

VITAMIN CONTENT OF FISH AND FISH PRODUCTS CONSUMED IN PORTUGAL

Dias M G, Sánchez M V, Bártolo H, Oliveira L

Food Safety and Nutrition Centre – Centro de Segurança Alimentar e Nutrição
National Institute of Health, Lisbon, Portugal – Instituto Nacional de Saúde Dr. Ricardo Jorge, Lisboa
Av. Padre Cruz, 1649-016- Lisboa, Portugal; csan@insa.min-saude.pt; Tel.: +351217519298/390

KEYWORDS

vitamin content; fish; HPLC; microbiological methods

ABSTRACT

Portuguese Food Composition Table only includes values for vitamins A, B1, B2, PP determined before 1963. Most fish and fish products consumed in Portugal are not included in international food composition tables. Aims: To study vitamin content of fish and fish products consumed in Portugal. Design: Vitamins A, E, D, B1, B2, B6, B12, PP and Folate content was determined in fifty-six samples of raw and cooked fish and fish products, collected between October 1999 and February 2002.

A total of thirty-four species (thirty fish and four molluscs) were analysed raw. Twelve fish species and two molluscs were also analysed cooked at least by one cooking method in a total of twenty-two cooked samples. Vitamins A, E, D, B1, B2, B6, PP contents were determined by HPLC methods. Foliates and B12 contents were determined by microbiological methods. Results: Vitamin profiles differed significantly between species. Variability in vitamin content was observed and was wider for liposoluble vitamins. Excluding values under the Limit of Detection, the results varied over a factor of 100 for vitamins A, E, D, a factor of 20 for B6, B12 and niacin and a factor of 15 for B1 and B2. Folate showed the lower variability (factor < 5). Conclusion: The wide variability of vitamin content between species observed strengthens the importance of producing data derived from a selection of species representative of the national food habits.

INTRODUCTION

Fish and fish products are important items of Portuguese diet. Portuguese Food Composition Table only includes values for vitamins A, B1, B2, PP determined before 1963. Changes in analytical methods, food habits and food production methods make it necessary to update data on food composition. Data from international food composition tables on fish and fish products are of little use for national purposes as most of the fish and fish products consumed by the Portuguese population are not included in those tables (Greenfield, 1992).

Vitamins A, E, D, B1, B2, B6, B12, PP and Folate content was determined in fifty-six samples of raw and cooked fish and fish products.

MATERIALS AND METHODS

Samples

A total of thirty-four species (thirty fish and four molluscs) were analysed raw. Twelve fish species and two molluscs were also analysed cooked at least by one cooking method. A representative

sample of each species was collected, between October 1999 and February 2002, composed of at least 4 “individuals” and with a minimum weight of 10 kg. Edible portion was prepared, divided in representative sub-samples and deep-frozen (-80°C) under vacuum, in plastic bags with low permeability to oxygen. Analytical samples were prepared immediately before analysis by blending. Collection dates are not coincident for samples analysed raw and cooked.

Analytical methods

Vitamins A, E, D, B1, B2, B6, PP contents were determined by HPLC methods Brubacher (1985), EN12822 (1999), EN12821 (1999), French Official Methods published in “Journal Officiel de la République Française”(4/2/1999), annexes I, II, III and method described in CEN/TC 275/WG 9 N145 document, respectively. Folate and B12 contents were determined by microbiological methods prEN14131 and an adaptation from U.S.P. XXII, 1990/Difco Manual 10th Edition, 1984/Roche – Hoffmann – La Roche, 1988, respectively.

RESULTS AND DISCUSSION

Figure 1 shows vitamin profiles of some species of fish and molluscs expressed in % of Recommended Daily Allowance (RDA) per 100g of edible portion. For % RDA calculation purpose results under the Limit of Detection (LD) were assigned ½ LD.

