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Antimicrobial effects, and food applications of using Menthe long folia extracts

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Abstract:

The species of this genus have been known since ancient times for their medicinal importance in various fields and for their aromatic and therapeutic properties, and they hold a prominent economic and commercial position. Many types of mint are widely used in cooking and traditional medicine in many parts of the world. Essential oils extracted from mint species are commonly used as flavoring agents in beverages, imparting a refreshing aroma and taste. Moreover, the main constituents of mint are essential oils, phenolic compounds, and flavonoids. It also provides a comprehensive analysis of antibacterial studies conducted on mint species.

Keywords: Menthe , Antimicrobial ,effects, Phytochemicals, Ethno pharmacology long folia .

Introduction:

The genus Mentha belongs to the mint family (Lamiaceae) and includes between 25 and 30 species growing in temperate regions of Europe, Australia, Africa, Asia, and North America (Dorman et al., 2003; de Sousa Barros et al., 2015). Mint is currently classified within the tribe Mentheae, which also includes economically important genera such as Agastache, The large number of different taxonomic names given to mint plants by taxonomists over the past two centuries reflects considerable morphological diversity. Identifying species within the genus Mentha L. is challenging due to the complexity of its classification. Most mint species are capable of producing hybrids (Anca-Raluka et al., 2011). The five species of the genus Mint—field mint, water mint, spearmint, long-leaved mint, and smooth mint—have produced 11 natural hybrids (Figure 1). According to the most recent scientific classification, plants of the genus Mint are divided into four groups—tubular mint, eryodontoid mint, polyphyllum mint, and mint—and

18 species, based on chromosome number and morphological characteristics (Capp, 2015; Tucker and Natze, 2007). For example, M. aquatica and M.

Materials and Methods:

1- Extraction of Vegetable Oils:

After drying the plant leaves using a thermal oven and grinding them, the volatile oils were extracted by hydrodistillation, as described in most reference, using a Clevenger apparatus. 50 grams of oil were collected per sample for 2.5 hours. The oil (top layer) was separated and transferred to special bottles with tight-fitting lids. The samples were then stored pending study of their effect on microorganisms(1).

2- Physical Properties of Oils:

A 1 ml volume of oil was taken into a volumetric pipette at 25°C, and the average of three readings was calculated.

The refractive index of the volatile oils was estimated using a refrigerant meter at 25°C.

The optical rotation of the volatile oils was estimated using a polarimeter at 25°C, based in more references (2).

3- Qualitative chemical analysis:

It was performed to identify some of the active chemical compounds in plant leaves, according to the method described in most references.

4- The effect of volatile oil:

Effects of 0.1 ml of volatile oil was observed on identified isolates of food spoilage bacteria obtained from the Nutrition Research Institute: Pseudomonas spp., Bacillus subtilis, Escherichia coli, Staphylococcus aureus, and two yeast genera: Saccharomyces and Torulopsis. Nutrient agar (plant count agar) inoculated with 0.2 ml of a microbial suspension containing 1.0×10^5 cells/ml was poured into individual plastic dishes. with one remaining as a control containing only the suspension. Three replicates were performed for each isolate. The dishes were incubated at 37°C for 48

hours. The effectiveness of the extract was calculated by depending on the diameter of the inhibition zone and calculating the three replicates.

5- Preparation of Meat Samples and Study Treatments:

360 grams of locally sourced minced veal from butcher shops in Baghdad were randomly selected and divided into 36 samples, each weighing 10 grams. Three samples were used for the volatile oils treatment, and one sample served as the control treatment. Each sample was replicated three times and stored at 4-6°C for three periods(3). The total bacterial count was measured 1,72,192 hours after the treatment using plate counting and a 1.0×10^5 dilution.

6- Statistical Analysis:

The SPSS 12 software was used for statistical analysis using a one-way ANOVA method to study the effect of the different treatments.

