

## **DETERMINATION OF TOTAL PHENOLS IN SOME SPICES IN DIFFERENT PACKAGING**

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### **Abstract**

In this study total phenol content of some spices was determined. Determination was performed on nine different samples of spices, such as: rosemary, pepper, garlic, oregano, basil, clove, dill, cinnamon and parsley. Analyses were conducted on spices in two different packages: glass bottles and laminated paper bags with metal film. The total phenols (TP) content was determined spectrophotometrically using a method which is based on colour reaction of phenol with Folin-Ciocalteu reagent at 760 nm. The obtained data shows that highest total phenols content expressed as Gallic acid Equivalents (GAE) in spices in laminated bags, was found in oregano ( $457.05 \pm 0.23$ ), and the lowest content was in garlic  $19.80 \pm 4.42$  mg GAE/g of DW. Total phenols content in spices packed in glass bottles was found for oregano ( $333.80 \pm 0.53$ ) and  $26.20 \pm 1.37$  mg GAE/g of DW (for garlic). It can be concluded that most of tested spices showed higher total phenol content in laminated bags than those in glass bottles.

**Key words:** *Spices, total phenol content, glass bottles, laminated bags*

### **Introduction**

Spices and herbs have been researched for their antioxidant properties for reason that they have a variety of antioxidative effects and properties (Shobana and Naidu, 2000; Zheng and Wang, 2001). Spices like vegetables, fruits and medicinal herbs, are known to have different phenolic compounds. Phenolic compounds in these plant material are closely associated with their antioxidant activity. It is known that these compounds play an important role in inhibition of oxidizing enzymes and stabilization of lipid peroxidation (Laughton et al., 1991). The antioxidant activity of phenols is mainly due to their redox properties, which allow them to act as reducing agents, donor of hydrogen and quenching of singlet oxygen. After all, they also have a metal-chelation potential (Rice-Evans et al., 1995). These multiple potential mechanisms of antioxidant activity make different group of phenolic compounds an interesting target in the search for health-beneficial bioactive compounds and also offer a possibility to use phenolic compounds or pextracts rich with them, to extend shelf life of lipid rich foods. (Yanishlieva et al., 2001).

Many studies indicated that sage, oregano, rosemary, and thyme show high antioxidant activity (Cuvelier et al., 1994; Zheng and Wang, 2001; Pizzale et al., 2002).

Spices are known to significantly contribute to the aroma, taste, and medicinal properties of food. They are aromatic and pungent food ingredients and may be added to foods in several forms: as whole spices, as grounded spices, or as isolated from their extracts (Suhaj, 2006).

The objective of this study was to determine and compare total phenol content in nine different spices depending on different packaging (laminated bags and glass bottles).

## Materials and methods

### Materials

Samples of spices, such as: rosemary (*Rosmarinus officinalis*), pepper (*Piper nigrum L*), garlic (*Allium sativum L*), oregano (*Origanum vulgare*), basil (*Ocimum basilicum L*), clove (*Syzygium aromaticum*), dill (*Anethum graveolens*), cinnamon (*Cinnamomum zeylanicum*) and parsley (*Petroselinum crispum*), were collected and purchased from local supermarkets. Spices were packaged in different packaging material: laminated bags (9) and glass bottles (9). Samples were stored in dry, dark and cool places before analysis.

### Sample preparation

Spice samples were homogenized in fine powder and about 1 g of the powder was extracted with 40 ml of hot distilled water at 90-95°C for 15 min using reflux. The resulting extract was filtered into a volumetric flask of 50 ml, with the addition of distilled water to the mark.

