

Determination of Antibacterial Activity of *Artemisia Absinthium* L. (Asteraceae) Extracts

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Abstract—In this study, plant extracts of *Artemisia absinthium* L. were produced. Herbal extracts from leaves and flowers were evaluated for antibacterial activity against *Escherichia coli* and *Staphylococcus aureus*. As a result, it was found that plant extracts from *Artemisia absinthium* flowers have the greatest antibacterial properties. Their use as a substance of plant origin is the most appropriate.

Keywords—antibacterial activity, plant extract, microorganisms, *Artemisia absinthium*, *Escherichia coli*, *Staphylococcus aureus*

I. INTRODUCTION

The search and rational use of valuable biological resources in the pharmaceutical industry still remains an urgent task nowadays. It is known that medicinal plant material with sufficient pharmacological effectiveness is less toxic and has less allergenic capacity.

A. absinthium L. is a deserving phytoncidic medicinal plant for medicine and pharmacy. *Artemisia absinthium* L. is a perennial wild plant with a characteristic specific aroma and a very bitter taste. It contains a variety of biologically active compounds such as: bitter glycosides (absintin and anabsintin), flavonoids, an essential oil consisting of terpenoids, phytoncides, alkaloids, capillin, vitamins, organic acids, ascorbic acid, saponins, carotene, mineral salts and tannins. The presence of at least 15 amino acids, 9 of which are irreplaceable, has been discovered in the grass and wormwood meal by the method of HPLC; 9 of which are irreplaceable, a wide range of trace elements has been determined, the presence of 62 compounds such as fatty acids, sterols, alcohols, heavy terpenoids has been discovered [1-3].

Previously, the authors had found the bactericidal, fungistatic, and antipersistent effect of various wormwood species *A. abrotanum*, *A. dracunculus*, *A. austriaca*, *A. obtusiloba*, *A. pontica*, *A. glauca* [4].

Due to the emergence of antibiotic-resistant strains of microorganisms, there is a need to search for new sources of

raw materials with microbial properties. In this regard, plant organisms are of great interest, which can serve as a basis or substance for the development of agents with antibacterial activity, to which resistance does not emerge.

The aim of the research was to study the antibacterial activity of plant extracts obtained from flowers and leaves of *A. absinthium*.

II. EXPERIMENTAL

As objects of study intact plants (flowers and leaves) of *Artemisia absinthium* L., test objects of gram-negative bacteria of the *Escherichia coli* species, and gram-positive bacteria of the species *Staphylococcus aureus* were used.

Intact plants were gathered during mass flowering in the summer of 2019 (Belgorod region, Korochohansky district, the village of Gremyachye, the right bank of the Koren river). Plant extracts were produced by maceration of leaves and flowers of plants separately, with the use of the method of alcoholic extracts preparation [5-7].

After getting a 100% plant extract of the studied species, the procedure for obtaining serial dilutions was carried out. To obtain a 1:10 dilution, 1 ml of a 100% plant extract was taken and placed using an automatic dispenser in the first tube with 9.3 ml of autoclaved distilled water. To obtain a 1:100 dilution, 1 ml of the solution was already taken from a 1:10 dilution and added to a test tube with 9.3 ml of distilled water. Subsequent dilutions of 1:1000 and 1:10000 were prepared in a similar way [8].

The study of antibacterial activity, based on the method of diffusion into agar with filter discs, was carried out. Diurnal cultures of *E. coli* (strain VKPM-M17) and *S. aureus* (strain MDC 5233) were obtained on oblique agar-agar in the nutritional medium GRM; microorganism suspensions were prepared according to standard methods [7-8]. To determine the antimicrobial properties of plant extracts, the nutritional medium GRM was poured into sterile Petri plates; after the solidification 100 mcl of a suspension of microorganisms were inoculated using a continuous lawn method with a Drigalski spatula. Then, in each Petri plate pre-sterile filter disks were placed on which

the studied solutions were applied and the diameters of the zones of inhibition of microorganisms' growth were taken into account. As a control, a 40% solution of ethyl alcohol (a component of the extracts) and antibiotic solutions were used. The antibiotic cefepime was used for *E. coli*, and levofloxacin for *S. aureus*. [9]. The data obtained were statistically processed with the use of the statistical functions of the Microsoft Office Excel 2007 application with AtteStat 8 add-ons. The accuracy of the studies was verified by the Fisher Test [10].

