

RUST FUNGI FROM MADEIRA

By Halvor B. Gjaerum*

With 1 figure

SUMMARY. Forty-five rust taxa making 71 rust-host combinations are reported. *Dicheirinia maderensis* on *Teline maderensis* is described as a new species. Eight rust species are reported as new to Macaronesia and eight are new to Madeira. Eight hosts are recorded as new to their rusts, four are new to their rusts in Macaronesia and five to their rusts in Madeira.

SUMÁRIO. Neste trabalho são descritos 45 táxones de ferrugens formando 71 combinações ferrugem-hospedeiro. *Dicheirinia maderensis* em *Teline maderensis* é descrita como uma nova espécie. Oito espécies de ferrugens são referidas como novas para a Macaronésia e 8 como novas para a Madeira. São também referidos 8 novos hospedeiros para as suas ferrugens; 4 hospedeiros são novos para as suas ferrugens na Macaronésia e 5 na Madeira.

The first record of a rust fungus on Madeira was published by Holl (1830), who reported on *Uredo helioscopiae* DC. on leaves of *Euphorbia helioscopia*. Later several small contributions were given by Schroeter (1884), Bornmüller (1903), Torrend (1909, 1912, 1913), and Sydow (1937). The main publication on the rust fungi of Madeira as well as other fungal groups is still the one by Viennot-Bourgin (1939). Later Gjaerum (1970) added a few rust and host species to the flora. Guyot and Viennot-Bourgin (1946) discussed the distribution of the rust fungi then known in the Canary Islands and Madeira archipelagoes.

The material presented in this paper has partly been collected by myself during an excursion to Madeira in January 1980, and by examining the phanerogam collection preserved in the Museu Municipal do Funchal (MADM) and material brought to the Botanical Museum in Oslo by Mr. Ø. H. Rustan (herb. O) who visited Madeira in spring 1978 and 1980. Dr. P. Alanio, Botanical Museum, Helsinki (herb. H) kindly sent me his collection of Madeiran rust fungi collected in December 1969, and so have Mr. A. Hansen, Botanical Museum, Copenhagen (herb. C) and Dr. R. W. G. Dennis, Royal Botanic Gardens, Kew (herb.

* Norwegian Plant Protection Institute, P. O. Box 70, N - 1432 AS - NLH, Norway

K). Mr. Hansen visited Madeira several times in the 70-es, while Dr. Dennis collected there in March 1975. The greater part of the hosts of my own collection has been identified by Mr. Ø. H. Rustan and Mr. A. Hansen. I would like to express my sincere thanks to the botanists mentioned above for their kindness and help, as well as Mr. G. E. Maul, former Curator at the Museu Municipal do Funchal (now retired) for allowing me to examine the phanerogams preserved in the herbarium. My own collection is kept in the herbarium of the Norwegian Plant Protection Institute (NPPI).

Unless otherwise stated, the distribution of the rust species in Madeira is taken from the publication by Viennot-Bourgin mentioned above. Information on Canarian rusts is from the papers by Dr. I. Jørstad (1958, 1962, 1966) while that on Azorian rusts is from Gjørnum & Dennis (1976). The nomenclature of the hosts follows Eriksson, Hansen and Sunding (1979).

The names of the main collectors are abbreviated as follows:

P. Alanko	—	A.
R. W. G. Dennis	—	D.
H. B. Gjørnum	—	G.
A. Hansen	—	H.
Ø. H. Rustan	—	R.

Cerotelium fici (Butl.) Arth., Bull. Torrey Bot. Club 44: 509, 1917.

Syn. *Kuehneola fici* Butl., Annal. mycol. 12: 79, 1914.

On *Ficus carica* L.

Between Monte and Funchal, and 1 km E of Câmara de Lobos, A. (30, 45), II; ca. 1 km W of Funchal and just W of Machico, G. (27, 47), II.

This uredineal stage, which seems to follow the host everywhere, has previously been reported from Porto Santo. Elsewhere in Macaronesia it has been reported from several Canarian islands and also from the Azores. Telia seem to be rare and have not been found in Macaronesia.

Coleosporium tussilaginis (Pers.) Berk., Outl. Brit. Fung. p. 333, 1860.

Syn. *C. campanulae* Cke., Microscopic Fungi p. 213, 1865;

C. rhinanthacearum Kickx, Fl. Flandres 2: 53, 1867; *C. senecionis* Kickx, ibid. 2: 53, 1867.

On *Senecio mikanioides* Otto ex Walp.

Along the path from Encumeada to Casa do Lombo do Moiro, 1325 m above sea level; along the levada from Folhadal to Encumeada, Rocha do Folhadal, 1030 m; Fajã da Nogueira valley along the levada on the S slope, 950 m, R. (451, 492, 593), II + III.

On *Senecio mikanioides* Otto ex Walp.

Monte, 400 m, between Monte and Terreiro da Luta, 700 m, and Funchal,

near Jardim Botânico, A. (51, 57, 110) II; Funchal, Rua das Dificuldades, D., II.

On *Senecio vulgaris* L.

Funchal, H., II; G. II; on the road Camacha - Funchal, at the road junction to Terreiro da Luta, G. (38), II + III; near Curral das Freiras, G. (78) II.

