Biological characteristics of some types of medicinal and aromatic plants, their antifungal activity

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SUMMARY

The work provides generalized information on the chemical composition, therapeutic properties and forms of application of Phlomis pungens Willd., Chenopodium botrys L., Leucanthemum vulgare Lam., Conyza canadensis (L.) Cronq., Anthemis rigescens Willd., Eupatorium cannabinum L. the distribution of these species in the regions of the Guba massif of the Greater Caucasus (within Azerbaijan), their phytocenological features and stocks. The antifungal activity of the plants themselves and their water extracts has been studied. It has been established that the plants themselves (except for Chenopodium botrys) are a good breeding ground for colonies of the fungi Trichoderma lignorum, Fusarium oxysporum, and Aspergillus niger.

Water extracts of Chenopodium bothrys and Eupatorium cannabinum have the highest fungistatic activity against all of the above-mentioned fungi.

Key words: medicinal and aromatic plants, resource science, biologicallyactive compounds, therapeutic properties, form of application, antifungal activity.

In recent years, the demand for herbal preparations has increased significantly. It is known that plants contain various biologically active substances such as; alkaloids, essential oils, flavonoids, glycosides, coumarins, tannins, fatty oils, resins, vitamins, gums, etc. In the arsenal of antifungal drugs, along with synthetic ones, there are also drugs from medicinal and aromatic plants that have low toxicity and high activity. Therefore, the search for antifungal agents among plants of the wild flora is an expedient and promising study. In the literature there are works devoted to the study of the antifungal activity of essential oils, saponins, flavonoids and other biologically active substances isolated from Eupatorium cannabinum, Satureja thymbra, Salvia pomifera, Salvia desoleana, Monarda didyma, Thymus vulgaris, Pimenta racemosa, Cymbopogon citrates, Curcuma longa, Thymus capitellatus, Bergamot, Coriandrum sativum, Chaerophyllum by Macrozantin15, 18, 19, 20, 21, 22, 25, 26, 27, 28, 29, 31, 32, 33, 4]. Considering this fact, for a number of years we have been conducting comprehensive research in this direction. So, we have studied antifungal activity, both of the plants themselves,Achillea biebersteinii, A.filipendulina, Pimpinella peregrine, Daucus carota, Salvia officinalis, Artemisia lerchiana, Euphorbia amygdaloides, E. boissieriana, Lepidotheca aurea, Chaerophyllum crinitum, Teucrium hircanicum water extracts and their essential2, 3, 6, 7].

The aim of this work was to study the distribution, phytocenological features, reserves and antifungal activity of some medicinal and aromatic plants of the flora of Azerbaijan.

Material and research methods

The object of the study was poorly studied and widespread species in Azerbaijan - Phlomis pungens Willd., Chenopodium botrys L., Leucanthemum vulgare Lam., Conyza canadensis (L.) Cronq., Anthemis rigescens Willd., Eupatorium cannabinum L., collected in the areas of the Guba massif of the Greater Caucasus.

Expeditionary trips were made to Siazan, Divichinsky, Khizinsky, Gubinsky and Gusarsky districts. The surveyed area was carried out using the route-reconnaissance method. Determination of reserves on the massifs occupied by the studied plants was carried out according to the method of VILAR (1986). Moreover, the operational reserve was calculated as 30% of the biological one, taking into account the restoration of natural populations. Aqueous extracts are obtained from aerial parts of plants collected during the flowering and fruiting phases (Chenopodium botrys).

To determine the antifungal activity, dried (air-dry) aerial parts and aqueous extracts of the studied plants were tested. As a strain culture usedTrichoderma lignorum, Fusarium oxysporum and Aspergillus niger in the Institute's Museum

Microbiology of the National Academy of Sciences of Azerbaijan. Determination of antifungal activity was carried out in 2 stages: on solid and liquid nutrient medium (water extract).

1. To determine the growth of fungi on a solid nutrient medium, air-dry raw materials of the investigated plants were crushed to 0.5–1 cm, then moistened with tap water to 55–60%, at pH 6.5–7. The moistened substrate was placed in Petri dishes and sterilized in an autoclave at 1 atm. within 45 minutes. After sterilization, the biomass of fungi was inoculated in the same amount in Petri dishes and kept in a thermostat at a temperature of 25–27-C. On the 3rd, 5th and 7th days of sowing (depending on the growth), the grown fungi colonies were counted. Wheat husk was used as a control.