### Determination of total phenols content

The total phenols content was measured using the Folin Ciocalteu reagents (FC), by a method based on colored reaction of phenols with FC (Ough and Amerine, 1998), with slight modification. 250 µl of extract and 1,25 ml dilution of Folin Ciocalteu reagents (diluted with distilled water in ratio 1:4) was added in a volumetric flask (25 ml). After five minutes 3,75 ml of saturated solution of Na<sub>2</sub>CO<sub>3</sub> was added, and distilled water was poured to the mark. After that the resulting mixture was incubated at 50°C for 20 min. In the same way the blank was prepared, and distilled water was used instead of the extract. The absorbance of resulting blue color was measured at 760 nm (Shimadzu 2200 UV-VIS spectrophotometer). Quantification was done with respect to the standard curve of gallic acid (300 mg/L). The results were expressed as gallic acid equivalents (GAE) miligram per g of dry weight (DW). All measurements were performed in triplicate.

### Statistical analysis

All data were evaluated statistically in excel by one-way analysis of variance (ANOVA).

## Results and discussion

The total phenols content of some spices purchased from local supermarkets from Sarajevo Canton were analysed and statistically evaluated. The summarised results of analysis of spices are presented by figures 1 and 2.

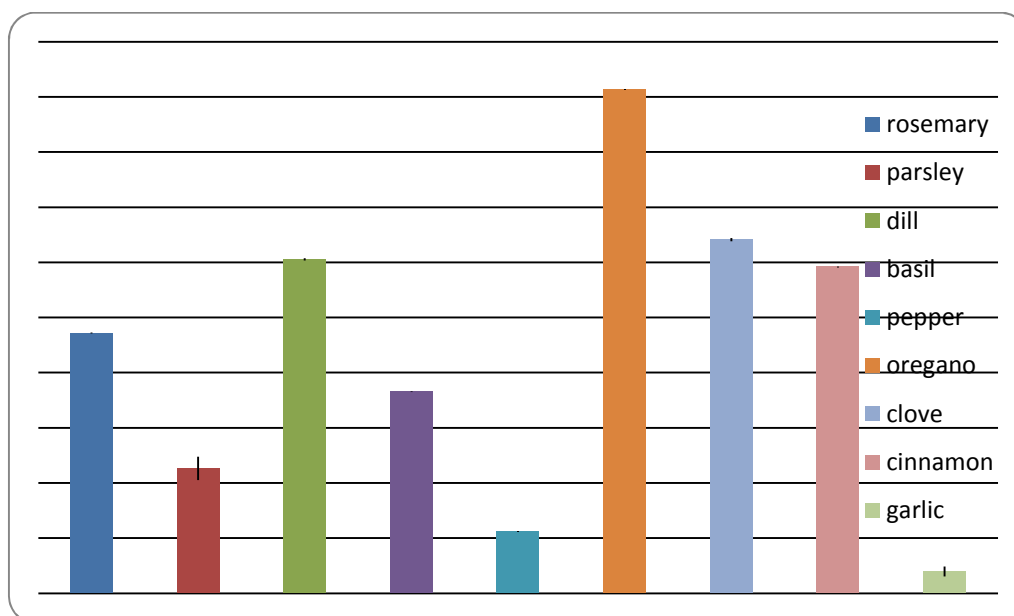


Figure 1: The total phenols content in spices in laminated bags (mean ± st.dev).

