

***Plasmopara orientalis* sp. nov.**  
**(Chromista, Peronosporales)**

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*Plasmopara orientalis* sp. nov., parasitic on *Schizopepon* spp., and occasionally on *Echinocystis lobata* is described and illustrated from specimens originating from Far East Russia, China and Japan. This fungus was previously confused with *Plasmopara australis*, a species restricted to Argentina and N. America. The phenetic characters, host range, and distribution areas of these two fungi are compared.

Keywords: Peronosporales, *Plasmopara*, *Plasmopara australis*, Cucurbitaceae, *Schizopepon*.

Specimens of *Schizopepon bryoniaefolius* Maxim. (Cucurbitaceae), parasitized by a *Plasmopara* species were collected by V. L. Komarov in Far Eastern Russia. These specimens were distributed in Jaczewski, Komarov and Tranzschel, *Fungi Rossiae exsiccati*, fasc. 6, no 252, as *Plasmopara australis* (Speg.) Swingle. On the label of the exsiccata, Jaczewski emphasised the identity of the distributed fungus with *Pl. australis*, a species at that time only known from Argentina and N. America. In addition, he commented upon the distinction between *Pl. australis* and another parasite of the Cucurbitaceae, *Pseudoperonospora (Peronospora) cubensis* (Berk. & M. A. Curtis) Rostovzev. Jaczewski (1900) further elaborated on these matters. The distribution of *Pl. australis* in the exsiccata constituted the first report of this species on a new host genus, *Schizopepon*, and also the first account of its occurrence outside its known distribution area.

During the examination of specimens for a monographic study of *Plasmopara*, the collection studied by Jaczewski, as well as several other herbarium samples of *Plasmopara* parasitic on *Schizopepon* spp., became available. *Plasmopara* on *Schizopepon* turned out to be a new species that is described below.

Herbarium abbreviations follow Holmgren & al. (1990).

***Plasmopara orientalis* Constant. sp. nov. – Figs 3–7, 9, 14–20.**

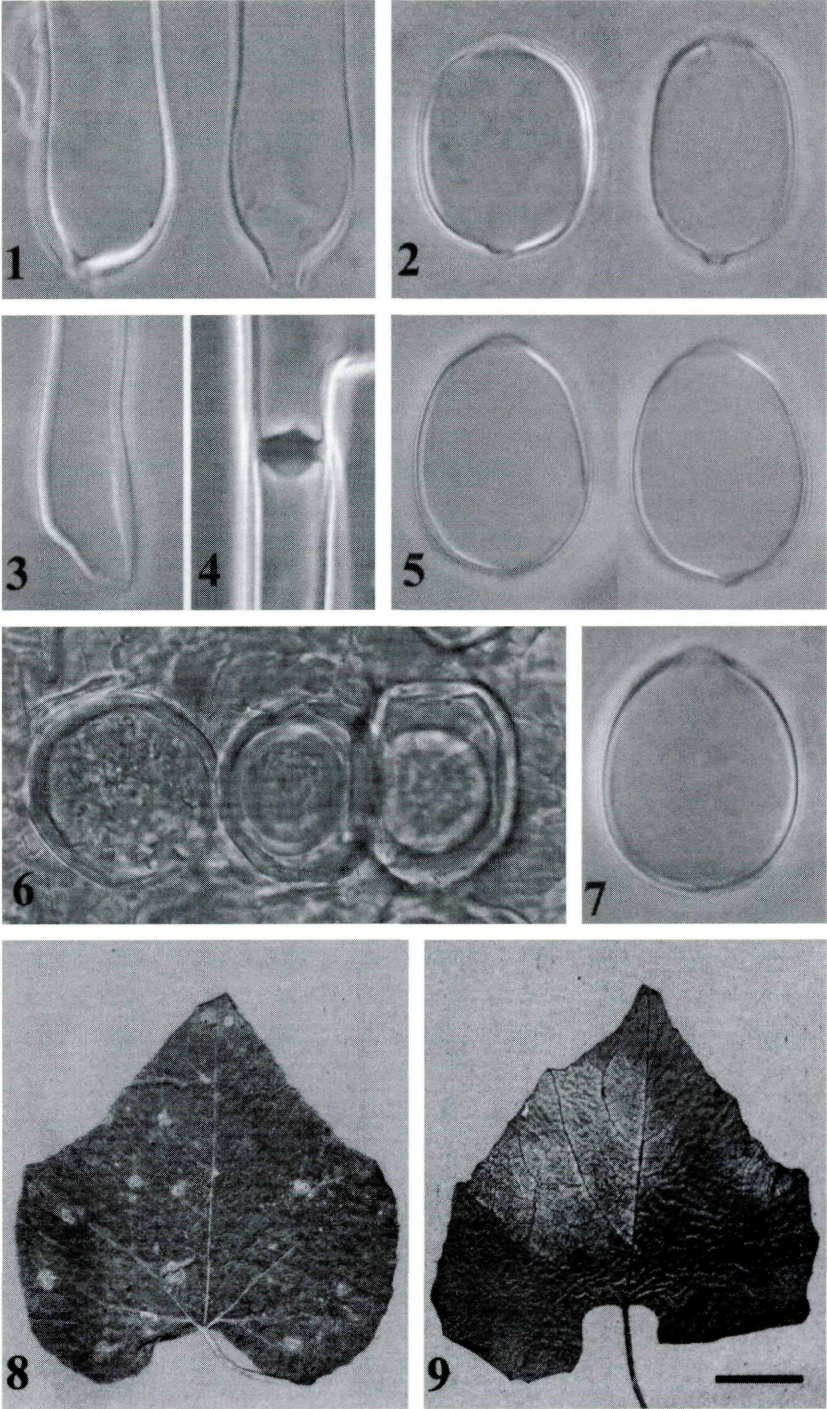
*Plasmopara australis* primo aspectu maxime simile, sed sporangiis ovoideis, trunco angustiore, ramis angulis parvioribus insertis et sporis quiescentibus praesentibus.

