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DRY SPICES AS NATURAL ANTIOXIDANTS FOR WALNUT OIL

Moigrădean Diana[1], Poiana Mariana-Atena[1*], Bordean Despina-Maria[1], Alda Liana-Maria[1], Rădulescu Laura[1], Tarkanyi Patricia[1], Lăcătuș Mihaela [1]
[*]University of Life Science "King Mihai I" from Timisoara, Romania, Faculty of Food Engineering
** Correspondence author. E-mail*: marianapoiana@usvt.ro

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ABSTRACT

The walnut (Juglans regia L.) is a tree whose fruit has been consumed for millennia in a wide variety of foodstuffs. The walnut kernel is consumed whole and raw, or as an ingredient in a variety of foods (chocolate, cheese, candy, baked goods, etc. Moreover, the cold pressing of walnut kernels results in the extraction of walnut oil, which is characterize by a pronounced and distinctive walnut flavour. The objective of the present study was to determine the antioxidant properties of three assortments of flavoured walnut oil: with garlic (Allium sativum) and black pepper (Piper nigrum), with cinnamon (Cinnamomum zeylanicum), vanilla (Vanilla planifolia) and raisins and with pistachio (Pistacia vera L.) and black pepper.

INTRODUCTION

Walnut oil (WO) has been regarded as a nutritionally valuable source of fat for humans due to a range of bioactive substances, including but not limited to tocopherols, phytosterols and polyphenols.In the present context of increasing consumer demand for minimally processed functional foods, cold-pressed oils can be promoted as a high-end health product (Massodi et al. 2025). This study was conducted to explore the potential of enhancing the antioxidant properties of walnut oil through the incorporation of various dry spices. Raisins (dried grapes) are considered part of the dried fruit category, as they contain no added sugar (Schuster et al. 2017). Pistachio seeds contain various antioxidants, including anthocyanins, tocopherols, carotenoids, chlorophylls, flavonoids, isoflavones, proanthocyanidins, resveratrol and vitamin C (Saitta et al. 2011). A minimal quantity of spice has the capacity to significantly modify a dish, bestowing upon otherwise unremarkable ingredients a distinctive flavour profile.

MATERIAL AND METHODS

The cold-pressed walnut oil and the dried spices was purchased from a Timisoara supermarket, Romania.

Obtaining walnut oil samples with spices The dry spices were introduced in dark bottle and covered with cold - pressed walnut oil, in a ratio of 1:20. The samples were stirred frequently during 21 days of maceration at room temperature (20 ^{o}C) in laboratory conditions. The macerates with walnut oil, garlic and black pepper (WODS 1), with walnut oil, cinnamon, vanilla and raisins (WODS 2) and with

pistachio and black pepper (WODS 3) were then filtered and analysed. They were kept in the refrigerator until they were consumed.

Analytical methods. Flavored walnut oils were analyzed in terms of total antioxidant capacity (TAC) by FRAP assay (Benzie at al. 1996), total polyphenolic compounds content (TPC) by Folin-Ciocalteau method (Singleton at al. 1999) and vitamin C by titration with 2,6-dichlorophenolindophenol sodium (Nielsen, 2010). The samples were read using the Analytik Jena UV-VIS SPECORD 205 spectrophotometer at λ = 593 nm and λ = 725 nm respectively for the determination of TAC and TPC. Gallic acid was used as standard to determine TPC. All determinations were made in triplicate.

Statistical analysis. Some correlations between the content of bioactive compounds in flavoured walnut oil samples were obtained using simple linear regression analysis.

RESULTS AND DISCUSSIONS

Trained panelists consisting of 20 students of the Faculty of Food Engineering from Timisoara (n = 20; aged from 20 to 26 years old, 14 women and 6 men) were recruited for the hedonic analysis. The results of the hedonic measurement, which used 9-point category ordinal hedonic scale (1 = dislike extremely, 5 = neither like nor dislike, 9 = like extremely) (Tauferova et al. 2021), clearly demonstrated that the maximum score was attributed to the odor (9.2) in WODS 2, while the control sample received a score of 9.0 for its appearance (Table 1).

Table 1

The average of the results obtained for the sensory characteristics

Samples	Appearance	Consistency	Color	Odor	Taste	General availability
C*	9.0	8.0	8.1	9.1	8.7	8.6
WODS 1	7.6	7.5	7.1	7.0	7.1	7.3
WODS 2	8.2	7.9	8.2	9.2	8.7	8.4
WODS 3	7.8	7.8	8.8	8.0	9.1	8.3

***Control sample**

The bioactive compounds of walnut oil and dry spices (Table 2) and flavoured walnut oil (Table 3) were analyzed.

