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Chemical Composition of Essential Oil from *Rosmarinus Officinalis* L. Leaves

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Abstract – The chemical constituents of the essential oil from leaves of *Rosmarinus officinalis* L. was produced by steam distillation using the Clevenger apparatus. The oil was analyzed by gas chromatography and mass spectrometry (GC-MS). The main constituent of the oil was 1,8-cineole with 81.47% which is important for medicinal and pharmaceutical.

Keywords – *1,8-cineole, Rosmarinus officinalis L., essential oil.*

1. Introduction

Rosmarinus officinalis L. belonging to Lamiaceae family, known as Rosemary is grown Mediterranean and distributed throughout the world. It has been utilized for treatment of asthma, eczema and rheumatism as a traditional medicine [1]. Rosemary extracts display many biological activities, including antimicrobial [2], anti-mammary tumorigenesis and anti-mutagenesis [1], antidepressant [3], anti-ulcerogenic [4], anti-inflammatory [5] and antioxidant [6]. The main components of Rosemary are rosmarinic acid which has been reported to have anticarcinogenic, anti-allergic, antimutagenic, antibacterial and antioxidant activities [7, 8].

Essential oils (EOs) are volatile, natural products with terpene skeleton described by an intense scent and are constituted by aromatic plants as secondary metabolites. In nature,

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EOs play a significant function in the protection of the plants as antibacterials, antivirals, antifungals, insecticides and also against herbivores by reducing their desire for such plants [9].

Rosemary essential oil is used as brain and nerve tonic, and as a remedy for mental fatigue [10] as well as antiseptic, diuretic, anti depressant and anti spasmodic; it is also used to treat cold, influenza and rheumatic pain [11] and has the ability to enhance the performance of memory [12]. Diversity in the chemical contents of wild rosemary EOs and polyphenolic compounds have been ascribed to many factors, involving the environment [13], abiotic stress [14], genetic heritance [15, 16] and the phenological stages of the plants [17, 18].

Therefore essential oil contents and quantities in Rosemary grown in Denizli exhibit the diversity than the Rosemary grown in other places.

2. Material and Methods

Plant Materials

Rosemary was bought from herbalist in Tokat (collected from Denizli) and identified by Prof.Dr. Isa Telci.

Isolation of essential oil

The Rosemary leaves (30 g) and water (150 mL) were placed in a flask and hydro distillation process was applied using the Clevenger apparatus for 3h. The essential oil sample was separated, dried over sodium sulphate and stored at the fridge until usage.

GC analysis

GC analyses of essential oil were performed on Perkin-Elmer Clarus 500 model Autosystem GC. Acetone was used for dilation of oil (1:10) then injected in the HT-5 column (25 m×0.22 mm×0.1μm film). The column temperature was programmed from 50 to 120 °C at 3 °C/min, 120 to 220 °C 5 °C/min with initial and final temperatures held for 0,64 min (totally 44 min). Helium was used as carrier gas at 5 psi inlet pressure. The temperature was 250 °C for both injector and detector (FID). Diluted samples (1.0 μL) were injected in the split/splitless (50:1 split) mode.

GC–MS analysis

GC/MS analyses were performed on Perkin-Elmer mass spectrometer using BPX5 column (30 m×0.25 mm×0.25μm film). An electron ionization system with ionization energy of 70 eV was used for GC–MS detection. The carrier gas was helium with a flow rate of 1.3 mL/min. Injector and MS transfer line temperatures were set at 230 °C and 250 °C, respectively. The oven temperature was the same as with GC analysis. Diluted samples (1/10 in acetone, v/v) of 1.0μL were injected in the split/splitless (5:1 split) mode.

3. Results and discussion

Rosemary essential oil was generated by hydrodistillation using Clevenger apparatus. Besides the 1,8-cineole (81.47%) which is the main constituent, α-pinene (8.90%), camphor (3.3%), camphene (2.64), cymene (1.95%), α-limonene (1.25%), β-myrecene (0.45%) were determined in Rosemary essential oil (Table 1). 1,8-cineole, a natural compound has a diverse biological effectiveness such as it reduces the activity of NF-κB in vitro [19] and exhibits the antinociceptive and antiinflammatory activities [20]. 1,8-cineole is used to treat the bronchitis and sinusitis, in addition, it exhibits the direct protective effects within the rat and murine system [21, 22]. 1,8-cineole was isolated from Rosemary previously but amount of this molecule was rather low compared with the Rosemary we worked on.