2. To identify the antifungal activity of aqueous extracts of the studied species, extraction of aboveground parts of plants with tap water in a ratio of 1:10 in a water bath. After cooling, the obtained aqueous extract was filtered and poured into flasks with a capacity of 200 ml, 100 ml each, the pH was adjusted to 6.5–7, and then sterilized for 45 minutes at 0.5 atm. Next, the fungi cultures were sown in flasks with an aqueous extract of the studied plants. Then the flasks were placed in a thermostat for 7 days at a temperature of 25–27-C. Czapek's medium was used as a control. After filtration of the culture fluid, the weight of the biomass was determined. The filtrate was dried to constant weight at a temperature of 98-C.

Research results

Analysis of the literature data showed (Table 1) that the studied species contain various biologically active substances that predetermine their medicinal properties. It was revealed that all studied species are used in traditional medicine, only one species (Chenopodium botrys) finds use inscientific medicine, 2 types - in homeopathy (Conyza canadensis and Chenopodium botrys) and 2 types(Leucanthemum vulgare and Eupatorium cannabinum) have undergone experimental studies.

As you can see from the table. 1, most species have a diuretic and hemostatic effect and are used for diseases of the respiratory system and the digestive tract. Only for 2 types (Phlomis pungens and Chenopodium botrys) there is information about their antibacterial,protistocidal, fungicidal and phytoncidal activity. Phlomis pungens Willd. - prickly zopnik sem.Lamiaceae Lindl. Perennial plant 30-50 (60) cm high. It blooms in May-August, bears fruit in July-September. Distributed in the lower and middle mountain belts in almost all botanical and geographical regions of Azerbaijan. Occurs on dry stony, clayey slopes, talus among xerophilous shrubs, as well as in gardens and dry riverbeds. In the vicinity of the village of Khizi among the upland-xerophytic vegetation h. thorny often acts as the dominant of the thorny-herbaceous peppers-fragrant wormwood association. The projective cover of the herbage is 30–50%. We found that with a total area of 520 hectares of massifs occupied by h. prickly, the operational stock of its aboveground parts in the surveyed region was 7.5 tons.

Chenopodium botrys L. - fragrant marsh, sem. Chenopodiaceae Vent. Annual yellowish-green plant, height (9) 20-40 (65) cm, all glandular-pubescent, with a pleasant smell. Blossoms in May-July; bears fruit in June-September. Distributed throughout Azerbaijan from lowlands to the middle mountain belt (1800 m above sea level). It grows mainly along dry river beds, as well as in weedy places, along roads and on sands. In the vicinity of "Dzhannat Bagy" of the Gubinsky District, on the gravels, we recorded continuous thickets of m. Together with milkweed, shaggy forms associations. The projective cover of the cenosis is 60–70%. It was found that, with a total area of 500 hectares of massifs occupied by fragrant m. In the surveyed region, the operational reserve of its aboveground parts was 5.8 tons.Leucanthemum vulgare Lam. - common cornflower sem.Asteraceae Dumort. Perennial plant 25–100 cm high. It blooms in May-July, bears fruit in July-August. Distributed from lowlands to the middle mountain belt in the regions of the Guba mountain range of the Greater Caucasus and on the Kura plain. Inhabits meadows, forests, orchards and vegetable gardens. In the Gusar region in the vicinity of the villages. Laza, we have identified quite large areas occupied by N. common in the form of a solid white cover, where it forms a common-daisy association. The projective cover is 100%. With a total area of 1200 hectares, in the surveyed region, the operational stock of the aboveground parts of the common cornflower was 3.2 tons.

Conyza canadensis (L.) Cronq. (=Erigeron canadensis L.) - Canadian polypetal family. Asteraceae Dumort .. An annual or biennial plant 20–30 cm high. It blooms and bears fruit from May to September. Distributed in lowlands and lower mountainous zones. Its range covers all botanical and geographical regions of Azerbaijan. M. canadensis is quite common among forbs and shrubs. Quite often found along dry beds, river banks and in weedy places. Along the rivers Gilgilchay and Divichichai, Divichinsky district, we found places of the densest growth of the Canadian m.

in the form of intermittent stripes. Among the coastal vegetation, it is a member of the Canadian polypetal-oriental corky-herbaceous-basin association. In meadows among forbs, Cape Canadian was noted by us with an abundance of 3-4 points. The projective cover of the herbage is 90–100%. With a total area of massifs of 460 hectares, in the surveyed region, the operational reserve of the above-ground parts of the Canadian m. Was 2.5 tons.

