

Powdery Mildew Fungi of Dendroflora of Southern Uzbekistan (Surkhandarya Region)

Ilyor Mustafaev, Malika Iminova, Jamila Sherqulova

The Institute of Plant and Animal Gene Pool, Academy of Sciences of Uzbekistan, 232, Bogi Shamol Street, 700053, Tashkent, Uzbekistan

Abstract: The article presents data on Powdery mildew of trees and shrubs of the Surkhandarya region of Uzbekistan. 11 species of Powdery mildew fungi were found on trees and shrubs of this region. They belong to 2 classes (*Leotiomyces*, *Lecanoromycetes*), 2 orders (*Erysiphales*, *Lecanorales*), 2 family (*Erysiphaceae*, *Heterodeaceae*) and 5 genera (*Microsphaera*, *Phyllactinia*, *Sphaerotheca*, *Trichocladia*, *Uncinula*). Two species of Powdery mildew fungi, *Sphaerotheca pannosa* var. *rosae* Woron. on *Rosa ecae* Aitch. and *Trichocladia coluteae* f. *coluteae* Jacz. on *Colutea orbiculata* (Sumnev.) Yakovlev, have been recorded on the territory of Uzbekistan for the first time, and new host plants of these parasite fungi were identified.

Keywords: Powdery mildew, Ascomycetes, chasmothecia, asci, ascospores, mycelium, conidia

1. Introduction

Surkhandarya region is located in the south of Uzbekistan with area is 2 009 900 hectares. The region has a plain part (Amudarya, Surkhandarya and Sherabaddarya river valleys) and a mountain part which includes southern slope of the Hissar ridge, the Baysun mountains, Kuhitang and Babatag ridges (Ergashev, 1974).

Powdery mildew fungi belong to the class of marsupials - Ascomycetes. This is the group of exophytic obligate parasites of the vascular plants. Powdery mildew fungi are widely spread around the world, but they are unevenly allocated. Most of them are distributed in the temperate zone. The season of emerging of fungi is confined to the half of the summer. It is easy to detect them by the white powdery coating on vegetative organs of many cultivated and wild grasses, trees and shrubs (Vasjagina et al. 1961).

The first data on mycobiota of the Surkhandarya region can be found in the work of P.N. Golovin, who mentioned 7 species of imperfect fungi (Golovin 1949).

In 1984-1987, 61 species of Powdery mildew fungi were detected on the vascular plants of Surkhondarya region by Y.S. Solieva, 10 of them were found on trees and shrubs [2].

2. Materials and Methods

Our research is based on herbarium specimens of infected plants collected in 2015 on the territory of Surkhandarya region. Also we have studied herbarium materials from this area stored in TASH. The field work was carried out with the usual method of collection and herbarisation of plants affected by fungi (Pavlova et al. 2014). Determination of fungi was carried out "in vitro" by examination of diseased parts of plants using microscope. Receiving parts of collected specimens were necessary only in certain cases. We removed surface covered with chasmothecia from the plant, placed it into 50% lactic acid solution, warmed up to get in the expanded form all the parts and organs, and then studied the specimen by microscope. For calculating the number of asci in chasmothecia and ascospores in asci, fruit bodies should be slightly pressed with the needle * on the cover glass (Golovin 1949). We used published identification guides and monographs for Powdery mildew fungi identification (Vasjagina et al 1961; Gaponenko et al 1983). Names of fungi species and their systematic position are given according to Mycobank (<http://www.mycobank.org>) and "Dictionary of fungi Ainsworth and Bisby" (Kirk et al, 2008).

3. Results and Discussion

We studied the herbarium materials of trees and shrubs collected from the Surkhandarya region and identified 11 species of Powdery mildew fungi belonging to 2 classes, 2 orders, 2 family and 5 genera (Table 1).

Table 1: Taxonomic analysis of Powdery mildew fungi of the Surkhandarya region of Uzbekistan

Order	Class	Family	Genus	Species
<i>Leotiomyces</i>	<i>Erysiphales</i>	<i>Erysiphaceae</i>	<i>Microsphaera</i>	2
			<i>Phyllactinia</i>	4
			<i>Sphaerotheca</i>	2
			<i>Uncinula</i>	1
<i>Lecanoromycetes</i>	<i>Lecanorales</i>	<i>Heterodeaceae</i>	<i>Trichocladia</i>	2
2	2	2	5	11

Microsphaera Leveille

1. *Microsphaera lonicerae* (DC.) G. Winter, Rabenhorst's Kryptogamen-Flora, Pilze - Ascomyceten 1(2): 36 (1884)

[MB#120808]. Cobweb mycelium, mainly on the upper side of the leaf, blurry or with spots. Conidia are cylindrical or ellipsoidal, single, 30-41x11-14 µm. chasmothecia are scattered or in clusters, dark-brown, 60 -100 µm in diameter,

with polyhedral cells of peridium 8-17 µm in diameter. Appendages are equatorial, groove, 5-22, sometimes bigger, straight, colorless or slightly brown at the base, 80-300 µm long, 3-5 - a multiple dichotomously branched, with spreading not thickened branches, which are curved or straight. Asci 2-7, wide-ellipsoidal or almost spherical, with a mild foot or without, 39-56x28-48 µm. Ascospores 4-6, ellipsoidal, 14-24 x 8-14 µm.

