

## *Paraperonospora apiculata* sp. nov.

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*Paraperonospora apiculata* sp. nov., parasitic on *Galatella* (Asteraceae) collected from Kazakhstan, is described and illustrated. A key for the identification of *Paraperonospora* species is provided.

Keywords: *Galatella*, Oomycota, Peronosporales.

During the examination of herbarium specimens of *Plasmopara* preserved in Herb. LEP, a specimen labelled *Plasmopara halstedii* (Farlow) Berl. & De Toni parasitic on *Galatella punctata* (Wald. & Kit.) Nees was discovered. This specimen turned out to be an undescribed species of the genus *Paraperonospora* Constant., which is described here.

*Paraperonospora apiculata* Constant., sp. nov. – Figs 1–4.

Species sporis ovoideis, longioribus (>40 µm), apice elongato et apiculato, a congeneribus diversa.

**E t y m o l o g y .** – In reference to the apiculate tip of the conidia.

The attacked leaves are slightly paler than the healthy ones. – Down hypophyllous, greyish, rather scarce, consisting of scattered conidiophores. – Conidiophores colourless, stout, straight, 240–360 µm long; basal vesicle bulbous, up to 20 µm wide, rarely not differentiated; trunk 140–230 µm long, gradually broadening upwards, rarely of more or less uniform width, 6–13 wide at the base, 13–22 µm wide below the first branch; callose plugs absent; upper part of the conidiophore dichotomous, trichotomous or irregularly branched in two or three stages; primary branches 33–80 µm long, secondary branches 30–55 µm long, both distally broadened, more or less constricted at the base and lacking callose plugs; conidium bearing branchlets 2–4 at the end of each branch, arising from a slightly swollen base, long-conical, 10–18 µm long, 3–5 wide at the base, 1–2 µm wide just below the round, sometimes slightly inflated tip. –

Spores colourless, ovoid to ellipsoidal, (38-)45.4±2.93(-51) µm long, (21-)25.4±2.11(-30) µm wide, length/width ratio (1.52-)1.8±0.13(-2.08) (n = 57), broadest part sub-median in almost all conidia, base round, tip elongate to apiculate, very rarely rounded, wall ca 0.5 µm thick; pedicel cylindrical to short-conical, 1.5-3 µm long. - Oogonia globose to irregular, brownish, (37-)45(-55) µm diam, with smooth, 1.5 µm thick wall. - Oospores plerotic or aperotic, yellowish, globose, 30-35 µm diam, with smooth, 4-5 µm thick wall.

Holotype. - on *Galatella punctata* (Wald. & Kit.) Nees, Kazakhstan, Tselinograd Prov., Tselinograd Distr., on the valley of the river Kon, 17 June 1914, coll. S.S. Ganeshin, det. O. Constantinescu (LEP).

There are eight known species of *Paraperonospora* (Constantinescu, 1989). *P. apiculata* can easily be distinguished from the described species by its ovoid, much longer conidia (mostly over 40 µm long), with elongate and apiculate tips. The conidia are somewhat reminiscent of those of *P. sulphurea* (Gäum.) Constant., but in the latter they are much shorter (mostly 32-37 µm long) and yellowish. The conidia of *P. apiculata* show no vestigial dehiscence apparatus, as described in *P. chrysanthemi-coronarii* (Sawada) Constant. and *P. leptosperma* (de Bary) Constant. (Constantinescu, 1989), and at germination they produce a germ tube (Fig. 2).

**Key to species of *Paraperonospora***  
[partially based on Constantinescu (1989)]

- 1 Tip of ultimate branchlets swollen to 3-4 µm ..... 2
- 1 Tip of ultimate branchlets blunt, rounded or only slightly enlarged ..... 4
- 2 Conidia greyish brown ..... *P. artemisiae-annuae*
- 2 Conidia colourless or yellowish ..... 3
- 3 Most conidia 35-40 µm long ..... *P. chrysanthemi-coronarii*
- 3 Most conidia less than 35 µm long ..... *P. multiformis*
- 4 Tip of conidia elongate or apiculate ..... 5
- 4 Tip of conidia round or slightly flattened ..... 6
- 5 Most conidia 32-37 µm long ..... *P. sulphurea*
- 5 Most conidia 42-48 µm long ..... *P. apiculata*
- 6 Broadest part of conidia suprmedian ..... *P. tanacetii*
- 6 Broadest part of conidia median ..... 7

