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Medicinal moss species distributed in Azerbaijan

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Abstract: The article provides a list of 15 species of medicinal mosses found in the bryoflora of Azerbaijan. Brief information on medicinal properties, location and distribution of each species is given. It has been established that in the local bryoflora, leafy mosses of *Sphagnum*, *Amblystegium*, *Bryum*, *Philonotis*, *Mnium*, *Polytrichum* genera and liverwort of *Marchantia* genus are represented by the largest number. Azerbaijan has a significant resource of medicinal plants, including mosses. However, the question of the use of an extensive group of bryophytes in medicine is still ignored. According to the literature data, mosses as raw material and their extract possess medicinal properties and widely used by some communities. Currently, more than 500 species of mosses are recorded in the flora of Azerbaijan, of them *Sphagnum subsekundum* Nees, *Sphagnum centrale* C. Jens, *Polytrichum commune* Hedw., *Polytrichum junipennum* Hedw., *Leptodictyum riparium* (Hedw.) Warnst., *Marchantia polymorpha* L., *Conocephalum conicum* (L.) Dum., *Bryum argenteum* Hedw., *Bryum capillare* Hedw., *Bryum intermedium* (Brid.) Turton, *Mnium spinosum* (Voit) Schwaegr., *Mnium marginatum* (Dicks.) P. Beauv., *Philonotis marchica* (Hedw.) Brid., *Amblystegium serpens* (Hedw.) B.S.G. are widely distributed species of the medicinal importance. The article represents a brief information about the species including their distribution area and uses.

Keywords: *bryophyta, indigenous knowledge, Mnium, peculiarities, Polytrichum, Sphagnum, species, traditional medicines*

INTRODUCTION

The study of bryoflora of Azerbaijan started in 60s of the last century and significant number of specimens have been collected by bryologists working at the Institute of Botany based on which the current herbarium fund was established as a part of the plant herbarium (BAK). First planned studies of mosses in Azerbaijan was started by L.B. Lyubarskaya [1967] and about 400 species were recorded. Beginning from the XXI century, regional studies of bryophytes were intensified and number of new species were recorded [Baryakina, 2002, Alakbarov 2008, Mammadova, 2009, Gasimov 2017]. Most of these studies have been implement based on the morphological studies of collected specimens. Nowadays, bryological herbarium consists of about 1500 specimens representing different taxonomical and ecological groups. However, medicinal mosses have not received sufficient attention in Azerbaijan.

Based on literature mosses were widely used in different continents since ancient times. Some species of mosses from the genera *Sphagnum* L, *Polytrichum* Hedw, *Bryum* Hedw, *Mnium* Hedw, *Philonotis* Brid, *Leptodictyum* (Schimp.) Warnst., *Amblystegium* Schimp. were used by the Indians of North America as an anti-burn agent [Akatın et al., 2022; Carter, 2022]. Back in the 80s of the last century, sphagnum mosses were collected in the UK for the manufacture of sterile dressings for the needs of surgery; there is also information about the manufacture of a medicinal ointment from sphagnum mixed with animal fat by the inhabitants of Alaska [Bordunov, 1984]. Chinese healers used about 40 species of mosses in their medical practice. According to the literature data [Ignatov, Ignatova, 2003] there is information on uses of both extracts and the plants themselves in Russia.

Very valuable medicinal mosses include the species of *Sphagnum* containing bactericidal substances such as "sphagnol". The species of this genus have long been used in the folk, and recently in the official medicine as moisture-absorbing materials that have antimicrobial properties. Their bactericidal properties is conditioned by their thermal stability, as well as the ability to absorb and retain a significant amount of water for a relatively long time (10 times their weight). This made it possible to use them in surgery as a sterile dressing material for the rapid and successful healing of purulent wounds.

Beside their medicinal importance, mosses possess

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many other properties that makes them useful for the application in different fields such as in agriculture, erosion and landslide prevention, increase of soil productivity, etc. It also forms peat which represents a raw material for obtaining a biogenic stimulant-"torfotum" [Aleksandrov 1962; Bordunov 1984; Babeshina et al., 1995; Dmitruk 2008; Wadavkar et al., 2017; Akatın, 2022] which is used for eye diseases, arthritis and radiculitis. In many health institutions, peat is successfully used as therapeutic mud and for baths, in balneology. Mosses are also beneficial as indicators of air content due to their ability to accumulate heavy metals [Babeshina et al., 1995].

Currently, more than 500 species of mosses grow in the flora of Azerbaijan [Mamedova, 2022]. The article reports 15 medicinal species of mosses common in the territory of Azerbaijan.

