

## Flavonoids are preserving phenolic acids in vegetable oils under microwave heating

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Vegetable cooking oils are prone to oxidation during heating due to the high content of polyunsaturated fatty acids. Flavonoids and phenolic acids are among antioxidant defence systems protecting vegetable oils against oxidative damage.

The aim of our study was to estimate if either phenolics acids or flavonoid content are the first line of defence for vegetable oils against oxidation during microwave heating.

We used corn, soybean, sunflower, mixed (containing sunflower, grape, flaxseed and rice oil) and palm oil 5, 10 and 15 minutes microwave heated (n = 1). The level of total phenols in oils was determined by using Folin–Ciocalteu reagent<sup>(1)</sup>. Total flavonoid contents was determined by using the aluminium chloride colorimetric method as described by<sup>(2)</sup>.

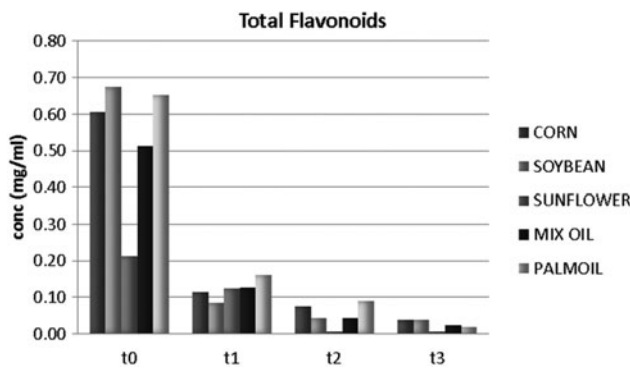


Fig. 1. Total flavonoid content (n = 1).

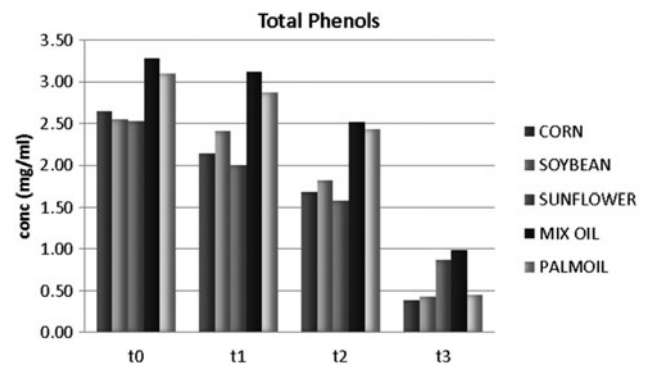


Fig. 2. Total phenols content, (n = 1).

Among the five oils, the highest phenols content determined with Folin–Ciocalteu reagent was found in the mixed oil before the microwave treatment (3.28 mg/ml). After 5 minutes of microwave exposure the majority of oils retained most of the phenols content: 95 % in mixed oil, 94.5 %, 92.8 % in palm oil. In 10 minutes of exposure, the phenols content was reduced to 63.6–78.6 %, and after 15 minutes the highest remaining content was found to be 30–34 % for sunflower and mixed oil. The total flavonoid content has been found to be highest for soybean oil before the microwave exposure (0.68 mg/ml), palm oil (0.65 mg/ml) and corn oil (0.61 mg/ml). Microwave treatment reduced the flavonoid content to 18.7–57 % after 5 minutes, 2.6–13.7 % after 10 minutes and only 2.6–6.2 % after 15 minutes of microwave heating. After 15 minutes, the smallest percent of flavonoids (2.62 %) was observed for sunflower oil, which had the highest remaining polyphenols value (34 %).

In conclusion, when subjected to microwave heating, vegetable oils will firstly lose the flavonoid content and will retain for longer periods the phenolic content, by this saving some of the antioxidant capacity.

- Singleton VL, Orthofer R, Lamuela-Raventos RM. [14] Analysis of total phenols and other oxidation substrates and antioxidants by means of folin–ciocalteu reagent. *Methods Enzymol.* 1999;(299C):152–78.
- Szydłowska-Czerniak A, Dianoczki C, Recseg K, Karlovits G, Szlyk E. (2008 Aug 15 [cited 2016 Feb 26]). Determination of antioxidant capacities of vegetable oils by ferric-ion spectrophotometric methods. *Talanta.* 76(4), 899–905. Available from: <http://www.sciencedirect.com/science/article/pii/S0039914008003330>