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Instrumental evaluation of selected properties of oil extracted from walnuts before and after the roasting process

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Introduction

- Walnuts (*Juglans regia*) have a high fat content of approximately 73%.

- The oil contained in the nuts is rich in unsaturated fatty acids, including monounsaturated oleic acid and polyunsaturated fatty acids, both of the n-3 and n-6 family.

Introduction

- The world production of walnuts exceeds almost 1,500,000 tonnes. China, the United States and Iran are the largest producers of walnuts in the world.

- Currently, production in the above-mentioned countries is growing rapidly.

Introduction

- One important thermal process for nuts is roasting, which significantly increases their palatability.

- Technically, roasting is a drying process at high temperatures. The purpose of roasting is to reveal new flavour and aroma properties of the raw material.

Methods

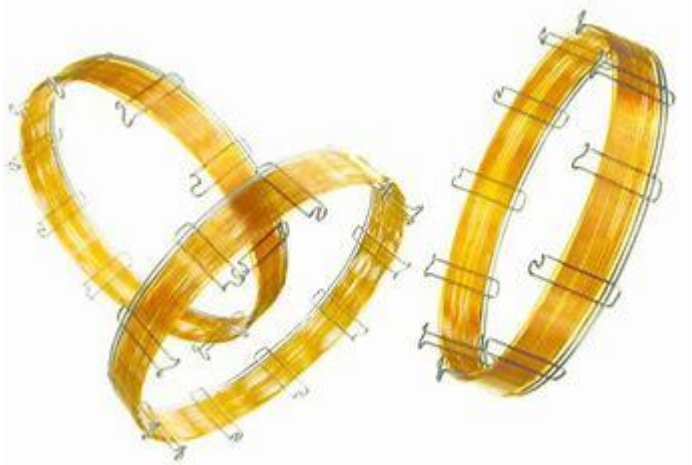
Material

- The walnuts, which were purchased from the Polish market

Technological methods

- Roasting: 100, 160°C for 9 and 60 min
- Oil extraction using hexane
- **Analytical methods**
- Determination of fatty acid composition by Gas Chromatography
- Determination of oxidative stability by Pressure Differential Scanning Calorimetry (PDSC)
- Determination of Acid and Peroxide Value by titration