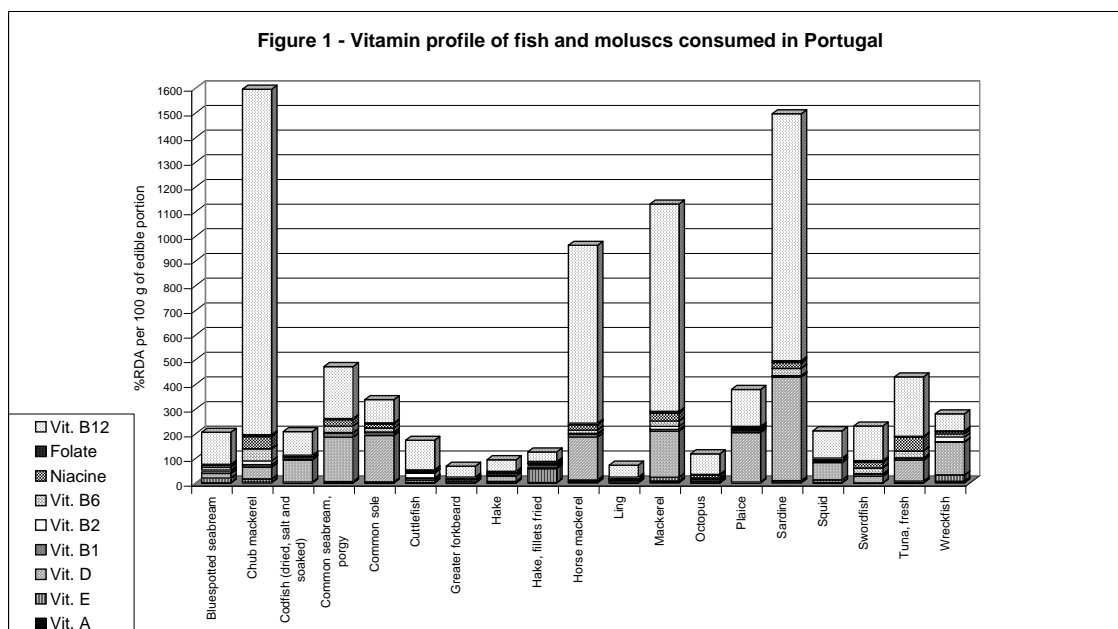


Figure 1. Vitamin content per 100 g of edible portion of raw and cooked fish and molluscs are presented in Table 1.

The results show that vitamin profile differs widely between species. Variability in vitamin content was observed and was wider for liposoluble vitamins. Excluding values under the LD, the results varied over, a factor of 100 for vitamins A, E, D, a factor of 20 for B6, B12 and niacin and a factor of 15 for B1 and B2. Folate showed the lowest variability (factor < 5).

Table 1 - Vitamin content of fish and moluscs consumed in Portugal (per 100 g of edible portion)

