Phytosterols Oxides in Ingredients for Functional Foods

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Phytosterols (Ps) used as food ingredients can be obtained from different sources and their obtaining usually involves thermal processing. The influence of this process upon the possible formation of their oxides (phytosterols oxidation products - POPs), and their contribution to food from the ingredient used for Ps supplementing are not known. POPs are structurally similar to cholesterol oxidation products (COPs), although the negative biological effects of the latter have been extensively documented, the possible toxic effects of POPs are still unclear.

The aim of this study is the identification and quantification of POPs in ingredients used for the addition of Ps in functional foods. Samples were eight ingredients with Ps (free or esterified with fatty acids) from different sources (pine, soybean, rapeseed, soybean, corn and sunflower), in different physical states (powder, paste and liquid).No validated, internationally recognised methodology exists for the analysis of POPs in foods. The procedure used involved extraction of lipids, cold saponification, purification and enrichment (SPE), and derivatization to TMS ethers. The subsequent qualitative and quantitative determination was performed by GC-FID and GC-MS.

In the analyzed samples the following oxides were identified: 7α/β-hydroxysitosterol, 7-ketositosterol, sitostanetriol, 7α/β-hydroxycampesterol and 7-ketocampesterol. In all the samples the following POPs were quantified (μg POPs/100g of Ps): 7α-hydroxysitosterol (0,0064-0,0252); 7β-hiyroxysitosterol (0,0014-0,0154); 7-ketositosterol (0,0094-0,0586); 7-ketocampesterol (0,0111).The total amounts of POPs in the samples ranged from 0,0212 to 0,0968 μg POPs/100g of Ps. The highest amounts of POPs in all samples were derived from β-sitosterol, due to the fact that this sterol was the most abundant one in all of the samples. Among the POPs quantified, 7-keto derivatives were the major ones and 7-ketositosterol is the dominating POP in all the samples. 7-ketocampesterol was found only in one sample, no detectable levels of POPs from stigmasterol were found.

Different sources of Ps, physical states, Ps free or esterified with fatty acids do not seem to influence the total amount of POPs and the distribution of the different oxides.