

Physicochemical characterization and thermal behaviour of almonds oils from two morphotypes of *T. catappa* grown in two regions with three soil types

Kowiou Aboudou^{1,2}, Paul Malumba³, Christophe Blecker², Eva Tyteca⁴, Mohamed Manzourou Soumanou¹, Sabine Danthine²



¹Research Unit Enzyme Engineering and Food Technology, Laboratory of Study and Research in Applied Chemistry, Department of Food and Technology Engineering, University of Abomey Calavi, 01 BP 2009 Cotonou 01, Benin.

²Food Science and Formulation, University of Liege, Gembloux Agro-Bio Tech, Passage of the Deportees, 2, B-5030 Gembloux, Belgium

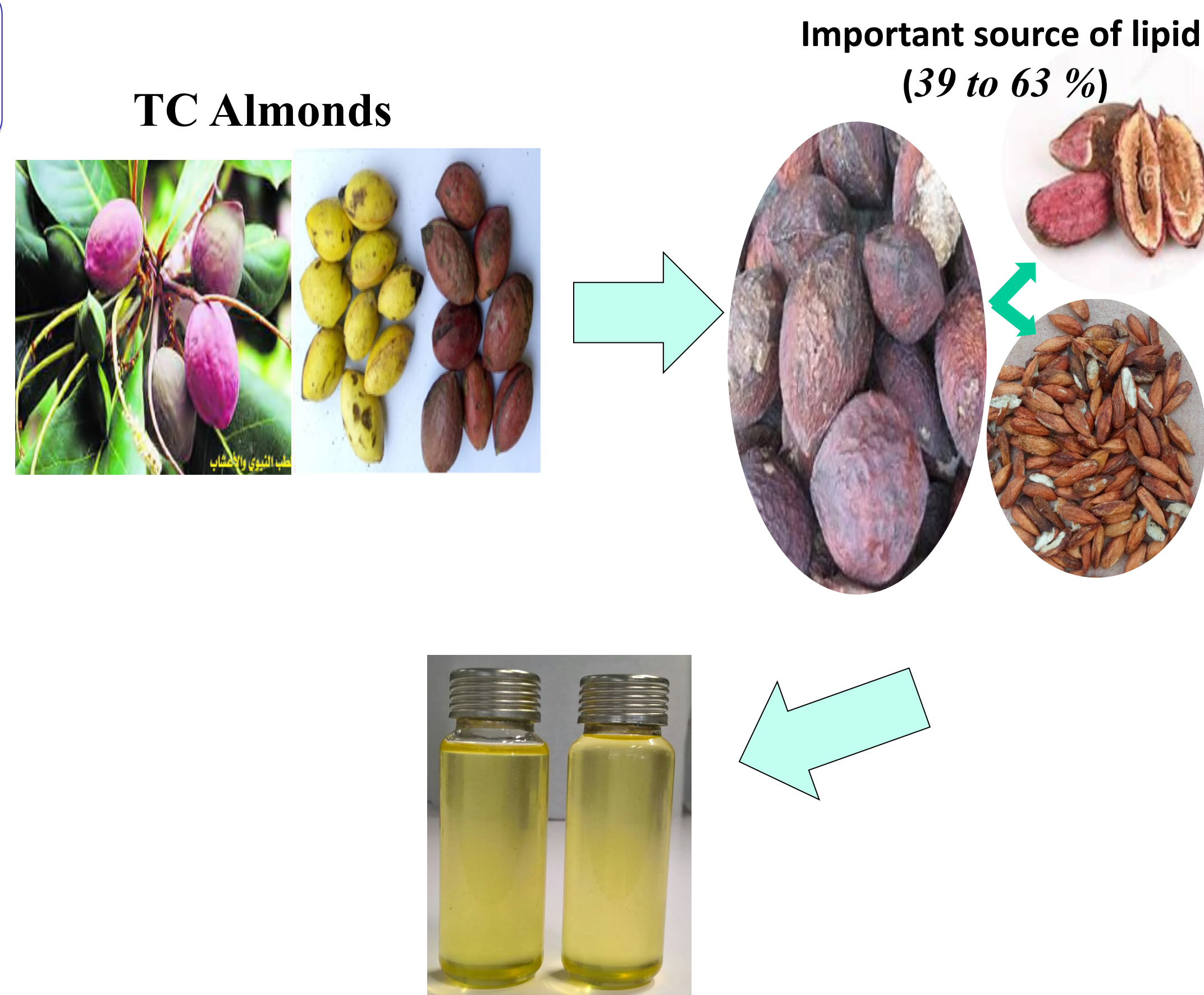
³Care FoodsLife, Terra Teaching and Research Center, Liège University, Gembloux Agro-Bio Tech, Avenue de la Faculté 2B, 5030 Gembloux