C. tussilaginis embraces several races or specialized forms, described and often recognized as species, alternating with *Pinus* spp. However, this host alternation is not obligate as no aecial stage has been found in Macaronesia so far. The rust on *Odontites* belongs to *C. rhinanthacearum*, by Boerema & Verhoeven (1972) recognized as *C. tussilaginis* f. sp. *rhinanthacearum*. *O. holliana*, endemic to Madeira, is a new host for this rust. *S. mikanioides*, and *S. maderensis* DC., were reported as hosts by Viennot-Bourgin (1939), who also reported on *Campanula erinus* L. Petrak (1929) reported on *S. sylvaticus* L. and Gjærum (1970) reported on *S. vulgaris*. *C. tussilaginis* s. lat. is widespread in the Canary Islands, and it is also known from the Azores (Trelease 1897, Gjærum & Dennis 1976).

Dicheirinia maderensis n. sp.

Pycnia et aecia non visa. Uredinia amphigenia plus minusve rotundata vel elliptica, atrofusca, aparaphysata.

Uredinosporae subgloboideae vel ellipsoideae, saepe apice attenuatae, $27-31 \times 18-21 \mu\text{m}$, parietibus brunneis, $1.5-2.5 \mu\text{m}$ crassis, apice usque ad $7 \mu\text{m}$ incrassatis, saepe ad hilum leviter incrassatis, echinulatis, spinis $2.5-3 \mu\text{m}$ separatis, 3 vel rare 4 poris equatorialibus obsitae.

Telia ut apud uredinia, mox nuda, fuliginia, omnis spora obovoidea, latere uno tantum complanata, $20-29 \times 11-13.5 \mu\text{m}$. Parietis brunneus, $1-1.5 \mu\text{m}$ crassus, apice usque ad $5.5 \mu\text{m}$ incrassatus, verrucis paucis parvis obsitus. Pedicellus hyalinus, usque $45 \mu\text{m}$ longus.

In foliis vivis *Telines maderensis* Webb & Berth., Madeira, Queimadas, 6.5.1956, leg. C.H.C. Pickering, II + III, typus herb. MADM.

Pycnia and aecia not seen. Uredinia amphigenous, roundish to elliptical, dark brown, aparaphysate. Uredinospores subglobose to ellipsoid, often attenuated at the apex, $27-31 \times 18-21 \mu\text{m}$. Wall brown $1.5-2.5 \mu\text{m}$ thick, at apex thickened to $7 \mu\text{m}$, often also slightly thickened at the hilum, echinulate, spines $2.5-3 \mu\text{m}$ apart, with 3, rarely 4, equatorial pores. Telia as the uredinia, soon naked, blackish brown, pulverulent, aparaphysate. Teliospores brown to dark brown, each spore obovoid, somewhat flattened at one side, $20-29 \times 11-13.5 \mu\text{m}$. Wall brown, $1-1.5 \mu\text{m}$ thick, at the apex thickened to $5.5 \mu\text{m}$, with a few small warts. Pedicel hyaline, at least up to $45 \mu\text{m}$ long.

On leaves of *Teline maderensis* Webb & Berth., Madeira, Queimadas, 6.5.1956, leg. C.H.C. Pickering, II + III, type, herb. MADM.

Material examined:

Madeira, Queimadas, 6.5.1956, leg. C.H.C. Pickering, II + III (type, herb. MADM.); Ribeiro Frio, along levada dos Balcões, II + III, and near Forest Garden, II + III, H.; along levada to Caldeirão do Inferno, near Ribeiro do Taborda, 900 m, R. (290), (II +) III.

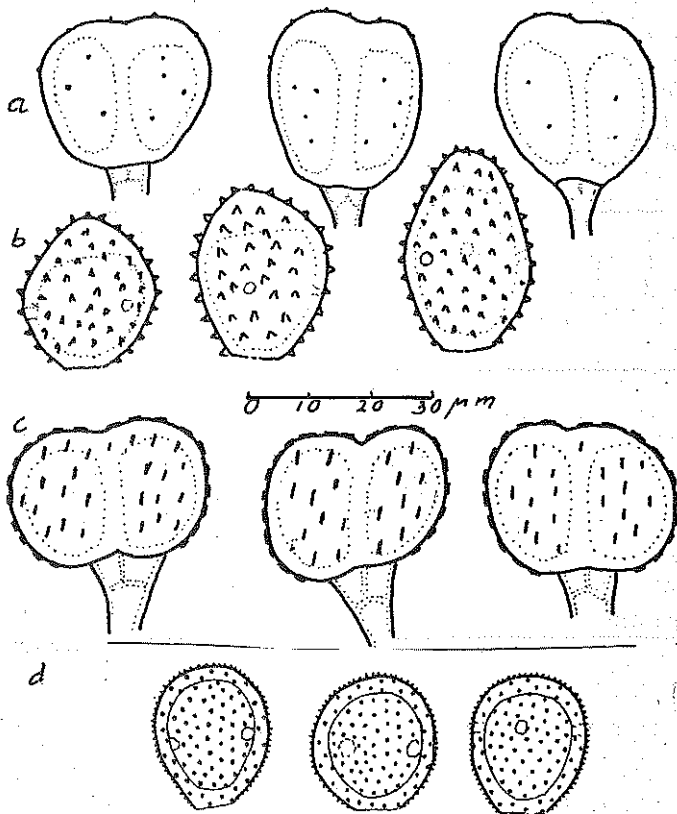


Fig. 1—*Dicheirinia maderensis*. Teliospores (a) and urediniospores (b) from type. *D. canariensis*. Teliospores (c) from type, herb. MA and urediniospores (d) from I. Jørstad (137), herb. O.

