A Novel Method of Determination of Individual Oil Content in Sunflower and Flaxseed Oil Blends

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- Vegetable oils have different sensory, physico-chemical and nutritive characteristics and shelf life, which is why the use of only one vegetable oil in diet is often not sufficient.

- Oil blending represents a very simple way to employ various characteristic properties of a large number of vegetable oils and is also an economical way to change sensory, physico-chemical and nutritive characteristics and improve oxidative stability.

- Blending of various vegetable oils can change the fatty acid compositions and provide a higher content and different composition of natural antioxidants and bioactive lipids, thereby improving the nutritive value and stability, i.e. shelf life of the obtained oil.

- Sunflower oil is one of the top five edible oils in the world, having a full priority in Serbia, due to the high availability of raw materials over others.

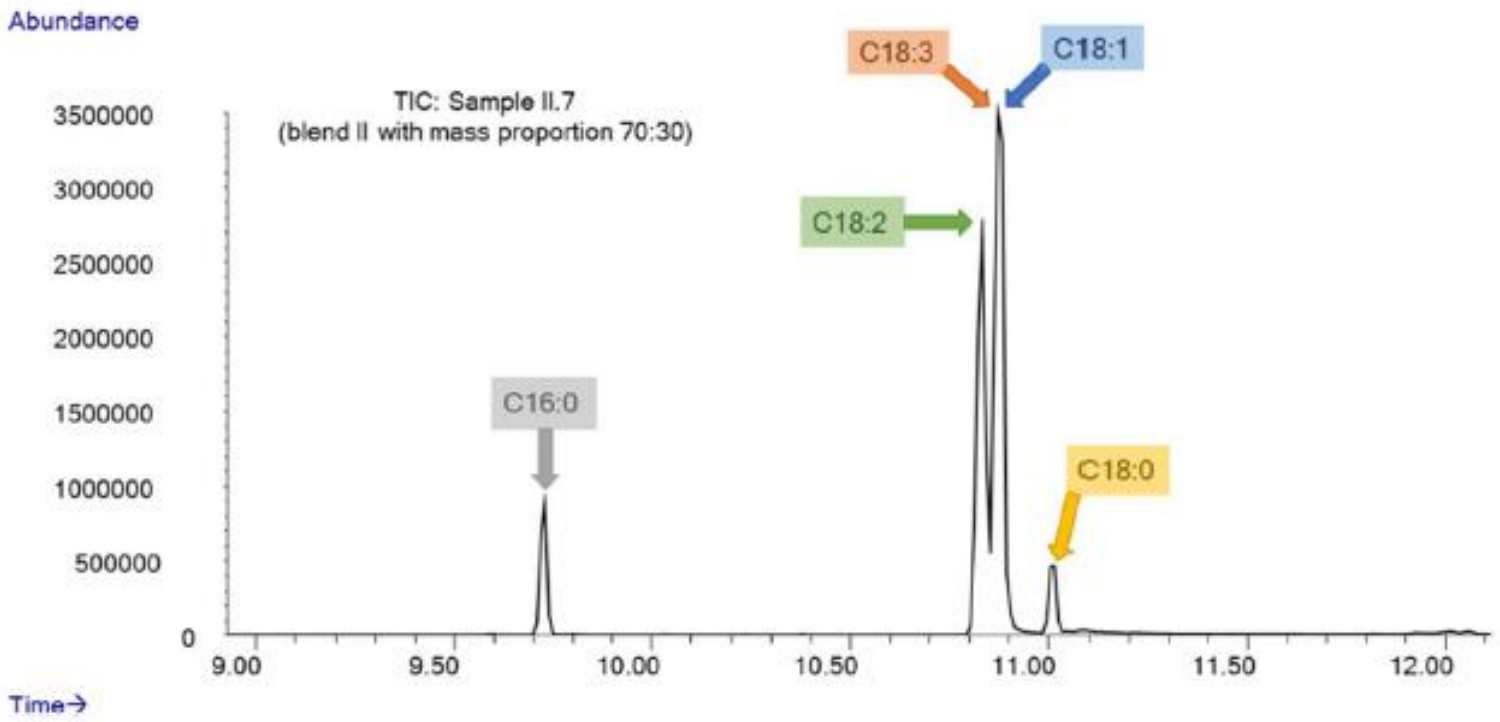
- Due to the presence of essential linoleic (omega 6) fatty acid and alpha-tocopherol (vitamin E), it has a high nutritive value, while due to its extremely good nutritive characteristics and the presence of bioactive components, such as essential alpha-linolenic (omega 3) fatty acid, flaxseed oil has been increasingly used in the diet in recent years.