Table 1. Chemical composition of the Rosemary essential oil analyzed by gas chromatography-mass spectrometry and comparison with the literature [23]

Compounds	Rt (min)	Oil composition(%)	Oil composition(%)[23]
α-Pinene	4.498	8.90	20.3.12
Camphene	4.905	2.64	-
β-Myrecene	5.815	0.45	-
α-Limonen	7.232	1.25	-
Cymene	7.322	1.95	1.91
1.8.Cineole	7.589	81.47	35.22
Camphor	13.384	3.33	7.65

The content of 1,8-cineole in Rosemary leaves collected from Behira, Egypt was 19.60% [24]. The essential oil generated from Tunisian Rosemary consisted of 35.22% of 1.8.cineole [23]. Another survey carried out in Italy indicated that essential oil of Rosemary leaves included 18.6% of 1.8.cineole [25]. Therefore, the result of this work as 81.47% of 1,8-cineole exhibited the significance of Rosemary grown in Denizli province.

References

[1] Fahim, F.A.; Esmat, A.Y.; Fadel, H.M.; Hassan, K.F.S., Allied studies on the effect of Rosmarinus officinalis L-on experimental hepatotoxicity and mutagenesis. International Journal of Food Sciences and Nutrition, 1999, 50, (6), 413-427.

[2] Bernardes, W.A.; Lucarini, R.; Tozatti, M.G.; Souza, M.G.M.; Silva, M.L.A.; da Silva, A.A.; Martins, C.H.G.; Crotti, A.E.M.; Pauletti, P.M.; Groppo, M.; Cunha, W.R., Antimicrobial Activity of Rosmarinus officinalis against Oral Pathogens: Relevance of Carnosic Acid and Carnosol. Chemistry & Biodiversity, 2010, 7, (7), 1835-1840.

[3] Machado, D.G.; Cunha, M.P.; Neis, V.B.; Balen, G.O.; Colla, A.; Bettio, L.E.B.; Oliveira, A.; Pazini, F.L.; Dalmarco, J.B.; Simionatto, E.L.; Pizzolatti, M.G.; Rodrigues, A.L.S., Antidepressant-like effects of fractions, essential oil, carnosol and betulinic acid isolated from Rosmarinus officinalis L. Food Chemistry, 2013, 136, (2), 999-1005.

[4] Amaral, G.P.; de Carvalho, N.R.; Barcelos, R.P.; Dobrachinski, F.; Portella, R.D.; da Silva, M.H.; Lugokenski, T.H.; Dias, G.R.M.; da Luz, S.C.A.; Boligon, A.A.; Athayde, M.L.; Villetti, M.A.; Soares, F.A.A.; Fachinetto, R., Protective action of ethanolic

extract of Rosmarinus officinalis L. in gastric ulcer prevention induced by ethanol in rats. Food and Chemical Toxicology, 2013, 55, 48-55.

[5] Lucarini, R.; Bernardes, W.A.; Ferreira, D.S.; Tozatti, M.G.; Furtado, R.; Bastos, J.K.; Pauletti, P.M.; Januario, A.H.; Silva, M.L.A.E.; Cunha, W.R., In vivo analgesic and anti-inflammatory activities of Rosmarinus officinalis aqueous extracts, rosmarinic acid and its acetyl ester derivative. Pharmaceutical Biology, 2013, 51, (9), 1087-1090.

[6] Ma, C.H.; Song, K.G.; Yu, J.H.; Yang, L.; Zhao, C.J.; Wang, W.J.; Zu, G.; Zu, Y.G., Pyrolysis process and antioxidant activity of pyroligneous acid from Rosmarinus officinalis leaves. Journal of Analytical and Applied Pyrolysis, 2013, 104, 38-47.

[7] Wang, H.; Liu, F.; Yang, L.; Zu, Y.G.; Wang, H.; Qu, S.Z.; Zhang, Y., Oxidative stability of fish oil supplemented with carnosic acid compared with synthetic antioxidants during long-term storage. Food Chemistry, 2011, 128, (1), 93-99.

[8] Munoz-Munoz, J.L.; Garcia-Molina, F.; Ros, E.; Tudela, J.; Garcia-Canovas, F.; Rodriguez-Lopez, J.N., Prooxidant and Antioxidant Activities of Rosmarinic Acid. Journal of Food Biochemistry, 2013, 37, (4), 396-408.

[9] Bakkali, F.; Averbeck, S.; Averbeck, D.; Waomar, M., Biological effects of essential oils - A review. Food and Chemical Toxicology, 2008, 46, (2), 446-475.