Results and Discussion:

Table (1) shows the physical results, demonstrating the superior extraction rate of peppermint oil. The specific gravity ranged from 0.903 for peppermint oil, which is consistent with the findings of researchers (4). The specific gravity range for essential oils of all aromatic plants is between (0.824-1.172).

The results, as shown in Table (2) through qualitative chemical analysis, indicate that the plant leaves contain compounds glycosides, saponins, coumarins, flavonoids, and phenols. This result is consistent with the findings of some researchers(4,5). These compounds have a significant effect in inhibiting microorganisms.

Table (3) shows that the oil extracts have a clear effect in inhibiting some bacteria and yeasts that cause food spoilage (6). The oil was found to have a significant effect in inhibiting the growth of Staphylococcus aureus bacteria, with an inhibition diameter of 16 mm. Peppermint oil was used. The effect of the oil on the other bacteria and yeasts studied varied, particularly on Escherichia coli and on Peusedomonas spp. These results are consistent with the findings of (7), (8), and (9), which indicated that the oils of these plants contain compounds effective against bacteria, especially Staphylococcus aureus, such as Carvone $C_{10}H_{14}O$.

Table (4) shows a decrease the average totals of bacterial count after one hour in the treatments to which peppermint oil was added. The difference was clear between the treatments, with the count after 72 hours being (810 × 6.33) for the control treatment and (7.66 × 510) for the control treatment. Results appears highly significant differences at the $P \leq 0.01$ level between all treatments to which vegetable oils were added and the control treatment for all three storage periods. It was observed that the reduction in bacterial counts was due to the presence of peppermint oil, which is consistent with (12).

Table (1) Physical Properties of Oil Menthe long folia

Type of oil	specific gravity	light rotation	refractive index	percentage of oil extracted
Menthe long folia	0.925	*-7.3*	1.5	0.56%

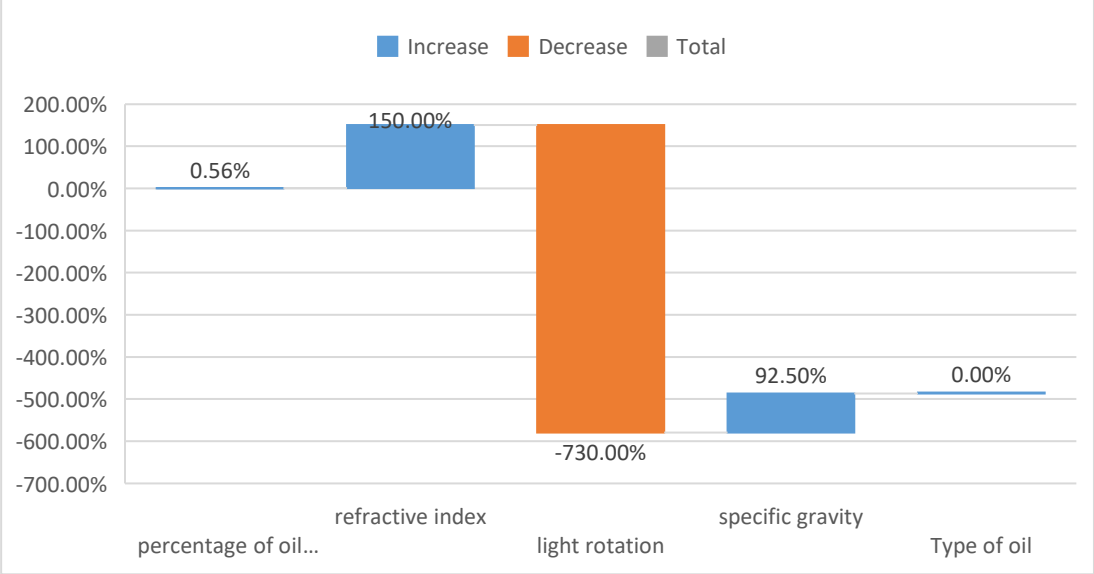

FIGURE (1): Physical Properties of Oil Menthe long folia

Table (2): Qualitative chemical analysis of the active compounds present in Oil Menthe long folia