**Type.** – On *Schizopepon bryoniaefolius* Maxim. RUSSIA: Far East, near Poltavsk, on the river Suifun, 27.6.1896, coll. V. L. Komarov, det. A. Jaczewski, in Jaczewski, Komarov & Tranzschel, *Fungi rossiae exsiccati*, fasc.6, no 252 [LE 183217 – holotype, BPI, HGB (two specimens), S, UPS – isotypes. According to V. Mel'nik (*in litt.*), additional isotypes are present at LE 183212–183216, 183218–183224, and LEP].

Produces slight discoloration of tissues to clearly defined epiphyllous spots on leaves. – Spots pale yellowish, polyangular, 10–15 mm diam, vein-limited, up to 40 mm when coalescent; attacked tissues become necrotic. – Down hypophyllous, white, lanose to felt-like. – *Haustoria* vesicular, 7–9  $\mu\text{m}$  diam. – *Sporangiophores* slender, straight (but often the upper, branched part having a slightly wavy appearance), 300–810  $\mu\text{m}$  long; basal end not differentiated to slightly bulbous, up to 15  $\mu\text{m}$  wide; trunk 160–700  $\mu\text{m}$  long, of more or less uniform width, 6–12  $\mu\text{m}$  wide at the base, 7–11  $\mu\text{m}$  wide below the first branch; callose plugs frequently present. – Branches showing an elaborate, arborescent structure, at least some terminating in a subulate tip; branching monopodial, of two to three orders; primary-order branches alternate, arising at c. 65–75(–85) angle to the main axis, 50–250  $\mu\text{m}$  long, more or less uniform in width, not constricted to slightly constricted at the base, callose plugs frequently present; secondary-order branches alternate to opposite, 30–50  $\mu\text{m}$  long, more or less uniform in width, at the base not constricted. – Ultimate branchlets 3–5 at the end of each branch, common base not inflated (rarely slightly swollen), often differentiated into an axial (usually longer) and abaxial ones, long-conical to almost cylindrical, of variable length, 11–15  $\mu\text{m}$  when axial, 5–11  $\mu\text{m}$  when abaxial, 2–3  $\mu\text{m}$  wide at the base, 1–1.5  $\mu\text{m}$  wide just below the tip, tip swollen up to 1.5–2  $\mu\text{m}$  diam (but often collapsed and having a cup-like appearance). – *Sporangia* ovoidal (rarely broadly ellipsoidal), 14–19.5(–25)  $\mu\text{m}$  long, (12)–12.5–16(–20)  $\mu\text{m}$

