Popular science summary

Vegetable oil has got health benefit compounds for example high amount polyunsaturated fatty acids (PUFA) which are suitable for oxidation process. Therefore, oxidation stability of oils reach in PUFA should be especially controlled during production, refining process, storage and frying. Phenolic compounds with antioxidants properties naturally occur in vegetable oils, but there are insufficient quantities to protect the PUFA and triacylglycerol (TAG) against unfavourable oxidation process. Furthermore these desirable compounds are removed during pressing and refining process. Hence, supplementation of oil by antioxidants is desirable. However, application of phenolic compounds, especially acids is limited due to their hydrophilic character.

Therefore, the primary task of this research project is to conduct basic research of new synthetic antioxidant obtained as a result of modified estrification of phenolic acid with alkyl alcohol without organic solvent and sterol esters of hydroxycinnamic acids. Obtained esters of and amphiphilic character will be interesting for fat industry, due to their properties.

Commercially available synthesised antioxidants such as: butylated hydroxyanisole (BHA), butylated hydroxytoluene (BHT) and propyl galleate demonstrated cytotoxicity against normal cells according with recent research. Therefore, the interest in new antioxidant compounds of plants origin systematically increasing. However their hydrophilic character decreaes efficiency in liphophilic structure as oils or emulsion. In order to enhance hydrophobic character of phenolic acid liphophilization will be applied. Liphophilization will be performed by modified estrification of carboxyl group of phenolic acid with alcohol. New amphiphilic compounds with originally functionalized properties will be created as a opposites to parents compounds, enhanced anti-cancer properties, without toxicity to normal cells and higher bioavaliability which will allow to applying them in vegetable oil and food based on them. New antioxidants compounds will be comapre with synthethised hydroxycinnamic acids sterol esters naturally occur in plants.

The main aim of this research project will be to determine the impact of chemical structure of synthesised esters and their concentration and interaction with oil component on oil fortified and/or fat product with new antioxidants.

The main goal of antioxidants added to oil and products containing on oil is protection against oxidation process during storage and more intensively during frying. Therefore, the impact on chemical structure of new esters will be determined during heating (height layer of oil, time, temperature), storage condition, concentration of phenolipids in oil on antioxidant capacity and oxidative stability of oil fortified with phenolipids. Standard methods allow to establish rancid value and amount of product primary and secondary oxidation will be replaced by new proposed methods based on spectroscopy technique such as: Fourier-transform infrared spectroscopy (FTIR) and spectrofluorimetry.

Furthermore, bioavailability test of oil fortified with phenolipids is planned in various digestion model *in vitro:* stomach-small intestine, oral cavity-stomach-small intestine.

Due to limited information on the effect of toxicity of new antioxidants- phenolipids in relation to normal cell there will be determination *in vitro* cytotoxicity of synthethised phenolic acid ester with various alkyl alcohols. Determination will be carried out by MTT methods or neutral red uptake assay. Additionally, determination of reactive oxygen species in cell by H2DCFDA methods and total antioxidant capacity by colorimetric assay kit will be a valuable source of information about phenolipids as a potentially food additives with health benefit properties. Also, research will be focus on search dependency between cytotoxicity activity of new ester on A 549 human lung carcinoma cells, HeLa human cervical cancer cell and their chemical structures.