⁴Laboratory of Analytical Chemistry, University of Liege, Gembloux Agro-Bio Tech, Passage des Déportés, 2, B-5030 Gembloux, Belgium

* Corresponding Author: sabine.danthine@uliege.be



Introduction



The tropical almond tree (*Terminalia catappa*) is recognized for its edible fruits which are unexploited industrially due to a lack of scientific data on the potential applications in food systems of the oil it contains. In the present study, oils from two morphotypes of *T. catappa* (TC) were solvent extracted and characterized.

The key purpose of the present study was to provide more data on the chemical composition, some physical properties especially crystallization and melting behavior and oxidative stability of oils extracted from almonds of two morphotypes of TC found on different soil types in order to determine the variability and their potential applications in food systems.

Terminalia catappa

Material and Methods

Sample codes

| Zones | Soil | Morpho types | Sample codes |
|---------|---------|--------------|--------------|
| Coastal | Ferrous | Yellow | 1J |
| | | Red | 1R |
| | Sandy | Yellow | 2J |
| | | Red | 2R |
| | Clayey | Yellow | 3J |
| | | Red | 3R |
| Oueme | Sandy | Yellow | 4J |
| | | Red | 4R |
| Oueme | Sandy | Yellow | 5J |
| | | Red | 5R |
| | Clayey | Yellow | 6J |
| | | Red | 6R |

Samples preparation

- Mature fruits collected on 3 soils (Ferrous, Sandy, Clayey) types in 2 areas (coastal zone and Ouémé) from Benin (See table for sample codes)