Table 2

The total antioxidant activity (TAC), the total polyphenols content (TPC) and vitamin C of dry spices

Dry spices	TAC (mM Fe^{2+} /g d.w.)	TPC (mg GAE/g d.w.)	Vitamin C (mg/100 g d.w.)
garlic (cloves)	762.21	122.75	2.81
black pepper	442.64	1200.56	0.41
raisins	280.98	1140.22	4.21
cinnamon	882.44	40.58	3.80
vanilla (powder)	550.02	372.54	2.04
pistachio (kernels)	142.20	220.40	1.24

Of all spices, the raisins, traditional dried fruits, have been shown to contain one of the highest concentrations of polyphenolic compounds and antioxidant high levels (Schuster et al. 2017).

Lower levels of bioactive phenolics in pistachios may negatively impact about of consumption in health benefits and favour lipid oxidation (Ballistreri et al., 2009).

Table 3

The total antioxidant activity (TAC), the total polyphenols content (TPC) and vitamin C of walnut oil by addtion of dry spices

Walnut oils with dry spices	TAC (mM Fe^{2+} /g)	TPC (mg GAE/g)	Vitamin C (mg/100 g)
C	920.24	1210.68	-
WODS 1	1332.08	946.42	0.01
WODS 2	1448.88	810.02	0.02
WOSD 3	1421.20	886.48	0.012

The highest antioxidant capacity value was observed in the sample that contained cinnamon, vanilla and raisins (WODS 2). The highest total polyphenol content was found in WODS 1 and WODS 3 samples due to black pepper addition. Known as the "king of spices", its nutritional value and potential applications in human and animal nutrition make it a versatile and valuable spice. Black pepper has significant antioxidant properties and offers a range of health benefits (Navaro et al. 2006). In the control sample, the presence of vitamin C was not detected.

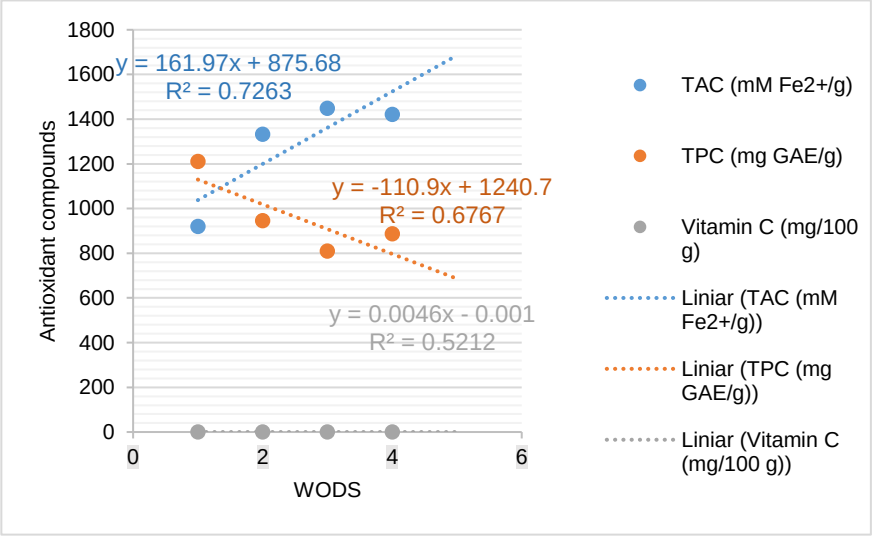

Figure 1. Simple linear regression analysis between antioxidant compounds in flavoured walnut oil samples

In Figure 1 as observed a positive correlation between total antioxidant capacity, total polyphenolic compound content, vitamin C and flavored walnut oil samples. The coefficient of determination (R^2) was found to be 0.7263, 0.6767 and

0.5212, respectively. According to Yang et al. (2024), these indicate that the addition of natural bioactive compounds (spice mixture) enhances the quality of the oil.

CONCLUSIONS

The addition of natural bioactive compounds to walnut oil through the utilisation of a selection of spices has been proven to enhance its quality.

The continued development of food products enriched by dry spices is predicted to be a major trend throughout, driven by consumer demand for healthful products.

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