Results



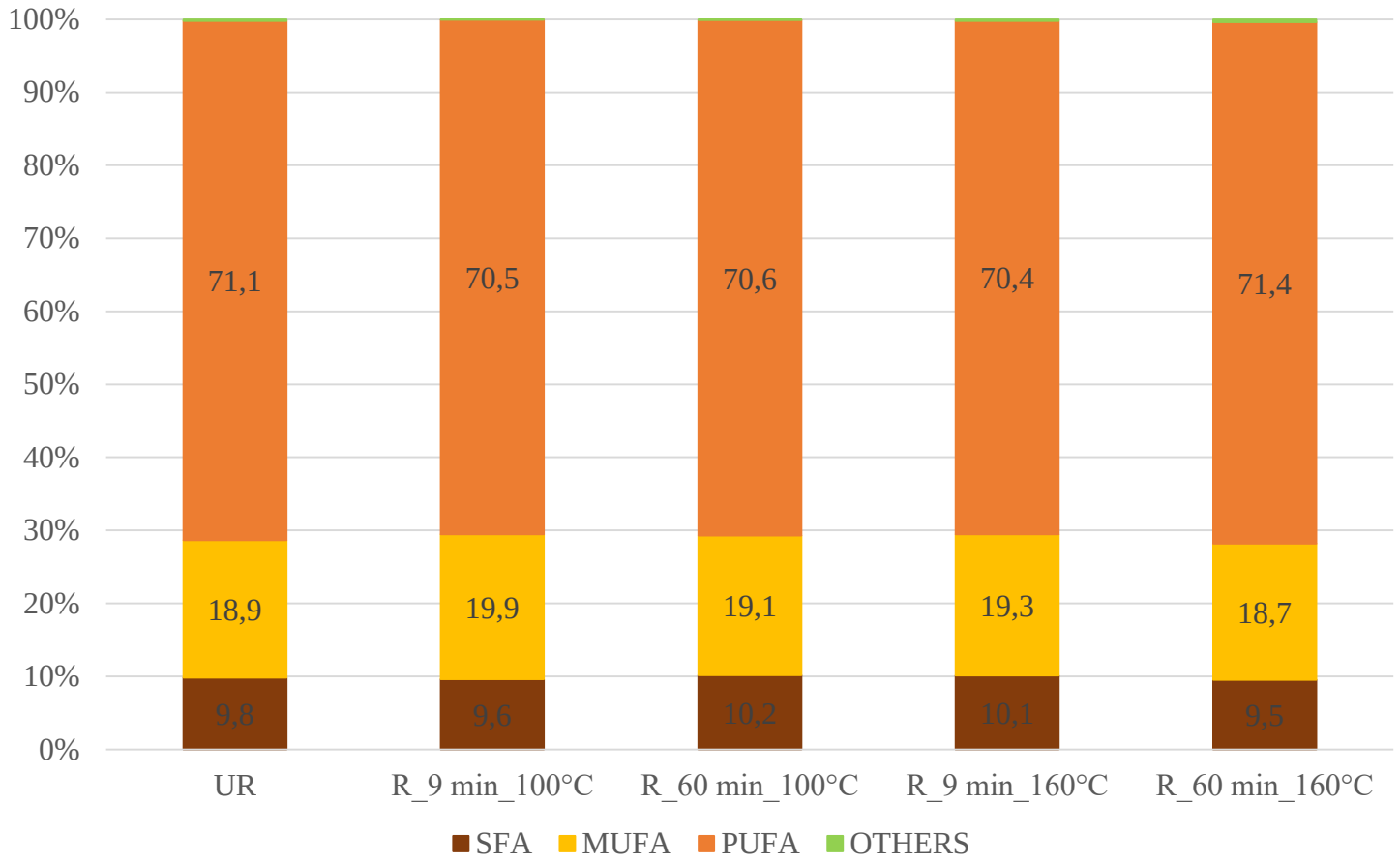
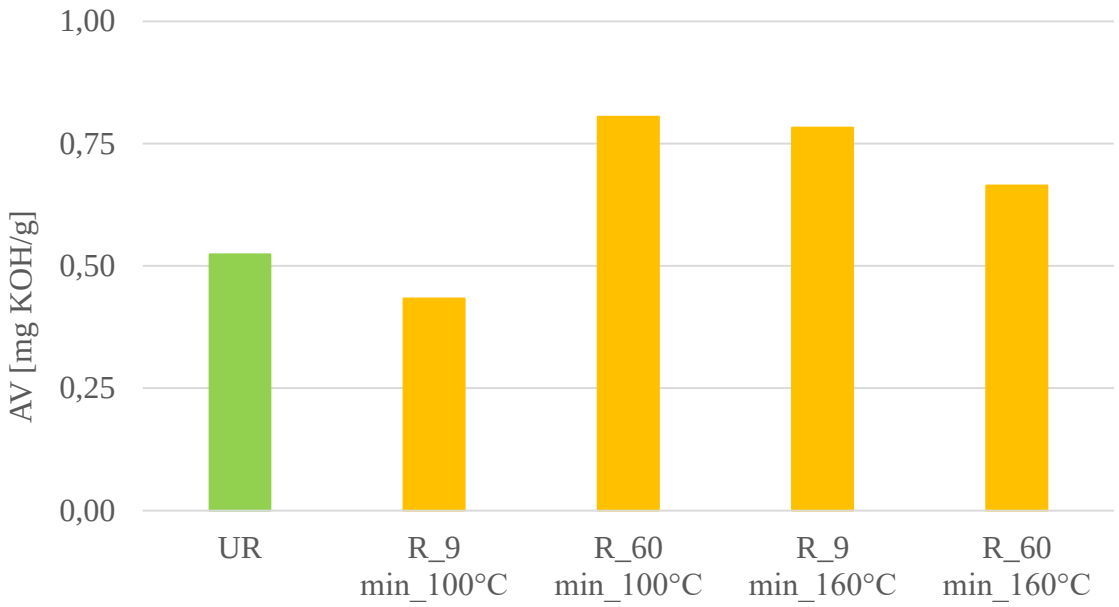
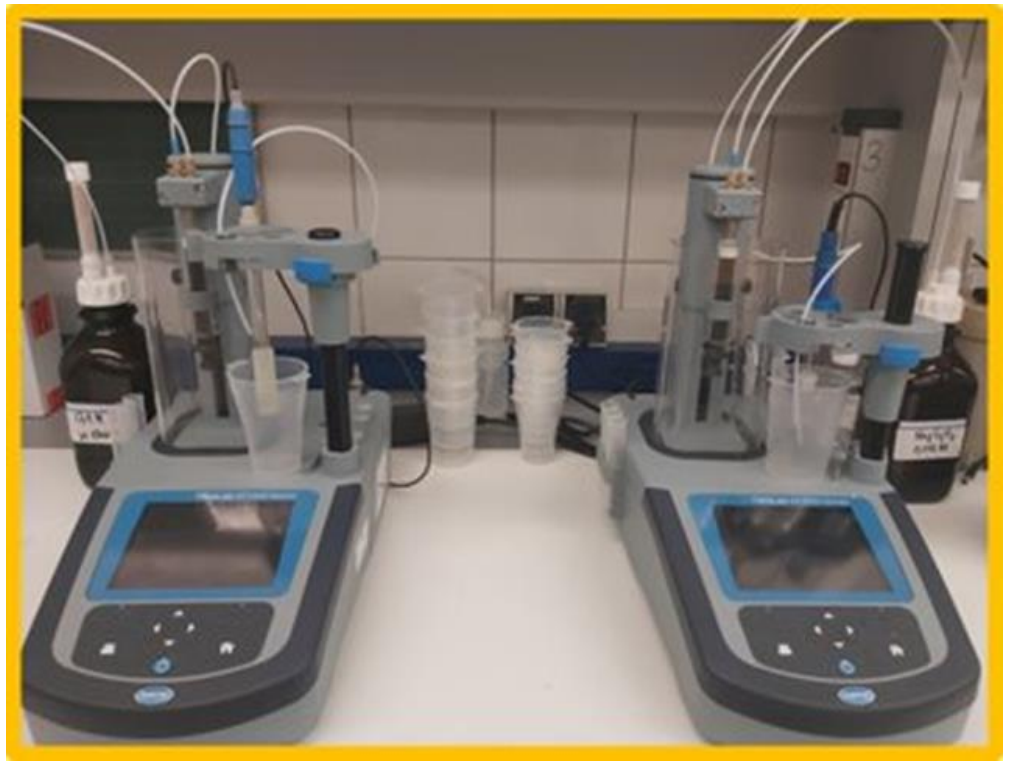


