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Three New Species of Microfungi for the Mycobiota of Uzbekistan

Sh. U. Mardonov[1], Jahongir J. Jo'raqulov[2], Ilyor M. Mustafaev[3]

[1]Denov Institute of Entrepreneurship and Pedagogy, Denov, Uzbekistan
[2]Institute of Botany of the Academy of Sciences, Tashkent, Uzbekistan
[3]Tashkent Botanical Garden Named after F.N. Rusanov at the Institute of Botany of the Academy of Sciences, Tashkent, Uzbekistan
Email: elyor-mustafaev@inbox.ru

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Abstract

This study reports the identification of three previously unrecorded micromycetous species in Uzbekistan: *Stemphylium vesicarium*, *Phoma punctulata*, and *Monilinia johnsonii*. These species were discovered through mycological analyses conducted in various regions of Uzbekistan, including the Nurata, Bobotog, and Northern Turkistan Mountain ranges. *Stemphylium vesicarium*, found on *Tulipa turkestanica*, is known to cause leaf blight. *Phoma punctulata*, which affects *Colutea paulsenii*, belongs to the widely distributed and significant *Phoma* genus, which includes several species that are important plant pathogens. *Monilinia johnsonii* was observed on *Crataegus turkestanica* and *C. pontica*, with its apothecia emerging in early spring and causing leaf damage. This research contributes to the growing body of knowledge on Uzbekistan's fungal biodiversity and highlights the importance of monitoring these newly identified pathogenic species for their potential impact on plant health. The findings underscore the need for comprehensive monitoring and control measures, particularly in mountainous regions where hawthorn species are predominant.

Subject Areas

Mycology

Keywords

Stemphylium, *Phoma*, *Monilinia*, Host Plant, Conidiophore, Conidium, Phytopathogenic, Micromycetes, Nurata Mountain Range, Bobotog Mountain Range, Northern Turkistan Mountain Range

1. Introduction

In Uzbekistan, mycologists such as P.N. Golovin, B.D. Kleiner, T.S. Panfilova, N.I. Gaponenko, S.S. Ramazanova, Ya.S. Solieva, Sh.G. Kamilov, X.X. Nuraliev, Yu.Sh. Gafforov, I.M. Mustafayev, and J.P. Sherqulova have made significant contributions to the study of vascular plant microfungi. Their scientific research has provided valuable insights into the taxonomy, distribution, and ecology of these fungi. Mycological research in Uzbekistan began to develop primarily in the early 20th century. In 1912, K.I. Barbarin, while studying plant diseases, documented fungal infections affecting plants in the Tashkent, Samarkand, and Fergana regions. In 1914, the Turkestan Plant Protection Center was established under the leadership of N.G. Zaprometov. Between 1914 and 1928, mycological and phytopathological studies were conducted across Central Asia, including Uzbekistan. By 1928, 767 species of microfungi from various systematic groups had been identified. From 1935 onwards, mycological research in Uzbekistan expanded under the leadership of P.N. Golovin, with studies conducted in the country's natural regions, including Fergana, Korzhontog, Ugam, Chotkol, Bobotog, Hisar, and Zarafshan. By 1945, the mycobiota of Central Asia had grown to include 4000 species. In 1950, based on extensive mycological studies in Central Asia, P.N. Golovin documented more than 2378 fungal species, of which 1278 were recorded in Uzbekistan. T.S. Panfilova and N.I. Gaponenko studied the mycobiota of the Angren Basin, identifying 867 species. They reported that five species from the order *Peronosporales* were newly recorded in Central Asia, and two were previously unknown to science. In her research on the vascular plant microfungi of the Surkhandarya region, Yo.S. Solieva identified 352 species of microfungi, 24 of which were new to the mycobiota of Uzbekistan, and two species were new to science. Additionally, Yo.S. Solieva, Kh.M. Kyrgyzbaeva, and collaborators (1998, 2001) studied the mycobiota of the lower parts of the Kizilkum and Amu Darya deltas. X.X. Nuraliev, in his study of the higher plant microfungi of the Kashkadarya region, identified 364 species, 49 forms, and 2 variations. Among these, 24 species were new to the mycobiota of Uzbekistan, and two species were new to science. Similarly, Yu.Sh. Gafforov, in his research on the higher plant microfungi of the Namangan region, identified 480 species and forms, including four groups and 25 species that were newly recorded in Uzbekistan [1]. In recent years, additional new species of micromycetes have also been identified in Uzbekistan [2] [3].

This article aims to provide information on three phytopathogenic species newly recorded in the mycobiota of Uzbekistan.