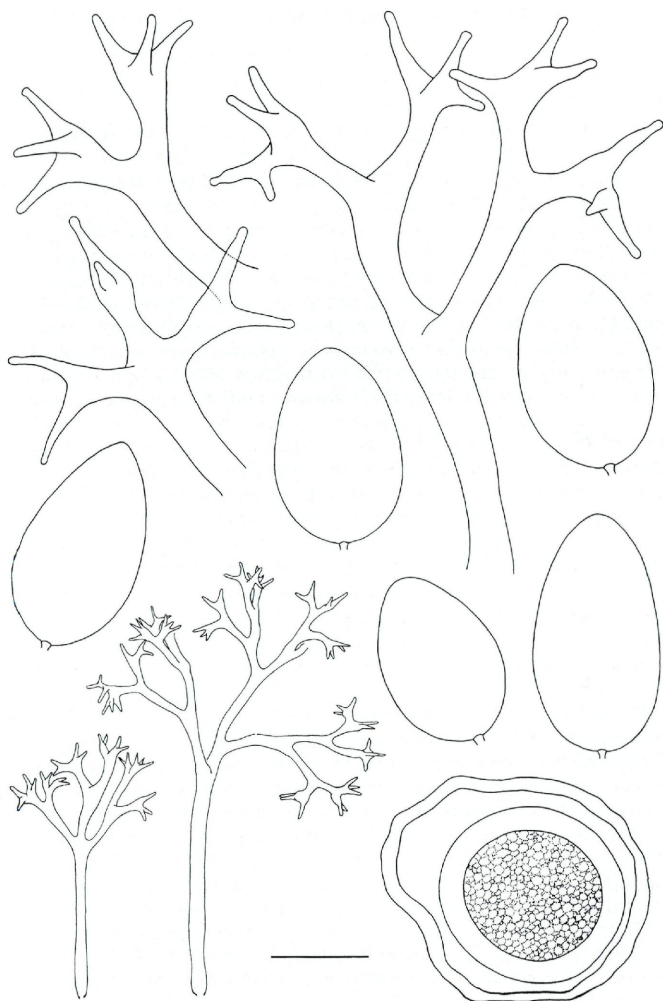
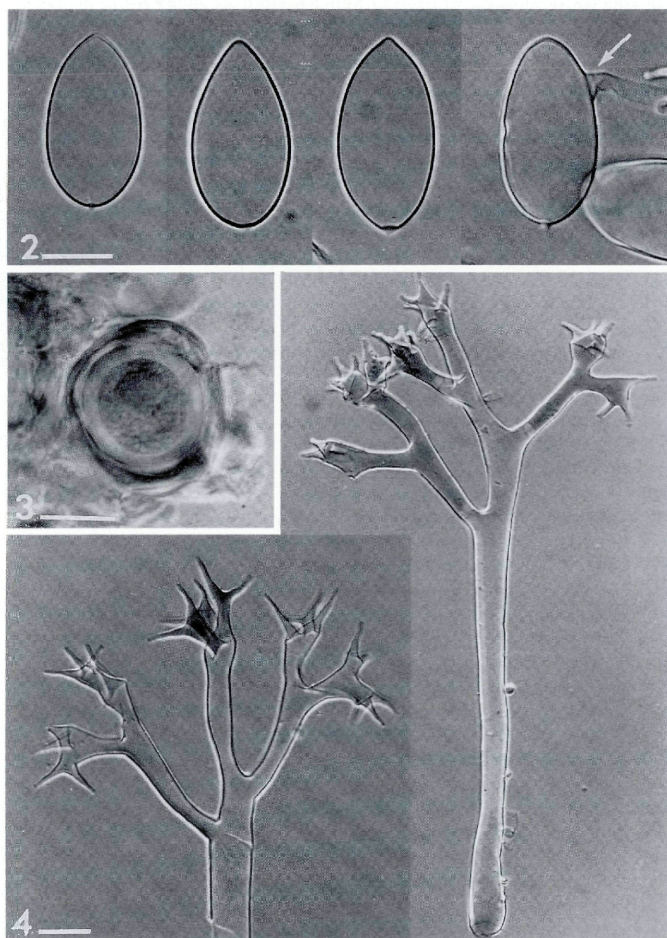


Fig. 1. - *Paraperonospora apiculata* from the holotype. - Bar = 80  $\mu\text{m}$  for conidiophores, and 20  $\mu\text{m}$  for conidia, ultimate branchlets, and oogonium with oospore.