Eleven species have previously been ascribed to the genus *Dicheirinia* Arth., all on hosts belonging to Fabaceae. Judging from the descriptions given by the various authors none of them corresponds to the Madeiran species. From the Canarian species, *D. canariensis* Urrés on *Chamaecytisus proliferus* (L. fil.) Link var. *proliferus* and var. *perezii* (Hutch.) Kunk., it is easily separated both in the uredinial and

in the telial stage. Urediniospores in the Madeiran species are thickened and more attenuated at the apex, and the wall is spiny, while in the Canarian species the urediniospores are more rounded, not thickened at the apex, and the wall is coarsely verrucose. The teliospores of this new species have a more thickened part of the apex than have those of the Canarian species (Fig. 1), and the wall is darker brown.

The host is endemic in Madeira.

Frommea obtusa (Str.) Arth., Bull. Torrey Bot. Club 44: 503, 1917.

On *Duchesnea indica* (Andr.) Focke.

Funchal, below Terreiro da Luta, D., II.

On *Potentilla anglica* Laich.

Along the levada from Folhadal to Encumeada, NW of Rocha Negra, 1025 m, R. (483), II.

On *D. indica* this rust was published from Madeira (Gjaerum 1970) and also from the Azores. In the Azores also *Potentilla erecta* (L.) R.äusch and *P. procumbens* Sibth. (= *P. anglica*) (on the latter published by Arwidsson (1940) as *Phragmidium potentillae* (Pers.) Karst.) are hosts. *P. anglica* is a new host to the rust in Madeira, but it has been reported from Poland and Germany with this rust.

Melampsora euphorbiae (Schub.) Cast., Obs., Pl. Acotyl. 2: 18, 1843.

Syn. *M. gelmii* Bres., Bull. Soc. Bot. Ital. p. 75, 1897; *M. ricini* Pass. ex Noronha, Agron. Lusit. 14: 242, 1952.

On *Euphorbia helioscopia* L.

1 km E of Câmara de Lobos, A. (249), II.

On *Euphorbia mellifera* Ait.

W of Ribeiro Frio, along the levada near Balcões, 860 m, R. (334), II.

On *Euphorbia pepplus* L.

On the road from Camacha to Funchal, near the road junction to Poiso, II; and between Água de Pena and Santa Cruz, G. (36, 51), II + III.

On *Ricinus communis* L.

1 km W of Funchal, G. (29), II.

E. mellifera, endemic in Macaronesia, known from Madeira and from Tenerife and La Palma in the Canaries, is a new host for this rust. The other hosts listed above have previously been reported from Madeira by Holl (1830, as *Uredo euphorbiae* DC.), Bornmüller (1903) and Torrend (1909), (as *Melampsorella ricini* (Biv.) de Ton.) These three host species are also known from the Canaries, while *E. pepplus* and *R. communis* are reported as hosts for this rust in the Azores. Torrend (op. cit.) also reported *E. pterococca* Brot. as a host in Madeira while Tutin and Warburg (1932) did so for *E. azorica* Hochst. from the

Azores and Chevalier (1935, as *M. gelmi* Bres.) on *E. tuckeyana* Steud from the Cape Verde Islands.

Melampsora hypericorum Wint. in Rabh. Krypt.-Fl., Ed. 2, I, 1: 241, 1882.

Syn. *Mesospora hypericorum* (Wint.) Diet., Annal mycol. 20: 30, 1922.

On *Hypericum grandifolium* Choysi.

Ribeiro Frio, G. (54), I.

Torrend (1909) published this rust on *H. humifusum* L. and Viennot-Bourgin (1939) published it on *H. grandifolium*. The rust is reported from the five westernmost islands in the Canaries with *H. grandifolium* and *H. canariense* L. as the main hosts. Other Canarian hosts are *H. humifusum* and *H. glandulosum* Ait. In the Azores *H. humifusum* (Arwidsson 1940) and *H. foliosum* Dryand (Trelease 1897) are the known hosts.

Phragmidium bulbosum (Str.) Schlecht., Fl. Berol. 2: 156, 1824.

Syn. *Ph. rubi* (Pers.) Wint. in Rabh. Krypt.-Fl. Ed. 2, I, 1: 230, 1882.

On *Rubus ulmifolius* Schott.

Monte, 400 m, A. (50), II; Caniçal, H., II.

On *Rubus* sp.

Camacha, II + III, 1 km W of Funchal, II, Encumeada, 1020 m, II, ca. 1 km E of Caniçal, II, and on road from Eira do Serrado to Curral das Freiras, just above the first tunnel, II + III, G. (2, 3, 4, 44, 68).