- Oil extraction by Soxhlet using the AOAC Method 945.16

Methods

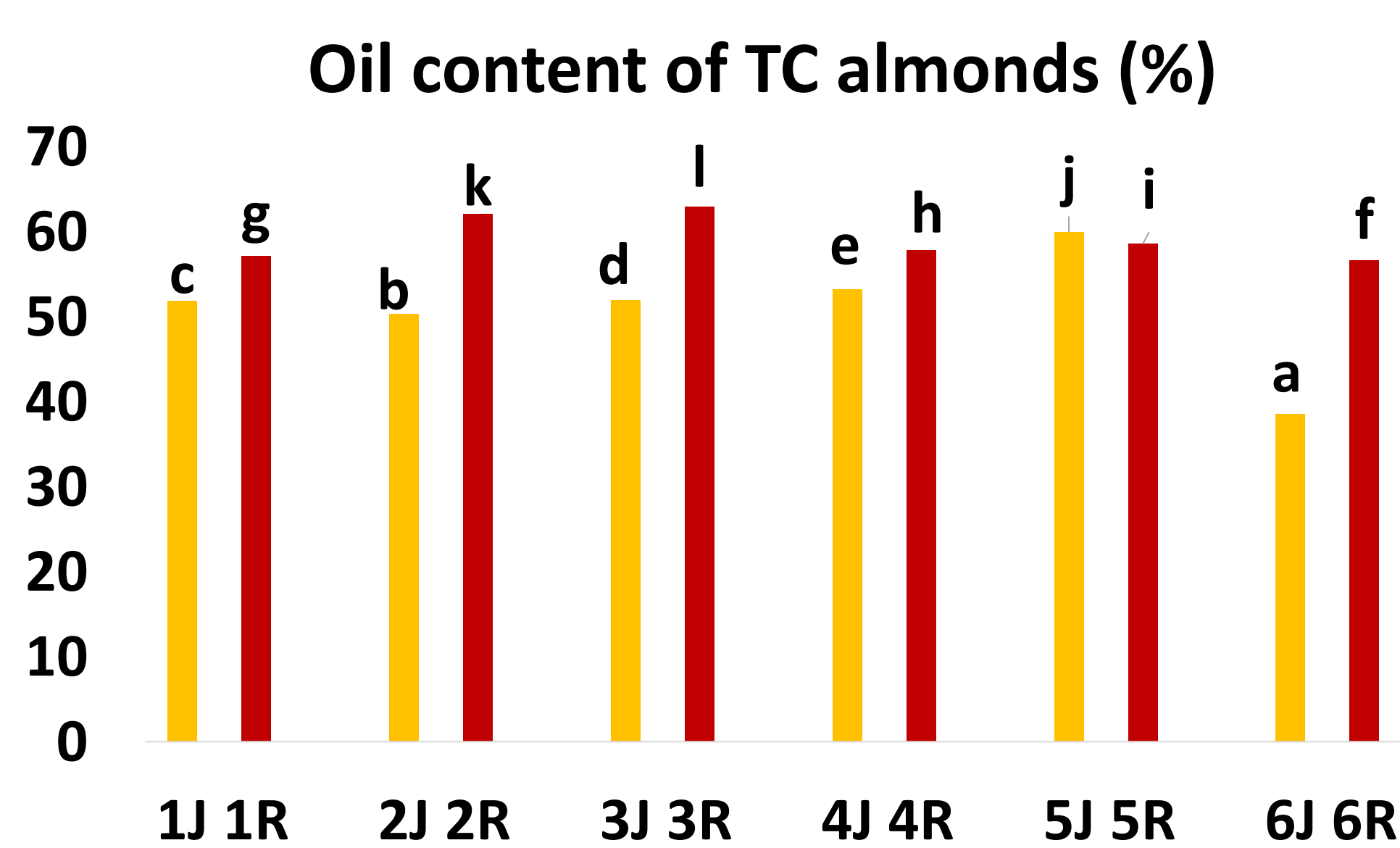
- Fatty acid composition by GC according to AOCS (2005) Ce 2-66 method

-Color: Lovibond 3-Aparatus comparator and Hunter Lab Color Flex EZ

-DSC melting profiles using a Q2000 DSC (TA Instruments) according to AOCS Cj 1-94 method