Oil Menthe longfolia	Test type	active compounds
++ ++	Fehling reagent Benedict reagent	Glycosides
++ ++	Mayer reagent Wagner reagent	Alkaloids
++	Sodium hydroxide with UV.	Coumarins
++	Ferric chloride 1%	Phenols
++	Potassium hydroxide in ethanol	Flavones
++	Lead acetate 1%	Tannins
++	Ethanol + Hydrochloric acid	Resins
++	Mercury chloride	Saponins

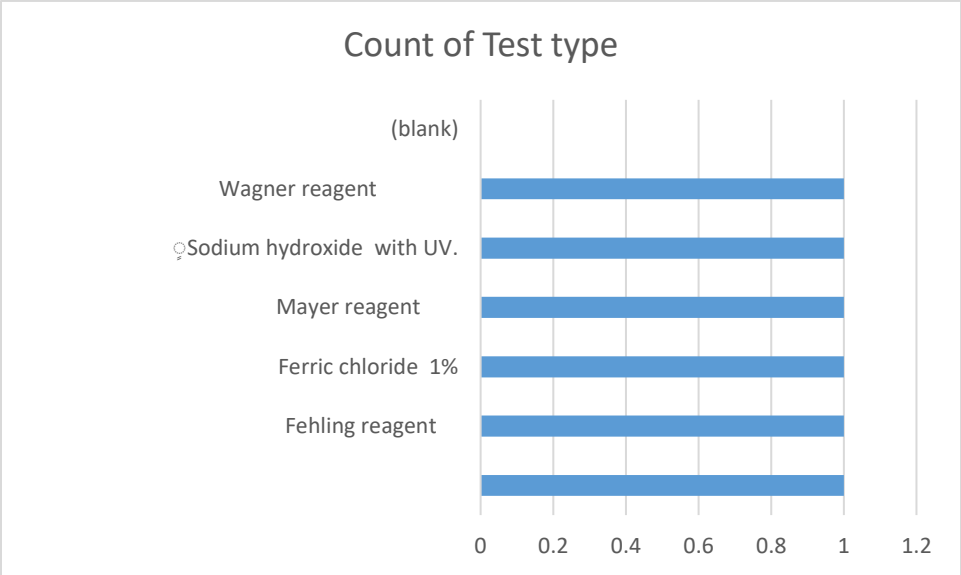

FIGURE (2): Qualitative chemical analysis of the active compounds present in Oil Menthe long folia

Table No. (3) Average diameters of inhibition of the growth of some species of bacteria and yeasts (mm) using a concentration of 10 l/mlµ of Menthe long folia extracts.

Menthe long folia .	Microorganisms
18	*Staphylococcus aureus*
12	*Escherichia coli*
14	*Pseudomonas spp.*
10	*Bacillus subtilus*
8	*Saccharomyces cerevisiae*
8	*Torulopsis spherical*

