Influence of Medicinal Plant Extracts on the Number of Columns of Strain Escherichia Coli

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Abstract—The effect of extracts of medicinal plants from the families Lamiaceae and Asteraceae on the growth and development of the bacterial culture of Escherichia coli is question for discuss. The strain of Escherichia coli was chosen as the object of the study. Extracts of medicinal plants peppermint, salvia officinalis, common oregano, thyme, calendula officinalis, wormwood, yarrow, tansy, chamomile at a dilution of 106 was studied. The extracts of all studied plant species had a bacteriostatic effect. After 24 hours, the greatest bacteriostatic effect was shown by extracts of chamomile, peppermint, wormwood and oregano. After analyzing oregano, calendula and chamomile from three of the above groups on the number of colonies of the collection strain of lactobacilli, we found that plant extracts of calendula and chamomile stimulated an increase in the number of colonies of lactobacilli.

Keywords—extracts of medicinal plants, Escherichia coli, lactobacilli, bacteriostatic effect

I. INTRODUCTION

Even the ancient physician Claudius Galen, who believed that the special forces of plants act on a diseased organism, collected rich material on medicinal plants. In Europe in the XVI century, extracts from medicinal plants began to called "galena preparations". Pharmacies traditionally present both mono-specific forms of herbal medicinal raw materials, as well as herbal preparations, as well as numerous herbal remedies and bio additives that can effectively correct intestinal function. Most of them underwent full-fledged experimental and clinical pharmacological studies, and the mechanism of their action is understandable, although some used only taking into account popular experience, and there is no exact information about the current principles.

Today, experts are interested in medicinal plants that are directly used to correct dysbiosis, which affect both microorganisms and the human body. Medicinal plants are able to synthesize and accumulate a huge amount of biologically active substances (BAS), which can have a stimulating effect on the growth of microorganisms and therapeutic effect. Medicinal plants eliminate pathogenic flora and contribute to the development of normal Escherichia coli. In addition, they allow you to restore bowel function, and eliminate inflammation, helping to restore the functions of the pancreas, liver, stomach and biliary tract.

Problems of dysbiosis, acute intestinal infections and other diseases of the gastrointestinal tract (GIT) require attention of microbiologists to study the features of the influence of biologically active substances of plants on microorganisms [1, 2].

In humans, conditionally pathogenic Escherichia is part of the intestinal microflora, and bacteria of the E. coli species predominate in the microflora of the large intestine of birds, reptile fish, and mammals. With waste products, microorganisms released into the environment. The presence of Escherichia coli in soil, water, products, and household items is an indicator of fecal contamination, especially water, and often used as sanitary and hygienic indicators [3-6].

The aim of this study is to study the effect of extracts of medicinal plants from the families Lamiaceae and Asteraceae on the growth and development of the bacterial culture of Escherichia coli.

II. EXPERIMENTAL

The strain of E. coli chosen as the object of the study, as a normal representative of the colon microflora that performs a number of useful functions, including antagonism of pathogenic intestinal bacteria, participation in the synthesis of vitamins B, E, K2, partially breaking down fiber [7-9], and using in practical goals in biotechnology and genetic engineering.

The peppermint (Mentha piperita L.), medicinal sage (Salvia officinalis L.), oregano (Origanum vulgare L.), creeping thyme (Thymus serpyllum L.), calendula officinalis (Calendula officinalis L.), wormwood (Artemisia absinthium L.), yarrow (Achillea millefolium L.), tansy (Tanacetum vulgare L.), Chamomile officinalis (Matricaria chamomilla L.) was studied.

Extracts of medicinal plants at a dilution of 106 obtained according to the procedure regulated by GF XI [4]. Bacterial contamination determined by the cup method. The repetition of the experiment is 4 times. Distilled water used as a control.