Anthemis rigescens Willd. - umbilical cord hard sem.Asteraceae Dumort. Perennial plant 30–80 cm high. It blooms in July-August, bears fruit in August-September. It is found from the middle to subalpine mountain belts in the regions of Talysh, Nakhchivan Autonomous Republic, the northern part of the Lesser Caucasus and the western part of the Greater Caucasus. P. tough is a component of forest and meadow cenoses.

For the first time, the umbilical cord hard was found and collected in July 2005 in the vicinity of the villages. Vladimirovka, Guba region, with an abundance of 2–3 points, where it forms a coarse-cape-bird-bird association. The projective cover of the cenosis is 95–100%. With a total area of this array of 120 hectares, the operational reserve of the above-ground parts of the rigid settlement was 740 kg.Eupatorium cannabinum L. - hemp stethosis, family Asteraceae Dumort. Perennial plant 50-100 (120) cm high. It blooms in July-August, bears fruit in August-September. Distributed both in the lowlands and in the mountainous regions of the republic. It is found in forests, in humid places near springs and waterfalls, as well as in wet meadows and along river banks. In the vicinity of the villages. Gyryz-dakhna of the Guba region near the waterfall of the village of hemp forms associations together with meadowsweet and large-flowered hogweed. The projective cover of the herbage is 90–100%. With a total density of 320 hectares of tracts occupied by the cannabis plant in the surveyed region, the operational stock of its aboveground parts was 2.9 tons.

Studies have shown that the selected plant species and their water extracts differ in their antifungal activity against fungi. Trichoderma lignorum, Fusarium oxysporium and Aspergillus niger. So, experiments to identify the growth of fungal colonies on a solid nutrient medium showedthat the largest growth (4.7-5.8 cm) of the diameter of the colonies Trichoderma on The 3rd day of the experiment was observed on plants Anthemis rigescens, Eupatorium cannabinum and Erigeron canadensis, which exceededcontrol (0.2–1.3 cm). Whereas the smallest growth (1.3 cm) was noted on plantsChenopodium bothrys.Average growth of the diameter of the colonies Trichoderma has been observed on Leucanthemum vulgare and Phlomis pungens (2.4 and 2.7 cm, respectively).

On the 5th day of the experiment, the growth of the diameter of the colonies of the tested fungus on all the studied plants increased more than twofold, as in the control. On the 7th day of observation, the maximum growth of colonies Trichoderma was recorded on Erigeron canadensis plants (diameter increased by 1.2 cm), and on plantsChenopodium bothrys and Anthemis rigescens, the diameter of the fungus colonies did not change and corresponded to the diametercolonies on the 5th day of the experiment. On other plants, the diameter of the coloniesTrichoderma increased slightly(from 0.5 to 2.8 cm), the indicators of which were lower than the control (Fig. 1).

Table 1

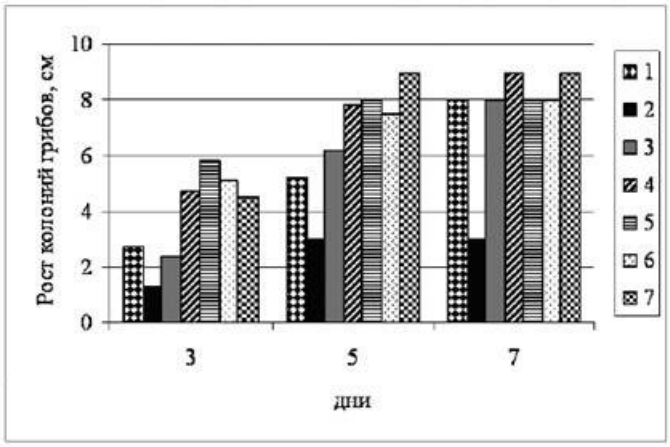
Content of biologically active compounds and medicinal properties of some species medicinal and aromatic plants