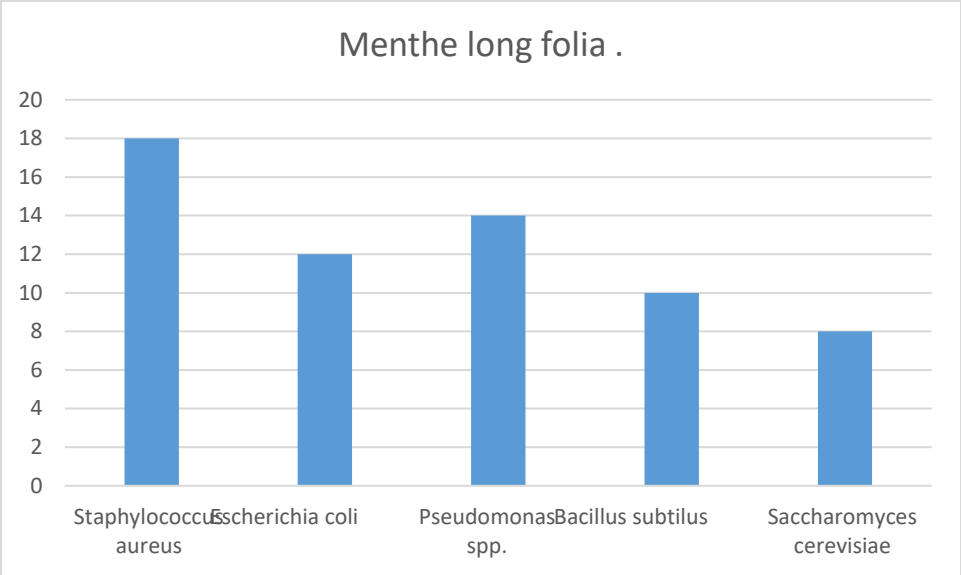

Figure (3): Average diameters of inhibition of the growth of some species of bacteria and yeasts (mm) using a concentration of 10 l/mlμ of Menthe long folia extracts.

Table (4) Effect of essential Menthe long folia oil from the genus Labiatae in reducing the bacterial counting for different storage cycles.

essential oils	1 hour	72 hour	192 hour
Control treatment	× ^{5}10 6.33	6.33× 10^{8}	3.33×10^{10}
Menthe long μl 50/gm folia	4.33× 10^{4}	8.66×10^{5}	4.0×10^{7}
LSD	4.5×10^{5}	4.48×10^{8}	6.3×10^{8}

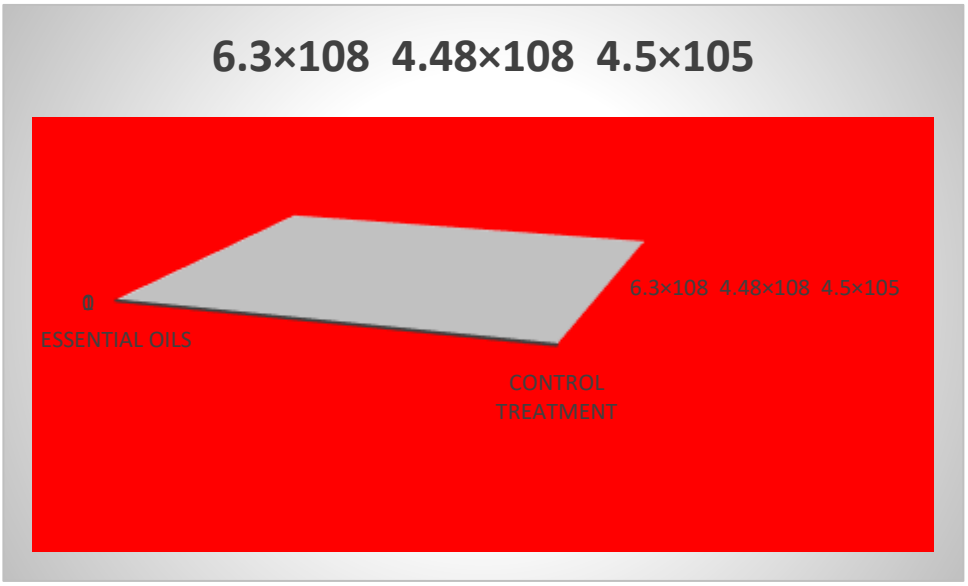

Figure (4):Effect of essential Menthe long folia oil from the genus Labiates in reducing the total bacterial count during different storage periods.

Conclusion:

Menthe long folia oil is a distinctive herb commonly used in cooking. Its essential oils have been studied and used throughout history, particularly for their protective properties. For many years, and continuing to this day, they have been used in food products, perfumes, and oral and dental care products. Studies have shown that basil possesses remarkable antimicrobial and antibacterial properties. Basil essential oils and their main components have been yeasts, and fungi. This research paper primarily examines basil essential oils in terms of their chemical composition and their effect on the structure of microorganisms. Laboratory experiments have confirmed their antimicrobial activity and their potential for future use in preserving various foods and food products. They can be used as a slow-release antimicrobial agent in effective packaging.

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