# COMPARATIVE STUDY REGARDING THE TOTAL POLYFENOL CONTENT OF SOME TINCTURES AND OILS FROM ROMANIAN MARKET

**Becze A.[1)], M. Roman[1)], C. Puia[2)], M. Dordai[1)], D. Simedru[1,*], E. Luca[2)]**

*[1]INCDO-INOE 2000, Research Institute for Analytical Instrumentation, 67 Donath, 400293 Cluj-Napoca, Romania; [2]University of Agricultural Sciences and Veterinary Medicine, 3-5 Calea Manastur, 400372 ClujNapoca, Romania; *Corresponding author: dorina.simedru@icia.ro*

**Abstract.** In the last decade, there has been much interest in the potential health benefits of plant tinctures because of their high content of polyphenols. 27 samples of tinctures and oils from different plants were analyzed using Folin-Ciocalteu method in order to determine the total polyphenols content. Measurements were compared with the calibration curve of Gallic acid (25, 50, 100, 250, 500 ppm) and the results were expressed as Gallic acid equivalents. Values obtained ranged within very broad limits 6 - 964 mg/L GAE. The lowest concentration was found in *Aloe paradisiacum* and *Aloe marlothi* (6 and 9 mg/L GAE) and the heights concentration in *Cinnamomum* sp. (964 mg/L GAE). The concentration of total polyphenols found in *Cinnamomum* sp. was 5.6 times bigger than the average concentration of total polyphenols found for the others tinctures (172 mg/L GAE).

**Key words:** polyphenols, Folin-Ciocalteu, Spectrophotometer, tinctures, plants

## INTRODUCTION

Polyphenols are secondary metabolites of plants [1]. They give to fruits, berries, and vegetables their vibrant colors and contribute to the bitterness, astringency, flavor, aroma, and oxidative stability of the food. In the plant, they protect against ultraviolet radiation, pathogens, oxidative damage and harsh climatic conditions. Interest in the availability of polyphenolic compounds and volatile oils is also increasing due to the demonstrated therapeutic effects [1]. Polyphenols are generally recognized for their antioxidant, anti-inflammatory, antibacterial, anti-tumor and anti-atherogenic properties (which limits fat deposition on blood vessel walls) [2, 3]. Some classes of polyphenols are excellent disinfectants, being used in hospitals, clinics and medical offices. This quality is due to the fact that a number of antibiotic-resistant bacteria (some types of staphylococci) become sensitive to polyphenols [2]. A great way to introduce polyphenols from in different parts of the plant into the diet is by consuming tinctures and oils. Tinctures and oils ensure a high extraction of active substances from the plants and a fast absorption in the human body [4].

High number of tincture and oils are commercially available on the market without a characterization regarding the total polyphenols content.The purpose of the study is to compare the total polyphenols content of different plant tinctures and oils found on the Romanian market using Folin-Ciocalteu method for determining the total polyphenols content of different plant tinctures and oils [5, 6].

## MATERIALS AND METHODS

**Samples.** 27 samples of tinctures and oils from different plants were taken into analysis. The plant and vegetable material used are presented in Table 1.

Table 1

Plants and plant material

| No. | Plant | Vegetable material | Sample cod |
|---|---|---|---|
| 1. | *Targetes erecta* and *Targetes patula* | flores | T1 |
| 2. | *Satureja hortensis* | herba | T2 |
| 3. | *Aristolochia clematitis* | herba | T3 |
| 4. | *Armoracia rusticana* | radix | T4 |
| 5. | *Helleborus purpurascens* | rhizoma | T5 |
| 6. | *Arnica montana* | flores | T7 |
| 7. | *Zingiber officinale* | rhizoma | T8 |
| 8. | *Allium cepa* | bulbus | T9 |
| 9. | *Aloe vera* | folium | T10 |
| 10. | *Allium sativum* | bulbus | T11 |
| 11. | *Azadirachta indica* oil | semen | T13 |
| 12. | *Melaleuca alternifolia* oil | herba | T14 |
| 13. | *Aloe marlothi* | folium | T16 |
| 14. | *Aloe paradisiacum* | folium | T17 |
| 15. | *Azadirachta indica* | herba | T18 |
| 16. | *Capsicum anuum* | fructus | T19 |
| 17. | *Brassica aleracea* | herba | T20 |
| 18. | *Origanum vulgare* essential oil | semini | T21 |
| 19. | *Cinnamomum* sp. essential oil | cortex | T22 |
| 20. | *Rubus idaeus* | folium | T23 |
| 21. | *Satureja hortensis* essential oil | semini | T25 |
| 22. | *Allium ursinum* | herba | T29 |
| 23. | *Ocinum bassilicum* | herba | T30 |
| 24. | *Carum carvi* | herba | T31 |
| 25. | *Chelidonium majus* | herba | T32 |
| 26. | *Apium graveolens* | herba | T33 |
| 27. | *Avena sativa* | herba | T34 |

**Reagents and standards.** The fallowing reagents where used: Folin-Ciocalteu solution from VWR, Gallic acid from Supelco , sodium carbonate from Merck, ultra-pure water obtained using ULTRACLEAR TWF UV UF T from EVOQUA WATER TECHNOLOGY - SIEMENS, Ethanol from Merck.