Results & Discussion

1. Oil content of *T. catappa* almonds

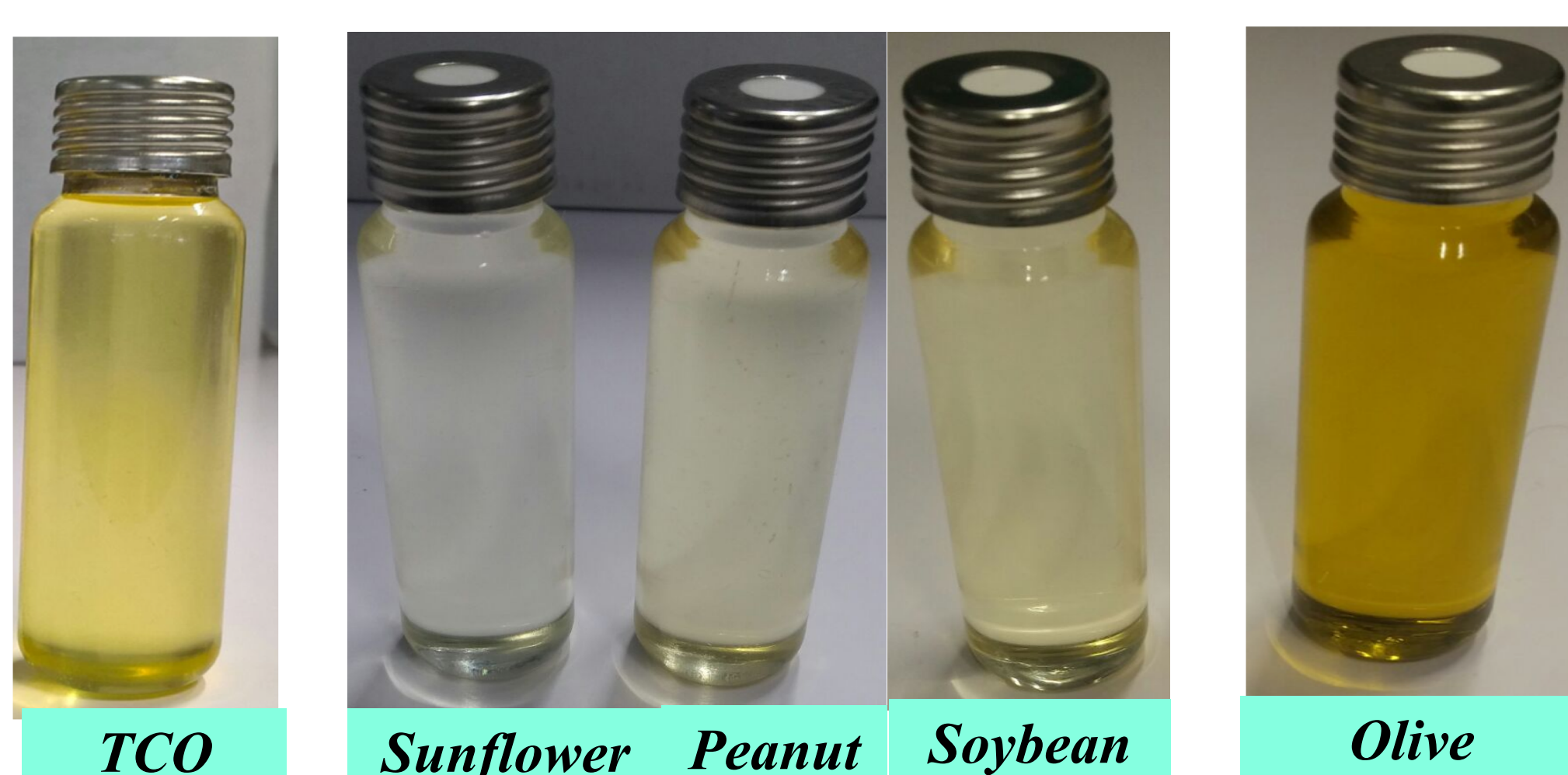


2. Fatty acid composition of TC oils

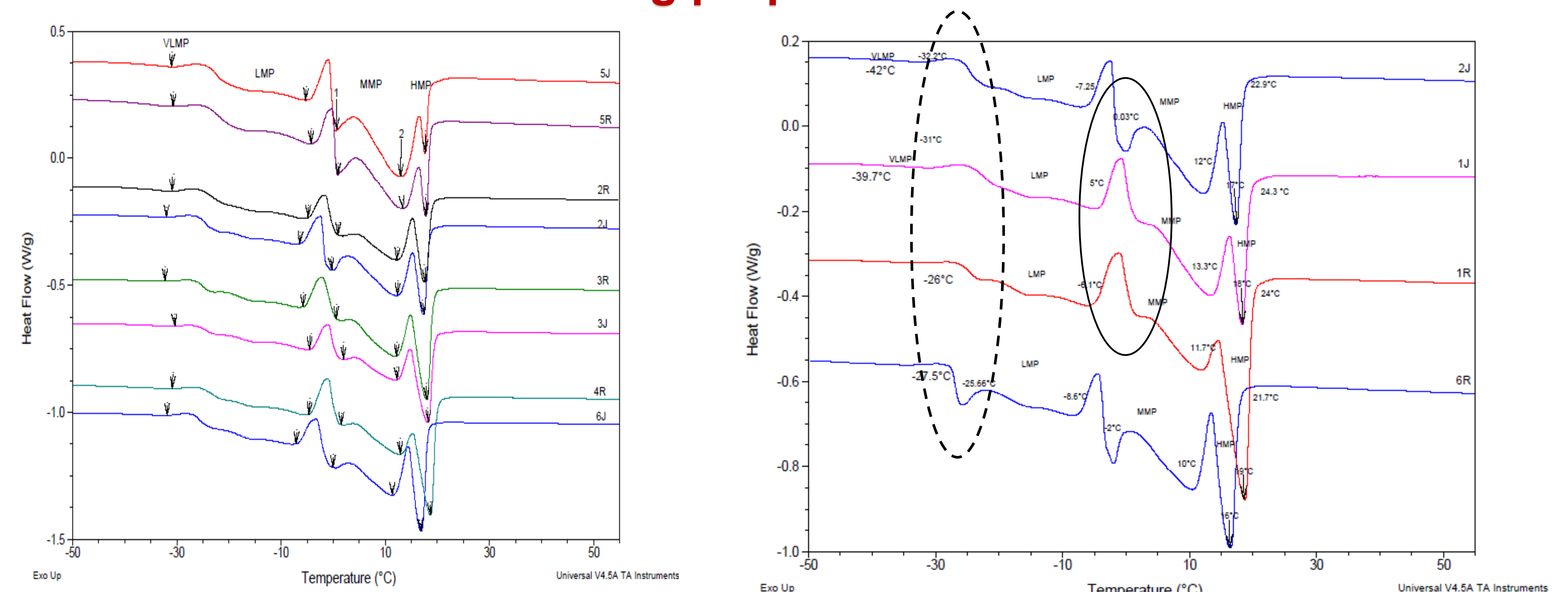
| Samples | Fatty acid composition (%) | | | | | | |
|---------|----------------------------|-----------|-----------|------------|------|------|-----------|
| | C 16:0 | C 18:0 | C 18:1 | C 18:2 ω-6 | SFA | USFA | SFA/US FA |
| 1J | 47.5±0.5 | 4.7±0.03 | 22.2±0.2 | 25.5±0.2 | 52.2 | 47.7 | 1.1 |
| 1R | 49.5±0.1 | 4.8±0.01 | 20.7±1.3 | 24.8±2.1 | 54.3 | 45.6 | 1.2 |
| 2J | 46.4±0.6 | 3.8±0.45 | 22.6±0.03 | 27.0±0.1 | 50.2 | 49.6 | 1.01 |
| 2R | 44.2±1.5 | 2.9±0.35 | 24.2±1.5 | 28.6±0.4 | 47.1 | 52.8 | 0.9 |
| 3J | 43.7±3.1 | 3.7±0.3 | 19.7±0.4 | 32.8±0.2 | 47.4 | 52.5 | 0.9 |
| 3R | 46.3±0.3 | 4.1±0.11 | 21.7±0.21 | 28.0±0.20 | 50.3 | 49.6 | 1.0 |
| 4J | 48.3±0.7 | 3.6±0.04 | 21.5±0.2 | 26.5±0.4 | 51.9 | 47.9 | 1.1 |
| 4R | 45.7±0.49 | 4.1±0.13 | 21.4±0.02 | 28.7±0.6 | 49.8 | 50.1 | 0.99 |
