

VIERAEA	Vol. 27	173-182	Santa Cruz de Tenerife, diciembre 1999	ISSN 0210-945X
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## Additions to the Uredinales and Ustilaginales of the Azores

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Spooner, B.M. & Butterfill, G.B. (1999). Additions to the Uredinales and Ustilaginales of the Azores. *Vieraea* 27: 173-182.

**RESUMEN:** Se dan a conocer nuevas citas de especies de Uredinales y Ustilaginales para las Islas Azores. Por primera vez se proporcionan datos individuales para ciertas Islas de las especies de Uredinales lo mismo que de las plantas hospedantes que no se habían mencionado anteriormente. Se formaliza y hace válida una nueva combinación para un taxon que no cumplía los requisitos del Código de Nomenclatura Botánica. Además, se propone una nueva combinación para substituir el nombre ilegítimo de la especie tipo de *Naohidemycetes*. Por último, se presenta un listado de las especies de Ustilaginales y referencias bibliográficas completas de las especies de Uredinales y Ustilaginales de Las Islas Azores.

**Palabras clave:** Uredinales, Ustilaginales, Azores, citas nuevas, combinación Nueva.

**ABSTRACT:** Species of Uredinales and Ustilaginales not previously known from the Azores are reported. In addition, species of Uredinales which are first records for individual islands or from host plant species not previously recorded in the Azores are noted. One combination which failed to fulfill bibliographic requirements of the Code of Botanical Nomenclature is validated, and a new combination to replace the illegitimate name of the type species of *Naohidemycetes* is proposed. A checklist of Ustilaginales known from the Azores, and a full bibliography of references to Uredinales from the Azores are given.

**Key words:** Uredinales, Ustilaginales, Azores, New Records, New Combinations.

### INTRODUCTION

The collections reported in this paper were obtained by the authors as part of a general mycological investigation of the Azores archipelago undertaken during two visits to the Islands in April - May 1995 and October - November 1996. They form

part of a larger collection of fungi which are currently under study, and include eleven species of Uredinales not previously known from the Azores, five of these proving of greater significance as first records from Macaronesia. In addition, species of Uredinales which prove to be new records for individual islands or on host plant species not previously reported from the Azores are noted here. In contrast to the Uredinales, only four species of Ustilaginales have hitherto been reported from the Azores; one additional species is reported here.

The Azores archipelago, located in the mid-Atlantic some 1250 km west of the nearest part of Europe, is of tertiary age and comprises nine main islands. These are volcanic in origin and were never connected to any land mass. Since colonization by European settlers during the 15th century their wildlife has, inevitably, been greatly influenced by human activity. The native flora, especially, has been and continues to be adversely affected in many areas, sometimes severely so, by the naturalization and spread of exotic species from many parts of the world able to thrive in the mild, humid climate. This has also had an influence on the mycological composition of the Islands, as indicated by Dennis *et al.* (1977), some species, including many of the Uredinales, having inevitably been introduced with their host plants. However, further study is required before the extent of this influence is fully understood.

Although botanical study of the Azores has a long history, the earliest contributions, notably those of Adanson (1757, 1759), Forster (1787a, b) and Masson (1778), appearing in the latter part of the 18th century (Dias, 1989; Dias & Hansen, 1990), mycological study of the Islands is comparatively recent in its origins. Earliest contributions date only from 1866 when Drouet (1866), in a catalogue of Azores plants collected in 1857, listed 41 lichens and two species referred to the genus *Peziza*. A review of the main mycological contributions, with lists of species and descriptions of new or additional Azorean fungi, was published (Dennis *et al.*, 1977) following a visit to the Azores by R.W.G.Dennis in 1975. Since then, contributions have been few and a recent bibliography (Spooner & Butterfill, in press) includes just 62 items.

