EXAMINING THE POSSIBILITY OF IMPROVING THE PROPERTIES OF SUNFLOWER OIL IN ORDER TO OBTAIN A BETTER MEDIUM FOR THE PROCESS OF FRYING FOOD

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INTRODUCTION

- Due to its presence in the diet, sunflower oil is often a frying medium. The composition of sunflower oil varies depending on the hybrid, environmental conditions, harvest and processing. Oils rich in polyunsaturated fatty acids, namely sunflower oil, are particularly susceptible to oxidation under high temperature conditions.
- Deep frying is widely used to prepare many types of food around the world. High temperatures during food frying lead to complex levels of reactions that result in hydrolysis, oxidation or polymerization of the oil.

INTRODUCTION

- To prevent lipid peroxidation in oils, synthetic antioxidants have been used as food additives for more than 50 years. The addition of synthetic antioxidants such as butylhydroxyanisole (BHA), butylhydroxytoluene (BHT), tert-butylhydroquinone (TBHQ), is one of the most effective and popular methods to prevent oxidation and changes in the sensory properties of the oil. However, there are growing concerns about the safety and health risks associated with the use of synthetic antioxidants, but increasing attention is focused on the utilization of biologically active substances derived from plants, which have antioxidant effects.

AIM THIS STUDY

- Investigate new possibilities of improving refined sunflower oil in order to obtain oil with widespread application in the food frying process. Three refined sunflower oils were investigated (with synthetic antioxidant added, with natural antioxidant added and high oleic refined sunflower oil) as well as palmolein and compared with the standard (linoleic) refined sunflower oil. Iodine value was determined in the aim to investigate the degree of unsaturation impact on oxidative characteristics of oil. As oxidative characteristics indicators, overall oil stability index (OSI) and total oxidation index (TOTOX) were examined. All investigations were done in the initial samples and after frying process.

MATERIAL

Table 1. Samples used in this study

	Explanation
Sample 0	Standard (linoleic) refined sunflower oil – control sample
Sample 1	Palmolein
Sample 2	Standard (linoleic) refined sunflower oil with synthetic antioxidant (TBHQ) added: 200 ppm
Sample 3	Standard (linoleic) refined sunflower oil with natural antioxidant (rosemary extract) added: 200 ppm
Sample 4	High oleic refined sunflower oil

METHODS

Oil samples were subjected to deep frying. Namely, the samples were used for frying French fries which was purchased at the local market. French fries (600 g) fried in a controlled temperature domestic deep fat fryer model FF230831 (Tefal, UK) filled with 1.2 L of each oil sample used in this study. Frying conditions were 2.5 minutes at temperature 175 °C. After cooling, a portion of each oil after frying was taken for testing.

Iodine value - ISO 3960: 2017, oxidative oil stability index (OSI) - Metrohm Application Bulletin 204/2e and according by ISO 6886:2016 and total oxidation index (TOTOX = 2 × PV + *p* - AnV), was investigated in the initial oil samples and oil samples after frying.
PV - ISO 3960:2017 and *p* - AnV - ISO 6885:2016.

