

First Report of Powdery Mildew Caused by *Erysiphe euonymicola* on *Euonymus japonicum* in Uzbekistan

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Abstract

A new powdery mildew fungus named *Erysiphe euonymicola* was discovered in the mycobiota of Uzbekistan as a result of a mycological study conducted in the city of Samarkand. This fungus was found on the bush *Euonymus japonicum* and a brief description along with photographs of *Erysiphe euonymicola* have been provided. *Erysiphe euonymicola* is a phytopathogenic fungus that infects 80% - 90% of the leaves and young branches of *Euonymus japonicum*. The first symptoms of the disease are round, weeping spots on the leaves; later the spots form white mycelium over the entire surface of the leaves. When the plant is heavily infected, both sides of the leaves are completely covered with mycelium. The fungus *Erysiphe euonymicola*, parasitizing *Euonymus japonicum*, seriously inhibits the development of the host plant. The mycelium of *Erysiphe euonymicola* is formed on the surface of the leaf of the host plant and is a cluster of hyphae that form a dense covering in the form of a round spot. Conidiophores are erect, unbranched, and of *Pseudoidium* type, very variable in shape and size. Conidiophores consist of 2 - 3 cylindrical cells growing vertically from the hyphae; the sizes of conidiophores are given relative to the average length and width of selected conidiophores (n = 15). According to scanning electron microscopy, ellipsoidal-cylindrical conidia are single, scattered among conidiophores, ranging in size from 23.97 to 24.51 × 11.5 to 12.47 μm (n = 15). Conidial stalk cells are usually straight or slightly curved, ranging in size from 23.5 to 23.91 × 7.17 to 7.47 μm (n = 15).

Keywords

Pseudoidium, Anamorphs, Conidia, Mycelium, Samarkand City, Low Dew

1. Introduction

Members of the order *Erysiphales* are considered obligate parasites that cause powdery mildew in approximately 10,000 plant species and are important because they cause severe economic damage to their host plants [1] [2]. The order *Erysiphales* includes about 900 species belonging to 16 genera. Species of the genus *Erysiphe* belong to the group of ectoparasites of higher plants and form epiphytic mycelium on plant organs [3].

The study of fungi that cause powdery mildew diseases in Uzbekistan has been carried out for about 100 years [4]-[7]. In many cities of Uzbekistan, unique ornamental trees and shrubs have been introduced for the purpose of landscaping. Trees and shrubs introduced in recent years not only renew the flora of the territory, but also change the species composition of the mycobiota of the territory [8]. Previously, a number of studies were carried out on the distribution of powdery mildew fungi in Uzbekistan and new species for this territory were identified: for example, *Erysiphe platani* (Howe) U. Braun et S. Takam. on *Platanus orientalis* L. [9] [10].

Euonymus japonicum Thunb.—belongs to the family Celastraceae and is one of the most common euonymus species in the world. *Euonymus japonicum* is a useful, valuable species that does not belong to the forest fund, and is an ornamental plant belonging to the group of shrubs. *Euonymus japonicum* is planted throughout Uzbekistan for landscaping alleys, roadsides and gardens [11].

The purpose of this article is to describe powdery mildew infection by *Erysiphe euonymicola* U. Braun recorded for the first time for Uzbekistan on *Euonymus japonicum* Thunb. [11].

2. Material and Methods

The city of Samarkand (39°38'43"N, 66°57'42"E) is located in the middle reaches of the river. Zarafshan is in the southwest of Uzbekistan and occupies 28,415 km² of the total land area of the Samarkand region. In 2023, during a mycological study conducted in Samarkand, powdery mildew disease was detected on *Euonymus japonicum* and samples with symptoms of the disease were taken (Figure 1).

Specimens of *Euonymus japonicum* Thunb. with symptoms of powdery mildew were marked, dried and analyzed in the mycological laboratory of the herbarium-botanical research laboratory of Samarkand State University, and the herbarium samples were transferred for storage to the collection of mushrooms of the mycological laboratory. The study of the morphology and symptoms of fungal diseases and the determination of species composition were carried out on the basis of scientific literature. For macro- and micromorphological examination of herbarium specimens, trinocular (MED D30T LCD) and electronic (JSM-IT200LA) microscopes were used. The structures of the fungus were examined in an electron microscope with magnifications of ×500, ×1900, ×3700

and $\times 4500$. Conidia (at least 20) were examined using a scanning electron microscope (JSM-IT200LA, Japan).