- 7 Most conidia 35–45 µm long, l/b ratio ca. 2 ..... *P. artemisiae-biennis*  
 7 Conidia shorter, l/b ratio <2 ..... 8
- 8 Conidia mostly 25–30 µm long ..... *P. minor*  
 8 Conidia mostly 30–40 µm long ..... *P. leptosperma*

A downy mildew of *Galatella dahurica* DC from Kirgizstan was described under *Peronospora pospelovii* Gaponenko (1972). The conidia were described as brownish and 15.9–31.9 x 14.5–21.7 µm in size. Gaponenko stated that in the type collection only conidia were present. Consequently, his description was completed from collector's (A. G. Pospelov) notes attached to the specimen, where the size of the conidia was given as 32–48 x 16–25.6 µm. Only Novotol'nova & Pystina (1985) mentioned *Peronospora pospelovii* afterwards, giving a different size of the conidia [15.9–32(–48) x 14.5–25.6 µm], which is actually a combination of Pospelov and Gaponenko's figures. Constantinescu (1989), having no access to the type specimen, considered the presence of a *Peronospora* on a member of the tribe Astereae as improbable. When the type later became available, it proved to contain only *Aspergillus* (Constantinescu, 1991). It is most likely that the conidia described by Pospelov in his notes were actually belonging to *Paraperonospora apiculata*, but that subsequent investigations of the specimen caused the loss of sporulating structures, a rather common hazard in specimens of downy mildews.

Species of *Paraperonospora* are typically parasitic on hosts belonging to the tribe Anthemideae of the Asteraceae family (Constantinescu, 1989). The known exceptions are *P. leptosperma* (De Bary) Constant., on cultivated *Dimorphotheca aurantiaca* DC (tribe Calenduleae), and *P. sulphurea* (Gäum.) Constant., on *Helichrysum bracteatum* (Went.) Andrews and on *H. orientale* (L.) Gaertner (tribe Gnaphalieae). These exceptions are most probably due to accidental infections. The presence of *Paraperonospora* on *Galatella punctata* (tribe Astereae) appears thus rather uncommon. Unfortunately, like in most of the specimens of plant parasitic fungi, the identity of the host is difficult to endorse in the absence of flowers. The host is undoubtedly an asteraceous plant. The comparison of the leaves (including sections) to those from herbarium specimens confirms its affinity to *Galatella*. *Galatella punctata* is either treated as synonym of *Aster sedifolius* L. (Nyárády, 1965; Merxmüller & al., 1976) or considered a separate taxon (Tsvelev, 1959). Even the delimitation between the genera *Galatella* and *Aster*, particularly in Euroasiatic taxa, is difficult (Tsvelev, 1959; Tamamshyan, 1959). In the most recent treatment of the Asteraceae (Bremer, 1994), however, *Galatella* is retained as a distinct genus.



Figs. 2-4. - *Paraperonospora apiculata* from the holotype. - 2. Conidia; arrow shows a germ tube. - 3. Oogonium with oospore. - 4. Conidiophores Bars = 20  $\mu$ m.



Another species of *Galatella*, *G. fastigiiformis* Novopokr., as well as species belonging to related genera, such as *Aster altaicus* Willd., *Aster alpinus* L. and *Heteropappus canescens* (Nees) Novopokr., are parasitized by *Plasmopara asterea* Novot. (unpubl. data). It is likely that species parasitized by *Paraperonospora* belong to *Galatella* s.str., whereas species parasitized by *Plasmopara asterea* may be better placed in *Aster*. This fungus-host relationship, however, should be backed by more collections and better identified hosts. My attempts to find this fungus in the collections of *Aster* and *Galatella* at S and UPS herbaria were fruitless.

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