Наименование вида	Содержание биологически активные вещества	Форма применения	Применяемые органы	Биологическое действие	Показания к применению
Phlomis pungens	эфирное масло, дитерпеноиды, стероиды, алкалоиды, витамины С, B_2, Е, К, каротин, дубильные вещества, флавоноиды, фенолкарбоновые кислоты [9]	народная медицина	надз.ч. корни	н – тонизирующее, диуретическое, повышает иммунитет; ЭМ – протистоцидное; антибактериальное [9] п – ранозаживляющее [9]	О, н, н-ка – бронхит, туберкулез легких, пневмония, острые респираторные инфекции, водянка, хронический и гипацидный гастрит, язва желудка, анемия, геморрой, астения, малярия, гипертоническая болезнь, судороги у детей; нар. – гнойные раны; в – ревматизм [1,5, 9, 44].
Chenopodium botrys	эфирное масло, сапонины, флавоноиды, алкалоиды, жирное масло [8, 13, 16, 17]	народная медицина в эксперименте гомеопатия	надз.ч. – листья [4]	о., н. – диуретическое, противолихорадочное, антигельминтное; о., н., э. – гипотензивное, противоастматическое [8]; в.в. – антибактериальное, протистоцидное, фитонцидное, фунгицидное, антигельминтное [8]; ЭМ – применяется в медицине, проявляет антимикробную активность [8, 39]	о.,н., нар – кожные болезни, гонорея; о.,н., вн. - мигрень, желудочно-кишечные расстройства; в. – простуда, женские заболевания ; о., н., э. – нормализуют коронарное кровообращение, снимают головокружение, раздражительность [8].
Anthemis rigescens	сесквитерпеновые лактоны, полиацетиленовые, цианогенные, ароматические соединения [10, 36]	народная медицина	соцветия	антигельминтное [10]	–
Erigeron canadensis	эфирное масло, флавоноиды, алкалоиды, стероиды, витамин С, ароматические соединения, фенолкарбоновые кислоты, дубильные вещества, каротин, сапонины, [5, 10, 14, 23,34]	народная медицина корейская медицина гомеопатия немецкая народная медицина	надз.ч. части корни – надз.ч. части	э – диуретическое; н – гемостатическое, противовоспалительное [10, 37] о., н., н-ка – аналгезирующее, жаропонижающее, диуретическое [10]. эс. – гемостатическое [4, 10] в.н. и с.н-ка – кровоостанавливающее [5, 43]	э – асцит, дизентерия, нар. – болезни глаз, дерматозы, улучшает рост волос; н – диарея, дизентерия, мочекаменная болезнь, диабет [10] о., н., н-ка – радикулит, артрит, подагра, невралгия, бери-бери, головные боли, гипертоническая болезнь, инфекционный гепатит [10].
Eupatorium cannabinum	эфирное масло, сапонины, сесквитерпеноиды, алкалоиды, флавоноиды, дубильные вещества, тритерпеноиды, кумарины; фенолкарбоновые кислоты, углеводы, стероиды, полисахариды [10, 12, 24, 30, 33, 35, 38, 40]	народная медицина гомеопатия в Болгарии – в эксперименте	надз.ч. кор-ща – – надз.ч. полисахариды эупаториопикрин ЭМ	о. – слабительное, антигельминтное [10] желчегонное, диуретическое [10] [4] диуретическое [10] с.ф. – желчегонное, диуретическое [10] иммунологическая активность [33] цитостатическая активность [41] антибактериальное [35]	о. – цинга, геморрой; нар. - опухоли, длительно не заживающие раны [10] заболевания печени, желчного пузыря, селезенки, грипп, респираторные инфекции [10]