Rust fungi (Uredinales), perhaps especially due to their economic significance as plant pathogens, have received attention from a number of workers in the Azores and are amongst the better known groups of Azorean fungi. The earliest records of rust fungi from the Azores were published by Trelease (1897), who reported 14 species collected during extensive botanical study of the Islands undertaken in the summers of 1894 and 1896. There appear to be no further reports of Azorean rusts until Bensaude (1926) reported six species on plants of economic importance collected from São Miguel in 1923. Further records of Azores rusts were given by Bensaude (1926 - 27), by Tutin & Warburg (1932), and by Arwidsson (1940) and a few species are included in the reports of intercepted plant pests published annually by the United States Department of Agriculture (USDA) (Anon., 1935, 1937, 1939, 1979, 1986; Hunt, 1956, 1959; Mumford, 1965). Collections of rusts obtained by R.W.G.Dennis during March - April 1975 were published by Gjaerum & Dennis (1976), and by Dennis *et al.* (1977) and added significantly to knowledge of species composition, distribution and host range of these fungi in the Azores. Further Azorean rusts have been published by Gjaerum & Hansen (1984), and notes on some Azorean species were also included by JØRSTAD (1958) and by Gjaerum (1982). Hitherto, a total of 62 species of rusts has been reported from the Azores (Gjaerum & Sunding, 1986).

It may be of interest to note that the rust parasite *Eudarlucia caricis* (Fr.) O.E.Erikss. proves to be abundant in the Islands; pycnidia of the *Sphaerellopsis* state occur in sori of many of the collections cited below.

In contrast to the rusts, smut fungi (Ustilaginales) have received little attention in the Azores. Only four species have yet been published from the Islands, the first by Trelease (1897) who reported *Sphacelotheca reiliana* (as *Ustilago*) on *Zea mays*, and *Tilletia sphaerococca* (as *T. decipiens*) on *Agrostis castellana*. Smut fungi appear to be scarce in the Islands; recent collections by the authors included only a single species, *Sphacelotheca pamparum*, on *Setaria* cf. *pumila*. A list of Azores smuts is given below.

### SPECIES LIST

#### 1. Rust species new to the Azores \* = new to Macaronesia

##### *Coleosporium asterum* (Dietel) Syd. & P. Syd. \*

Graciosa: lighthouse at SE point (Restinga), II on *Solidago sempervirens*, 25 Oct. 1996, AZ902, K(M)55743; Serra da Juda, II on *S. canadensis*, 27 Oct. 1996, AZ955, K(M)47917.

The species may occur on various composites, but is especially common on *Solidago* (Cummins, 1978). Widely distributed, including temperate and subtropical regions of the northern hemisphere, but not known from Europe. Aecidia on *Pinus* spp.

##### *Melampsora larici-populina* Kleb. \*

Graciosa: nr Feiteira, II on *Populus nigra*, 25 Oct. 1996, AZ861, K(M)45748. São Jorge: Velas, II on *Populus nigra*, 28 Oct. 1996, AZ993, K(M)45747. Flores: Ponta Delgada, II on *Populus nigra*, 13 Nov. 1966, AZ1546, K(M)45860.

Widely distributed in Europe, but not recorded from USA. Uredia and telia occur on various species of the *Populus nigra* group, aecidia developed on *Larix*. *Naohidemyces vacciniorum* (J. Schröt.) Spooner, *comb. nov.*

Basionym: *Melampsora vacciniorum* J. Schröt., in Cohn, *Kryptogamen-Flora von Schlesien* Band 3: 365 (1887).

*Uredo pustulata* var. *vacciniorum* DC., *Flore Française* 6: 85 (1815), [II].

*Uredo pustulata* var. *vaccinii* Alb. & Schwein., *Conspectus Fungorum*: 126 (1805), [II].

