



ANTIOXIDANT ACTIVITY OF SOME ESSENTIAL OILS

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Abstract: *The paper presents the antioxidant activity of some essential oils: clove, basil, coriander, sage, dill, oregano, juniper, rosemary and thyme, as determined by the DPPH (2,2-diphenyl-1-picrylhydrazil). Clove oil has not only the greatest antioxidant activity but also a strong antimicrobial, antiseptic, astringent, anti-inflammatory analgesic properties, given by its main component namely eugenol. Following the results, the other essential oils, present an antioxidant activity with lower values.*

Keywords: *essential oils, antioxidant activity, DPPH*

1. Introduction

Essential oils are volatile, natural, complex compounds, that are characterized by a strong odor and are formed in aromatic plants as secondary metabolites. Antioxidants are molecules with electron stable up or with the ability to receive additional electrons. They are the body's natural defense system against the harmful effects of free radicals, electron capture seekers [26]. Antioxidants protect cell structures and DNA against free radicals. Antioxidants fail or receive an extra electron to neutralize free radicals and stop the cascade effect of oxidation.

Because free radicals are created not only in the local geography, but also in our body, for health and longevity, it is essential to have a continuous supply of antioxidants, so that our body can benefit from a healthy dietary plan and a healthy lifestyle. Essential oils which are concentrated in powerful antioxidants are

called plant essences. They come from raw plant material such as flowers, leaves, wood, bark, roots, seeds and shells. Essential oils have been used for thousands of years for their healing and purifying effects on the body. Today, consumers are demanding even more food quality and the demand for natural and organic food is also increasing. The food industry is required in these circumstances to replace synthetic food additives with natural additives, namely natural antioxidants, to retard oxidative degradation of lipids in foods and improve their nutritional quality and value. Aromatic and medicinal plants and their extracts have a growing interest for the food industry and scientific research due to the default content with antioxidant properties and antimicrobial substances.

Cloves are a spice made from the buds of a flowering exotic tree (*Syzygium aromaticum* or *Eugenia caryophyllata*) mirtaceelor family, which includes among

others myrtle and eucalyptus. Clove oil is obtained by distillation of the leaves, flowers and stems [1]. Clove oil is a strong antimicrobial, antiseptic, astringent and anti-inflammatory analgesic that is used in dental diseases. The antioxidant activity of clove oil is given by its main component namely eugenol (76.8%) [2]. Rosemary (*Rosmarinus officinalis L.*) is a plant that has been cultivated since ancient times due to strong antioxidant activity and antimicrobial activity. Rosemary has other important qualities such as antiviral, anti-inflammatory and anticarcinogenic [3], [4]. The composition of rosemary essential oil was a special research topic in recent years. It contains mainly monoterpenes and monoterpene derivatives (95-98%) [5], [6]. The main volatile compounds in rosemary are camphor and 1,8-cineole (Díaz-Maroto et al, 2007). Genus *Salvia* (sage) is one of the largest and most important type of medicinal and aromatic plant in the *Lamiaceae* family, which includes about 900 species, widespread throughout the world [7]. Previous studies on antimicrobial activity, antioxidant and antifungal showed that plants of this kind are particularly used as a natural preservative and antioxidant potential for the food industry and cosmetics [8]. The antioxidant activity of sage oil has been extensively studied with other plants of this kind [8]. Dill (*Anethum graveolens L.*) is an annual or biennial plant of the parsley family (*Apiaceae* or *Umbelliferae*), is native to southwest Asia and southeast Europe and is cultivated since ancient times [9]. The specialty literature speaks of the fact that the use of dill leaves in alimentation may reduce the risk of cancer and cholesterol levels [10]. Moreover, the essential oil of dill is a good antioxidant [11], [12]. Thyme (*Satureja hortensis*) is a perennial plant of the genus *Satureja*, labiates family (*Lamiaceae*). It is a shorter plant, that doesn't reach more than 20 to

30 cm in height. The main component of thyme oil is thymol, a powerful antiseptic that is considered to be quite toxic if used inappropriately. Aromatherapy is known in the ranks as one of the most powerful antiseptic. Thymol has been researched extensively for its antibacterial, antiviral and anti-fungal properties [13]. Coriander (*Coriandrum sativum*) is a species of annual herbaceous plant from the umbeliferelor family, exclusively of culture, 30-100 cm high. The addition of coriander in food increases its antioxidant content and may inhibit unwanted oxidation processes [14]. Studies on the chemical composition of coriander oil showed as major components linalool (75.30%) geranyle acetate (8.12%) and α -pinene (4.09%) [15].

Oregano (*Origanum vulgare - L.*), also known as wild marjoram, basil forest, is a medicinal plant of the *Lamiaceae* family, genus *Origanum*. The composition of oregano essential oil determined by gas chromatography shows a high content of carvacrol and thymol, which showed a high antioxidant activity when tested [16]. Other research results show that the essential oil of oregano may be used as a source of antioxidants to the food industry, so it is interesting to consider application of this natural antioxidant as an additive in some products [17].

Common basil (*Ocimum basilicum L.*, *O. basilicum*), belongs to the family *Lamiaceae* and is an annual plant that grows in many regions around the world. Contains a broad range of essential oils rich in phenolic compounds including polyphenols such as flavonoids and anthocyanin [18], [19], [20]. Basil essential oil is widely used for flavoring foods such as sauces, pickles, beverages, spices and pastries, but it is also used in perfumery, medicine, pharmaceutical, etc. [21].