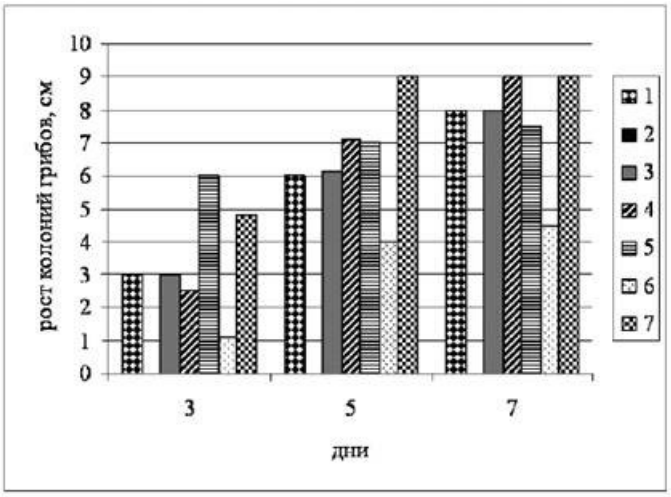
Leucanthemum vulgare	флавоноиды, кумарины, каучук стероиды, инулин, витамин С, алкалоиды, жирное масло, сесквитерпеновые лактоны, эфирное масло [10, 11,42, 45, 46]	народная медицина	надз. ч.	н., о. – противовоспалительное, спазмолитическое, седативное, слабительное, жаропонижающее, антигельминтное, обезболивающее [10, 16, 42, 45, 46]	н., о. – колит, гастрит, хронический запор, геморрой, скрофулез, туб. легких, респираторные инфекции, лихорадка, энурез, головная и зубная боль, при удушье и гельминтозах, невроз, нар. – скрофулез, женские и глазные болезни [10, 42, 45, 46] о. – гонорея [10]
			соцветия	о. – диуретическое, ранозаживляющее, антиспастическое [4, 10, 46]	
		в эксперименте	листья	гемостатическое [10]	п., м. – кожные болезни [10, 45, 46]
		гомеопатия		[4]	

Note: n - infusion; n-ka - tincture; o - broth, plank beds. - outwardly; ext. - inside; c - baths; EM - essential oil; p - powder; m - ointment; v. - water, with. - alcohol, e. - extract; es. - essence; supervising h. - aboveground parts; kor-shcha - rhizomes; dash - lack of data; c.v. - water extracts.

Colony growth studies Fusarium on the studied plants are shown in Fig. 2. So, on the 3rd day of the experiment, the largest diameter of the fungus colonies was noted on the plants Anthemis rigescens,which, as in the previous experiment, exceeded the control values by 1.2 cm.The average growth of the diameter of the colonies Fusarium has been observed on Erigeron canadensis, Phlomis pungens, and Leucanthemum vulgare(2.5 - 3.0 cm). Weak growth of colonies of this fungus is noted on plantsEupatorium cannabinum (1.1 cm in diameter), significantly different from the control (by 3.7 cm). On the 5th day of the experiment, an increase in the diameter of the colonies by 2–3 times was observed on plantsPhlomis pungens, Leucanthemum vulgare, Erigeron canadensis, and Eupatorium cannabinum. Whereas a slight growth of fungi was noted on Anthemis rigescens plants at5th day. A weak growth of the diameter of the fungus colonies on the 7th day was noted on the plantsPhlomis pungens, Leucanthemum vulgare, and Erigeron canadensis (1.9-2.0 cm). Complete inhibition of coloniesFusariumobserved on plants throughout the experiment Chenopodium bothrys.



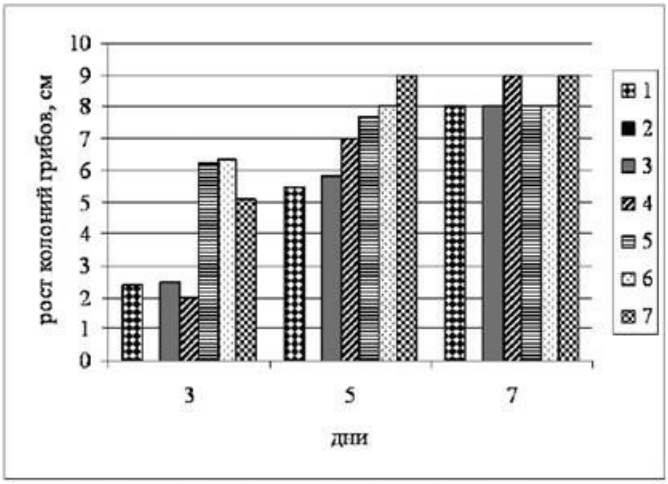
Rice. 1. Growth of coloniesTrichoderma lignorum on plants: 1. Phlomis pungens, 2. Chenopodium botrys, 3. Leucanthemum vulgare, 4. Conyza canadensis, 5. Anthemis rigescens, 6. Eupatorium cannabinum, 7. control.