*Melampsora vaccinii* (Alb. & Schwein.) G. Winter, *Hedwigia* 19: 56 (1880), *nom. illegit.*

*Melampsora vaccinii* G. Winter in Rabenhorst, *Kryptogamen-Flora Deutschland, Oesterreich und der Schweiz* 1, Abt. 1: 244 (1884), *nom. illegit.*

*Pucciniastrum vaccinii* (G. Winter) Jørst., *Skr. Norske Vidensk.-Akad. Oslo, Mat.-Naturvidensk. Kl.* 1951 (2): 55 (1951), *nom. illegit.*

*Naohidemyces vaccinii* (G. Winter) S. Sato, Katsuya & Y. Hirats., *Trans. Mycol. Soc. Japan* 34: 48 (1993), *nom. inval.*

Flores: W of Tapade de Forcada, II on *Vaccinium cylindraceum*, 6 May 1995, AZ569, K(M)34995. Faial: Caldeira, II on *V. cylindraceum*, 9 May 1995, AZ678, K(M)35044.



The epithet in *Melampsora vaccinii* G. Winter (1884) has long been applied to this fungus. However, this name is an illegitimate later homonym of the combination *M. vaccinii* (Alb. & Schwein.) G. Winter (1880), which itself is also illegitimate because its basionym applies to an anamorphic state (Article 59). All combinations based on Winter's name are illegitimate. The earliest correct name for the teleomorph of this fungus is *Melampsora vacciniorum* J. Schröt. Therefore, the new combination is proposed here.

The combination proposed by Sato et al. (1993) lacks bibliographical citation for the basionym and is a *nomen invalidum* (Article 33.2).

The species is widely distributed in north temperate regions on various species of *Vaccinium*.

***Puccinia acetosae* Körn.**

São Jorge: W of Pico de Choupana, II on *Rumex acetosella*, 30 Oct. 1996, AZ1069, K(M)45749.

Frequent, throughout Europe and North America.

***Puccinia polygoni-amphibii* Pers. var. *polygoni-amphibii* \***

Faial: nr Horta, Abegoarla, II on *Polygonum persicaria*, 5 Nov. 1996, AZ126, K(M)55342.

Virtually cosmopolitan in distribution, occurring on various species of *Polygonu*. var. *convolvuli* (Alb. & Schwein.) Arthur, on *Bilderdykia*, is known from Madeira (Gjaerum & Sunding, 1986). Aecidia occur on *Geranium* spp.

***Puccinia purpurea* Cooke**

Faial: Horta, on waste ground, II on *Sorghum* cf. *halepense*, 3 May 1995, AZ465, K(M)35263. Faial: nr Horta, roadside, II on *Sorghum halepense*, 16 Nov. 1996, AZ1593, K(M)50677.

Sori in conspicuous purple spots on leaves. Frequent, on various species of *Sorghum*, throughout warmer areas.

***Puccinia stenotaphri* Cummins**

Graciosa: Santa Cruz, roadside verge, II on *Stenotaphrum secundatum*, 27 Oct. 1996, AZ966, K(M)55748.

Widely distributed in tropical and subtropical areas.

***Uromyces dianthi* (Pers.) Niessl**

Graciosa: Santa Cruz, II on *Dianthus* sp., 27 Oct. 1996, AZ968, K(M)47440. São Jorge: Ribeira Seca, II on *Dianthus* sp., 1 Nov. 1996, AZ1181a, K(M)47442.

Virtually cosmopolitan in distribution. Occurs on various species of *Dianthus*, with forms also on some other genera of Caryophyllaceae. Aecidia on *Euphorbia* spp.

***Uromyces junci* (Desm.) Tul. & C. Tul.**

Faial: rim of Caldeira, II & III on *Juncus* sp., 6 Nov. 1996, AZ1315, K(M)49587.

The species is widely distributed in Europe and U.S.A. Its most frequent aecidial host in Europe appears to be *Pulicaria*, a genus not known to occur in the Azores (Hansen & Sunding, 1985). However, as noted by Wilson & Henderson (1966) and Farr et al. (1989), aecidia are found on various genera of Compositae in North America. It may be noted also that Dietel (1889) has shown that the species may overwinter as uredospores on *Juncus*.

***Uromyces* cf. *minor* J. Schröt. \***

São Miguel: Maia, 0, I & III on *Trifolium* sp., 24 April 1995, AZ109, K(M)29447.