To my knowledge this rust has not previously been reported from Madeira. As all my collections were on not flowering plants, the hosts can not be identified to species.

In Macaronesia this rust has been reported on *R. ulmifolius* from Tenerife and La Palma in the Canary Islands only.

Phragmidium sanguisorbae (DC.) Schroet. in Cohn, Pilze Schles. III, 1: 352, 1887.

Syn. *Puccinia sanguisorbae* DC., Fl. Fr. 5: 54, 1815.

On *Sanguisorba minor* Scop. var. *magnolia* (Spach) Brig.

On the track from Cabo Girão to Câmara de Lobos, G. (22), II.

This rust species is new to the flora of Madeira. In the Canaries it has been collected on all but the two eastern islands.

Phragmidium tuberculatum J. Müll., Ber. D. Bot. Ges. 3: 391, 1885.

On *Rosa* sp. (cult.).

Ribeiro Frio, near the trout hatchery, 850 m, II + III and Água de Pena, II + III, G. (53, 49).

Jørstad (1958), when referring to previous reports of *Ph. mucronatum* (Pers.) Schlecht. in Macaronesia, excepting the Canary Islands, indicated that *Ph. tuberculatum* might have been included. Torrend (1912) reported *Ph. subcorticium* (Schr.) Wint. (= *Ph. mucronatum*) from Funchal. However, to my knowledge, *P. tuberculatum* has previously not been reported from Madeira.

Phragmidium violaceum (C. F. Schultz) Wint., Hedwigia 19: 54, 1880.

Syn. *Puccinia violacea* C. F. Schultz, Prodr. Fl. Starg. p. 459, 1806.

On *Rubus ulmifolius* Schott.

Funchal, D. II; Monte, A. (49), II.

On *Rubus* sp.

Camacha, II, just W of Machico, II, on road from Camacha to Funchal, on the road junction to Terreiro da Luta, II, and above Cabo Girão, II + III, G. (29, 46, 39, 11).

The first record of this rust in Madeira was given by Torrend (1909), reporting it on *R. bollei* Focke. Later Viennot-Bourgin (1939) reported it on *Rubus* sp.

In the Canary Islands *Ph. violaceum* is far more common than is *Ph. bulbosum*, but there is not material enough from Madeira for such a comparison. This rust is also reported from the Azores by Trelease (1897), Tutin & Warburg (1932), and Gjaerum & Dennis (1976).

Puccinia arenariae (Schum.) Wint., Hedwigia 19: 35, 1880.

Syn. *P. stellaria* Duby, Bot. Gall. 2: 887, 1830; *P. saginae* Fuck., Jahrb. Nass. Ver. Nat. 23-24: 51, 1870.

On *Sagina* sp.

Chão do Arieiro W, A. (181), III.

On *Stellaria media* (L.) Vill.

Porto Moniz, Costa, III.

P. arenariae (s. lat.), a rust species of world-wide distribution living on a large number of caryophyllaceous genera including *Sagina* and *Stellaria*, is a new member of the Macaronesian rust flora. On *Stellaria media* it is reported from several European countries, and also from Asia, Australia and North America.

Puccinia brachypodii Oth var. **brachypodii**, Mitth. Naturf. Ges. Bern 1861: 82, 1861.

Syn. *P. baryi* Wint. in Rabh. Krypt. Fl. Ed. 2, I, 1: 178, 1882.

On *Brachypodium sylvaticum* (Huds.) PB.

Camacha, M. Malmberg, II (H); 14.1.1980 G. (34), II; on road Camacha - Funchal, near road junction to Terreiro da Luta, G. (34), II; hills

behind Funchal, D., II; Monte S, A., II; on the road to Cabo Girão and on the road Eira do Serrado - Curral das Freiras, below the first tunnel, II, G. (7, 69).

This rust, a new member of the rust flora of Madeira, has been reported on the same host from the Azores and from several localities in the Canary Islands where also *B. distachyum* (L.) PB. (= *Trachymia distachya* (L.) Link) is a host.

Puccinia buxi DC., Fl. Fr. &: 60, 1815.

On *Buxus sempervirens* L.

Monte, Vendas N, 700 m, A. III.; Terreiro da Luta, hill behind Funchal, D. III; Ribeiro Frio at the trout hatchery, 850 m, G. (42), III.

This rust has been known in Macaronesia since TRELEASE (1897) reported it from São Miguel in the Azores. Later TORREND (1909) and also VIENNOT-BOURGIN (1939) reported it from Madeira. It is still unknown in the Canary Islands and Cape Verde Islands.

Puccinia calcitrapae DC., Fl. Fr. 2: 221, 1805.

Syn. *P. centaureae* DC., Fl. Fr. 5: 59, 1815. *P. cirsii* Lasch, Rabh. Fungi Eur. No 89, 1859; *P. carduorum* Jacky, Zeitschr. Pfl. Krankh. 9: 288, 1899; *P. carlinae* Jacky, ibid. 9: 289, 1899.

On *Carduus tenuiflorus* Curt.

Ribeiro Frio, Costa, (II+) III.

On *Carlina salicifolia* (L. f.) Cav.

Curral das Freiras, G. (80), II.

