3rd European GREEN Conference
10-13 June 2025
Vodice, Croatia

Blending cold-pressed vegetable oils - a new way to functional products

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Keywords: cold-pressed oil blends; apricot; plum; raspberry; by-products

INTRODUCTION

The processing of fruits such as raspberries, plums and apricots produces by-products in the form of seeds and pits. The valorization of these by-products has proven to be an imperative of the circular economy.
Raspberry seeds as well as plum and apricot kernels are a source of high-quality vegetable oils. It is known that raspberry seed oil is rich in essential linoleic and linolenic acids, while apricot and plum kernel oil contains mainly oleic acid and is very stable to oxidation. To improve the nutritional value and stability of cold-pressed vegetable oils, a new trend is the blending of oils and as a result, a formulation that is rich in essential fatty acids and has good oxidation stability.
Here we present study designed to systematically evaluate blends of cold-pressed raspberry seed oil with plum and apricot kernel oils, focusing on optimizing essential fatty acid ratios to enhance oxidative stability. Measuring and reporting the fatty acid composition and balance, antioxidant capacity, and oxidative stability of cold-pressed oils and specific blends offers new comparative data and brings novelty to the field of functional oil development.

EXPERIMENT

The fatty acids composition was determined by gas chromatography according to the standard method [ISO 12966-2] on a GC 6890 instrument (Agilent Technologies, USA) with a split-splitless injector and a flame ionization detector (FID). The fatty acid methyl esters were prepared according to the standard method [ISO 12966-4] and the chromatographic peaks were identified by comparing the relative retention times of the fatty acid methyl esters of samples with the Supelco 37 Component FAME Mix. Results are presented as a mean value ± standard deviation (n = 3) in Table.

The oxidative stability of the oil samples was measured with the OXITEST apparatus (Velp Scientifica, Italy). An oil sample was filled into a hermetically sealed titanium chamber with a thermostat. The OXITEST reactor subjected the oil samples to an accelerated oxidation process by heating them to 90°C and exposing them to an oxygen pressure of 600 kPa. At the end of the test, the program automatically calculated the induction period (IP) from the resulting oxidation curves using the two-tangent method, i.e., the time required to reach the starting point of oxidation, which corresponds to a sudden change in the oxygen consumption rate.

RESULTS

The resulting blends with optimal ratio of essential fatty acids to oleic acid exhibited good oxidative stability and antioxidant capacity.

Raspberry seed oil antioxidant activity assays	
DPPH (µmol Trolox g-1 plant material)	**1304.0 ±4.5**
CUPRAC (µmol Trolox g-1 plant material)	**1305.3 ±0.0**
ABTS (µmol Trolox g-1 plant material)	**3725.2 ±62.1**

OIL BLEND
HINTS

- good oxidation stability
- high antioxidant activity
- optimal ratio of oleic to linoleic and linolenic acid (essential fatty acids)
- total phenolic content TPC **359 ± 2** mg GAE/kg
- DPPH radical scavenging activity **678 ± 2** µmol Trolox/kg

FATTY ACID COMPOSITION %	OIL MIX	RASPBERRY	APRICOT	PLUM
Myristic acid (C14:0)	0.03	0.02	0.02	0.02
Palmitic acid (C16:0)	4.07	1.98	5.25	4.96
Palmitoleic acid (C16:1)	0.57	<0.02	0.94	0.41
Heptadecanoic acid (C17:0)	0.05	0.15	0.09	0.02
Heptadecenoic acid (C17:1)	<0,02	<0.02	0.03	0.02
Stearic acid (C18:0)	0.97	1.04	0.55	0.90
Oleic acid (C18:1) and its isomers	35.38	11.93	69.32	60.20
Linoleic acid (C18:2) and its isomers	43.14	55.33	23.63	33.28
Linolenic acid (C18:3)	15.71	29.31	0.03	0.08
Arachidic acid (C20:0)	0.06	0.15	0.07	0.05
Gondoic acid (C20:1)	<0.02	0.07	0.05	0.04

	OIL MIX	RASPBERRY	APRICOT	PLUM
INDUCTION PERIOD IP (H)	14.15	11.10	45.80	40.75

According to a numerous studstudies, raspberry seed oil offers UVA + UVB protection similar to titanium dioxide, with a 28-50 SPF protection factor against UVB rays and 8 SPF against UVA rays.

CONCLUSION

While individual oils from these sources are available on the market, their blends do not seem to be present in current commercial offerings. The MiKSU formulation offers a novel approach to creating stable, nutrient-rich vegetable oil blends from fruit seed by-products, and opens opportunities for functional food and cosmetic applications.

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