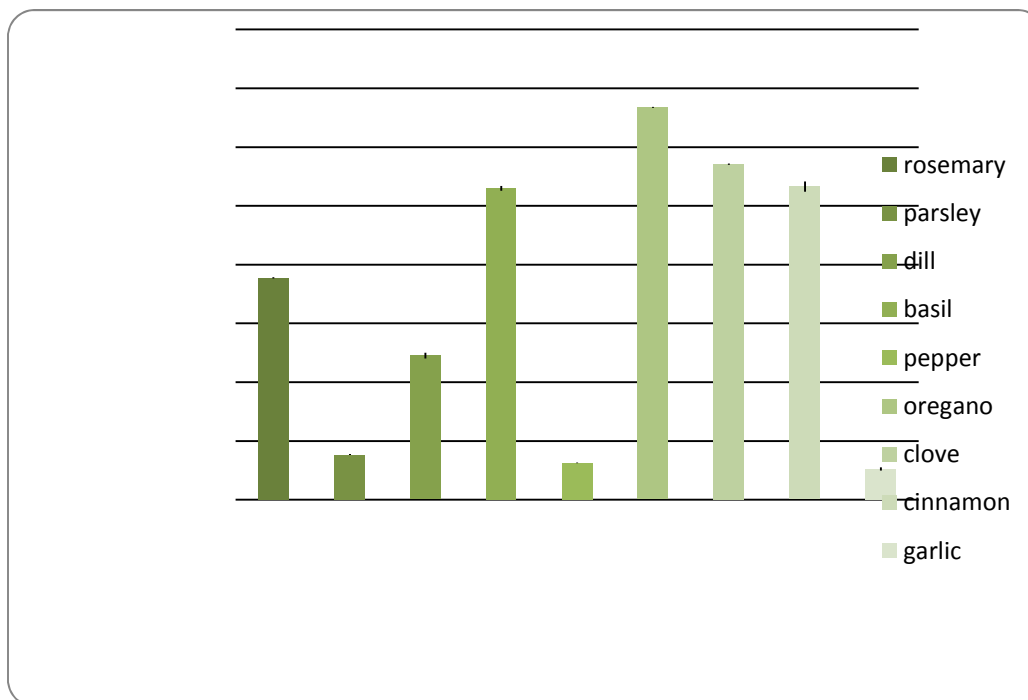


Figure 2: The total phenols content in spices in glass bottles (mean  $\pm$  st.dev).

The analysis of total phenols content of nine spices in different packaging showed higher values for oregano for the both of packaging. Our results showed that the amount of total phenols in spice samples varied widely and they are ranged from 19.8 – 457.05 mgGAE/g dry material (Fig1-2).

Statistical analysis of variance (ANOVA) showed that TP content in investigated spices were statistically different according to different packaging, ( $p < 0.001$ ) for oregano, rosemary, dill, clove and pepper; for the cinnamon significance was ( $p < 0.05$ ), and for the basil and garlic there was no significant difference.

In our study the TP content for rosemary was  $235,90 \pm 0.51$  (laminated bags) and in glass packaging was  $188.85 \pm 0.5$  mgGAE/g. Our results are in range found by Ünveret al., (2009). They found that TP content in methanolic extract of rosemary, expressed as  $214.21 \pm 1.14^c$  mgGAE/g. Our results are higher than TP content in methanolic extract for rosemary  $5.070 \pm 0,036$  gGAE/100g, which presented by Shan et al., (2005).

The values of TP for parsley were higher in laminated bags ( $113.20 \pm 10.51$ ) than in glass bottles  $38.25 \pm 0.13$  mgGAE/g. Shan et al., (2005) found that TP content in methanolic extract of parsley was  $0.97 \pm 0.002$  gGAE/100g. Also, for dill values of TP were higher more than twice in laminated bags ( $302.65 \pm 0.96$ ), than in glass bottles  $122 \pm 2.44$  mgGAE/g. Shan et al., (2005) found  $0.98 \pm 0.002$  gGAE/100g for TP content for dill methanolic extract.

The obtained data for basil showed that TP content for basil were ( $182.75 \pm 0.33$ ) for laminated bags and higher in glass bottles,  $265 \pm 2.07$  mgGAE/g. Values of TP methanolic extract of basil got lower  $3.64 \pm 0.014$  gGAE/100g by Shan et al., (2005).

Our results showed that the of pepper level of TP was ranged from 31.35 (glass bottles ) to 56.15 mgGAE/g in laminated bags. Shan et al., (2005) reported that TP content of black pepper methanolic extract was  $0.3 \pm 0.002$  gGAE/100g.

The results obtained for oregano were higher from the other analysed spices in both of packaging:  $457.05 \pm 0.23$  (laminated bags) and  $333.8 \pm 0.53$  mgGAE/g for this spice in glass bottles. Ünveret al., (2009) reported that TP content oregano methanolic extract was

420.51±2.44<sup>f</sup> mgGAE/g. Shan et al., (2005) found lower values for oregano TP content in methanolic extract (10.17 ±0.01 gGAE/100g), than our values.