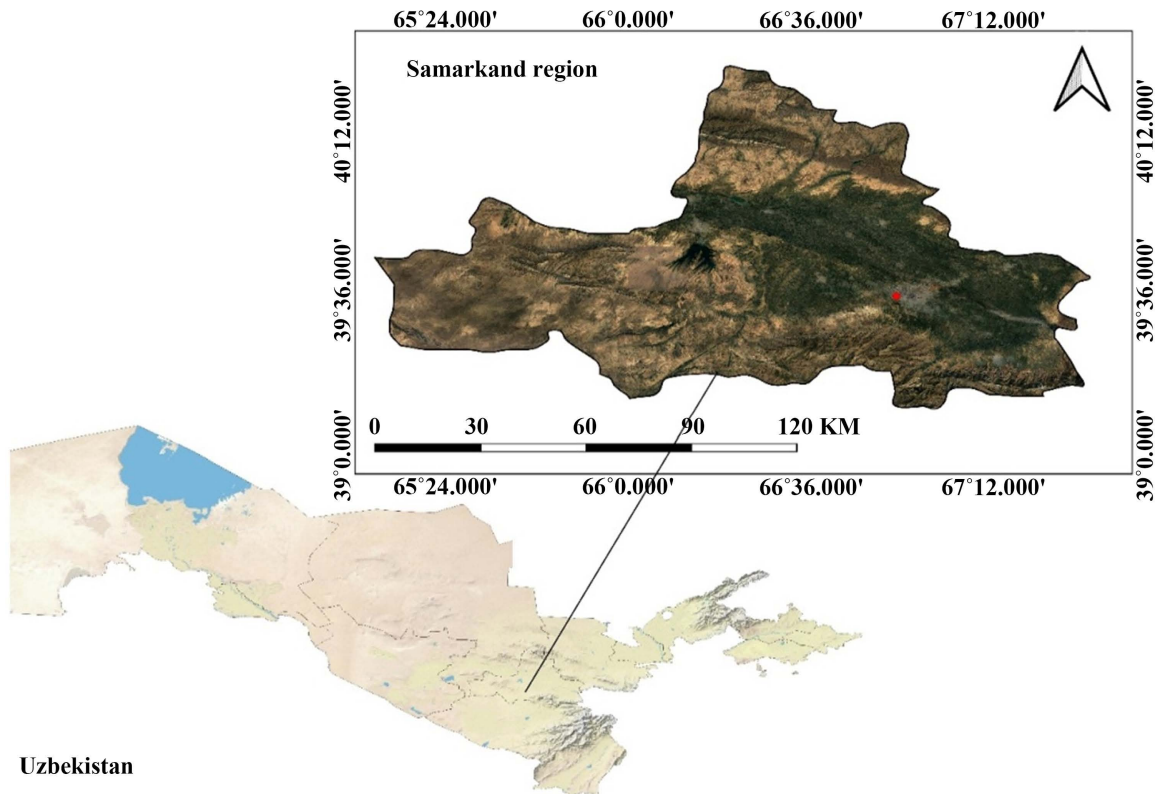


Figure 1. The collecting locality of the *Erysiphe euonymicola* in Uzbekistan.

In addition, the host plant was monitored from March to December 2023.

3. Results and Discussion

As a result of studying *Euonymus japonicum* leaves infected with powdery mildew, a new species for the mycobiota of Uzbekistan, *Erysiphe euonymicola*, was identified.

Erysiphe euonymicola U. Braun, 2012, Taxonomic Manual of the *Erysiphales* (Powder Mildews): 461.

= *Erysiphe euonymi-japonici* U. Braun et S. Takam., 2000, Schlechtendalia 4: 8.

The mycelium of *Erysiphe euonymicola* is formed on the surface of the leaf of the host plant and is a cluster of hyphae that form a dense covering in the form of a round spot. Conidiophores are erect, unbranched, *Pseudoidium* type, very variable in shape and size. Conidiophores consist of 2 - 3 cylindrical cells growing vertically from the hyphae; the sizes of conidiophores are given relative to the average length and width of selected conidiophores (n = 15). According to scanning electron microscopy, ellipsoidal-cylindrical conidia are single, scattered among conidiophores, ranging in size from 23.97 to 24.51×11.5 to $12.47 \mu\text{m}$ (n = 15). Conidial stalk cells are usually straight or slightly curved, ranging in size

from 23.5 to 23.91×7.17 to $7.47 \mu\text{m}$ ($n = 15$). These obtained data were compared with those of H. Chu (2023) and Juanni Yao (2018) and similarities were found (Figure 2).

The teleomorphic stage of this species was not observed in our sample.

Erysiphe euonymicola is a narrow monophagous phytopathogenic organism whose conidial spores are dispersed by wind. This pathogenic fungus initially forms germinal stems and attaches to the epidermis of the leaves of the host plant. Having attached itself to the epidermis of the leaf, it enters a parasitic stage, and absorbs nutrients from the plant cells, as a result of which the host plant forms many hyphae on the surface of the leaf. At the stage of sporulation development, a large number of conidiophores are formed. New conidia are formed from conidiophores [12] [13].