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Figs. 1–9. 1, 2, 8. *Plasmopara australis*. – 1. Trunk base. – 2. Sporangia. – 8. Leaf of *Sicyos angulatus* showing the fungus. – 3–7, 9. *Plasmopara orientalis*. 3. Trunk base. – 4. Callose plug along the trunk. – 5, 7. Sporangia. – 6. Empty oogonium (extreme left), and oogonia containing oospores. – 9. Leaf of *Schizopepon bryoniaefolius* showing the fungus. – Figs. 1, 2. Holotype. Figs. 3–6. Isotypes. Fig. 7. VLA (on *Echinocystis lobata*). Fig. 8. *Fungi columbiani* No. 2256, HGB. Fig. 9. Holotype. – Scale bar: Figs. 1, 6 = 15  $\mu\text{m}$ ; 2–5, 7 = 10  $\mu\text{m}$ ; 8, 9 = 13 mm.



wide, l/w ratio (1.07–)1.12–1.22(–1.31),  $n = 40$ , greatest width submedian (very rarely median), base and tip round; wall c.  $0.4 \mu\text{m}$  thick; pore (2.5–)3(–5)  $\mu\text{m}$  diam, covered by an outwardly convex, c. 1(–1.5)  $\mu\text{m}$  thick plug; pedicel absent, only a flat scar visible. – Resting organs in leaves; oogonia irregular (often mutually compressed), brownish, 30–60  $\mu\text{m}$  diam., with wrinkled, 2–3  $\mu\text{m}$  thick wall; oospore aplerotic (rarely plerotic), yellowish, globose to irregular by mutual pressure, 24–42  $\mu\text{m}$  diam, with smooth, (4–)6  $\mu\text{m}$  thick wall.

Typical host. – *Schizopepon bryoniaefolius* Maxim. Occasional hosts. – *Schizopepon dioicus* Cogn., *Echinocystis lobata* (Michx.) T. & G.

Distribution. – Far East of Russia, China and Japan.

Records of occurrence. – Russia (Jaczewski, 1901; Jaczewski & Jaczewski, 1931; Nelen & Ablakatova, 1974; Novotel'nova & Pystina, 1985; Bunkina, 1986), China (Tao & Qin Yun, 1987; Tao, 1998), and Japan (Ito, 1936; Hara, 1954). The records of occurrence were under *Plasmopara australis*, except for Bunkina (1986) who identified the fungus as '*Peronoplasmopara cubensis*'.