On *Cirsium latifolium* Lowe.

Chão do Arieiro W., A. (193), II.

Previously this rust was reported as *P. cirsii* from Madeira on the endemic *C. latifolium*, while the other two hosts are new to the island. *C. tenuiflorus* is commonly infected by this rust in the Canaries while *C. salicifolia*, endemic to the Madeira and Canary archipelagoes, is a new host for this rust. GJÆRUM (1975) published *P. calcitrapae* on *Centaurea melitensis* L. from the Salvage Islands.

Puccinia cnici-oleracei Pers. ex Desm., Cat. Pl. Omis. p. 24, 1823.

Syn. *P. galactitis* P. & H. Syd., Monogr. Ured. 1: 86, 1902.

On *Galactites tomentosa* Moench (syn. *Lupsia galactites* (L.) Ktze.). Ca. one km W of Funchal, G. (28), III.

This rust species is new to Madeira. In the Canary Islands it is commonly found on the same host, but has not been reported from the Azores where this host is also present.

Puccinia coronata Oda., Icon. Fung. 1: 6, 1873.

Syn. *P. avenae-barbatae* Gonz. Frag., Bol. Soc. Broter., 2. Ser. 2: 7, 1923.

On *Agrostis castellana* Boiss. & Reut.

At the summit above Cabo Girão, and at Camacha, G. (9, 35a), II.

On *Avena barbata* Pott ex Link.

Praia Formosa, W of Funchal, H, II + III; between Câmara de Lobos and Cabo Girão, Pico do Facho, 420 m, R. (263), II + III.

On *Avena fatua* L.

On the track from Cabo Girão to Câmara de Lobos, G. (18), II.

On *Bromus diandrus* Roth.

On the track from Cabo Girão to Câmara de Lobos, G. (19), II.

The widespread crown rust has previously been reported from Madeira by Bornmüller (1903) on *A. fatua* and by Viennot-Bourgin (1939) on *Elytrigia repens* (L.) Nevski., *A. barbata* and *Phalaris altissima* Mnzs. *A. castellana* and *B. diandrus* are both new hosts in Madeira, the former has been reported as host in the Canaries while *B. diandrus*, which is distributed in SW Europe and the Mediterranean, and also in the Azores and Canaries, is a new host for this rust species.

According to Cummins (1971) the rust on *Avena* belongs to the var. *avenae* Fraser & Leding., while that on *Agrostis* and *Bromus* is var. *coronata*.

Puccinia dioicae P. Magn., Amtl. Ber. 50 Versamml. Deut. Naturf. Arzte, München, p. 199, 1938.

Syn. *P. silvatica* Schroet. in Cohn, Beitr. Biol. Pfl. 3: 68, 1878.

On *Carex tumidicarpa* Ands. ssp. *cedercreutzii* Fagerstr.

E of Ribeira da Janela, Curral Falso, 650 m, R. (538), II.

P. dioicae is a new member of the rust flora of Madeira. Arwidson (1940) reported it as *P. silvatica* on *C. vulcanica* Hochst. (= *C. vulcani* Hochst. ex Seub.) from the Azores. To my knowledge there is no reference to *C. tumidicarpa* ssp. *cedercreutzii* as a host for this rust species.

Puccinia epilobii DC., Fl. Fr. 5: 61, 1815.

On *Epilobium tetragonum* L. ssp. *tetragonum*.

Paul da Serra, H., III.

This rust species is new to Madeira. The only record from Macaronesia was given by Tutin & Warburg (1932) who reported it from the Azores on *E. obscurum* Schreb. *P. epilobii* is recorded on *E. tetragonum* in Europe.

Puccinia hieracii Mart. var. **hieracii**, Prodr. Fl. Mosq., Ed. 2 p. 227, 1817.
Syn. *P. leontodontis* Jacky, Zeitschr. Pfl. Krankh. 9: 339, 1899;
P. taraxaci Plowr., Monogr. Brit. Ured. Ustil. p. 186, 1889; *P. canariensis* P. & H. Syd., Monogr. Ured. 1: 166, 1902.

On *Leontodon taraxacoides* (Vill.) Mérat ssp. *longirostris* F. & S. Quebrada, Costa (469 B), (II+) III.

On *Taraxacum officinale* Wigg. ssp. *densleonis* (Desf.) Flout. Seixal, Costa (470), II.

Viennot-Bourgin (1939) reported this rust variety on the former host as *P. leontodontis* and on the latter host as *P. taraxaci* as did Bornmüller (1903). Another Madeiran host is *Leontodon nudicaulis* (L.) Banks, type host of *P. canariensis*, and *Thrinicia hispida* Roth. (= *L. rothii* Ball) reported by Petrak (1929). *T. officinale* is reported from the Azores by Trelease (1897), and from the Canaries by Bornmüller (1903) as a host for this rust.

Puccinia hieracii Mart. var. **chlorocrepididis** (Jacky) Jørst., Skr. utg. Norske Vidensk. Akad. Oslo. 1. Mat.-Nat. Kl. 1958 No. 2, p. 63, 1958.

