

U.S. Department of Agriculture, Agricultural Research Service

Systematic Mycology and Microbiology Laboratory - Nomenclature Fact Sheets

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Confirmation of the Priority of the Epithet *infestans* for *Phytophthora infestans*, Cause of Late Blight of Potato and Tomato

The original name applied to this oomycete was *Gangraena tuberosum solani*, by Martius in 1842. Martius did not provide a description, therefore this cannot be regarded as a valid name. After a period of debate over whether this was the cause of the potato blight (see Erwin & Ribeiro 1996), Montagne published a description in 1845 under the name *Botrytis infestans*. It has received much renown as the cause of the great Irish potato famine of the 1840s.

In 1854 Caspary made the transfer to the genus *Peronospora*, publishing the new combination *Peronospora infestans* (Mont.) Casp. 1854 in Rabenhorst's Herbarium vivum Mycologicum exsiccati # 1879, citing *Botrytis infestans* Mont. as the basionym. This name is sometimes erroneously cited as *Peronospora infestans* (Mont.) de Bary 1863, overlooking the fact that Caspary had published the combination previously. In 1876, de Bary used it as the type species for his new genus *Phytophthora*, making the combination *Phytophthora infestans* (Mont.) de Bary 1876, which is the currently accepted name.

In 1936, Puttemans questioned the priority of the epithet *infestans*, arguing that the name *Botrytis vastatrix* Lib., published 19 Aug. 1845 (with alternate spelling *devastatrix*), had priority over *Botrytis infestans*, published 30 Aug. 1845. He accordingly published the new combination *Phytophthora devastatrix* (Lib.) Puttemans 1936, citing *Botrytis devastatrix* Lib. as basionym and *Phytophthora infestans* as a synonym.

The name *Phytophthora devastatrix* was reported in Saccardo's *Sylloge Fungorum* (1972, XXVI, p. 26), but has not otherwise been widely adopted. Waterhouse (1970) argued that the name *Phytophthora infestans* should be retained and that *Botrytis vastatrix* was an invalid name because it was published in a newspaper, but this is, in fact, permitted by the Code previous to 1953 (Art. 30.3).

Nevertheless, the epithet *vastatrix* should not replace *infestans*. While the name *Botrytis vastatrix* is in fact valid, it has apparently been overlooked that this name was nomenclaturally superfluous when published. In the protologue for *Botrytis vastatrix*, Libert cited *Botrytis farinosa* Fr.:Fr. 1832 as a synonym: "It has been described, for the first time, in 1832, on withered parts, and under the name *Botrytis farinacea* [*farinosa*], by Fries, expert Swedish mycologist, in his *Systema Mycologicum*, vol. III, p. 404." [translation from French provided by Waterhouse 1970]. Libert proposed a replacement name because the epithet *vastatrix* was more appropriate than *farinosa* due to the destructive nature of the pathogen; this is not permitted under the current Code, and the name must be treated as an illegitimate superfluous name (Art. 52.1, 52.2(e)).

Furthermore, the name *Botrytis vastatrix* has been misapplied to the pathogen of potato and tomato, and therefore the epithet *vastatrix* is not in competition with *infestans*. While Libert clearly considered the name *Botrytis vastatrix* to apply to the pathogen of potato and tomato, the nomenclatural type is that of *Botrytis farinosa*, as clearly established by Art. 7.4: "A new name formed from a previously published legitimate name... is, in all circumstances, typified by the type of the basionym, even though it may have been applied erroneously to a taxon now considered not to include that type..." *Botrytis farinosa* was described by Fries in 1832 [year on publication 1829] in *Systema Mycologicum* III:404 from living leaves of an *Atriplex* sp. This name has sanctioned status (Art. 13.1(d)). In 1849, Fries transferred it to the genus *Peronospora*, and the current accepted name is *Peronospora farinosa* (Fr.:Fr.) Fr. 1849.