Juniper (*Juniperus communis - L.*) is a conifer belonging to the genus *Juniperus* of

the family Cupressaceae. Dried fruits of juniper (berries large, black, shriveled) are used in cooking as a spice, especially in marinades for cabbage, and as an ingredient in the manufacture of gin. In many studies, there are results which indicate that juniper has antioxidant properties that can be exploited to inhibit lipid oxidation [22]. The main chemical components of the oil of juniper are α -pinene, camphene, β -pinene, sabinene, α -phellandrene, α -terpinene, γ -terpinene, 1,4-cineole, and traces of limonene, camphor, linalool, linalyl acetate, borneol and nerol, and to all of these substances juniper oil is an important antioxidant [23].

2. Experimental

The essential oils used in this study were purchased from a herbal pharmacy in Suceava, marketed and manufactured by Solaris in 10 ml glass bottles with shelf life until 16/03/2014. The DPPH reagent that was used at determination was pure from an analytical point of view, and the equipment used belongs to the Faculty of Food Engineering Suceava: Ocean Optics fiber optic spectrophotometer, other laboratory utensils.

Determination of antioxidant activity of essential oils by spectrophotometric method DPPH (2,2-diphenyl-1-picrylhydrazil). The DPPH test (2,20-diphenylpicrylhydrazyl) is based on the reaction of reduction of DPPH of violet color to pale yellow difenlpicrilhidrazină, the moment they react with the antioxidants in the sample [1]. DPPH is one of the most stable organic radicals and commercially available and has a maximum absorption at 515 nm in the VIS. When the solution starts to reduce its volume it begins a discoloration process and before that reaction, the solution is being monitored spectrophotometrically (spectrophotometer Ocean Optics). This is

an alternative method for the determination of antioxidant capacity of a system.

$$\text{Inhibition \%} = 100 - [(At5 / At0) * 100]$$

In which:

At0 - DPPH is the absorbance at $t = 0$ min.

At5 - is the absorbance of DPPH + oil sample after $t = 5$ min.

Table 1. Results for antioxidant activity

| Type of essential oil | Inhibition (%) |
|-----------------------|----------------|
| Thyme oil | 23.41 |
| Rosmary oil | 3.3 |
| Basil oil | 2.2 |
| Sage oil | 4.35 |
| Dill oil | 2.3 |
| Juniper oil | 2 |
| Coriander oil | 4.8 |
| Oregano oil | 29.35 |
| Clove oil | 93.69 |

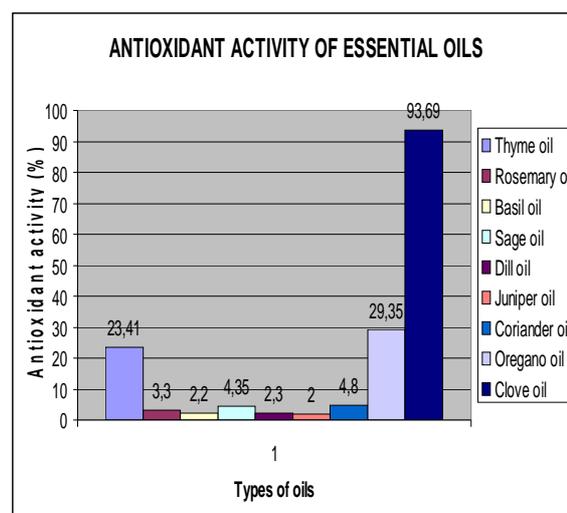


Fig. 1. Antioxidant activity

3. Results and Discussion

There are many methods used to evaluate the antioxidant capacity of foods and dietary supplements, herbal extracts and pure compounds. However, few of them have been widely used because of the difficulty of measurement associated

methodologies and sources of free radical [24], [25], [1].

After calculations it was found that clove oil has the highest antioxidant activity, or percent inhibition, reaching 93.69%. This could be observed even when added to DPPH solution because it has faded. High speed response seen in this oil shows a high content of antioxidants, able to act against free radicals. In the literature, this content is represented mostly by eugenol, which is a fenilpropen a substitute for guaiacol. It is an oily liquid, yellowish and clear which is extracted from certain essential oils is slightly soluble in water and soluble in organic solvents.

Discoloration of other types of essential oils was perceived by the naked eye, but there was oregano oil with antioxidant activity of 29.35% and 23.41% of the thyme. All oils showed antioxidant activity in different proportions.

4. Conclusion

Essential oils have a high density of antioxidants and also participate in the destruction of pathogens, microbes, viruses, having bactericidal action. Phenolic compounds, including polyphenols, tocopherols and fat-soluble vitamins with antioxidant activity are the main components of essential oils, antioxidant components which ensure potential. In terms of chemical content, eugenol has the highest proportion in oil of cloves, the thyme oil thymol prevails in coriander oil is linalool, carvacrol and thymol found in oregano oil, thujone and camphor in the essential oil sage, cineol and eugenol in basil oil, rosemary oil is found in camphor and 1,8-cineole, borneol, and that these substances are essential to provide an outstanding use in many fields such as medicine, food, perfumery and body care, pharmaceuticals etc..

5. References

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