2. Materials and Methods

Mycological herbarium specimens were collected from mycological research conducted in various regions of Uzbekistan, including the Nurata, Bobotog, and Northern Turkistan mountain ranges. These specimens were examined using a light microscope and identified based on relevant literature [4]-[8]. Host plant

species were determined using *Conspectus Florae Asiae Mediae* (1968–1993) [9] and *Flora of Uzbekistan* (1941-1962) [10]. All collected specimens are stored in the Fungarium of the Institute of Botany in Tashkent. The taxonomy and nomenclature of fungi in this article follow international databases, specifically *MycoBank* (2025) [11]. The nomenclature of host plants follows data from *Plants of the World Online* (2025) [12].

3. Results and Discussions

As a result of mycological analyses, three species of micromycetes previously unrecorded in Uzbekistan were identified. Below are concise descriptions of these species, including their host plants and the regions in which they are distributed.

1) ***Stemphylium vesicarium*** (Wallr.) E.G. Simmons, Mycologia 61 (1): 9 (1969) [MB#339660] (**Figure 1**).

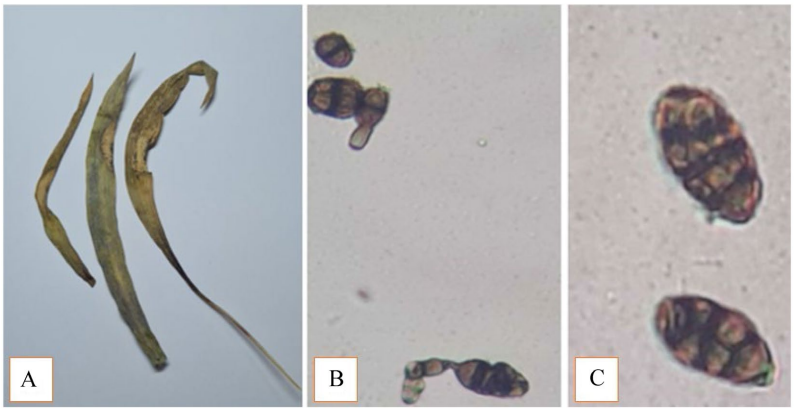

Figure 1. *Stemphylium vesicarium-Tulipa turkestanica*: A: affected leaves; B, C: conidia.

Host plant: *Tulipa turkestanica* (Regel) Regel. The genus *Stemphylium* was first reported in 1833, with *Stemphylium botryosum* (Teleomorph: *Pleospora tarda*) designated as the type species. *Stemphylium* is a dematiaceous hyphomycete, distinguishable from other hyphomycetes that form phaeodictyospores by the percurrent rejuvenation of its conidiophores and the presence of apically swollen conidiogenous cells [5]. *Stemphylium vesicarium* causes Stemphylium leaf blight (SLB) and can infect a broad range of crops and weed hosts. Primary crop hosts include onion (*Allium cepa* L.), garlic (*A. sativum* L.), leek (*A. porrum* L.), shallot (*A. cepa* var. *aggregatum*), asparagus (*Asparagus officinalis* L.), European pear (*Pyrus communis* L.), lucerne (*Medicago sativa* L.), mango (*Mangifera indica* L.), tomato (*Solanum lycopersicum* L.), radish (*Raphanus sativus* L.), sunflower (*Helianthus annuus* L.), parsley (*Petroselinum crispum* (Mill.) Fuss), and soybean (*Glycine max* (L.) Merr.) [6]. The disease causes small tan-to-brown lesions on leaves, which rapidly progress, leading to plant defoliation. Identification of *Stemphylium* species relies on morphological characteristics, particularly variations in conidia and conidiophores. The conidiophore exhibits swelling and produces dark-brown conidia. The conidia are oblong or broadly oval, measuring 21 - 36 ×

12 - 17 μm, with 1 - 6 transverse septa and 1 - 3 longitudinal septa per transverse sector (Figure 1).

Distribution: Bobotog mountain range (Bobotog National Nature Park).

2) *Phoma punctulata* Cooke, Grevillea 6 (40): 133 (1878) [MB#197940].

Host plant: *Colutea paulsenii* Freyn. The genus *Phoma* Fries includes approximately 200 species worldwide and is widely distributed across various ecological niches. While some *Phoma* species are harmless saprobes, others are significant plant pathogens that affect economically important crops. Moreover, certain *Phoma* species pose quarantine concerns, presenting challenges for plant health regulatory organizations [7]. In Uzbekistan, 60 species of the genus *Phoma* have been documented [12]. *Phoma punctulata* affects the leaves of *Colutea paulsenii*, causing round lesions on the upper leaf surface. These lesions develop with a central area that turns white, while the edges form light brown, liver-colored borders. (See Figure 2)