Uredinia are lacking, and further material is required to confirm the identity of this species. In the absence of uredospores, which differ in the number of germ pores, *U. minor* may be difficult to distinguish with certainty from *U. trifolii-repentis* Liro. In this collection (*teste* Gjaerum, pers. comm.), spermogonia are present, a stage said to be lacking in *U. minor* by some authors, notably Cummins (1978) and Wilson & Henderson (1966), although given by others, e.g. Gaumann (1959) and Guyot (1957). Peridial cells, as examined in sections of the aecidia, correspond better to *U. minor* (cf. Gaumann, 1959). Therefore, although the peridia are longer than mentioned in some descriptions, it seems best to refer the collection to *U. minor*.

*Uromyces minor* is a boreo-alpine species (Guyot, 1957), widely distributed in Central and Southern Europe, and found also in western USA and in Japan.

***Uromyces transversalis*** (Thüm.) G. Winter \*

São Jorge: Ribeira Seca, II & III on cf. *Monbretia*, 1 Nov. 1996, AZ1190, K(M)55343.

A southern African species, occurring also on *Gladiolus*.

## 2. Additional Island records

***Cerotelium fici*** (E.J. Butler) Arthur

Graciosa: Serra da Juda, II on *Ficus carica*, 27 Oct. 1996, AZ973, K(M)49150.

***Frommeëlla duchesneae*** (Arthur) Yohem, Cummins & Gilb.

Flores: roadside S of Boca da Baleia, II on *Duchesnea indica*, 5 May 1995, AZ507, K(M)29433. São Jorge: SE of Rosais, nr Figueiras, II & III on *Duchesnea indica*, 29 Oct. 1996, AZ1055, K(M)47445.

Previously reported from the Azores (Dennis et al., 1977; Gjaerum & Dennis, 1976; Gjaerum & Hansen, 1984) as *Frommea obtusa* (F. Strauss) Arthur.

***Frommeëlla tormentillae*** (Fuckel) Cummins & Y. Hirats. ex Spooner comb. nov.

Basionym: *Phragmidium tormentillae* Fuckel, *Jahrbücher des Nassauischen Vereins für Naturkunde* 23 - 24: 46 (1870).

Flores: road to Ponta Ruiva, II on *Potentilla* sp., 6 May 1995, AZ566, K(M)29545.

The combination proposed by Cummins & Hiratsuka (1983) lacks bibliographical citation for the basionym, and is not validly published (Article 33.2). It is therefore validated here.

The species was previously reported from the Azores (Dennis et al., 1977; Gjaerum & Dennis, 1976; Gjaerum & Hansen, 1984) as *Frommea obtusa* (F. Strauss) Arthur.

***Kuehneola uredinis*** (Link) Arthur

Flores: road S of Caldeira Funda, streamside, II on *Rubus inermis*, 5 May 1995, AZ503a, K(M)35040; between Lagoa Funda & Lagoa Comprida, III on *R. inermis*, 10 Nov. 1996, AZ1420a, K(M)47434; nr Morro dos Frades, II on *R. inermis*, 10 Nov. 1996, AZ1430, K(M)47918; nr Tapada da Forcada, rocky gully, II & III on *R. inermis*, AZ1535, K(M)47446.

***Melampsora populnea*** (Pers.) P. Karst.

São Miguel: nr Ginetes, II on *Populus alba*, 20 Apr. 1995, AZ11, K(M)29384. Pico: nr Madalena, II on *P. alba*, 29 Apr. 1995, AZ341, K(M)29385. Flores: nr Fajãzinha,

II on *P. alba*, 5 May 1995, AZ480, K(M)29373. Graciosa: nr Carapacho, II on *P. alba*, 25 Oct. 1996, AZ903, K(M)45752.

***Miyagia pseudosphaeria*** (Mont.) Jørst.

Corvo: aerodrome, II on *Sonchus* cf. *tenerrimus*, 4 May 1995, AZ471, K(M)29490. Pico: nr Bandeiras, II on *Sonchus* sp., 29 Apr. 1995, AZ 327, K(M)35000.