| 5J | 45.0±0.32 | 4.1±0.002 | 24.6±0.4 | 26.2±0.02 | 49.1 | 50.8 | 0.96 |
| 5R | 44.7±0.06 | 3.6±0.21 | 23.1±0.1 | 28.5±0.1 | 48.2 | 51.6 | 0.9 |
| 6J | 43.4±0.62 | 5.4±1.3 | 23.0±0.3 | 28.2±0.3 | 48.7 | 51.2 | 0.95 |
| 6R | 41.4±1.21 | 3.6±0.22 | 22.8±0.8 | 32.0±0.6 | 45.1 | 54.9 | 0.8 |

Palmitic (41-50 %), linoleic (25-33 %), oleic (20-25 %) and stearic (3-5 %) acids are the main fatty acids identified in all the samples.

3. Color



4. Melting properties of TC oils



Conclusions

- TC Almonds are interesting sources of lipids. The Red morphotype contains more oil than the Yellow morphotype.
- TC oil is completely liquid at ambient temperature and contains around 50-50% of SAFA and USFA.
- Thermal properties such as onset, peak, and endset temperatures (°C) showed significant changes due to the saturated fatty acids content of the oil samples
- The oil extracted from the almonds of TC constitutes an alternative source of lipids and could be suitable for applications in several areas of the food industries.