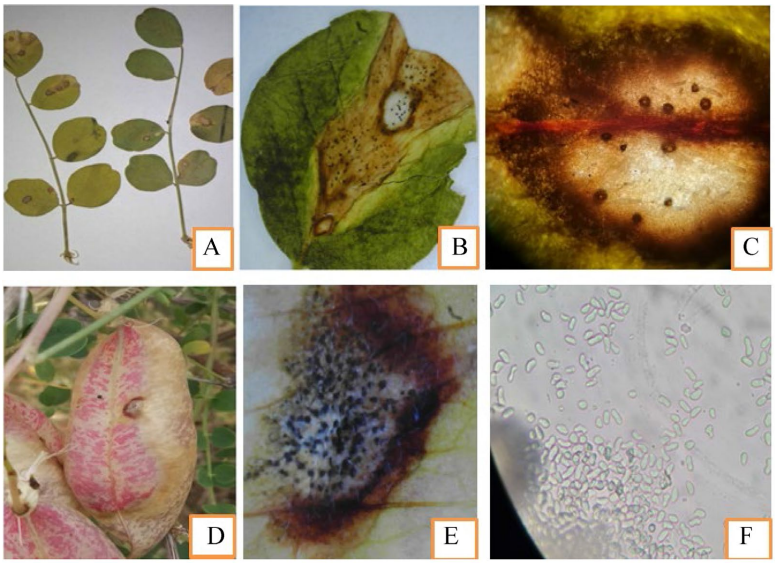

Figure 2. *Phoma punctulata-Colutea paulsenii*: A, B: affected leaves; C: pycnidia on the leaf surface; D, E: pycnidia on the surface of the pods; F: stilospores.

These spots are visible on the surface, particularly on necrotic tissues, where small black dots of fungal pycnidia are located. The pycnidia are spherical, measuring 110 - 130 μm, with a round opening, and are embedded in the necrotic leaf tissue. The pycnidial wall is light brown. The stilospores are small (10 - 15 × 2 - 3 μm), single-celled, cylindrical or ellipsoid in shape, and colorless. This species is widely distributed among members of the *Fabaceae* family.

Distribution: Northern Turkistan Mountain range (*Zaamin Nature Reserve*, *Zaamin National Nature Park*), Bobotog mountain range (*Bobotog National Nature Park*).

3) *Monilinia johnsonii* (Ellis & Everh.) Honey, American Journal of Botany 23: 105 (1936) [MB#268422].

Host plants: *Crataegus turkestanica* Pojark. and *C. pontica* K.Koch. All *Monilinia* species within the *Disjunctoriae* group, including *M. johnsonii*, exhibit a strong synchronization with the phenology of their host. From an evolutionary standpoint, this synchronization occurs because both spore stages of the pathogen can only infect during specific, short periods in the host's development. Ascospores infect young vegetative tissues exclusively at bud break, while conidia infect open flowers only during the bloom phase [9]. Long-term studies have shown that small, round spots initially appear on the leaves of *Crataegus turkestanica* and *C. pontica*. Over time, these spots enlarge and cover a significant portion of the leaf, leading to leaf curling and desiccation. The first recorded emergence of apothecia of *M. johnsonii* occurred on the ground beneath *C. turkestanica* trees in early to mid-March of 2023 and 2024 in the Nurata Nature Reserve and Zaamin National Nature Park (**Figure 3**).

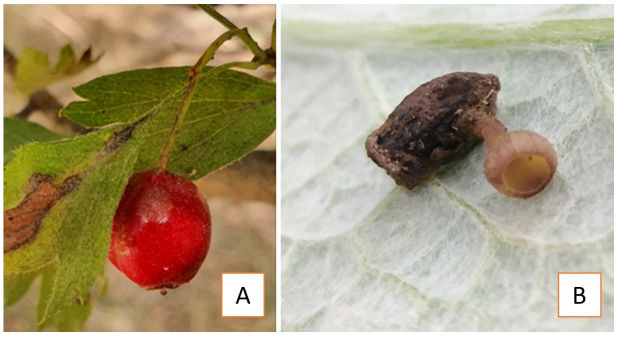

Figure 3. *Monilinia johnsonii-Crataegus turkestanica*: A: affected leaf, B: apothecia of the fungus grown from the seed of a diseased fruit.

Distribution: Nurata mountain range (*Nurata Nature Reserve*), Northern Turkistan Mountain range (*Zaamin National Nature Park*).

