

VARIATION OF ESSENTIAL OIL QUANTITY OF GERANIUM LEAVES (*PELARGONIUM GRAVEOLENS* L.) AT DIFFERENT GROWTH STAGES, WITH PRELIMINARY EVALUATION OF ANTIBACTERIAL ACTIVITY

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ABSTRACT

Objective: The Study was designed to investigate the effect of two different growth stages on quantity of essential oil of Geranium leaves with Evaluation of its antimicrobial activity

Methods: The leaves were collected from plants during vegetative and flowering stages. The leaves were dried at room temperature and the essential oil was obtained by steam distillation processes. Antimicrobial activity of essential oil was tested against four types of bacteria, including *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Salmonella typhi*.

Results: The results were referred to percentage of essential oil of geranium leaves was 0.10% at vegetative stage while the percentage of essential oil was reached to 0.04 % at flowering stage. The essential oil exhibited an antibacterial effect against all the four bacteria tested.

Conclusion: The different growth stage have effect on essential oil percentage and the essential oil of geranium leaves must be obtained during vegetative stage and pre flowering stage.

Keywords: Medicinal plants, *Pelargonium graveolens*, Geranium, Essential oil, Antibacterial activity.

INTRODUCTION

Geranium (*Pelargonium graveolens* L.) is considered among the most important medicinal and food plants. Its belong to Geraniaceae family, hardly perennial herbs with to purplish flowers, leaves are green to gray-green and may be hairy or smooth [1].

In Iraq the local name is (Ettra) and cultivated as garden plant [2]. *P. graveolens* L. is the main commercial variety cultivated for its oil. The chief constituents of the oil are geraniol and citronellol in various proportions depending upon the source of the oil. The esters of these alcohols as format are also present, other components are limonene [3].

The geranium oil used for aromatherapy and massage theory application. As a flavoring the flowers and leaves are used in cakes, jams, jellies, ice cream, sorbet salads, sweets and teas [4]. The growth stage have an important effect on the essential oil quantity [5].

The development of resistance by a pathogen to many of the commonly used antibiotics provides and impetus for further attempts to search for new antimicrobial agents to combat infection and overcome the problem of resistance and side effects of the currently available antimicrobial agents [6]. The aim of this study was Evaluation the essential oil quantity at two different stages with antibacterial activity of this essential oil.

MATERIAL AND METHODS

Geranium leaves were collected from medicinal plants garden of pharmacy college of Karbala university during two different growth stages (vegetative and flowering) in April and June 2012.

The plant material was dried at room temperature for two weeks to constant weight. The botanical identification was performed by National herbarium of Agriculture Ministry. Plant material (2x3 batches of about (500)g for each sample) was subjected to by Steamdistillation with approximately (2L) of distilled water for (2)h. using the original Clevenger-type apparatus [7,8]. In vitro the antimicrobial activity of the essential oil was tested against a panel of microorganisms, including *Escherichia coli*, *staphylococcus aureus*, *Pseudomonas aeruginosa* and *Salmonella typhi* obtained from central laboratory of republic health of

health ministry. Antimicrobial activity was determined by the disc diffusion method. The microorganisms were cultured overnight at (35°C) in nutrient suspension of the bacteria with an optical density McFarland (0.5) was made in isotonic sodium chloride solution.

Petri dishes with 60/ml. of sterile Mueller Hinton agar were seeded with the appropriate bacterial suspension. Sterile, (6mm) diameter filter paper disc were impregnated with extract of different concentration, gently tapped to remove excess liquid and positioned on seeded plates at (45°) opposite each other into each petri dish, respectively. After incubation for (24h) at (35°C), the plates were observed for zones of inhibition and the diameter of these zones measured in millimeters.

RESULTS AND DISCUSSION

Steamdistillation of leaves at vegetative stage gave bright yellow, semiliquid essential oil in mean yield (percentage) (0.10%), while the mean yield of essential oil at flowering stage was (0.04%). the differences in essential oil percentage between two growth stages may be belong to translocation of active compounds that important in essential oil production to flowering parts at flowering growth stage [9,10]. Also the reduction of volatile oil quantity at flowering stage may be belong to increasing of stress condition such as temperature that increased the evaporation or volatilization of essential oil from plant leaves [11].

However the reduction in essential oil at flowering stage was reached to (60%) compared with vegetative stage. Determination of the inhibition zones by means of the disc diffusion method Tables(1) shows that essential oil exhibited an antibacterial effect against all the four tested bacterial *S. typhi*, *S. aureus*, *P. aeruginosa* and *E. coli* respectively. The obtained results, along with the activity (MIC) for the standard antibiotics, showing more activity. From these results, higher activity against gram-positive bacteria can be observed, in agreement with the conclusions of previous screenings of medicinal plants for antimicrobial activity [12].

The lowest antibacterial activity of the same essential oil was obtained at *P. aeruginosa* and *E. coli* tests respectively. The antibacterial activity of geranium oil may be belong to a amount of monoterpenoids which are significant for a high antimicrobial

potential [13]. On the other hand, the noted activity could be attributed to the presence of significantly high percentage of hexadecanoic acid in essential oil [14,15].

Table 1: Minimum inhibitory concentrations (MIC, mg/mL) and Minimum bactericidal concentration (MBC, mg/mL) of the investigated essential oils

Test Bacteria	MIC	MBC	Chloramphenicol/MIC
E. coli	0.870	0.878	0.032
S. aureus	3.51	13.0	0.071
P. aeruginosa	0.876	7.00	0.251
S. typhi	7.00	> 14.0	0.126

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