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ANTIMICROBIAL ACTIVITY OF ESSENTIAL OILS OF *LAMIACEAE* FAMILY MEDICINAL PLANTS

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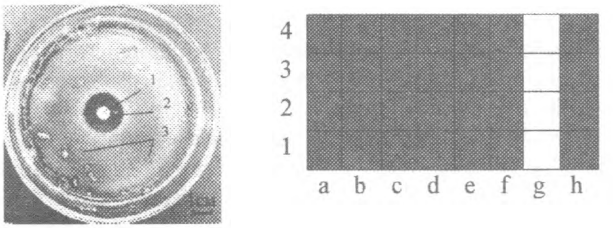
Abstract. *Plants of Lamiaceae family produce essential oils that are known as strong antimicrobial agents. Antimicrobial activity of hydro distillated essential oils was tested with disk-diffusion and microdilution methods. This experiment reveals strong and medium antimicrobial activity of essential oils tested. So, these oils can he usedfor the development of new antimicrobial medicines and pesticides.*

Keywords: *antimicrobial activity, essential oil, Thymus vulgaris L., Thymus serpyllum L., Satureja hortensis L.*

Introduction. Relevance of research is related to strong antimicrobial activity of essential oils of *Lamiaceae* family plants [1]. The purpose of the research was to study antimicrobial activity of essential oils distillated from such species as *Thymus vulgaris L, Thymus serpyllum L, Satureja hortensis L.* The tasks were: 1 - to use disk-diffusion and microdilution methods for antimicrobial testing, 2 - to compare the results of these methods, 3 - to give a recommends for practical use of essential oils tested.

Objects and methods of research. Place of research was the laboratory of Microbiology and Immunology Department. Raw material for hydro distillation was received from plots of medicinal plants at Edelstein vegetable station. Climatic conditions at the time of harvesting were more humid in comparison with common climatic conditions. Objects of research were microbial strains from Russian microbial collection and hydro distillated essential oils from *Thymus vulgaris L., Thymus serpyllum L., Satureja hortensis L.*

Disc diffusion test is the most commonly used method in a laboratory to determine susceptibility of bacteria to antibiotics. In this method, as the name suggests, discs impregnated with essential oil are placed on agar plate that has been inoculated with a culture of the bacteria or fungal strains to be tested. The plate is incubated at 22-37°C for 24 hours for bacteria and 5 days for fungi. After diffusion, the concentration of essential oil is higher near the site of antibiotic disc, but decreases with distance. Susceptibility' to testing oil is determined by measuring the zone of inhibition of microbial growth around the disc. Control №1 was “Fitolavin”, sterile water is used as a conrol №2. At the picture №1A you can see result of disk-diffusion method [2, 3].



A B

Picture 1 Disk diffusion method (A):
1 - disk with essential oil, 2 - inhibition zone, 3 - testing microbial strain.
Microdilution method (B): rows: 1 - control “Fitolavin”; 2-4 - replicates of testing essential oil; columns: a-e - dilution of testing essential oil (1-0,06%), f - control without essential oil, g - control without resasurin, h - control without testing strain.

The microdilution method is a quantitative method for determining the minimal inhibition concentration (MIC) of an antimicrobial agent that inhibits the growth of organisms *in vitro.* In this method, the essential oil is serially diluted in glucose peptone agar (GPA) by doubling dilution in tubes and then a standard suspension of the broth culture of test organism is added to each of the antibiotic dilutions and control tube. This is mixed gently and incubated at 22-37°C for 24 hours for bacteria and 5 days for fungi. At the picture №1B you can see dilution scheme. The MIC is recorded by noting the lowest concentration of the essential oil at which there is no microbial growth. The main advantage of this method is that this is a simple procedure for testing a small number of isolates [2. 3].

Results. Antimicrobial activity of essential oils was tested on 9 microorganisms from different systematic groups (Table № I): grampositive (*Bacillus subtilis, Bacillus licheniformis*) and gramnegative (*Enterobacter cloaceae, Escherichia coli M-17, Pseudomonas aeruginosa)* bacteria and fungi (*Candida albicans, Saccharomyces cerevisiae, Fusarium oxysporum TCXA-4, Penicillium expansum*).

Table 1

Level of antimicrobial activity of essential oils tested

№	Microbial strains tested		Level of antimicrobial activity
1	Bacteria	Bacillus subtilis	medium
2		Bacillus licheniformis	medium
3		Enterobacter cloacae	medium
4		Escherichia coli M-17	medium
5		Pseudomonas aeruginosa	0
6	Fungi	Candida albicans	medium
7		Saccharomyces cerevisiae	medium
8		Fusarium oxysporum TCXA-4	strong
9		Penicillium expansum	strong

There is strong and medium antimicrobial activity against the most strains tested but the inhibition of *Pseudomonas aeruginosa* was not revealed. Essential oils from three *Lamiaceae* species showed the same level of antimicrobial activity. Linear inverse relationship was determined between results of disk-diffusion and microdilution methods.

Conclusions. Medium and strong antimicrobial activity of essential oils of *Lamiaceae* family medicinal plants (*Thymus vulgaris I... Thymus serpyllum L., Satureja hortensis L.)* was revealed against different systematic groups of microorganisms in our research. These essential oils can be recommended for the development of new antimicrobial medicines and pesticides.

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