Syn. *P. andryalae* Poir. in Vestergr. Microm. rar. sel. 1654, 1913 (nom. nud.) ; *P. andryalae* Maire, Bull. Soc. Hist. Nat. Afr. Nord 8: 253, 1917; *P. heribaudiana* Hariot, Bull. Soc. Myc. Fr.: 237, 1914.

On *Andryala glandulosa* Lam. ssp. *varia* (Lowe ex DC.) R. Fern. Near Eira do Serrado, G. (66), II; between Eira do Serrado and Curral das Freiras, 800 m, R. (976), II, near Cabo Girão G. (8), II.

On *Tolpis barbata* (L.) Gaertn.

Jardim da Serra, 750 m, A. Danielsen (5333, herb. O), II (+III).

A. varia ssp. *sparsiflora* Lowe has previously been reported as a host for this rust variety. *T. barbata* is a new host for the rust in Macaronesia, but it is the type host of *P. heribaudiana*, described from France. Canarian hosts for the var. *chlorocrepididis* are *A. glandulosa* var. *varia* and *Tolpis* spp.

Puccinia hieracii Mart. var. **hypochoeridis** (Oud.) Jørst., Skr. utg. Norske Vidensk.-Akad. Oslo, 1935, 38: 27, 1936.

Syn. *P. hypochoeridis* Oud., Nederl. Kruidk. Arch. II, 1: 175, 1874.

On *Hypochoeris radicata* L.

Near Cabo Girão, G. (7a), II + III.

This rust variety has previously been reported from Madeira and the Canaries on *H. glabra* L., from the Canaries also on *Launaea nudicaulis* (L.) Hook. f. *H. radicata* is a new host in Macaronesia, but it is commonly infested with this rust species in Europa, and it is also reported from Africa, Australia and the Americas.

Puccinia hyparrheniicola Jørst. & Cumm. in Cumm., Bull. Torrey Bot. Club 83: 227, 1956.

On *Hyparrhenia hirta* (L.) Stapf.

Monte S, and between Funchal and Monte and above the Jardim Botânico, A. (37, 284, 118), II; along «Levada dos Piornais», E of Arieiro, 120 m, R.; W of Cabo Girão, G. (12, 16) II, and E of Funchal, G. (26), II.

This rust species, described from the Canary Islands, is common both in Madeira and in the Canaries. As pointed out by Cummins (op. cit.) the uredineal stage is very similar to those of *P. eritraeensis* Paz. and *P. andropogonis-hirti* Beltrán, the former an East-African species, the latter a Mediterranean one.

Puccinia jasmini DC., Fl. Fr. 2: 219, 1805.

On *Jasminum odoratissimum* L.

Penha de Águia, 90 m, R. (127), III.

This rust has previously been reported from Madeira by Torrend (1909) and Petrak (1929). In the Canaries it is reported from Tenerife and La Palma only.

Puccinia malvacearum Bert. ex Mont. in C. Gay, Hist. Fis Polit. Chile 8: 43, 1852.

On *Lavatera cretica* L.

Funchal, Praia Formosa, H.; Funchal, Costa, III; D., III.

On cf. *Lavatera cretica* L.

Near Cabo Girão and on track from Cabo Girão to Câmara de Lobos, G. (4, 21), III.

On *Malva parviflora* L.

Funchal, H., III.

Porto Santo, Vila do Porto Santo, Costa, III.

On *Malva* cf. *parviflora* L.

Ca. one km W of Funchal, G. (30), III.

This rust has previously been reported from Madeira on *Alcea rosea* L. (syn. *Althaea rosea* (L.) Cav.) by Torrend (1912) and on *L. cretica* by Viennot-Bourgin (1939).

M. parviflora is a new Madeiran host for this rust, but it is commonly infested in the Canaries.

Puccinia menthae Pers., Syn Meth. Fung. p. 227, 1801.

On *Bystropogon canariensis* (L.) L'Gerut. (syn. *B. maderensis* Webb). Along levada from Folhadal to Encumeada, NW of Rocha Negra, 1025 m, R. (487), II.

On *Calamintha nepeta* (L.) Savi (syn. *Satureja nepeta* (L.) Scheele).
Monte, Vendas N, A. (69), II.

On *Calamintha sylvatica* Bromf. ssp. *ascendens* (Jord.) P. W. Ball. Along
the path from Eira do Serrado to Curral das Freiras, 900 m, R. (417),
II, near Eira do Serrado and just above Curral das Freiras, G. (65, 76), II.

On *Clinopodium vulgare* L. (syn. *Satureja vulgaris* (L.).

Fritsch, *Calaminth clinopodium* Moris).

Monte, Vendas W 700 m, A. (274), II.

On *Origanum virens* Hoffm. & Link.

Along the path from Eira do Serrado to Curral das Freiras, 750 m, R.
(431), II.

This rust is widespread in Madeira as well as in the Canaries, and
it is also reported from the Azores. *C. nepeta* is a new host for this
rust in Madeira. The other hosts mentioned previously been report-
ed from Madeira, and so has *Mentha rotundifolia* L.

Puccinia oxalidis (Lév.) Diet. & Ell. in Dietel, Hedwigia 34: 291, 1895.

On *Oxalis corymbosa* DC.

Funchal, H, II.