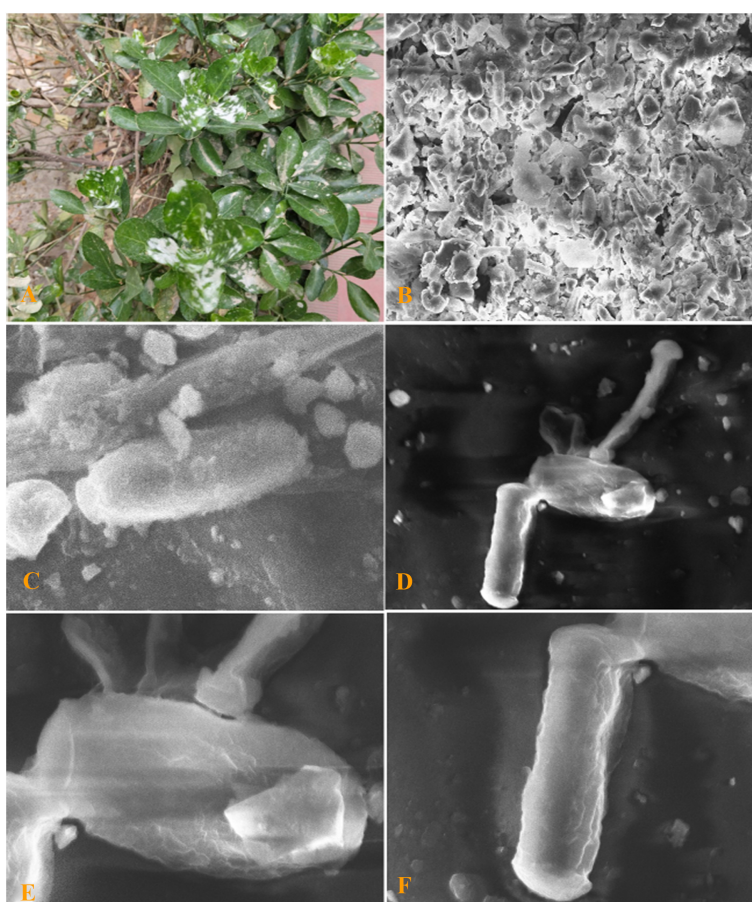


Figure 2. The symptoms and morphological characters of *Erysiphe euonymicola* (NGK 059). (A) Powdery mildew on *Euonymus japonicum*; (B) General view of conidia located on the leaf surface, (C)-(F) conidia, Scale bars: (C) $5 \mu\text{m}$, (D) $10 \mu\text{m}$, (E)-(F) $5 \mu\text{m}$.

Studied samples: Uzbekistan, Samarkand, University Avenue, $39^{\circ}38'43''\text{N}$, $66^{\circ}57'42''\text{E}$, 28 III 2023, Norimova, Umurzakova, NGK 059 (Mycological laboratory of the herbarium-botanical research laboratory).

Erysiphe euonymicola is a phytopathogenic fungus that infects 80% - 90% of

the leaves and young branches of *Euonymus japonicum*. The first symptoms of the disease are round, weeping spots on the leaves; later the spots form white mycelium over the entire surface of the leaves. When the plant is heavily infected, both sides of the leaves are completely covered with mycelium. The fungus *Erysiphe euonymicola*, parasitizing *Euonymus japonicum*, seriously inhibits the development of the host plant.

Erysiphe euonymi DC. parasitizes the species *Euonymus europaeus* L. This species differs from *Erysiphe euonymicola* U. Braun in the elongated shape of conidia, the absence of a conidial stalk and size $((28 - 40) \times (10 - 18) \mu\text{m})$ [14].

Erysiphe euonymicola has been repeatedly found in Europe, Oceania and North America, and has also been recorded in Asia, South America and Africa [15]. The closest records of *Erysiphe euonymicola* were noted in China [12] [16], where it was recorded in the cities of Zhoukou and Shanqiu, Henan Province, an ornamental plant growing region in central China. There is still no information about the occurrence of this species in the Central Asian region, so the discovery in Uzbekistan can be considered the first for the countries of Central Asia.

4. Conclusion

In the course of the research, it was established that the pathogenic fungus *Erysiphe euonymicola*, first registered in the conditions of Uzbekistan, parasitizes the ornamental shrub *Euonymus japonicum*. This identified species is new to the mycobiota of Uzbekistan. As a result of observations, this species is currently only in an anamorphic state, and the teleomorphic stage of the fungal life cycle was not observed during our study. Based on the collected data, *Erysiphe euonymicola*'s teleomorphic stage may soon be discovered in Uzbekistan.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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