blackspot seabream (*Pagellus bogaraveo*) has recently attracted a great interest in the European markets because of its firm and flavourful flesh. This has recently led to remarkable efforts focused onto its commercialisation as a farmed product. The present work focuses on the lipid composition (fatty acids and lipid classes and groups) of this fish species. Its objective was to identify elements of differentiation that characterise wild and farmed fish (Project 2005).

MATERIAL AND METHODS

Wild fish were captured near the Galician (Spain) coast and obtained from a local market. Farmed fish were provided by an aquaculture facility (Project 2005). For both kinds of fish (0.65–0.85 kg weight; 32–37 cm length), six different groups were considered ($n = 6$) and analysed separately. The study was addressed to three different edible sites (ventral, dorsal and tail white muscles) of the fish body. The lipid fraction was extracted by the Bligh and Dyer (1959) method; results are expressed as g/100 g muscle. Fatty acid methyl

esters (FAME) were prepared from lipid extracts and analysed according to Aubourg *et al*. (1996); content on individual fatty acids (g/100 g FAME) and fatty acid groups (saturated, SFA; monounsaturated, MUFA; polyunsaturated, PUFA; total ω3/total ω6) was analysed. Phospholipid content was obtained by the Raheja *et al*. (1973) method; results are expressed as g/100 lipids. Triglycerides were previously purified (Aubourg *et al*. 1991) and then quantified by the Vioque and Holman (1962) method; results are expressed as g/100 g lipids. Sterols were determined according to the Huang *et al*. (1961) method; results are expressed as g/100 g lipids. Alpha-tocopherol was determined by HPLC according to Cabrini *et al*. (1992); data are expressed as mg/100 g lipids. Data were subjected to statistical analysis ($P < 0.05$) to explore significant differences as a result of the kind of fish (farmed and wild) and the muscle zone considered (SPSS Inc., Chicago, Il, USA).

RESULTS (Table 1)

From a nutritional point of view, lipid composition of farmed and wild blackspot seabream showed valuable lipid parameters (total PUFA, total ω3/total ω6 fatty acid ratio and α-tocopherol values). For all parameters studied, both farmed and wild fishes provided very little differences ($P < 0.05$) among the muscle zones considered; accordingly, an inhomogeneous distribution in the actual species could not be concluded, in contrast to previous related research focused on other fish species (Body & Vlieg 1989; Aubourg *et al*. 2007).

However, comparison between farmed and wild fish led to a wide number of differences. Thus, farmed fish muscle showed a higher ($P < 0.05$) total lipid content than its counterpart wild one (1.10–1.55 and 0.50–0.65, respectively). In addition, farmed fish showed higher triglyceride contents but lower ($P < 0.05$) values for the remaining

Table 1. Lipid parameter analysis* in different muscle zones of farmed and wild blackspot seabream**

Lipid parameter	Kind of fish	Muscle zone		
		ventral	dorsal	tail
Total SFA	farmed	30.83 (0.26)	31.15 (0.93)	30.81 (0.44)
	wild	30.41 (0.71)	31.00 (0.34)	30.47 (0.66)
Total MUFA	farmed	25.10^{b} (2.56)	25.52 (2.28)	23.90^{b} (2.89)
	wild	15.33^{a} (4.60)	22.28 (5.34)	17.48^{a} (2.21)
Total PUFA	farmed	44.07^{a} (2.39)	43.34 (2.51)	45.29^{a} (2.53)
	wild	54.25^{b} (5.19)	46.72 (5.57)	52.05^{b} 3(.76)
ω3/ω6 fatty acid ratio	farmed	2.59^{a} (0.25)	2.56^{a} (0.17)	2.78^{a} (0.34)
	wild	12.09^{b} (1.08)	10.66^{b} (1.14)	11.48^{b} (0.82)
Phospholipids	farmed	22.06^{a} (5.40)	19.30^{a} (5.77)	25.30^{a} (7.60)
	wild	y 57.96^{b} (0.77)	z 43.51^{b} (11.41)	yz 54.21^{b} (9.35)
Triglycerides	farmed	11.96^{b} (1.00)	13.02^{b} (0.92)	11.35^{b} (1.32)
	wild	z 4.43^{a} (3.40)	y 8.98^{a} (2.57)	yz 6.18^{a} (2.29)
Sterols	farmed	1.74^{a} (0.32)	1.60^{a} (0.47)	2.16^{a} (0.55)
	wild	4.77^{b} (0.70)	3.66^{b} (0.83)	4.74^{b} (0.67)
Alpha-tocopherol	farmed	39.8^{a} (3.8)	33.5^{a} (5.2)	37.8^{a} (5.4)
	wild	y 173.6^{b} (10.2)	z 126.1^{b} (15.8)	z 141.2^{b} (12.1)

*Mean values of six independent determinations ($n = 6$). Standard deviations are indicated in brackets. Abbreviations: saturated fatty acids (SFA), monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA)

**For each parameter and for each muscle zone, mean values followed by a different letter (a, b) denote significant differences ($P < 0.05$) between wild and farmed individuals. For each parameter and for each kind of fish, mean values preceded by a different letter (y, z) indicate a significant difference ($P < 0.05$) among muscle zones considered

lipid classes and groups studied (phospholipids, sterols and α-tocopherol). Concerning the fatty acid analysis, farmed fish showed a higher ($P < 0.05$) MUFA (ventral and tail zones) content but lower for PUFA (ventral and tail zones) and total ω3/ total ω6 ratio. No differences ($P > 0.05$) were detected between both kinds of fish for the SFA proportion.

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