MATERIAL AND METHODS

The study is based on the herbarium collection stored at the BAK and newly collected specimens during last two years. Samples were collected by route and stationary methods. The collected herbarium materials were determined using hand magnifiers, light microscope (MBS-1; MBI-3) and identification key [Ignatov, Ignatova, 2003], according to the systems of F.V. Brotherus, L.E. Anderson and M.I. Ignatov. Names of species were checked against the database of Tropicos.

RESULTS AND DISCUSSION

Based on the study, the following species of mosses of medicinal importance were recorded [Fig. 1]. Most of them belong to the leafy mosses and two species to liverwort.

Sphagnales, Sphagnaceae

***Sphagnum subsekundum* Nees** - slender cowhorn bog-moss. It occurs in the districts of the Lesser Caucasus (Khanlar) and in the Goygol Reserve. They are used as a moisture-absorbing material with antimicrobial properties.

***Sphagnum centrale* C.Jens.** On the territory of Azerbaijan, it was recorded only in Talysh (Lerik district). It has bactericidal properties.

Polytrichales, Polytrichaceae

***Polytrichum commune* Hedw.** – common haircap moss. Mainly grows in mountain forests. It is collected in the Greater Caucasus (Sheki district); Lesser Caucasus (Kalbajar, Goygol National Park) and Talysh (Lankaran district). The species has bactericidal properties and according to literature [Bordunov, 1984;

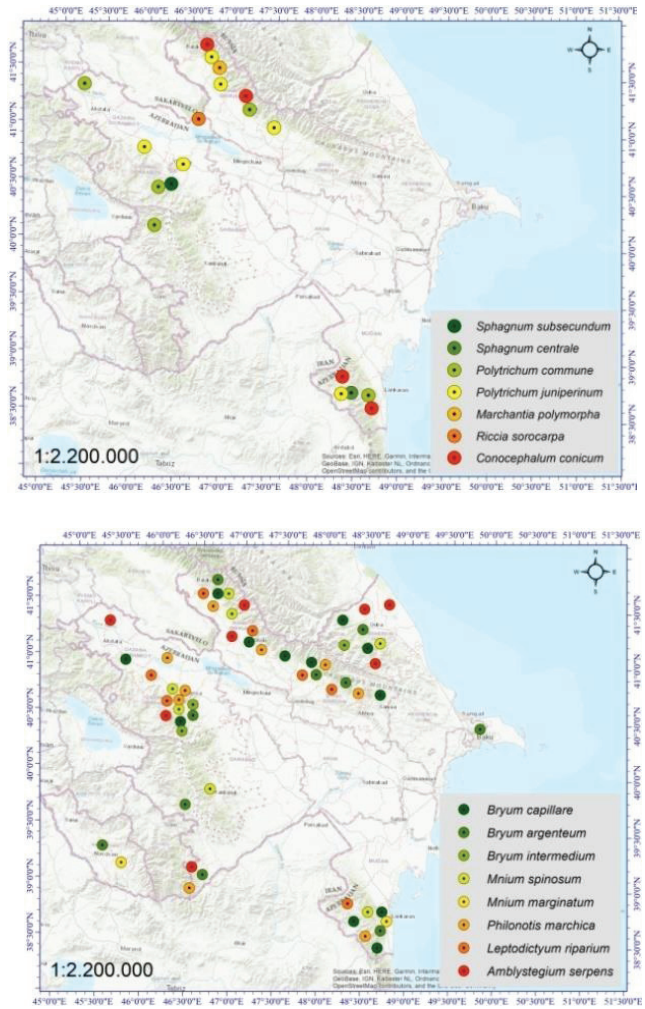

Figure 1. A map showing the distribution of the species. Species are indicated with different color on the map.

Babeshina et al., 2008, 2009] are used as an antipyretic and diuretic, in severe cough, pneumonia, bronchitis, to stop severe uterine bleeding, to dissolve stones in the kidneys and gallbladder, as well as to strengthen hair, improve their growth. An infusion of common haircap moss herb is used for dropsy, edema, constipation and kidney stone disease, and an infusion of seeds is used as an demulcent, anti-inflammatory, expectorant and coating agent. This species also has a laxative effect as it contains resinous substances, essential oil. Since the properties of common haircap moss have not been sufficiently studied to date, it is not used in traditional medicine. Only experienced herbalists use it in folk medicine.

***Polytrichum juniperinum* Hedw.** – juniper polytrichum moss or juniper haircap. In the territory of Azerbaijan, distributed in the districts of the Greater

Caucasus (Zagatala, Gakh, Oghuz); Lesser Caucasus (Ganja, Shamkir) and Talysh (Lerik). The extract isolated from it has an antitumor effect with regards to some human oncological diseases.