Nomenclature Reports

Phytophthora infestans (Mont.) de Bary 1876 (Oomycetes, Pythiales)

≡ *Botrytis infestans* Mont. 1845

≡ *Peronospora infestans* (Mont.) Casp. 1854 Note: This name is sometimes erroneously cited as (Mont.) de Bary 1863 (e.g., Erwin & Ribeiro 1996). This combination was published in the Rabenhorst exsiccati with appropriate basionym reference.

= *Botrytis fallax* Desm. 1846

= *Peronospora fintelmannii* Casp. 1852

= *Botrytis solani* Harting 1846

= *Phytophthora thalictri* G.W. Wilson & Davis 1907

≡ *Phytophthora infestans* f. sp. *thalictri* (G.W. Wilson & Davis) G.M. Waterhouse 1963

= *Peronospora trifurcata* Unger 1847

Notes: The original name applied to this oomycete was *Gangraena tuberosum solani*, by Martius in 1842. After a period of debate (see Erwin & Ribeiro 1996), it was described by Montagne in 1845 and given the name *Botrytis infestans*. It has received much renown as the cause of the great Irish potato famine of the 1840s, and it is the type of the genus *Phytophthora*. The name *Botrytis devastatrix* (alternate spelling *vastatrix* or *devastrix*) Lib. 1845 was published previous to *Botrytis infestans*, and has been listed as a synonym by various authors (e.g. Waterhouse 1963, Erwin & Ribeiro 1996). If this were true, the epithet *vastatrix* would have priority for this species. Waterhouse (1970) retained the name *Phytophthora infestans*, arguing incorrectly that *Botrytis vastatrix* was an invalid name because it was published in a newspaper, but this is permitted by the Code previous to 1953 (Art. 30.3). While it is in fact valid, *Botrytis vastatrix* is an illegitimate superfluous name; Libert published it as a replacement name for *Botrytis farinosa* Fr.:Fr. 1829. Therefore the name *Botrytis vastatrix* must be typified by *Botrytis farinosa* (= *Peronospora farinosa*), and refers to a different species than *Phytophthora infestans* (Art. 7.4).

Distribution: Cosmopolitan.

Substrate: Tubers, leaves, haulms of potato and tomato. Also stems, flowers, fruits, buds on other hosts.

Disease Note: Late blight of potato and tomato. Overwinters in tubers. Several races occur. Also causes leaf blights and, rarely, damping off, flower, and fruit blight in a wide range of hosts.

Host: Principal hosts are Solanaceae including *Solanum* spp. (potato) and *Lycopersicon esculentum* (tomato). Also occurs on hosts in 15 other genera and in ten other families (Erwin & Ribeiro 1996).

Supporting Literature:

Erwin, D.C., and Ribeiro, O.K. 1996. *Phytophthora* Diseases Worldwide. APS Press, St. Paul, Minnesota, 562 pages.

Kroon, L.P.N.M., Bakker, F.T., van den Bosch, G.B.M., Bonants, P.J.M., and Flier, W.G. 2004. Phylogenetic analysis of *Phytophthora* species based on mitochondrial and nuclear DNA sequences. *Fungal Genet. Biol.* 41: 766-782.

Puttemans, A. 1936. Reivindicacao visando a denominacao scientifica da doenca da batateira *Phytophthora infestans* (Mont.) de Bary. *Rodriguesia* 2: 341-350.

Stamps, D.J. 1985. *Phytophthora infestans*. C.M.I. *Descr. Pathog. Fungi Bact.* 838: 1-2.

Tucker, C.M. 1931. Taxonomy of the genus *Phytophthora* de Bary. *Univ. Missouri Agric. Exp. Sta. Bull.* 153: 1-208.

Peronospora farinosa (Fr. : Fr.) Fr. 1849 (Oomycetes, Peronosporales)

≡ *Botrytis farinosa* Fr. : Fr. 1832

≡ *Botrytis vastatrix* Lib. 1845 Note: Superfluous illegitimate name; Libert cited *Botrytis farinosa* as a synonym. This name has incorrectly been considered to be synonymous with *Phytophthora infestans* (e.g. Erwin & Ribeiro 1996). Waterhouse regarded it as an invalid name because it was published in a newspaper, but this is permitted by the Code previous to 1953 (Art. 30.3).