	Vit. A mcg	Vit. E mg	Vit. D mcg	Vit. B1 mg	Vit. B2 mg	Vit. B6 mg	Niacine mg	Folate mcg	Vit. B12 mcg
Alfonsino	9,6	0,62	2,7	0,10	0,015	0,12	3,9	11	n.a.
Axillary bream	n.a.	1,1	<0,70	0,066	n.a.	0,32	2,4	17	n.a.
Axillary bream, boiled	n.a.	1,4	(1,2)	n.a.	n.a.	0,15	2,1	9,5	n.a.
Axillary bream, fried	n.a.	1,4	(0,94)	0,072	n.a.	0,14	2,2	11	n.a.
Axillary bream, grilled	n.a.	1,6	n.a.	n.a.	n.a.	n.a.	2,1	15	n.a.
Black scabbardfish	23	1,1	2,1	<0,018	0,038	0,16	1,8	8,3	n.a.
Bluespotted seabream	6,0	1,9	(0,94)	0,13	0,064	0,22	1,6	7,0	1,3
Chub mackerel	28	1,3	2,4	0,13	0,23	1,0	9,0	14	14
Chub mackerel, canned in olive oil	n.a.	1,9	<0,70	(0,036)	0,20	0,26	5,8	17	n.a.
Codfish (dried, salt and soaked)	3,8	0,28	4,5	(0,047)	0,068	0,072	0,76	8,1	0,95
Codfish (dried, salt and soaked), boiled	2,7	0,28	<0,70	(0,018)	0,086	0,057	(0,28)	5,7	n.a.
Codfish (dried, salt and soaked), grilled	(1,4)	0,34	<0,70	(0,048)	0,056	0,047	0,48	9,9	n.a.
Common seabream, porgy	6,3	0,45	9,0	0,25	0,023	0,50	4,8	10	2,1
Common sole	4,4	0,32	9,4	0,091	0,13	0,33	2,8	10	0,94
Conger	267	1,5	91	(0,041)	0,050	0,55	1,5	13	n.a.
Cuttlefish	9,4	0,94	<0,70	(0,042)	0,30	0,064	1,1	8,8	1,2
Eel	887	2,4	16	0,28	0,26	0,15	1,3	9,3	n.a.
European dogfish	2,9	0,35	<0,70	(0,040)	0,032	0,12	1,9	6,2	n.a.
Gilthead	14	1,3	14	0,18	0,057	0,44	4,5	9,4	n.a.
Gilthead, boiled	12	0,32	8,4	0,23	0,11	0,27	2,9	9,6	n.a.
Gilthead, grilled	n.a.	<0,014	10	0,26	0,13	0,22	3,7	n.a.	n.a.
Greater forkbeard	(0,65)	(0,038)	<0,70	(0,034)	0,027	0,064	0,56	12	0,44
Hake	7,3	0,51	(1,1)	(0,047)	0,037	0,058	0,74	13	0,47
Hake, boiled	7,2	0,79	(1,1)	(0,037)	0,019	0,049	0,66	15	n.a.
Hake, fillets fried	18	5,6	<0,70	(0,050)	0,058	0,050	0,76	16	0,38
Hake, fried	14	3,8	(0,82)	(0,050)	0,031	0,073	1,1	13	n.a.
Horse mackerel	37	0,74	8,7	0,15	0,072	0,26	3,9	13	7,2
Horse mackerel, fried	16	0,18	(0,98)	0,10	0,11	0,25	3,2	9,2	n.a.
Horse mackerel, grilled	n.a.	0,18	(0,77)	0,14	0,12	0,19	3,7	17	7,7
Ling	8,6	0,13	<0,70	(0,044)	0,019	0,067	0,67	6,8	0,48
Mackerel	64	1,5	9,3	0,11	0,19	0,43	5,8	15	8,4
Meagre	(1,3)	0,45	16	0,066	0,14	0,29	2,7	12	n.a.
Monkfish	24	0,23	<0,70	(0,036)	0,019	0,046	2,0	7,3	n.a.
Octopus	4,5	0,78	<0,70	<0,018	0,024	0,056	1,9	8,1	0,83
Octopus, boiled	11	1,7	<0,70	<0,018	0,046	(0,028)	5,1	7,6	n.a.
Plaice	<0,64	0,35	10	0,12	0,050	0,13	0,51	8,5	1,5
Red seabream	19	0,70	15	(0,046)	0,066	0,41	2,6	15	n.a.
Salmon	33	4,0	11	0,18	0,041	0,45	n.a.	10	n.a.
Salmon, boiled	65	5,3	11	0,17	0,081	0,34	3,0	8,4	n.a.
Salmon, grilled	70	4,3	9,2	0,19	0,12	0,21	4,4	10	n.a.
Sardine	22	0,66	21	<0,018	0,081	0,57	4,4	15	10
Sardine, canned in olive oil	9,0	1,5	8,8	<0,018	0,036	0,10	6,0	21	n.a.
Sardine, canned in water	8,6	2,0	9,8	<0,018	0,039	0,19	n.a.	15	n.a.
Seabass	36	0,17	5,0	0,26	0,084	0,49	2,7	9,5	n.a.
Seabass, boiled	n.a.	0,34	5,8	0,18	0,13	0,14	2,6	9,3	n.a.
Seabass, grilled	n.a.	0,21	6,7	0,21	0,18	0,13	3,5	n.a.	n.a.
Shortfin squid	20	1,1	5,0	0,15	0,044	n.a.	1,3	8,2	n.a.
Silver scabbardfish	34	1,8	7,4	(0,033)	0,053	0,29	4,0	9,7	n.a.
Skate	2,0	0,24	<0,70	(0,029)	0,033	0,19	1,7	12	n.a.
Squid	9,6	1,2	3,5	0,071	0,016	0,053	1,0	7,1	1,1
Squid, grilled	n.a.	1,8	<0,70	(0,041)	0,027	0,095	0,63	8,8	n.a.
Swordfish	<0,64	0,088	(1,3)	0,11	0,043	0,47	4,1	14	1,4
Trout, rainbow	8,8	0,13	19	0,091	0,040	0,28	4,0	n.a.	n.a.
Tuna, canned in vegetable oil	23	1,9	<0,70	(0,022)	0,022	0,23	9,8	14	n.a.
Tuna, fresh	11	0,64	4,2	0,096	0,048	0,56	10	8,3	2,4
Wreckfish	55	2,6	6,6	(0,035)	0,30	0,24	1,8	6,0	0,7

Legend: < values under Limit of Detection; () values between Limit of Detection and Limit of quantification; n.a. not analysed

CONCLUSION

The wide variability of vitamin profile and content between species observed, strengthens the importance of producing data derived from a selection of species and cooking methods representative of the national food habits.

ACKNOWLEDGMENTS

Financial support by Portuguese Science and Technology Foundation (FCT) – Project PRAXIS XXI 2/2.1/MAR/1747/95 "Composition and nutritional value of fish and fish products consumed in Portugal and evaluation of biological effect of fish oils".

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