***Phragmidium mucronatum*** (Pers.) Schltdl.

Flores: Santa Cruz, Monte das Cruze, old garden, II on *Rosa* sp., 12 Nov. 1996, AZ149, K(M)55333.

***Puccinia antirrhini*** Dietel & Holw.

Faial: Horta, waste ground, II on *Antirrhinum* cf. *majus*, 2 May 1995, AZ448, K(M)29476.

***Puccinia buxi*** DC.

Flores: nr Cedros, hedgerow, III on *Buxus sempervirens*, 6 May 1995, AZ565a, K(M)35595. São Jorge: Sete Fontes, Parque Florestal, III on *B. sempervirens*, 29 Oct. 1996, AZ1652, K(M)53452.

***Puccinia hieracii*** H. Mart.

Pico: nr São Caetano, II & III on cf. *Hypochaeris glauca*, 1 May 1995, AZ441a, K(M)35024. Flores: Ponta Ruiva, II on *Taraxacum officinale*, 6 May 1995, AZ558, K(M)48311.

***Puccinia malvacearum*** Bertol. ex Mont.

Corvo: aerodrome, III on *Malva* sp., 4 May 1995, AZ 472, K(M)29381. Flores: Ponta Delgada, III on *Malva* sp., 13 Nov. 1996, AZ1532, K(M)45537.

***Puccinia menthae*** Pers.

São Jorge: nr Norte Pequeno, roadside, II on *Mentha aquatica*, 1 Nov. 1996, AZ1149, K(M)52556. São Miguel: c. 10km E of Ribeira Grande, roadside, II & III on *M. sp.*, 24 Apr. 1995, AZ107a, K(M)29430.

***Puccinia oxalidis*** Dietel & Ellis

Flores: Alagoa, roadside, II on *Oxalis* sp., 6 May 1995, AZ562, K(M)29457. Pico: viewpoint over Santa Barbara, II on *Oxalis* cf. *corymbosa*, AZ249, K(M)29445.

***Puccinia pelargonii-zonalis*** Doidge

Faial: Horta, II on *Pelargonium* x *zonale*, 2 May 1995, AZ447, K(M)29477. Flores: Santa Cruz, Monte, garden, II on *P. x zonale*, AZ587, K(M)29478. São Jorge: nr Rosais, rd to Sete Fontes, II on *P. x zonale*, 28 Oct. 1996, AZ1006, K(M)45689.

***Puccinia saniculae*** Grev.

Faial: Caldeira, lower slopes, I, II & III on *Sanicula azorica*, 9 May 1995, AZ677, K(M)29519; same locality, II & III on *S. azorica*, 6 Nov. 1996, AZ1336a, K(M)45853.

***Puccinia vincae*** Berk.

São Miguel: Ponte dos Regos, II on *Vinca major*, 20 Apr. 1995, AZ17, K(M)35009.

***Tranzschelia discolor*** (Fuckel) Tranzschel & Litv.

Graciosa: nr Feiteira, II on *Prunus* sp., 25 Oct. 1996, AZ859, K(M)47431.

***Uromyces anthyllidis*** J. Schröt., s. lat.

Graciosa: W of Santa Cruz, S of Dores, II & III on *Medicago* sp., 27 Oct. 1996, AZ967a, K(M)48948.



The urediniospores have many (up to at least seven) scattered germ pores (Gjaerum, pers. comm.), and the teliospore wall is thick and rather uniformly warted. The collection corresponds to the species previously named as *U. magnusii* Kleb., on *Medicago* (see Guyot, 1957).