Bryales, Bryaceae

***Bryum capillare* Hedw.** - capillary thread-moss. Species is distributed in the districts of the Greater Caucasus (Zagatala, Gabala, Sheki, Oghuz, Ismayilli, Shamakhi, Gusar, Guba), Lesser Caucasus (Tovuz, Goygol reserve) and Talysh (Astara, Lerik, Lankaran). It has antibacterial properties.

***Bryum argenteum* Hedw.** – silvergreen bryum moss. It is widely distributed in the districts of the Greater Caucasus (Zagatala, Gabala, Ismayilli, Absheron, Guba), Lesser Caucasus (Ganja, Goygol National Park, Lachin, Nakhchivan, Zangilan), Talysh (Lankaran). Used in the treatment of burns, cuts, bites.

***Bryum intermedium* (Brid.) Turton** - many-seasoned thread-moss. The species is distributed only in both Caucasus (Guba, Ganja, Goygol National Park). It has antibacterial properties.

Bryales, Mniaceae

***Mnium spinosum* (Voit) Schwägr.** - spiny leafy moss. The species is distributed in the districts of the Greater Caucasus (Zagatala, Gakh, Guba) and Lesser Caucasus (Karabakh, Ganja, Goygol reserve), Talysh (Lankaran). It has antitumor activity.

***Mnium marginatum* (Dicks.) P. Beauv.** – bordered thyme-moss. The species is distributed in the districts of Nakhchivan AR (Shahbuz) and in Talysh (Lankaran). It has antibacterial properties.

Bartramiales, Bartramiaceae

***Philonotis marchica* (Hedw.) Brid.** Distributed in the districts of the Greater Caucasus (Zangilan, Ismayilli), Talysh (Lerik) in the districts of the Greater Caucasus (Zagatala, Sheki, Ismayilli, Gabala) and Lesser Caucasus (Khanlar, Shamkir), Talysh (Lerik). It has antibacterial properties. Non-volatile antibacterial substances isolated from this species are similar to phytoncides of terrestrial plants.

Hypnales, Amblystegiaceae

***Amblystegium serpens* (Hedw.) Schimp.** – creeping feathermoss. The species is distributed in the districts of the Greater Caucasus (Zangilan, Sheki, Gakh, Gusar, Guba) and Lesser Caucasus (Goygol reserve, Khachmaz, Aghstafa). Infusions are taken orally for disorders of the gastrointestinal tract.

***Leptodictyum riparium* (Hedw.) Warnst.** – Kneiff's feathermoss. The species occurs in the districts of the Greater Caucasus (Zagatala, Sheki, Ismayilli, Gabala) and Lesser Caucasus (Khanlar, Shamkir), Talysh (Lerik district). Used for treating burns.

Marchantiales, Marchantiaceae

***Marchantia polymorpha* L.** - common liverwort. An alcoholic tincture is prepared from Marchantia polymorpha, which is used for liver diseases [Aleksandrov, 1962]. The prestige of marchantia as a medicine was incredibly high, as early as the beginning of the 17th century, it was considered the only good remedy for leukemia. Recorded only in the Greater Caucasus (Zagatala district). Alcohol tincture from this species is used for liver diseases. Previously, at the

Figure 2. Species : 1. *Polytrichum commune* Hedw., 2. *Polytrichum junipennum* Hedw., 3. *Sphagnum centrale* C. Jens., 4. *Sphagnum subsekundum* Nees, 5. *Bryum argenteum* Hedw., 6. *Mnium spinosum* (Voit) Schwägr, 7. *Marchantia polymorpha* L., 8. *Leptodictyum riparium* (Hedw.) Warnst

beginning of the 18th century, Marchantia was considered the only good remedy for leukemia.

Marchantiales, Conocephalaceae

***Conocephalum conicum* (L.) Dum**. – great scented liverwort. The range covers areas such as the Greater Caucasus (Sheki, Zagatala) and Talysh (Lerik, Lankaran). Species has antitumor activity. Mixed with vegetable oils, they are used as an external remedy for the treatment of eczema, burns, cuts, bites.

Based on the recent literature some of species from the genera *Philonotis* Brid., *Bryum* Hedw., *Mnium* Hedw., *Barbula* Hedw., *Leptodictyum* (Schimp.) Warnst. and *Amblystegium* Schimp. are still used in folk medicine to treat burns, and infusions are taken orally in case of lack of appetite, disorders of the gastrointestinal tract, with diarrhea - as an astringent, with constipation, as a laxative [Mammadova, 2022; Wadavkar, 2017].

