DETERMINATION OF THE ANTIMICROBIAL AND ANTIBACTERIAL ACTIVITY OF THE EXTRACTS OBTAINED FROM THE ABOVE-GROUND PART OF THE PLANT *CYNARA SCOLYMUS* L. GROWING IN THE UZBEKSITON REGION

[1]Kh.Kh. Dolimov, [2]I.J. Jalolov, [3]M.Y.Imomova, [4]M.R.Mamadaliyev
[1]Lecturer of the Department of Botany and Biotechnology, Fergana State University
[2]Doctor of Philosophy on Chemical Sciences (PhD), Associate Professor, Fergana State University
[3]Doctor of Philosophy on Chemical Sciences (PhD), Associate Professor, Department of Botany and Biotechnology, Fergana State University
[4]Student in the Field of Medicine, International Faculty of Fergana Public Health Medical Institute

https://doi.org/10.5281/zenodo.8021609

Abstract*. Extracts obtained from the above-ground part of Cynara scolymus L., a member of the Asteraceae family, obtained using ethyl alcohol and low polar solvents, have an effective effect against gram-positive bacteria (Staphylococcus aureus ATCC 25923 and Bacillus subtilis RKMUz-5), gram-negative bacteria. showed. Biological activities against fungi (Pseudomonas aeruginosa ATCC 27879 and Escherichia coli RKMUz-221) and (Candida albicans RKMUz-247) were studied. As a result of research, it was found that the extracts obtained using ethyl alcohol have a relatively high activity.*

Keywords: *Cynara scolymus L, Asteraceae, biological properties, fungus, bacteria, secondary metabolites.*

I. INTRODUCTION

It is natural that the increase in the number of infectious diseases sharply increases the demand for drugs used against them. In addition, the development of resistance to antibiotics by harmful microorganisms complicates the situation even more [1]. Production of new antibiotic drugs is one of the biggest problems faced by pharmaceutical companies in countries around the world today [2]. This situation is the reason for carrying out new research on plants, which are considered natural sources of antibiotics [3]. One of the plants that has been appreciated for its medicinal properties and has been used in folk medicine and modern medicine for a long time is the Artichoke plant belonging to the Asteraceae family [4]. Its extracts and tinctures are still recommended in pharmacies for the effective treatment of a wide range of diseases [5.6]. In the country of Colombia alone, more than 10 medicines are prepared and used from the root and above-ground part of this plant [7]. Secondary metabolites isolated from this plant have an effective effect in the treatment of infectious diseases [8,9,10]. In the following pictures (Figure 1), we can see several medicines made from this plant:

Figure 1. Some medicines created on the basis of the artichoke plant. wildberries.ru

II. METODS

The object of our research work is root extracts of Cynara scolymus L., belonging to the Asteraceae family. Microorganisms (bacterial and fungal strains) used in our research are cell cultures. Conditionally pathogenic microorganism strains stored in the Laboratory of Molecular Genetics of the Institute of Plant Substance Chemistry of the Russian Federation are: Bacillus subtilis UzMT – 5, Pseudomonas aeruginosa UzMT – 225, Staphylococcus aureus UzMT – 91, Staphylococcus aureus MCHSA 25923, Escherichia coli UzMT – 221, Pseudomonas aeruginosa VCHPA 27879, Candida albicans UzMT – 247

To date, the root of Cynara scolymus L, a member of the Asteraceae family, has been extracted using several different solvents. For this, the root of the plant (500 g) was dried in the shade and extracted with ethanol, ethyl acetate and chloroform 3 times in a ratio of 1:6. Extracts against two gram-positive bacteria, Staphylococcus aureus (UzMT 25923) and Bacillus subtilis (UzMT – 5), two gram-negative bacteria, Escherichia coli (UzMT 27879) and Pseudomonas aeruginosa (UzMT 27879) were tested for antibacterial activity, and tests were also conducted for one pathogenic fungi Candida albicans (UzMT - 247) strain.

The antimicrobial biological activity of the synthesized compounds is determined by the modified agar-disc diffusion method. Bacterial cells are propagated in sterile nutrient agar (LB Agar, Invitrogen, USA, 25 g agar/l distilled water) and solid medium poured into Petri dishes (2 ml of 0.9% NaCl suspension and 200 µl of bacterial cells in 20 ml of medium). Candida albicans and Pichia anomala (1x106 colony-forming units) were cultured on CLSI-sterile Mueller-Hinton agar for agar disk diffusion assay.

The evaluation of antimicrobial activity is based on the measurement of the zone of inhibition on the surface of the agar around the disk together with the diameter of the disk. After the incubation time, the inhibited level was measured and recorded.

III. RESULTS

For the study, extracts of the above ground part of Cynara scolymus L, collected from the territory of Uzbekistan, listed in the following table, in the specified solvents were used (Table 1).