***Uromyces rumicis*** (Schumach.) G. Winter

São Jorge: nr Rosais, rd to Sete Fontes, II on *Rumex pulcher*, 29 Oct. 1996, AZ1007, K(M)47726. Flores: Santa Cruz, Monte das Cruze, II on *R. sp.*, 9 Nov. 1996, AZ1408, K(M)45750; nr Fajãzinha, II & III on *R. sp.*, 5 May 1995, AZ482, K(M)29530; Ponta Ruiva, II on *R. cf. obtusifolius*, 6 May 1995, AZ561, K(M)29492. Pico: 4km SE of Madalena, II on *R. pulcher*, 1 May 1995, AZ394, K(M)29491.

***Uromyces setariae-italicae*** Yoshino

Faial: above Flamengos, II on *Setaria glauca*, 16 Nov. 1996, AZ1591, K(M)55346. Graciosa: Serra da Juda, II on *Setaria verticillata*, 27 Oct. 1996, AZ965, K(M)55338. São Jorge: c. 1km W of Pico da Choupana, II & III on *Setaria pumila*, 30 Oct. 1996, AZ1079, K(M)55321.

***Uromyces trifolii-repentis*** Liro

São Jorge: SE of Rosais, between Arrilana & Figueiras, I on *Trifolium repens*, 29 Oct. 1996, AZ1054, K(M)47925.

***Uromyces viciae-fabae*** (Pers.) J. Schröt.

Pico: Madalena, II on *Vicia faba*, 25 Apr. 1996, AZ145a, K(M)38861; nr Bandeiras, II on *Vicia sp.*, 29 Apr. 1995, AZ326, K(M)29436.

### 3. New Azores host records

***Puccinia iridis*** (DC.) Wallr.

On *Iris foetidissima*, II & III [Graciosa: SE of Santa Cruz, Pico Machado, 26 Oct. 1996, AZ913a, K(M)50642]

***Puccinia menthae*** Pers.

On *Mentha aquatica*, see above

***Uromyces anthyllidis*** J. Schröt.

On *Medicago sp.*, see above

***Uromyces rumicis*** (Schumach.) G. Winter

On *Rumex obtusifolius*, II & III [Faial: nr Horta, Abegoaria, 5 May 1996, AZ1270, K(M)47436. São Miguel: Ponta Delgada, University grounds, 20 May 1995, AZ27, K(M)29494]

***Uromyces setariae-italicae*** Yoshino

On *Setaria verticillata*, II [Graciosa: Serra da Juda, 27 Oct 1996, AZ965, K(M)55338]. On *Setaria pumila*, see above.

### 4. Checklist of Ustilaginales from the Azores

***Entyloma brizae*** L.M. Unamuno & R. Ciferri

Azores, unlocalised, on *Briza sp.* (Hunt 1955)

***Entyloma calendulae*** (Oudem.) de Bary

Terceira, on *Calendula sp. cult.*, 30 Mar. 1975 (Dennis et al. 1977)

***Sphacelotheca pamparum*** (Speg.) G.P. Clinton

São Jorge: above Velas, on *Setaria cf. pumila* (= *S. glauca*), 30 Oct. 1996, AZ1633, K(M)49635.

- Sporisorium reilianum* (J. Kühn) R.F.N. Langdon & R.A. Fullerton  
Flores, on *Zea mays* (Trelease 1897, as *Ustilago reiliana* J. Kühn)
- Tilletia sphaerococca* (Rabenh.) Fischer v. Waldh.  
Flores & São Miguel, on *Agrostis castellana* (Trelease 1897, as *T. decipiens*  
(Pers.) Körn.)

## ACKNOWLEDGEMENTS

The authors are indebted to Dr. H.B.Gjaerum for identification of many of the collections reported here, and for helpful comments. Our thanks are also extended to Dr. R.W.G. Dennis for generously funding the visit to the Azores in 1995, and to Dr. Eduardo Dias (Universidade dos Açores, Terceira) and Dr. Luis Silva (Universidade dos Açores, São Miguel) for invaluable assistance with logistics and field work within the Islands. Further thanks are due to Dr. P.M.Kirk and Dr. R.K.Brummitt for invaluable advice on nomenclature, and to Dr. L. Rico-Arce for translation of the Abstract into Spanish.

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