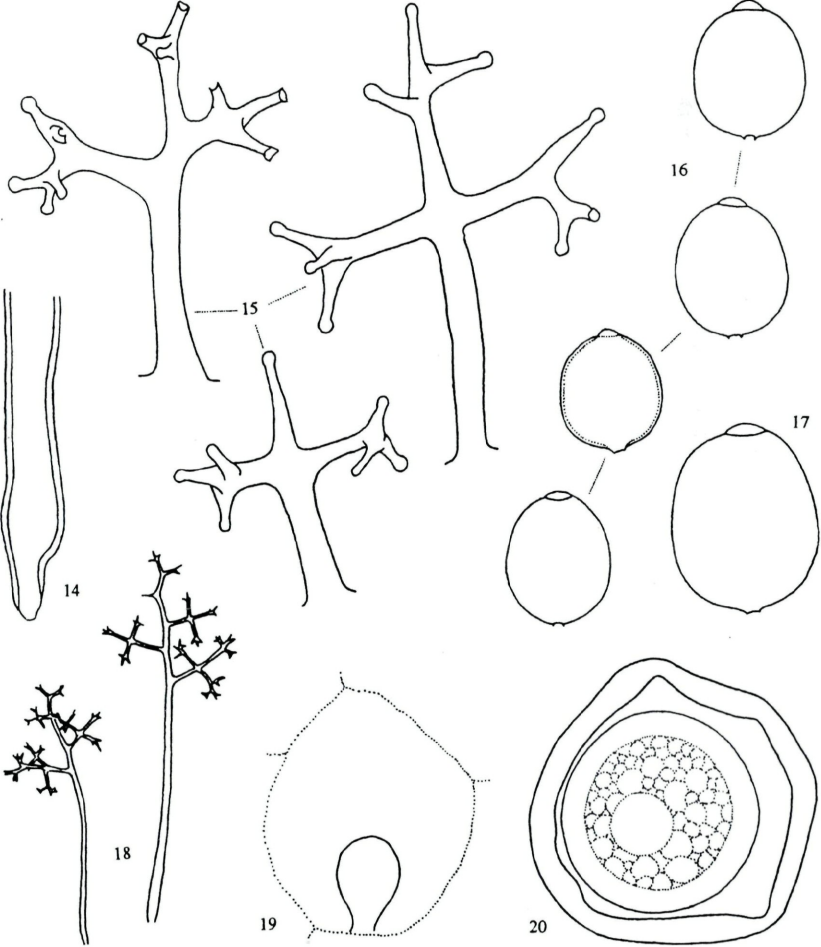
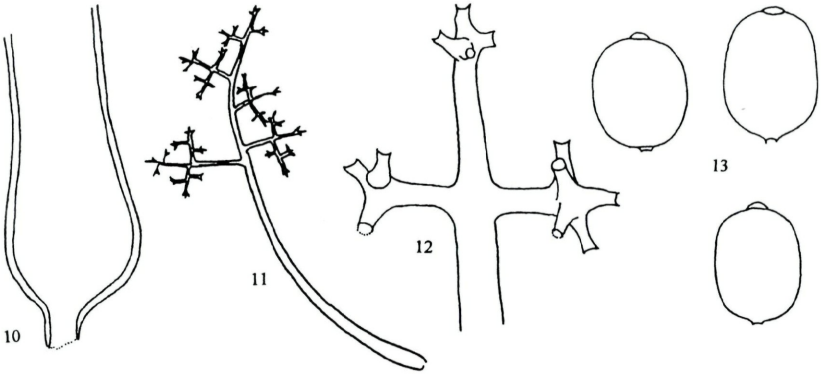
Additional specimens examined. – On *Echinocystis lobata*. RUS-SIA: Primorye Territory, the power station Sirenewka, 26.7.1982, Coll. I.A. Bunkina, det. O. Constantinescu (VLA). – On *Schizopepon bryoniaefolius*. RUSSIA: Sakhalin Island, Novo-Alexandroskoe, 26.7.1960, E. S. Nelen (VLA). – JAPAN: Oshima Prov., Yego, Shiriuchi Mt, 17.7.1890, K. Miyabe (WSP 36914); Sapporo, Yezo, 29.7.1891, coll. K. Miyabe, det. J. A. Stevenson (BPI 187424); Ishikari Prov., Sorachigun, Otoibokke, 9.8.1891, K. Miyabe (NY). – On *Schizopepon dioicus*. CHINA: Sichuan Prov., Emeishan, 25.5.1979, coll. Shen Yin-shang et al. 1354, det. Tao Jia-feng (HMAS 52305).

*Plasmopara orientalis* is phenetically close to *Pl. australis*, but these fungi can nevertheless be distinguished (Tab. 1, Figs 1–20).

*Plasmopara orientalis* was confused with *Pl. australis*, parasitic on related hosts in North America. Although these fungi occasionally share a common host, *Echinocystis lobata*, they are not sympatric. *Echinocystis lobata*, a North American plant, is parasitized by *Pl. australis* in U.S.A., although to a lesser extent than *Sycios angulatus*

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Figs. 10–20. 10–13. *Plasmopara australis*. – 10. Trunk base. – 11. Sporangiphore habit. – 12. Ultimate branchlets. – 13. Sporangia. 14–20. *Plasmopara orientalis*. – 14. Trunk base. – 15. Ultimate branchlets. – 16, 17. Sporangia. – 18. Sporangiphores habit. – 19. Host cell with haustorium. – 20. Oogonium and oospore. – Figs 10, 11, 13. Holotype. Fig. 12. FH (holotype of *Peronospora sycicola*). Figs. 14–16, 18–20. Isotypes. Fig. 17. VLA (on *Echinocystis lobata*). Scale bar: Figs. 10, 12–17, 19, 20 = 10  $\mu\text{m}$ ; 11, 18 = 60  $\mu\text{m}$ .