P. oxalidis is new to the flora of Madeira. It has been reported
from Tenerife in the Canary Islands by Beltrán Tejera (1976) on *O.*
purpurea L. and from the Azores on *O. corymbosa*. The rust has been
spread from the Americas to Europe and Japan.

Puccinia pelargonii-zonalis Doidge, Bothalia 2: 203, 1926.

On *Pelargonium zonale* Willd. (cult.).

Funchal, Santa Catarina Park, and between Funchal and Monte, A. (283,
4), II; Terreiro da Luta, hill behind Funchal, D. II; ca. one km W of
Funchal, between Água de Pena and Santa Cruz, and on road to Curral
das Freiras, below the second tunnel, G. (1, 37, 50, 74), II.

Originally from S. Africa, the pelargonium rust is now wide-
spread in Europe and also in N. America. In Macaronesia it is common
in Madeira and the Canary Islands, and it is also reported from the
Azores. Alanko (1973) published the first record from Madeira.

Puccinia punctata Link. Mag., Ges. Naturf. Fr. Berlin 7: 30, 1815.

Syn. *P. galii-elliptici* Maire, Bull. Soc. Bot. Fr. 48 (1901): p.
CCXV, 1903.

On *Galium productum* Lowe.

On the track from Cabo Girão to Câmara de Lobos, G. (20, 23), II; on
road down to Curral das Freiras, below the first tunnel, G. (72), II + III.

The urediniospores have two superequatorial pores.

P. punctata has previously been reported from Madeira on *G. mollugo* L., but this host is not listed by Eriksson, Hansen & Sunding (1979). Urries (1975) and Jørstad (1958) reported it from the Canary Islands on *G. rotundifolium* L. and *G. ellipticum* Willd. ex Hornem. (both now recognized as *G. scabrum* L.). *G. productum*, endemic to Madeira, is a new host for this rust species.

Puccinia purpurea Cooke, *Grevillea* 8: 15, 1876.

On *Sorghum halepense* (L.) Pers.

Funchal, W, H. II (+ III), G. (25), II + III.

This rust, which on the present host is circumglobal in warmer regions, has been reported from Madeira by Bornmüller (1903) and Viennot-Bourgin (1939). The former author also reported it from the Canary Islands and so did Jørstad (1958).

Puccinia recondita Rob. ex Desm., *Bull. Soc. Bot. Fr.* 4: 798, 1857.

Syn. *P. rubigo-vera* Wint. in Rabh. *Krypt-Fl.* Ed. 2, I, 1: 217, 1882;

P. agrostidis Plowr., *Gard. Chron.* 3 ser. 8: 139, 1890.

On *Agrostis castellana* Boiss. & Reut.

Ribeiro Frio, 800 m, C. Simon, II + III.

On *Elytrigia repens* (L.) Nevski (syn. *Agropyron repens* (L.) PB.). Funchal, H. (2422), II.

Torrend (1912) reported *P. agrostidis* on *A. castellana* from Madeira while *E. repens*, a new host for this rust in the island, has previously been reported from Gran Canaria in the Canary Islands. Other hosts reported from Madeira are *Holcus lanatus* (Bornmüller 1903, Viennot-Bourgin 1939) and *Triticum aestivum* L. (cf. Jørstad 1958).

Puccinia stenotaphri Cumm., *Bull. Torrey Bot. Club* 87: 40, 1960.

On *Stenotaphrum secundatum* (Walt.) Ktze. (syn. *S. americanum* Sw.).

Funchal, S. Simon, II + III.

P. stenotaphri, described from Mauritius, is a new species to the rust flora of Macaronesia. It has been reported from India, Mozambique, Puerto Rico and U.S.A. in addition to the type locality. Other host genera are *Pennisetum* and *Sterochlaena*.

Puccinia tanacetii DC., *Fl. Fr.* 2: 222, 1805.

Syn. *P. chrysanthemicola* Cam., *Oliv. & Luz., Agron. Lusit.* 2: 348, 1940.

On *Argyranthemum pinnatifidum* (L. f.) Lowe ssp. *pinnatifidum*. Between São Vicente and Seixal, Ribeira de João Delgado, 90 m, Ribeiro

Frio on NW slope of Rocha da Moitada, 800 m, Encumeada, 1000 m, R. (196, 1014, 1041), II; Terreiro da Luta and one km E of Santa Cruz, G. (40, 52), II.

On *Argyranthemum pinnatifidum* (L. f.) Lowe ssp. *succulentum* (Lowe) Humphr.

Between São Vicente and Seixal, near Ribeira da Pedra, 100 m, R. (1038, 1039), II.

Jørstad (1958) reported this rust from Madeira on the endemic *Chrysanthemum pinnatifidum* L. f. (= *A. pinnatifidum*) without reference to the variety. The rust has been reported on several hosts in the Canary Islands.

Puccinia vincae Berk. in Smith, Engl. Fl., V, 2: 364, 1836.

On *Vinca major* L.

Between Monte and Funchal, 400 m, 0 + II, and Monte S, 0 + I + III, A. (23, 55).

This rust, quite common in the Canaries, has been reported from Madeira by Petrak (1929) and Viennot-Bourgin (1939).