RESULTS

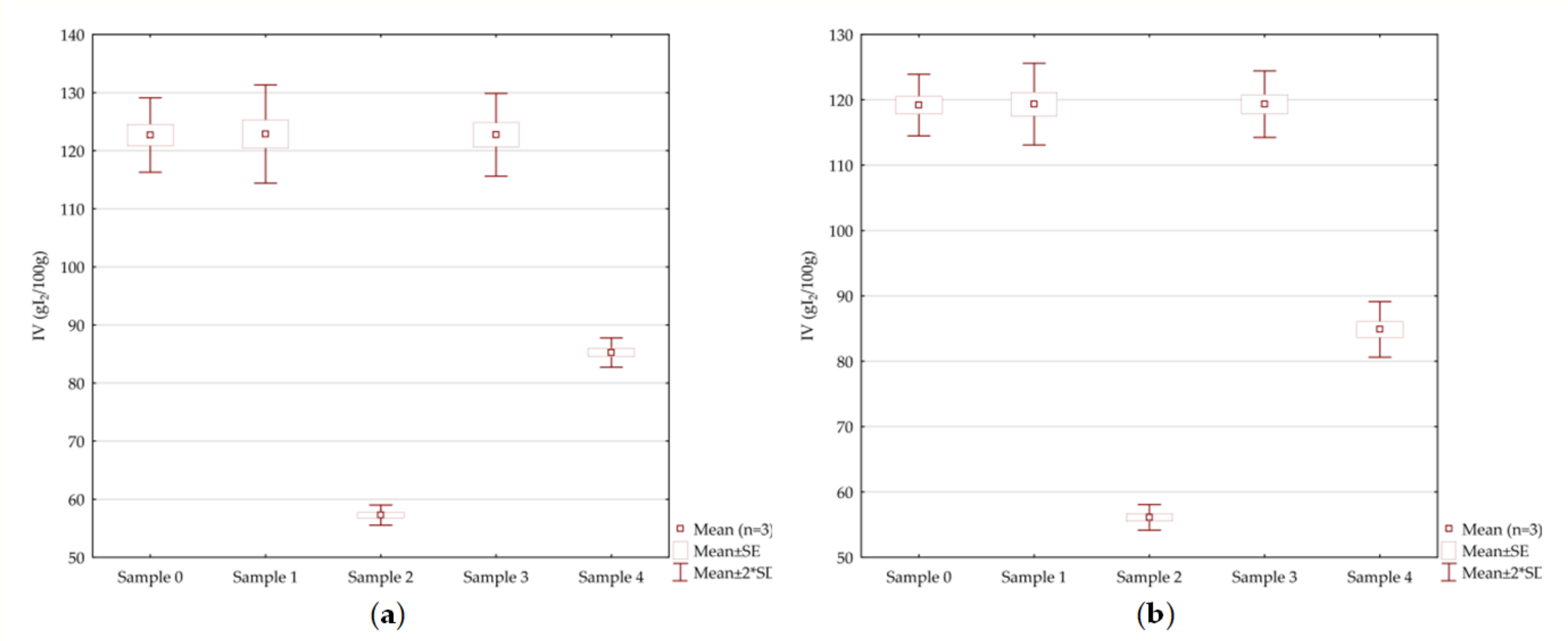

Figure 1. Box plot presented iodine values of **(a)** the examined initial samples and (**b**) examined samples after frying process

