

Biology

FUNGAL DISEASES OF MEDICINAL PLANTS IN ARID
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This research indicated various fungal infections in different parts of several medicinal plants that grown in arid woodlands of Vayots Dzor region of Armenia. In this territory we investigate 289 species of medicinal plants belonging to 175 genera and 58 families. 39 species of microscopic fungi were found from 41 species of medicinal plants from this area. Among the taxa of fungi 18 species belong to *Ascomycota*, 7 belong to *Basidiomycota* and 1 belongs to *Oomycota* divisions. *Golovinomyces* genus from powdery fungi was the dominant for 11 higher plants, the most common species of micromycetes in this territory is *G. galeopsis* (about 15.4% of the total), which causes of medicinal plants from the family *Lamiaceae*.

Keywords: Vayots Dzor region, medicinal plants, powdery mildew, hyphal fungi, rust fungi.

Introduction. Traditional medicine is used globally and has a rapidly growing economic importance. Complementary-alternative and traditional medicine are gaining more and more respect by national governments and health providers in developing countries [1]. Today the use of natural resources in Armenia as well as in many other countries is uncontrolled are absent systems of monitoring and management. Particularly this problem is actual for medicinal plants. Medicinal plants traditionally occupied an important position in rural and urban lives of Armenia. They constitute the basis of primary health care for the majority of the population in Armenia and are significant source of benefits for rural population.

Our research indicated various fungal infections in different parts of several medicinal plants that grown in arid woodlands of Vayots Dzor region of Armenia. This region is one of the most picturesque and historically interesting region of Armenia, which is situated in southern part of the republic and centered on the watershed of the Arpa River and its tributaries.

The climate of Vayots Dzor on the whole is continental with cold or moderate cold winter and hot or warm summer. The highest possible air temperature reaches +40°C in southern districts, and the exceptional minimum –35°C. Precipitations comprise 300–700 mm. The region has 4 climatic types: arid continental, moderately warm arid, moderately cold forest and cold mountain climate.

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The variation of relief, climatic conditions and soil cover cause also diversity of vegetation with prevalence of the extremely xerophyllous vegetation units. The territory of Vayots Dzor is covered by semi deserts, steppes, subalpine and alpine meadows, arid woodlands, intra-zonal types of vegetation: phryganoid vegetation, rocky habitats (rocks, scree, placers) and wetlands. Investigated territory administratively coincides with borders of Darelegis floristic region that presents one of the richest flora in Armenia (1740 species). The flora of deciduous arid woodlands of this region includes 753 species of plants belonging to 344 genera and 70 families. The high floristic richness for this type of vegetation proves its integrated character and presence of disturbed habitats rather than the diversity of climatic conditions [2].

Medicinal plants of this area are collected and used not only by locals and tourists, but also by procurers and traditional herbal drug dealers for sale purposes.

Taking into account all mentioned, facts we undertook the study of arid woodlands of Vayots Dzor, which has not been explored in mycological respect, yet. The aim of this study was to identify systematic structure of fungal biota of arid woodlands of Vayots Dzor, to establish regularities in distribution and specialization of fungi to host plants.

Materials and Methods. The current study is based on previous collections, herbarium specimens of Yerevan State University and Institute of Botany of NAS RA, reference data and results of our field study. Sample collection, description and fungi microscopy were performed by standard mycological methods [3–4]. The names of plants and fungi, place and time of samplings were recorded accordingly. Classification and reclassification of the taxa was conducted during the work. The taxonomic revision of fungal species, stored in herbariums or previously mentioned in the literature was carried out [5–8]. Many of them are renamed in accordance with the International Code of Botanical Nomenclature [9] and Index Fungorum online database (see [10]).

Results and Discussion. As a result of the revision of herbarium samples, analysis of publication data and examination of our own material we investigate 289 species of medicinal plants belonging to 175 genera and 58 families. From these plants 41 species from 37 genera and 19 families separated, on which fungal diseases were found. Among them dominate grasses (32 species, most of them are perennials). Woody plants amount is only 9 species, which are the main formations of arid woodlands of Southern Armenia. We also note that all 41 species are distributed in Vayots Dzor region, as well as in adjacent areas. This proves the importance of our research of the diseases of these plants, as they can easily be distributed and become an epidemic.

Totally, 39 species of microscopic fungi were found from 41 species of medicinal plants, collected in deciduous arid woodlands of Vayots Dzor region. Among the taxa of fungi 18 species belong to *Ascomycota*, 7 belong to *Basidiomycota* and 1 belong to *Oomycota* divisions. *Golovinomyces* genus from powdery fungi was dominant for 11 higher plants. The most common species of micromycetes in this territory is *G. galeopsis* (about 15.4% of the total), which causes powdery mildew of medicinal plants from the family of *Lamiaceae* and infects their leaves, stems and flowers.

The greatest number of fungi species is found on the plants from the family *Lamiaceae* (6 species), *Asteraceae* and *Rosaceae* (4 species), *Fabaceae*, *Plantaginaceae*, *Rhamnaceae* (3 species for each), *Anacardiaceae*, *Boraginaceae*, *Ephedraceae*, *Oleaceae*, *Poaceae* and *Polygonaceae* (2 species), mycobiota of other families are represented by a single species.

The data show that powdery mildew is the most common disease on medicinal plants of this area: 69% of infected medicinal plants.

As a result of our studies we have found 20 species of powdery mildew fungi, belonging to 8 genera from division *Ascomycota*. We have identified the following genera of powdery mildews: *Golovinomyces* (5 species), *Sphaerotheca* (4 species), *Leveillula* (3 species), *Microsphaera*, *Erysiphe* and *Phyllactinia* (2 species for each), *Podosphaera* and *Blumeria* (1 species for each).

In the studied area is created favorable conditions for the development of hyphal fungi [5]. Identified 9 species of hyphal fungi belonged to 6 genera. By the number of species should be noted the following genera: *Ramularia* (3 species), *Curvularia* (2 species), *Acremonium*, *Fusicladium* and *Ulocladium* are presented by one species. We have defined 7 species of *Basidiomycota*, most of them belong to rust fungi (5 species).

Thus, our investigation has shown that the largest numbers of species of fungi are included in the division *Ascomycota* (18 species), among them large number of species is represented by the order *Erysiphales* (20 species).

Undoubtedly, above mentioned number of plants and their diseases does not exhaust all flora and mycobiota of our studied territory. Unique natural conditions, the richness of vegetation types and the relatively mild climate provide the basis to expect that further research will add to this list more species.

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