Tab. 1. – Distinctive characters of *Plasmopara australis* and *Pl. orientalis*.

	<i>Plasmopara australis</i>	<i>Plasmopara orientalis</i>
Trunk diameter	Mostly 10–15 µm	Mostly 8–10 µm
Insertion angle of the first-grade branches	Mostly at ca. 90°	Mostly at <80°
Shape and size of the ultimate branchlets	Mostly short-cylindrical, tip ca. 2 µm wide	Mostly long-conical, tip ca. 1.5 µm wide
Shape of sporangia	Broadly oblong to oblong	Ovoidal
Resting organs presence	Unknown	Oogonia and oospores present
Typical hosts	<i>Echinocystis</i> , <i>Sicyos</i>	<i>Schizopepon</i>
Occasional hosts	<i>Cyclanthera</i>	<i>Echinocystis</i>
Distribution	Argentina, USA, Canada	Far East Russia, China, Japan

L., the most common host of this fungus (Selby, 1899). The only specimen of *E. lobata* attacked by *Plasmopara*, collected outside N. America and examined during this study, harbours *Pl. orientalis*. This specimen was collected in Far East Russia where the host is introduced (Vasil'chenko, 1957).

In experimental tests carried out in the U.S.A., *Echinocystis lobata* showed resistance towards another peronosporaceous fungus, *Pseudoperonospora cubensis* (Doran, 1932). Nevertheless, *E. lobata*, which is naturalised in Central and South East Europe (Tutin, 1968), was found in Romania parasitized by *Ps. cubensis* (BUCM 122044, 125569 and 135966), a widespread parasite of the cucurbitaceous crops in this country (Săvulescu & Săvulescu, 1964; Constantinescu & Negrean, 1983).

These are additional examples of a host growing outside its natural area of distribution and becoming susceptible to 'local' fungi.

The symptoms produced by *Pl. orientalis* on *Echinocystis lobata* are different from those induced on its ordinary host, *Schizopepon* sp., but similar to those induced by *Pl. australis* on *E. lobata* (Figs. 8, 9). This suggests that the characteristics of the symptoms depend on the host and not on the fungus. This host-symptom relation was demonstrated experimentally by Ball (1983), in the case of another chromistan fungus, *Sclerospora graminicola* (Sacc.) J. Schröter.

Jaczewski (1900) claimed that, in spite of repeated attempts, he did not find resting organs in the examined specimens collected from Far East Russia or from North America. His claim is accurate as concern the specimens originating from North America, on which *Pl. australis* is present. However, I found resting organs on *Schizopepon* in all examined duplicates from Fungi Rossiae exsiccati no. 252, as well as in the specimens at VLA, and HMAS 52305.

## Host affinity

With the exception of a single specimen of *Echinocystis lobata* (see note above), *Plasmopara orientalis* was only found on two species of the cucurbitaceous genus *Schizopepon* Maxim. *Schizopepon* was considered a member of the tribe Sicyoëae Schrad. (Jeffrey, 1962) but, as a result of the study of the pollen morphology, the distinct, unigeneric tribe Schizopeponeae was erected (Jeffrey, 1964). Further studies confirmed the uniqueness of this tribe (Lu & Zhang, 1985), and Schizopeponeae is accepted in the most recent classification of the Cucurbitaceae (Jeffrey, 1990). *Schizopepon* has its origin in eastern Asia (Lu & Zhang, 1985; Jeffrey, 1990), and it seems most likely that *Pl. orientalis* originates from the same area. Besides *Pl. orientalis*, two other species of Peronosporales are parasitic on members of the subfamily Cucurbitoiideae of the Cucurbitaceae family: *Pl. australis* and *Pseudoperonospora cubensis*. These three fungi differ not only phenotypically, but also in their host range. Thus, *Pl. orientalis* is parasitic on representatives of the tribe Schizopeponeae, *Pl. australis* on members of the tribe Sicyoëae, whereas the host plants of *Pseudoperonospora cubensis* belong to the tribes Melothrieae Endl., Joliffieae Schrad., Benicaseae Ser., and Cucumerinae Pax. The host preference of *Pl. orientalis* endorses the separation of the tribe Schizopeponeae by Jeffrey (1964).

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