Although some species of mosses are widely distributed in Azerbaijan and characterized by high abundance in plant communities, they are not used in traditional medicine and do not represent part of the indigenous knowledge on medicinal plants. This could be explained that people are not familiar with mosses and most of time confuse them with lichens and not informed about their use peculiarities.

CONCLUSION

The range of medicinal plants in Azerbaijan is very wide. Most of them are collected and widely used in traditional medicine [Ibadullayeva, 2017, Mehdiyeva 2022, Benek, 2022]. However, the medicinal importance of mosses (bryophytes) is not considered yet. The study of medicinal mosses and their introduction to local communities in the districts are very important. In order to realize this, we are planning to carry out plot projects and awareness-raising activities in the near future.

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Azərbaycanda geniş yayılmış dərman əhəmiyyətli mamır növləri

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Məqalədə Azərbaycanın brioflorasında rast gəlinən 15 növ dərman mamırının siyahısı təqdim edilir. Hər bir növün dərman xüsusiyyətləri, yeri və yayılması haqqında qısa məlumat verilir. Müəyyən edilmişdir ki, yerli brioflorada *Sphagnum*, *Amblystegium*, *Bryum*, *Philonotis*, *Mnium*, *Polytrichum* cinslərinə aid yarpaqgövdəli mamırlar və *Marchantia* cinsinə aid ciyərotu mamırlar ən çox sayda təmsil olunur. Azərbaycanda əhəmiyyətli sayda dərman bitkiləri, o cümlədən mamır ehtiyatları var. Bununla belə, briofitlərin böyük bir qrupunun tibbdə istifadəsi məsələsi hələ də diqqətdən kənarda qalır. Ədəbiyyat məlumatlarına görə, xammal kimi mamırlar və onların ekstraktı müalicəvi xüsusiyyətlərə malikdir və bəzi icmalar tərəfindən geniş istifadə olunur. Hazırda Azərbaycanın florasında 500-dən çox mamır növü qeydə alınıb. Onlardan *Sphagnum subsekundum* Nees, *Sphagnum centrale* C. Jens, *Polytrichum commune* Hedw., *Polytrichum junipennum* Hedw., *Leptodictyum riparium* (Hedw.) Warnst., *Marchantia polymorpha* L., *Conocephalum conicum* (L.) Dum., *Bryum argenteum* Hedw., *Bryum capillare* Hedw., *Bryum intermedium* (Brid.) Turton, *Mnium spinosum* (Voit) Schwägr., *Mnium marginatum* (Dicks.) P. Beauv., *Philonotis marchica* (Hedw.) Brid., *Amblystegium serpens* (Hedw.) Schimp. geniş yayılmış müalicəvi əhəmiyyətə malik növlərdir. Məqalədə yayılma sahəsi və istifadələri daxil olmaqla növlər haqqında qısa məlumat verilir.

Açar sözlər: *briofitlər, yerli bilik, Mnium, xüsusiyyətlər, Polytrichum, Sphagnum, növlər, ənənəvi dərmanlar*

Широко распространенные в Азербайджане виды лекарственных мхов

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В статье приведен список 15 видов лекарственных мхов, встречающихся в бриофлоре Азербайджана. Даны краткие сведения о лечебных свойствах,

местонахождении и распространении каждого вида. Установлено, что в местной бриофлоре наибольшее количество представлено листостебельными мхами родов *Sphagnum*, *Amblystegium*, *Bryum*, *Philonotis*, *Mnium*, *Polytrichum* и печеночником рода *Marchantia*. Азербайджан обладает значительными ресурсами лекарственных растений, в том числе мхами. Однако вопрос об использовании обширной группы мохообразных в медицине до сих пор игнорируется. По данным литературы, мхи как сырье и их экстракт обладают лечебными свойствами и широко используются некоторыми общинами. В настоящее время во флоре Азербайджана отмечено более 500 видов мхов, из них *Sphagnum subsekundum* Nees, *Sphagnum centrale* C. Jens, *Polytrichum commune* Hedw., *Polytrichum junipennum* Hedw., *Leptodictyum riparium* (Hedw.) Warnst., *Marchantia polymorpha* L., *Conocephalum conicum* (L.) Dum., *Bryum argenteum* Hedw., *Bryum capillare* Hedw., *Bryum intermedium* (Brid.) Turton, *Mnium spinosum* (Voit) Schwägr., *Mnium marginatum* (Dicks.) P. Beauv., *Philonotis marchica* (Hedw.) Brid., *Amblystegium serpens* (Hedw.) Schimp. – широко распространенные виды, имеющие лекарственное значение. В статье представлены краткие сведения о видах, включая их распространение и использование.

Ключевые слова: *мохообразные, местные знания, Mnium, особенности, Polytrichum, Sphagnum, виды, традиционные лекарства*