III. RESULTS AND DISCUSSION

On dense nutrient media, Escherichia form different sizes of dense, convex, rough (R-forms) or smooth (S-forms) colonies. One can see the formation of large mucous colonies in strains with pronounced K-antigens. In liquid media, diffuse growth observed; a precipitate or film may
form on the surface of the medium. They can grow over a wide temperature range: from 15 to 45 °C. The optimum growth is 37 °C, pH – neutral (7.2). When cultured on blood media, some strains can cause hemolysis.

The calculation results presented in the table I and in the diagram (Fig.1).

It can be seen that the extracts of all studied plant species had a bacteriostatic effect, but with an increase in the exposure time of the experiment, the number of colonies in plates with plant extracts increased, however, much more slowly than in the control. The extracts of _A. absinthum_, _M. piperita_, _M. chamomilla_, as well as _O. vulgare_ and _S. officinalis_ most actively restrained the increase in the number of colonies in the first 4 hours. After 24 hours, the greatest bacteriostatic effect carried out by extracts of _M. chamomilla_, _M. piperita_, _A. absinthum_ and _O. vulgare_, which showed statistically similar results.

Plants of the species _A. absinthum_, _M. chamomilla_, _M. piperita_ attributed to one, first, group with the greatest bacteriostatic effect with respect to the _E. coli_ strain.

Then, plants _O. vulgare_ and _S. officinalis_ can be attributed to the second group, and species _C. officinalis_, _T. vulgare_, _T. serpyllum_ and _A. millefolium_ are included in the third group (with the least bacteriostatic effect).

The data obtained taken into account when developing drugs based on these plant species.

**TABLE I. DYNAMICS OF THE NUMBER OF _ESCHERICHIA COLI_ COLONIES TAKING INTO ACCOUNT THE EXPOSURE TIME**

| Plants          | The average number of bacterial colonies in a cup by exposure time, hours |
|-----------------|--------------------------------------------------------------------------|
|                 | 4  | 6  | 24             |
| _Achillea millefolium_ | 22.6 | 42.8 | 47.8           |
| _Artemisia absinthium_   | 16.1 | 19.6 | 21.1           |
| _Calendula officinalis_   | 28.3 | 46.3 | 52.5           |
| _Mentha piperita_         | 16.4 | 18.3 | 20.5           |
| _Matricaria chamomilla_   | 17.9 | 18.3 | 18.6           |
| _Origanum vulgare_        | 18.8 | 21.5 | 22.4           |
| _Salvia officinalis_      | 18.9 | 27.8 | 30.1           |
| _Tanacetum vulgare_       | 26.6 | 44.9 | 46.9           |
| _Thymus serpyllum_        | 20.6 | 38.6 | 44.5           |
| Control (water)           | 57.5 | 81.2 | 99.1           |

**TABLE II. AVERAGE NUMBER OF BACTERIAL COLONIES BY EXPOSURE TIME**

| Plants          | The average number of bacterial colonies in a Petri dishes by exposure time, hours | Standard error of the arithmetic mean |
|-----------------|---------------------------------------------------------------------------------|----------------------------------------|
| Control         | 31.3                                                                            | 0.84                                    |
| _Matricaria chamomilla_   | 39.9                                                                            | 0.23                                    |
| _Calendula officinalis_    | 37.2                                                                            | 0.41                                    |
| _Origanum vulgare_         | 33.4                                                                            | 0.47                                    |

IV. CONCLUSION

It can be seen (Tables I and II, Fig.1) that the medicinal plants used really have antibacterial activity against _Escherichia coli_ and _Lactobacillus_ strains. In addition, they do not inhibit beneficial microflora, in particular bacteria.

Therefore, using extracts of medicinal plants _Achillea millefolium_, _Artemisia absinthium_, _Calendula officinalis_, _Matricaria chamomilla_, _Mentha piperita_, _Origanum vulgare_, _Salvia officinalis_, _Tanacetum vulgare_, _Thymus serpyllum_, it is possible control the growth of intestinal bacteria _Escherichia coli_ and bacteria of the genus _Lactobacillus_.

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