

Changes of omega-3 and omega-6 fatty acids content in sardines and sprats after heat treatment

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Fatty acids play a major role in human nutrition and diet. The correct fatty acid composition is important and leads to beneficial health effects. Among fatty acids, omega-3 and omega-6 are most often dealt with. Their ratio in diet should be 4:1 (n-6:n-3) according to WHO. Those fatty acids are essential and play a key role in inflammatory processes, promoting cognitive functions and cardiovascular system health. Sardines and sprats are rich in fat and so in omega-3 and omega-6 fatty acids. Heat treatment can affect lipid peroxidation, leading to loss of fatty acids and significantly changing the omega-3 and 6 ratio. We tested the four most common heat treatment methods baking, deep frying, steaming, and boiling. Major omega-3 and 6 fatty acids were observed – linoleic acid, gamma-linoleic acid, arachidonic acid, linolenic acid, eicosatetraenoic acid and docosahexaenoic acid.

Samples were from the Baltic and Mediterranean Sea. Before analysis, whole fish bodies were lyophilized and homogenized. From 1g of dry samples, fat was extracted using syringes and a vacuum pump with 16 ml of ethanol:acetone:hexane solution (1:1:2; V:V:V). Then solution was evaporated using rotary vacuum evaporator. Then 40 µl of fat was taken, and 0,5 ml of methanol HPLC and 0,5 ml natrium methanolate solution was added. Prepared tube was shaken and put in a water bath with 75-80 °C water and tempered. After 3 mins tube was shaken and cooled with cold water. Then 1,5 ml of hexane and saturated sodium chloride solution was added and carefully shaken. Samples were centrifuged for 5 mins at 5000 rpm to separate the organic phase. Finally, 400 µl of the sample was taken for GC/FID analysis.

Results vary greatly for individual fatty acids, but in general, cooked sardines had almost 10 times lower content of n-6 fatty acids and 3 times lower content of n-3 fatty acids. The most appropriate heat treatment for sardines is baking, where losses are lowest. As for sprats, heat treatment increases the content of n-3 and n-6 fatty acids, whereby steamed samples had the highest content. Fried samples are distorted by the frying medium. This research was funded by the Grant Agency of the Czech Republic, grant no. GA 21-42021L. And the National Science Centre Poland, grant no. 2020/39/I/NZ9/02959.

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