Aim

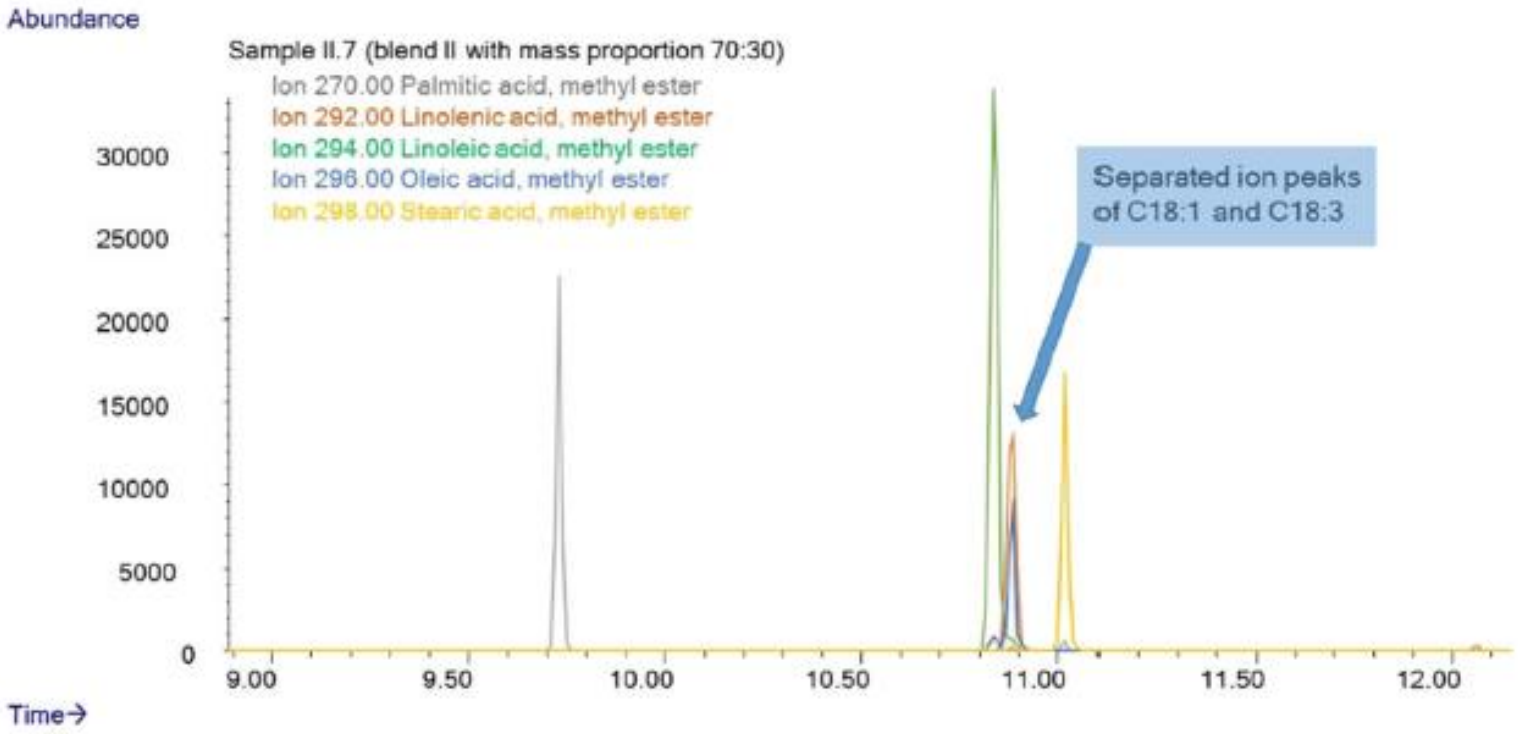
The aim of this paper is to determine the possibility of applying a gas chromatography device with a mass spectrometric detector (GC-MS) coupled to a newly developed mathematical model to determine the proportion of individual oils in oil blends.