**Total polyphenols analysis.** In order to obtain the total polyphenol content, a modified version of the Folin-Ciocalteu method was used. Polyphenols in plant extracts react with specific redox reagents (Folin-Ciocalteu reagent) to form a blue complex that can be quantified by visible-light spectrophotometry.

0,5 ml of sample, was pipette in a 10 ml volumetric flask, which contained 0.5 ml Folin-Ciocalteu solution, 5 ml ultra-pure water and 1,5 ml sodium carbonate solution (20%). The flask was filled up to the mark with ultrapure water. The volumetric flasks samples were left 90 min. and then measured at ~765 nm using the Spectrophotometer UV/VIS Lambda 25 from Perkin Elmer. Measurements were compared to a calibration curve of Gallic acid (25, 50, 100, 250, 500 ppm), and the results were expressed as Gallic acid equivalents (GAE).

## RESULTS

The results obtained for the total polyphenols analysis are presented in tabel 2.

Table 2

Total polyphenols content

| No. | Sample Cod | Results (mg/L GAE equivalent) | No. | Sample Cod | Results (mg/L GAE equivalent) |
|---|---|---|---|---|---|
| 1. | T1 | 164 | 15. | T18 | 15 |
| 2. | T2 | 267 | 16. | T19 | 17 |
| 3. | T3 | 74 | 17. | T20 | 108 |
| 4. | T4 | 305 | 18. | T21 | 116 |
| 5. | T5 | 33 | 19. | T22 | 964 |
| 6. | T7 | 106 | 20. | T23 | 269 |
| 7. | T8 | 74 | 21. | T25 | 295 |
| 8. | T9 | 197 | 22. | T29 | 50 |
| 9. | T10 | 164 | 23. | T30 | 309 |
| 10. | T11 | 106 | 24. | T31 | 492 |
| 11. | T13 | 9 | 25. | T32 | 61 |
| 12. | T14 | 86 | 26. | T33 | 210 |
| 13. | T16 | 26 | 27. | T34 | 120 |
| 14. | T17 | 6 | | | |

Values obtained ranged within very broad limits: 964 mg / L GAE equivalent gallic acid (T22) and 6 mg / L GAE gallium equivalent (T17). The obtained results are arranged as follows: 11 samples are in the range of 6-100 mg / L GAE equivalent gallic acid (T17, T13, T18, T19, T16, T5, T29, T32, T3, T8, T14); 8 propylate in the range of 100-200 mg / L GAE equivalent gallic acid (T7, T11, T20, T21, T34, T1, T10, T9); 4 samples in the 200-300 mg / L range GAE equivalent gallic acid (T33; T2; T23; T25) 2 samples in the 300-400 mg / L range GAE gallic acid equivalent (T4; T30) 1 sample in the 400-500 mg range / L

GAE gallic acid equivalent (T31) and one in the 900-1000 mg / L GAE equivalent gallic acid (T22) range.

## CONCUSSIONS

Analyzing the results in Table 2 it is observed that the highest values of the total polyphenol content were recorded for the samples:

• T22 (cinnamomum sp. Essential oil - cinnamon) whose antiseptic, antiinfectious, antibacterial action (destroys over 96% of pathogenic bacteria), antiviral, antifungal (Candida, Aspergilu), antiparasitic properties are well-known.

• T31 (carum carvi - caramel) which contains volatile oil consisting of carvone, limonene, dehydrocarvone, dihydrocarveol, lipids, albuminous substances, minerals, starch, carbohydrates, resins, tanoids, etc. It has also a powerful antimicrobial action.

**ACKNOWLEDGMENTS:** This work was supported by a grant of the Romanian National Authority for Scientific Research and Innovation, CNCS – UEFISCDI, project number PN-II-PT-PCCA-2013-4-1857.
*All authors had equal contribution to this study.

## REFERENCES

1. Scalbert, A., Johnson, I., Saltmarsh, M. (2005), Polyphenols: antioxidants and beyond, The American Journal of Clinical Nutrition, 81(1): 215-217.
2. Scalbert, A, Manach, C, Morand, C, Remesy, C. (2005), Dietary polyphenols and the prevention of diseases, Critical Reviews in Food Science and Nutrition, 45:287–306.
3. Pandey, K., Rizvi, S., (2009), Plant polyphenols as dietary antioxidants in human health and disease, Oxidative Medicine and Cellular Longevity, 2(5): 270–278.
4. Manach, C, Scalbert, A, Morand, C, Rémésy, C, Jimenez, (2004), L., Polyphenols: food sources and bioavailability. The American Journal of Clinical Nutrition, 79:727–747.
5. Grubešića, R.J., Vukovića, J., Kremerb, D. Vladimir-Knežević, S., (2005) Spectrophotometric method for polyphenols analysis: Prevalidation and application on Plantago L. species, Journal of Pharmaceutical and Biomedical Analysis, 39(3–4): 837–842.
6. Singleton, V., Orthofer, R., Lamuela-Raventós, R. (1999)Analysis of total phenols and other oxidation substrates and antioxidants by means of Folin-Ciocalteu reagent, Methods in Enzymology, 299:152-178.