4. Conclusions

The three fungi identified in Uzbekistan—*Stemphylium vesicarium*, *Phoma punctulata*, and *Monilinia johnsonii*—have distinct geographic distributions that extend beyond Uzbekistan. For instance, *Stemphylium vesicarium* is a known pathogen that affects a broad range of crops worldwide, including onions, tomatoes, and sunflowers. This species has been reported in various parts of the globe, especially in regions with agricultural significance. *Phoma punctulata* is a widely distributed species within the *Phoma* genus, which includes plant pathogens with a global presence, particularly affecting legumes like *Colutea* species. Similarly, *Monilinia johnsonii*, primarily affecting *Crataegus* species, has been reported in North America as well as in Central Asia, where it has been documented on hawthorn species. The findings from Uzbekistan are consistent with the broader patterns of these species being present in other regions. The geographic distribution of these fungi in Uzbekistan—specifically within the Nurata, Bobotog, and Northern Turkistan mountain ranges—aligns with the known global patterns, though

the presence of these species in Uzbekistan appears to be a novel record. The mountainous regions of Uzbekistan, with widely distributed plant species such as *Tulipa turkestanica*, *Colutea paulsenii*, and *Crataegus*, create specific ecological niches for these pathogens. In other parts of the world, similar fungi have been observed infecting related plant species. However, this study highlights that these fungi have previously gone unrecorded in Uzbekistan, underscoring the country's distinct mycological biodiversity and the importance of targeted mycological surveys in such ecologically rich areas.

The study underscores the critical need for long-term monitoring to track the spread of these newly identified pathogenic fungi. The introduction of these species into Uzbekistan's mycobiota signals the potential for these fungi to pose risks to local plant health, particularly in regions where hawthorn species dominate. Monitoring will be essential for tracking the progression of diseases like *Stemphylium* leaf blight and *Monilinia* leaf damage, especially given their observed seasonal patterns—like the emergence of *Monilinia johnsonii*'s apothecia in early spring. The study recommends a comprehensive understanding of these fungi's life cycles to implement timely control measures. Future efforts should include regular surveys of key host plants, coordinated data collection on fungal spread, and the establishment of monitoring plots in the affected regions (e.g., the Nurata Nature Reserve and Zaamin National Nature Park).

In conclusion, the discovery of these fungi expands the knowledge of Uzbekistan's fungal biodiversity and emphasizes the importance of long-term monitoring, particularly in mountainous regions that are critical to the health of both forest and agricultural ecosystems.

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Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Mustafaev, I.M. (2018) Micromycetes on Vascular Plants of Nurota Nature Reserve. PhD Thesis, The Institute of Botany of the Academy of Sciences.

[2] Nabieva, D.B., Mustafaev, I.M. and Iminova, M.M. (2021) First Report of *Erysiphe australiana* from Uzbekistan. *New Disease Reports*, **44**, e12032. https://doi.org/10.1002/ndr2.12032

[3] Ortiqov, I.Z., Mustafaev, I.M. and Sherkulova, J.P. (2023) First Report of Powdery Mildew on Platanus Orientalis Caused by Erysiphe Platani in Uzbekistan. *Novosti sistematiki nizshikh rastenii*, **57**, F27-F33. https://doi.org/10.31111/nsnr/2023.57.2.f27

[4] Aveling, T.A.S. and Snyman, H.G. (1993) Infection Studies of Stemphylium Vesicar-

ium on Onion Leaves. *Mycological Research*, **97**, 984-988. https://doi.org/10.1016/s0953-7562(09)80866-6

[5] Han, J., Shin, J., Fu, T. and Kim, K.S. (2019) A New Record and Characterization of Asparagus Purple Spot Caused by *Stemphylium vesicarium* in Korea. *Mycobiology*, **47**, 120-125. https://doi.org/10.1080/12298093.2018.1561238

[6] Foster, J.M., Tayviah, C.S., Stricker, S.M., Gossen, B.D. and McDonald, M.R. (2019) Susceptibility to *Stemphylium vesicarium* of Asparagus, Onion, Pear, and Rye in Canada. *Canadian Journal of Plant Pathology*, **41**, 228-241. https://doi.org/10.1080/07060661.2019.1574901

[7] Aveskamp, M.M., De Gruyter, J. and Crous, P.W. (2008) Biology and Recent Developments in the Systematics of Phoma, a Complex Genus of Major Quarantine Significance. *Fungal Diversity*, **31**, 1-18.

[8] Scherm, H. and Savelle, A.T. (2003) Epidemic Development of Hawthorn Leaf Blight (*Monilinia johnsonii*) on Mayhaw (*Crataegus aestivalis* and *C. opaca*) in Georgia. *Plant Disease*, **87**, 539-543. https://doi.org/10.1094/pdis.2003.87.5.539

[9] Editorial Team (1968-1993) Conspectus Florae Asiae Mediae. Vol. 1-10. FAN, Tashkent.

[10] Editorial Team (1941-1962) Flora of Uzbekistan. Vol. 1-6. Editio Academiae Scientiarum UzSSR, Tashkent.

[11] MycoBank in Short. http://www.mycobank.org

[12] Plants of the World Online. https://powo.science.kew.org