Host plants and their locations. On leaves of *Lonicera nummularifolia* Jaub. Surkhandarya region, Kuhitang ridge, Machaylisoy valley, (alt. 1900 m a.s.l., 09.07.1986), Baysun forestry farm, Machaylisoy valley, (alt. 1600 m a.s.l., 11.08.2015).

2. *Microsphaera berberidis* (DC.) Lév., Ann. Sci. Nat., Bot.: 381 (1851) [MB#162891]. Mycelium cobweb on both sides of the leaf, on the branches and fruits. Conidias are cylindrical, ellipsoidal, 20-28x10-15µm. Chasmothecia are scattered or in small groups of 70-120 µm. Asci numbers 4-12, ovate-oblong, usually on short legs, 22-50x24-40 µm. Ascospores 3-6, ellipsoidal 15-18x9-11 µm.

Host plants and their locations. On the leaves of *Berberis* sp. Surkhandarya region, Mechetly ridge, Zinchob village (alt. 2200 m a.s.l., 20.06. 1987). Baysun forestry, Machaylisay valley, Gurbulak tract, (alt. 1600 m a.s.l., 11.08.2015).

Phyllactinia Leveille

3. *Phyllactinia fraxini* (DC.) Homma, Journal of the Faculty of Agriculture of the Hokkaido Imperial University 38: 409 (1937) [MB#265323]. Mycelium on the underside of the leaf, quickly disappearing. Conidia are clavate. Chasmothecia are scattered on the underside of the leaf, spherical, 204-240 µm in diameter. Appendages are colorless, without partitions, awl-shaped, pointed, length 295-340 µm, at the bottom of the inflated globular. Asci are numerous, widely ovate-ellipsoid, 77-88x32-41 µm. Ascospores 3, ovate, 28-35 x 19-22 µm.

Host plants and their locations. On the leaves of *Fraxinus sogdiana* Surkhandarya region, Baysun forestry, Machayli valley (alt. 1400 m a.s.l., 11.08.2015).

Note. It should be noted that the parasite strongly affects plants especially young.

4. *Phyllactinia suffulta f. moricola* Jacz., Karmannyi opredelitel' gribov. II. Muchnisto-rosjanye griby: 434 (1927) [MB#279485]. Mycelium on the underside of leaves, disappearing. Chasmothecia are on the underside of leaves, scattered, 177,1x209 µm. Appendages located equatorially, without walls, pointed at the end, at the base of globular-inflated. Asci are numerous, widely-ellipsoidal. Ascospores ovate, 2 in the asci.

Host plants and their locations. On leaves of *Morus alba* L. Surkhandarya region, Zharkurgan district, Zharkurgan city, (alt. 550-600 m a.s.l., 27.10.1985).

5. *Phyllactinia suffulta f. pistaciae* Jacz., Karmannyi opredelitel' gribov. II. Muchnisto-rosjanye griby: 425 (1927)

[MB#279492]. Mycelium on the underside of leaves, disappearing. Conidia are colorless, widely-clavate, 65.1-71.3-71.3x15.5-18.6 µm. Chasmothecia are scattered or in separate groups, 226- 249,6 µm in diameter. Appendages located equatorially, swollen spherically at the base, without walls, pointed at the end, 160-380 µm in length. Asci numerous, oblong-ellipsoid, 71,3-80,8 x 24,8 - 34,1 µm. Number of ascospores 2, ellipsoidal.

Host plants and their locations. On the leaf of *Pistacia vera* L. Surkhandarya region, Kugitang ridge, 12.06.1985.

6. *Phyllactinia suffulta f. populi* Jacz., Karmannyi opredelitel' gribov. II. Muchnisto-rosjanye griby: 439 (1927) [MB#279493]. Disappearing mycelium on both sides of the leaf. Conidia broadly-clavate, 65,5-72x17-22 µm. Chasmothecia scattered on both sides, more on the lower side, 178-249 µm in diameter. Asci are numerous, saccular, 69-87x30-34,5 µm on the foot. Ascospores number 2, ellipsoidal, 34,5-41x19-25 µm.

Host plants and their locations. On the leaves of *Populus afganica* (Aitch.et Hemsl.) Schneid. Surhandarya region, Machay village, Kugitang ridge, (alt. 1400 m a.s.l., 11.08.2015).