The TP content in clove was 320.55±1.50 (laminated bags) and 285±0.55 mgGAE/g for clove in glass bottle. Bamdad, et al., (2006) reported that total phenol content of caraway and clove extracts determined by the Folin-Ciocalteu method, were 13.76 and 243.91 mg /g dry matter respectively, expressed as tannic acid equivalents. Medhat and El-Sayed (2013) showed that total phenol content of acetone, ethanol and water clove extracts was (31.88, 10.06, 28.7 mg GAE/100g respectively).

The obtained results in our study for cinnamon for TP content showed 295.75±0.33 in laminated bags and 266.40±4.37 mgGAE/g in glass bottle. Monica Gallo et al., (2010) reported that TP content for cinnamon obtained by microwave assisted extraction (MAE) was 1679.201±65.33 mgGAE/100g in ethanol/water extracts (50:50 v.v) at 50°C for 18 min.

Of all the tested spices in our study, garlic had the lowest content of TP and 19.80±4.42 in laminated bags and 26.20±11.37 mgGAE/g in glass bottles (Fig. 3).

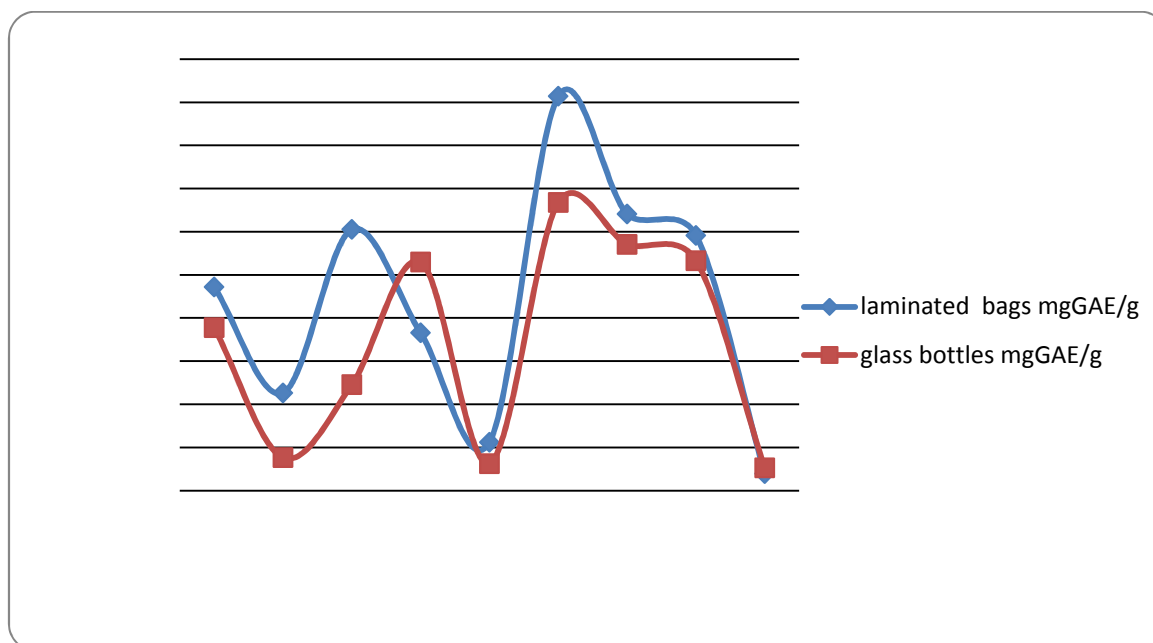


Figure 3: Comparison the total phenols content in both of packing of spices

### Conclusions

In this study two different packing of nine spices were analysed and compared. The analysis of mentioned spices showed that greatest content of total phenols in both of packing were obtained for oregano and smallest for garlic. It can be concluded, that laminated bags packing of spices had higher values of TP (for oregano, rosemary, dill, clove and pepper) than these spices in glass bottles.

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