Table 1

Information about the plant extracts used in the study

№	Plants used in research	Parts of examined plants	Alcoholic extract ethanol	Ethyl acetate extract	Chloroform extract
1	*Cynara scolymus* L	The surface of the earth	+	+	+

In this study, the activities of the extracts of the above-mentioned plant above-ground part obtained in different solvents against Gram-positive and Gram-negative bacteria and harmful fungi were studied. As a result, the biological activity of the obtained alcohol extract was much higher than the rest of the extracts. At this stage of the study, the antibiotic Ampicillin was used as a positive control against Gram-positive bacteria, and it showed the appropriate activity against Staphylococcus aureus ATCC 25923 and Bacillus subtilis RKMUz-5 strains of 26.08 ± 0.12 mm and 27.04 ± 0.10 mm. The obtained extracts showed significant activity against Gram-negative bacteria. Antibiotic Ceftraksion taken as a control showed activity of 25.12 ± 0.13 mm and 26.12 ± 0.13 mm against Pseudomonas aeruginosa ATCC 27879 and Escherichia coli RKMUz - 221 strains. The results of antibacterial activity against harmful bacterial strains are fully presented in the table below (Table 2).

Table 2

In vitro activity of extracts from *Cynara scolymus* L., a member of the *Asteraceae* family, against Gram-positive and Gram-negative bacteria n=3

№	Samples	Inhibition diameter (mm, ± SD, P≤0.05)			
		Gram-positive bacteria		Gram-negative bacteria	
		S. aureus ATCC 25923	***B. subtilis*** RKMUz – 5	***P. aeruginosa*** ATCC 27879	***E. coli*** RKMUz – 221
1.	*Cynara scolymus* L (ethanol)	18.08±0.17	17.01± 0.14	15.08± 0.12	19.04± 0.10
2	*Cynara scolymus* L (ethyl acetate)	9.07±0.10	10.02± 0.12	8± 0.15	9.03± 07
3	*Cynara scolymus* L (Chloroform)	9.08±0.11	7.15±0.11	9.01± 0.13	NA
4	**Ampicillin**	26.08± 0.12	27.04± 0.10		
5	**Ceftriaxone**			25.12± 0.13	26.12± 0.13

NA*-no activ

Determination of the antifungal activity of the extracts isolated from the above-ground part of *Cynara scolymus* L. belonging to the *Asteraceae* family

The activities of the extracts of Cynara scolymus L, belonging to the Asteraceae family, in ethyl alcohol, chloroform, and ethyl acetate solvents, against yeast Candida albicans RKMUz-247 were studied. According to the obtained results, none of the extracts showed activity against Candida albicans. Fluconazole antibiotic taken as a control showed 26.04 ± 0.10 mm of activity, which means that the study was conducted correctly. The activity of plant extracts against Candida albicans is fully presented in the table below (Table 3).

Table 3

***Cynara scolymus* L plant belonging to the *Asteraceae* family**
In vitro antifungal activity of extracts isolated from the surface of the earth n=3

Samples		**Inhibition diameter (mm, ± SD, P≤0.05)**
		Candida albicans
1	*Cynara scolymus* L (ethanol)	NA
2	*Cynara scolymus* L (ethyl acetate)	NA
3	*Cynara scolymus* L (Chloroform)	NA
Fluconazole		28.04± 0.10

NA*- not active.

IV. CONCLUSION

These results obtained as a result of the study motivate the implementation of more comprehensive investigations on the extracts obtained from the Artichoke plant. Studying the composition of the obtained extracts, as well as working on their other biological activities, is considered the main task before us. We hope that the results obtained with the help of our research will provide important information needed by the researchers when working on this plant.

REFERENCES

1. David, J. P. Occurrence, biological activity and 13C NMR data of amides from Piper (Piperaceae). Quim. Nova, 2012, 35, p. 2288-2311
2. Yakovlev, S.A. Infectious diseases as a global problem of our time / S.A. Yakovlev // Territory of Science. - 2017. S. 98-113.
3. Antibacterial, antifungal and cytotoxic activites of eight asteraceae and two rubiaceae plants from Columbian biodiversity : Jaim N, Diana M Narvaez, Oscar M.Mosquera. 2007.
4. Fawzy, G. A., Malik, A., Afza., Iqbal, L., Latif, M. Bioactive phenolic amides from Celtis Africana. Molecules 2012, 17, 2675–2682.
5. Mihovolovic, M. D., Kopp, B., Bauer, R., Dirsch, V. M., Stuppner, H. Discovery and resupply of pharcologically active plant-derived natural products: a review. Biotechnology advances 2015, 1582 – 1614.
6. Ávila, H.P., De Fátima Albino Smânia, E., Monache, F.D, Júnior, A.S. Structure-activity relationship of antibacterial chalcones. Bioorg. Med. Chem. 2008, 16, 9790 – 9794.
7. Chupakhina G.N., Skrypnik L.N. The content of phenolic compounds in medicinal plants of the botanical garden//News of the Russian Academy of Sciences. Biological series.2013.S. 47-62.
8. Balunas, M. J., Kinghorn, A. D., Drug discovery from medicinal plants. Life Sci. 2005, 78, 431 – 441.
9. Kaufman, P. B., Kirakosyan, A., Cseke, L. J. Phytochemicals: The chemical components of plants, in Natural products from plants 2nd.Taylor&Francis Group, Boca Raton.2006,22 – 25.
10. Siddalingaiah, K. S., Whiting, D. A. The absolute configuration of rotenone. J. Chem. Soc. 1961, 2843 – 2840.