Note. On the territory of Surkhandarya region, *Phyllactinia suffulta f. populi* was detected on the *Populus afganica* for the first time.

Sphaerotheca Leveille

7. *Sphaerotheca pannosa var. rosae* Woron.: 450 (1914) [MB#138397] (Fig. 2). The mycelium is abundant, initially white, cobweb, and then sealing up of felt or membranous, becoming gray or brown. Chasmothecia are in mycelium plexus, dark brown, 76,8-89,6 µm in diameter. Asci are ellipsoidal, 20-3-30x12-17,5 µm.

Host plants and their locations. On the leaves, fruits and branches of *Rosa maracandica* Bunge and *Rosa ecae* Aitch. Surhandarya, Sherobad district, village Kampirtepa (height 600 – 700 m a.s.l., 10.07.1987 city), Baysun district, Machaylisay valley (height 1400 – 2000 m a.s.l., 11.08.2015).

Note. This species was found for the first time on *Rosa ecae* in Uzbekistan, which marked as a new host plant.



Figure 2: *Sphaerotheca pannosa f. rosae* on *Rosa ecae*

8. *Sphaerotheca pannosa var. persicae* Woron., Trudy Byuro po Prikladnoj Botanik 7 (7): 749 (1914)

[MB#137769]. Mycelium first cobweb, and then sealing up the felt. Conidia is barrel-shaped 16-25 µm. Chasmothecia spherical 64-78 µm. Asci are ellipsoidal, 75-100 x 55-75 µm. Ascospores are 8 in the asci, ellipsoidal, 21-24 x 11-18 µm.

Host plants and their locations. On the leaves and sprigs of *Amygdalus busharica* Korsh. Surkhandarya region, Sherabad district, Kugitang ridge, Kampyr-Tepa village, (alt. 800 - 900 m asl, 07.04.1986; alt. 1600 m a.s.l., 11.08.2015). Baysun district, Baysun forestry farm, Omonhona resort (alt. 1300 -1600 m a.s.l., 13.08.2015).

Trichocladia Neger

9. *Trichocladia atraphaxidis* Golovin (1950) [MB#286369]. White mycelium is abundant, covering both sides of the leaf in some areas is roughly cobweb. Conidia are elongate-ellipsoidal, 29-44x7-21 µm. Chasmothecia are spherical, dark brown, numerous, 108-166,5 µm in diameter. Asci numbers 8-10, ellipsoidal or almost spherical, on the feet, 55,5-87x29-41 µm. Ascospores 3-4 in the asci, ellipsoidal, 20,5-29x12-14,8 µm.

Host plants and their locations. On the leaves of *Atraphaxis* sp. Surkhandarya region, Mechitli ridge, Zavareh village (alt. 1500 m a.s.l., 22.06.1987). On the leaves of *Atraphaxis pyrifolia* Bunge., Baysun forestry farm, Machaylisay valley (alt. 1600 m a.s.l., 11.08.2015).

10. *Trichocladia coluteae f. coluteae*, Karmannyi opredelitel' gribov. II. Muchnisto-rosjanye griby: 310 (1927) [MB#505400] ((Figure 4). Mycelium is bright yellow, flocculent. Conidia is cylindrical, 30-49x11-16,5 µm. Chasmothecia are 100-170 µm in diameter, with long, flexible, simple or weakly branched appendages. Bags in Chasmothecia are about 6-23, ovate, 52-65x30-35 µm. Spores ellipsoidal, 4-5 in the asci.

Host plants and their locations. On both sides of leaf of *Colutea orbiculata* (Sumnev) Yakovlev, Baysun forestry farm, the Etimtag tract, (alt. 1500 m, a.s.l., 11.08.2015) (Fig. 4).

Note. *Trichocladia coluteae f. coluteae* was firstly recorded on the territory of Surkhandarya region, and the defeat of *Colutea orbiculata* by this parasite species was detected for the first time in Uzbekistan.



Figure 4: *Trichocladia coluteae f. coluteae* on *Colutea orbiculata*

Uncinula Leveille

11. *Uncinula aceris* (DC.) Sacc., Sylloge Fungorum 1: 8 (1882) [MB#157622]. Mycelium is cobweb disappearing. Conidia ellipsoidal, 23-30x10-16 µm. Chasmothecia are scattered on the underside of leaves, spherical. Asci numbers 5-12, ovate. Ascospores in the asci is 8, ellipsoidal, 17.5 - 28.5 x 12.2 µm.

Host plants and their locations. On leaves of *Acer turkestanicum* Pax. The southern slope of the Hissar ridge, the middle mountain belt (alt. 1700 m a.s.l., 14.06.1987).

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