RESULTS

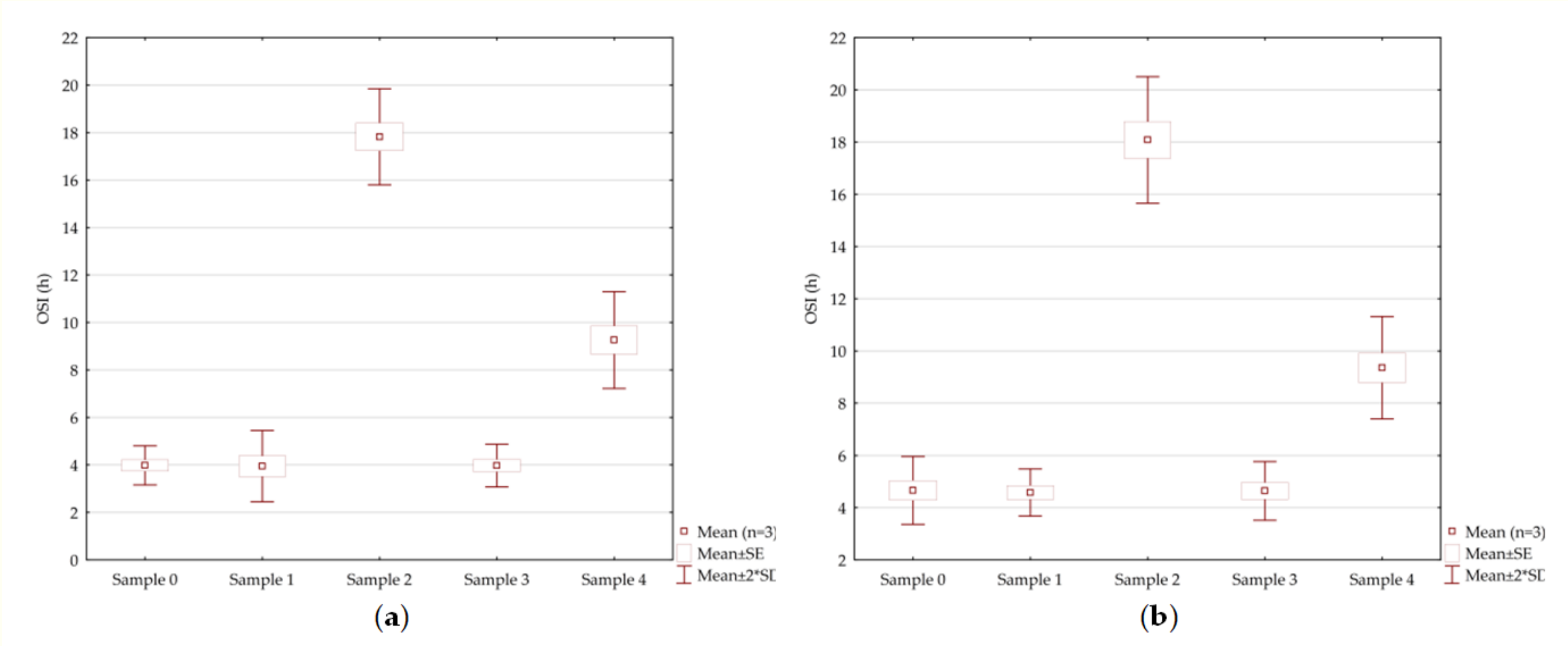

Figure 2. Box plot presented OSI index values of **(a)** the examined initial samples and (**b**) examined samples after frying process

RESULTS

	Before frying	After frying
Sample 0	12.41 ± 0.87^{aA}	80.80 ± 3.24^{dB}
Sample 1	12.70 ± 0.92^{aA}	50.92 ± 6.12^{aB}
Sample 2	7.60 ± 0.84^{cA}	48.32 ± 3.15^{aB}
Sample 3	10.59 ± 1.75^{aA}	66.97 ± 4.57^{cB}
Sample 4	4.73 ± 0.45^{bA}	31.48 ± 3.56^{bB}

Table 2. TOTOX values obtained before and after frying of examined samples. Values are means ± standard deviation (n=3); Different lower-case letters in the same column indicate significantly different values between samples while different upper-case letters in same raw indicate significantly different TOTOX values before and after frying ($p<0.05$)

CONCLUSION

- Based on the obtained results, it was concluded that frying process does not significantly affect the iodine value of the tested samples. Chebet *et al*. [13] also concluded that frying process does not significantly affect the iodine value of palm oil, while in soybean oil frying leads to a significant reduction in iodine value. Of the tested samples, the worst choice for frying turned out to be standard sunflower oil, the most often used in the household for these purposes due to its affordability. Modification of this oil by the addition of antioxidants (natural or synthetic) showed an improvement in the oxidative properties of these oils, the TOTOX index after frying process decreased by 32.48 and 13.83 by the addition of synthetic and natural antioxidants. Slightly better frying oil is palmolein with a TOTOX index 29.88 lower than refined sunflower oil, while the best frying oil was high-oil sunflower oil with a TOTOX index even 49.32 lower compared to the control sample.

THANK YOU FOR YOUR ATTENTION !