Variant spelling *Botrytis devastrix* Lib. 1845

≡ *Peronospora devastatrix* (Lib.) Casp. 1855 Note: Spelling was altered; reason unclear; see Waterhouse 1970.

≡ *Phytophthora devastatrix* (Lib.) Puttemans 1936

Variant spelling *Phytophthora devastrix* (Lib.) Puttemans 1936 Note: Erroneously cited by Saccardo as (Lib.) Oudemans (26:26 193

= *Peronospora atriplicis-halimi* Savul. & Rayss 1934

= *Peronospora atriplicis-hastatae* Savul. & Rayss 1932

= *Peronospora atriplicis-hortensis* Savul. & Rayss 1932

= *Peronospora atriplicis-tataricae* Oescu & Radul. 1933

= *Peronospora bohémica* Gäum. 1923

= *Peronospora chenopodii-ficifolii* Sawada 1916

= *Peronospora chenopodii-glauci* Gäum. 1919

= *Peronospora chenopodii-opulifolii* Savul. & Rayss 1932

= *Peronospora chenopodii-rubri* Gäum. 1919

Variant spelling *Peronospora chenopodii rubri* Gäum. 1918

= *Peronospora chenopodii-urbici* Savul. & Rayss 1932

= *Peronospora chenopodii-vulvariae* Savul. & Rayss 1935

= *Peronospora effusa* var. *major* Casp. 1855 Note: Published as alpha-major.

= *Peronospora effusa* var. *minor* Casp. 1855 Note: Published as β-minor.

≡ *Peronospora minor* (Casp.) Gäum. 1918

= *Botrytis epiphylla* Pers. 1822

= *Peronospora litoralis* Gäum. 1919

= *Peronospora monolepidis* Gäum. 1923

= *Peronospora muralis* Gäum. 1920

= *Peronospora nitens* Oescu & Radul. 1933

= *Peronospora obionis- verruciferae* Savul. & Rayss 1935

= *Peronospora spinaciae* Laubert 1906

= *Peronospora tatarica* Savul. & Rayss 1932

= *Peronospora vistulensis* Wróbl. 1915

Notes: Multiple species of downy mildews on Chenopodiaceae have been described based on host specialization, but Yerkes et al. (1959) found them morphologically indistinguishable and made them synonyms of *Peronospora farinosa*. Byford (1967) argued that, despite the absence of morphologically distinguishing characters, differences in host range amongst isolates from different genera justified treating them as distinct formae speciales. The taxonomy of this species complex is in flux (Choi et al. 2010). In a strict sense, it is probably limited to *Atriplex*.

Distribution: Cosmopolitan.

Substrate: Leaves.

Disease Note: Downy mildew.

Host: Chenopodiaceae. Also reported on *Amaranthus* (Amaranthaceae) and *Tetragonia* (Aizoaceae).

Internal Note: Drew provided minor modifications to Erica's treatment.

Supporting Literature:

Brandenberger, L.P., Correll, J.C., and Morelock, T.E. 1991. Nomenclature of the downy mildew fungus on spinach. Mycotaxon 41: 157-160.

Choi, Y.-J., Danielsen, S., Lubeck, M., Hong, S.-B., Delhey, R., and Shin, H.-D. 2010. Morphological and molecular characterization of the causal agent of downy mildew on quinoa (*Chenopodium quinoa*). Mycopathologia 169: 403-412.

Puttemans, A. 1936. Reivindicacao visando a denominacao scientifica da doenca da batateira *Phytophthora infestans* (Mont.) de Bary. Rodriguesia 2: 341-350.

Shin, H.D., and Choi, Y.J. 2006. Peronosporaceae of Korea. National Institute of Agricultural Science and Technology, Suwon, Korea, 166 pages.

Waterhouse, G.M. 1970. The genus *Phytophthora* de Bary. Mycol. Pap. 122: 1-59.

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