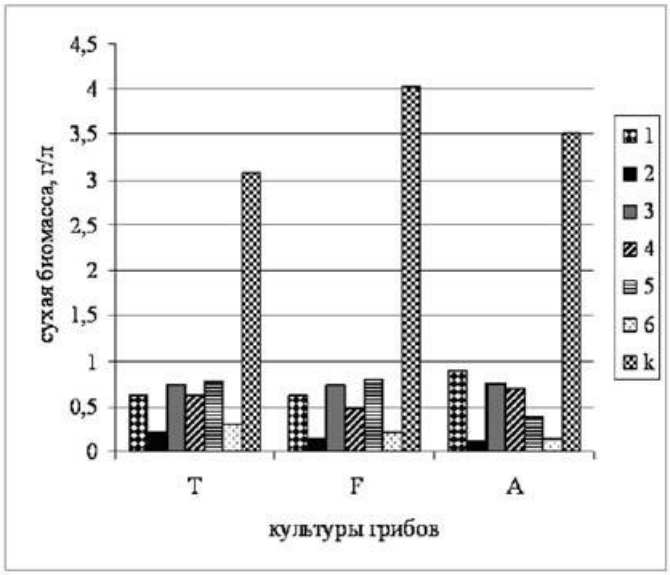
Rice. 2. Growth of coloniesFusarium oxysporium on plants (designations in Fig. 1).

Research on the development of the fungus Aspergillus on the studied plants showed that on On the 3rd day of the experiment, the greatest growth in the diameter of the colonies, exceeding the control by 1.1–1.2 cm, was observed on plantsAnthemis rigescens and Eupatorium cannabinum (as with Trichoderma). Almost equally tallthe diameter of the colonies of this fungus is marked on the plants Erigeron canadensis, Leucanthemum vulgare and Phlomis pungens (2.0-2.5 cm). On the 5th day, an increase in the diameter of the colonies by 2–3 times was observed in plantsLeucanthemum vulgare and Phlomis pungens and Erigeron canadensis, while Anthemis rigescens and Eupatorium cannabinum plants showed a slight increase in the diameter of fungal colonies. OnOn the 7th day of the experiment, a slight increase in the diameter of the colonies (by 2.0-2.5 cm) was observed on plants Erigeron canadensis, Phlomis pungens, and Leucanthemum vulgare. No changes were observed on Eupatorium cannabinum plants. Onplants Chenopodium bothrys, as in the previous experiment, throughout the experiment, growthcolonies Aspergillus was not observed (Fig. 3). Thus, as a result of the studies carried out, it was established that the studied plant species are a nutrient substrate forTrichoderma lignorum, Fusarium oxysporum and Aspergillus niger. An exception is the plants Chenopodium bothrys, on whichonly colonies develop rather poorly Trichoderma lignorum.

Aqueous extracts, in contrast to the studied plants themselves, exhibit a fungistatic effect on the strain-culture. Trichoderma lignorum, Fusarium oxysporum and Aspergillus niger. (rice.4). Thus, the greatest inhibitory activity against all strain-cultures of fungi was possessed by water extractsEupatorium cannabinum and Chenopodium bothrys (dry weight 0.12 - 0.21 g / l). Aqueous extract obtained from plantsLeucanthemum vulgare, showed the same activity towards allstrain cultures. With regard to strain culturesTrichoderma lignorum and Fusarium oxysporum aqueous extract of Phlomis pungens is more active than aqueous extract of Anthemis rigescens. An aqueous extract from Erigeron canadensis plants exhibited the highest fungistatic activity against the Fusarium oxysporum test culture, and showed almost the same effect on the rest.



Rice. 3. Growth of coloniesAspergillus niger on plants (designations in Fig. 1).



Rice. 4. Influence of aqueous plant extracts (1. Phlomis pungens, 2. Chenopodium botrys, 3. Leucanthemum vulgare, 4. Conyza canadensis, 5. Anthemis rigescens, 6. Eupatorium cannabinum. K - control) for growth Trichoderma lignorum (T), Fusarium oxysporum (F) and Aspergillus niger (A).

Conclusion

As a result of the studies carried out, it was found that all plants except Chenopodium bothrysare a good nutrient substrate for fungal colonies Trichoderma lignorum, Fusarium oxysporumand Aspergillus niger. The highest fungistatic activity against all of the abovemushrooms have aqueous extracts Chenopodium bothrys and Eupatorium cannabinum, and for Aspergillus niger, Anthemis rigescens. Thus, the primary results of the study allowconsider further in-depth study of the plants themselves and their aqueous extracts promising in terms of their antifungal action and practical use.

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