Figure 1. Percentage of saturated and unsaturated fatty acids in the walnut oil studied (PUFA, MUFA, SFA - Polyunsaturated, Monounsaturated, Saturated Fatty Acids, respectively)

Results





Peroxide value - below 0.01 mEq peroxide/kg

Figure 2. Acid value (AV) of oils from roasted (R) and unroasted (UR) walnuts

Results

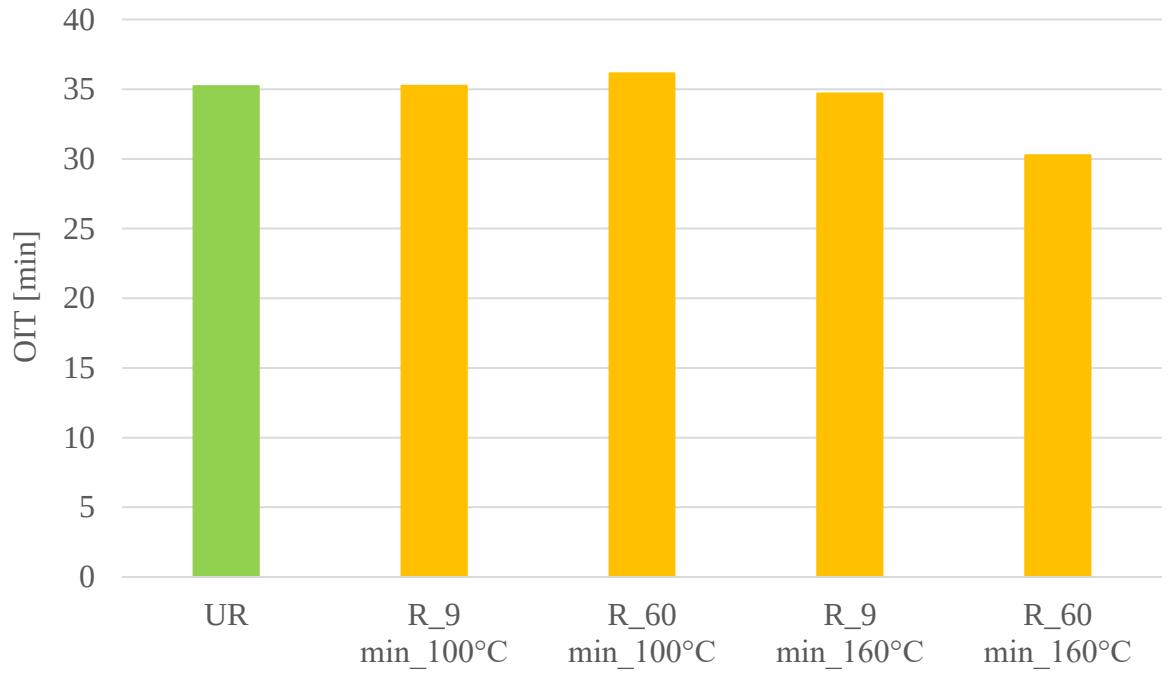


Figure 3. Oxidation induction time (OIT) of oils from roasted (R) and unroasted (UR) walnuts

Conclusions

- The results indicate that hydrolytic stability decreased after roasting, as a slight increase in acid value was recorded in the oil extracted from roasted walnuts.
- Oil extracted from walnuts roasted at 100°C had the highest acid value.
- The oxidative stability of the walnut oil after roasting did not change significantly.
- The low oxidative stability of walnut oil may be related to the high content of polyunsaturated fatty acids (about 70%).

Conclusions

- The fatty acids that dominate in walnut oil are polyunsaturated acids, i.e. linoleic acid (C18:2 n-6) and α - linolenic acid (C18:3 n-3). The oil contained in walnuts is also rich in monounsaturated fatty acids, including monounsaturated oleic acid (C18:1).
- The roasting process did not affect the fatty acid composition of the analyzed oils.

Conclusions

- Due to the high content of polyunsaturated fatty acids, the oil contained in walnuts is characterized by low oxidative stability. The PDSC method used in this work allows for quick monitoring of the oxidative quality of the oil before and after the walnut roasting process.

Thank you for your attention!

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