Method

- Nine blended oils with different proportions (10-90% w/w) of refined sunflower oil and cold pressed flaxseed oil, as well as a pure samples of refined sunflower oil and cold pressed flaxseed oil, were prepared and analyzed by GC-MS.
- The peaks of the molecular ions of specific fatty acids were integrated.
- Based on the surface areas of these peaks, a novel mathematical model was developed to determine the proportion of individual oils in the blends.



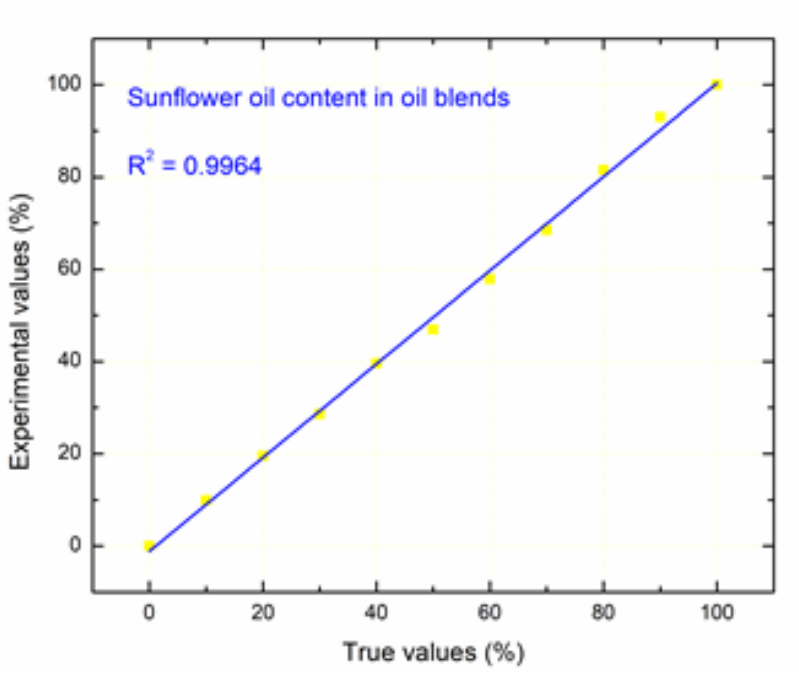
Total ion chomatograms (TIC) obtained by GC-MS of samples: an example of the FO-SO blend.



Ion current chromatograms of five prominent FAMEs of sample II.7 showing the extracted ions with the following m/z ratios: 270, 292, 294, 296, and 298.

Results

- All obtained experimental values are consistent with the actual mass fractions of individual oils in the oil blends.
- Very high correlation coefficient (0.9964) between experimentally determined and actual proportions of individual oils in blends is an indicator of the applicability of the developed method presented in this work.



Conclusion

- The GC-MS peak surface areas of prominent fatty acids, detected in simulated oil blends, were used to create data matrices as inputs for a novel mathematical model.
- The proposed model was developed without using multivariate statistics, and applied to estimate the exact content of the individual oil in simulated oil blends of FO and SO.
- The obtained results of a mathematical estimation showed high similarity to the theoretical values.
- This study represents a meaningful approach for the authentication of vegetable oils in terms to quantify the individual oils in adulterated oil blends.

Thank you for your kind attention!