III. RESULTS AND DISCUSSION

The test results of plant extracts obtained by us from *A. absinthium* plants gathered in Belgorod Region revealed the manifestation of antibacterial activity against two strains of microorganisms *E. coli* and *S. aureus* (Table I).

Screening of plant extracts obtained from *A. absinthium* flowers shown in Fig. 1 made it possible to determine sensitivity to microorganisms *E. coli* and *S. aureus*. Moreover, *S. aureus* turned out to be the most sensitive, while *E. coli* revealed less sensitivity to plant extracts obtained from flowers of intact plants as compared to the control indices. Ethanol extracts of *A. absinthium* flowers inhibit the growth of *E. coli* with a zone of 13.4 (100% extract) -15.6 (1: 100 dilution) mm, thereby exhibiting weak antibacterial sensitivity, the difference with the control was 9.1 mm. Also, plant extracts from flowers are highly sensitive to *S. aureus*, inhibiting their growth with delay zones of up to 17.3 mm.

The results of testing ethanol plant extracts from the leaves of *A. absinthium* revealed a high sensitivity to *E. coli* and *S. aureus* compared to the control (Fig. 2).

TABLE I. INHIBITION OF GROWTH OF TEST ORGANISMS BY PLANT EXTRACTS FROM FLOWERS AND LEAVES OF *A. ABSINTHIUM*

Extract concentration	The diameters of the zones of growth inhibition of microorganisms, mm			
	Flowers		Leaves	
	<i>E.coli</i>	<i>S.aureus</i>	<i>E.coli</i>	<i>S.aureus</i>
100%	13,4	16	17,5	17,6
1:10	9,4	16,3	23,5	15,4
1:100	15,6	9	12,8	8,5
1:1000	8,7	17,3	15	13,5
Control	6,5	0	4	6
Antibiotic	8,5	17,6	8,2	17,6

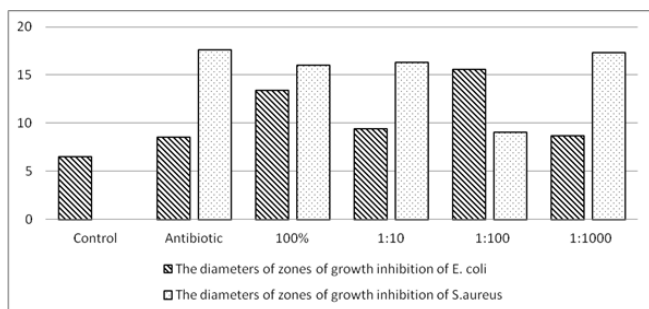


Fig. 1. The effect of plant extract from the flowers of *A. absinthium* on the microorganisms *E. coli* and *S. aureus*.

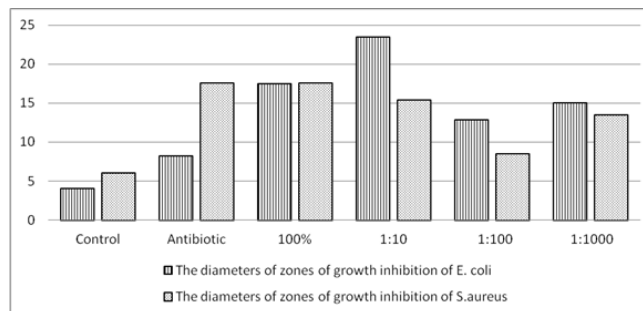


Fig. 2. The effect of plant extract from the leaves of *A. absinthium* on the microorganisms *E. coli* and *S. aureus*.

Zones of growth inhibition of *E. coli* up to 23.5 mm were recorded, with a control of 4 mm. Zones of growth inhibition of *S. aureus* with plant extracts were 17.6 mm, the difference with control was 11.6 mm. Thus, plant extract from leaves in different concentrations reveals antibacterial activity with high sensitivity to this microorganism.

IV. CONCLUSION

Thus, the results obtained revealed the manifestation of the antibacterial activity of alcoholic plant extracts of various dilutions of *A. absinthium* against gram-positive (*S. aureus*) and gram-negative (*E. coli*) bacteria. These data indicate a need for further pharmacological studies, expanding the species composition of microorganism strains, with the purpose of obtaining plant-based antimicrobial agents.

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