[10] Laybourne, G.; Moss, M.; Wesnes, K.; Scott, S.D., Effects of acute oral administration of rosemary and peppermint on cognition and mood in healthy adults. Journal of Psychopharmacology, 2003, 17, (3), A62-A62.

[11] Erenmemisoglu, A., Effect of a Rosmarinus officinalis leave extract on plasma glucose levels in normoglycaemic and diabetic mice. Pharmazie, 1997, 52, (8), 645-646.

[12] Moss, M.; Cook, J.; Wesnes, K.; Duckett, P., Aromas of rosemary and lavender essential oils differentially affect cognition and mood in healthy adults. International Journal of Neuroscience, 2003, 113, (1), 15-38.

[13] Tigrine-Kordjani, N.; Chemat, F.; Meklati, B.Y.; Tuduri, L.; Giraudel, J.L.; Montury, M., Relative characterization of rosemary samples according to their geographical origins using microwave-accelerated distillation, solid-phase microextraction and Kohonen self-organizing maps. Analytical and Bioanalytical Chemistry, 2007, 389, (2), 631-641.

[14] Tounekti, T.; Vadel, A.M.; Onate, M.; Khemira, H.; Munne-Bosch, S., Salt-induced oxidative stress in rosemary plants: Damage or protection? Environmental and Experimental Botany, 2011, 71, (2), 298-305.

[15] Yosr, Z.; Hnia, C.; Rim, T.; Mohamed, B., Changes in essential oil composition and phenolic fraction in Rosmarinus officinalis L. var. typicus Batt. organs during growth and incidence on the antioxidant activity. Industrial Crops and Products, 2013, 43, 412-419.

[16] Jordan, M.J.; Lax, V.; Rota, M.C.; Loran, S.; Sotomayor, J.A., Effect of bioclimatic area on the essential oil composition and antibacterial activity of Rosmarinus officinalis L. Food Control, 2013, 30, (2), 463-468.

[17] Yesil-Celiktas, O.; Kocabas, E.E.H.; Bedir, E.; Sukan, F.V.; Ozek, T.; Baser, K.H.C., Antimicrobial activities of methanol extracts and essential oils of Rosmarinus officinalis, depending on location and seasonal variations. Food Chemistry, 2007, 100, (2), 553-559.

[18] Singh, M.; Guleria, N., Influence of harvesting stage and inorganic and organic fertilizers on yield and oil composition of rosemary (Rosmarinus officinalis L.) in a semi-arid tropical climate. Industrial Crops and Products, 2013, 42, 37-40.

[19] Greiner, J.F.W.; Muller, J.; Zeuner, M.T.; Hauser, S.; Seidel, T.; Klenke, C.; Grunwald, L.M.; Schomann, T.; Widera, D.; Sudhoff, H.; Kaltschmidt, B.; Kaltschmidt, C., 1,8-

Cineol inhibits nuclear translocation of NF-kappa B p65 and NF-kappa B-dependent transcriptional activity. Bba-Mol Cell Res, 2013, 1833, (12), 2866-2878.
[20] Santos, F.A.; Rao, V.S.N., Antiinflammatory and antinociceptive effects of 1,8-cineole a terpenoid oxide present in many plant essential oils. Phytother Res, 2000, 14, (4), 240-244.
[21] Yuan, G.F.; Wahlqvist, M.L.; He, G.Q.; Yang, M.; Li, D., Natural products and anti-inflammatory activity. Asia Pac J Clin Nutr, 2006, 15, (2), 143-152.
[22] Santos, F.A.; Rao, V.S.N., 1,8-cineol, a food flavoring agent, prevents ethanol-induced gastric injury in rats. Digest Dis Sci, 2001, 46, (2), 331-337.
[23] Smeti, S.; Atti, N.; Mahouachi, M.; Munoz, F., Use of dietary rosemary (Rosmarinus officinalis L.) essential oils to increase the shelf life of Barbarine light lamb meat. Small Ruminant Res, 2013, 113, (2-3), 340-345.
[24] Badawy, M.E.I.; Abdelgaleil, S.A.M., Composition and antimicrobial activity of essential oils isolated from Egyptian plants against plant pathogenic bacteria and fungi. Ind Crop Prod, 2014, 52, 776-782.
[25] Canale, A.; Benelli, G.; Conti, B.; Lenzi, G.; Flamini, G.; Francini, A.; Cioni, P.L., Ingestion toxicity of three Lamiaceae essential oils incorporated in protein baits against the olive fruit fly, Bactrocera oleae (Rossi) (Diptera Tephritidae). Nat Prod Res, 2013, 27, (22), 2091-2099.