Puccinia violae DC., Fl. Fr. 5: 62, 1815.

On *Viola riviniana* Rchb. (syn. *V. broussonetiana* R. & S.). Poiso, T. Furlängen, II + III.

On *Viola paradoxa* Lowe.

Pico do Cidrão, G. Maul (II+) III.

On *V. riviniana* this rust has previously been reported by Schroeter (1884) and Viennot-Bourgin (1939) while *V. paradoxa*, endemic to Madeira, is a new host. Torrend (1909) reported it on *V. odorata* L. var. *maderensis* Lowe. In the Canary Islands it has been found on *V. odorata* var. *maderensis* and on *V. riviniana* (syn. *V. reichenbachiana* Jord.).

Pucciniastrum epilobii Oth, Mitth. Naturf. Ges. Bern 1861: 72 et 84, 1861.

Syn *P. pustulatum* Diet. in Engl. & Prantl Nat. Pfl. Fam. I, 1: 47, 1897.

On *Epilobium* sp.

On the road Eira do Serrado - Curral das Freiras, just below the first tunnel, Gj. (71), II.

This widespread rust species is new to the flora of Macaronesia. As the host plants were sterile nothing can be said about the species.

Pucciniastrum vaccinii (Wint.) Jørst., Skr. Norske Vidensk. - Akad. Oslo, 1951 No. 2: 55, 1952.

On *Vaccinium padifolium* J. E. Sm. ex Rees.

Ribeiro Frio and on the track to Balcões, G. (55, 59), II.

P. vaccinii is a new member of the rust flora of Macaronesia. It has a circumpolar distribution on *Vaccinium* spp. In N. America it occurs also on other ericaceous hosts. In Europe it has been found from the extreme north southward to the Mediterranean. The host is endemic to Madeira and thus a new host for the rust.

Tranzschelia discolor (Fckl.) Tranz. & Litv., Bot. Zhurn. 24: 248, 1939.

Syn. *Puccinia discolor* Fckl., Fungi Rhen. 2121, 1867; *Tranzschelia pruni-spinosae* (Pers.) Diet. var. *discolor* (Fckl.) Dunegan, Phytopathology 28: 424, 1938.

On *Prunus persica* (L.) Batsch.

Ca. one km W of Funchal, G. (31), II + III.

This widespread rust species, common in the Canary Island and also known from the Azores (Bensaude 1926), has previously been reported from Madeira on *P. domestica* (Viennot-Bourgin 1939) as well as on *P. persica* (Torrend 1909).

Uromyces anthyllidis Schroet., Hedwigia 14: 162, 1875.

On *Lotus ornithopodioides* L.

Ribeira Brava, H. II + III.

This rust has been reported several times from Madeira (cf. Jørstad 1958) on *Hippocrepis* sp., *Lotus angustissimus* L., *L. argenteus* Lowe and *L. albus* L. The present host is new to the rust in Macaronesia, but it has been reported with this rust in Spain, Italy and Malta.

The rust is common in the Canary Islands and it is also known from the Cape Verde Islands (Gjærum 1974) and from the Azores.

Uromyces betae (Pers.) Lév., Ann. Sci. Nat. Bot. ser. 4, 2: 89, 1854.

On *Beta maritima* L.

Porto Santo, Vila, H., II + III.

Torrend (1909) reported this rust on *B. vulgaris* L. and so did Viennot-Bourgin (1939) on *B. maritima*. It is also reported from the Azores on *B. sp. cult.* (Bensaude 1926-27), but to my knowledge not from the Canaries.

Uromyces bidenticola Arth., Mycologia 9: 71, 1917.

On *Bidens pilosa* L.

Near the chapel above Cabo Girão, and at Curral das Freiras, G. (13, 79), II.

This rust is common in the Canary Islands and it has been reported several times from Madeira (cf. Jørstad 1958), and also from the Azores.

Uromyces ervi West., Bull. Acad. Roy. Belg. 21, 2: 234, 1854.

On *Vicia hirsuta* (L.) S. F. Gray.

Ca. one km W of Funchal, G. (24), I + II + III.

Schroeter (1884) published this rust as *U. viciae-fabae* (Pers.) Schroet. on *V. disperma* DC. (syn. *Ervum parviflorum* (Loissl.) Bert.), while Viennot-Bourgin (1939) reported it on *V. hirsuta*. The rust is common on *V. disperma* in the Canaries.

Uromyces laburni (DC.) Otth, Mitth. Naturf. Ges. Bern., p. 87, 1863.

On *Cytisus scoparius* (L.) Link.

On road down to Curral das Freiras, just above the first tunnel, G. (67).

On *Cytisus tener* Jacq. (syn. *C. virgatus* (Ait.) Masf., *Genista tenera* (Jacq. ex Murr.) O. Ktze.).

Ribeira Brava, on road to Serra de Água, C. Simon.

This rust has been reported on *Genista virgata* DC. from Madeira as *U. genistae-tinctoriae* Wint. It is also known from the Canary Islands on *Cytisus* spp. *C. scoparius* is a new host for this rust in Macaronesia, but has been reported from several European countries. *C. tener* seems to be a new host for this rust.

U. laburni belongs to the *U. pisi* group (cf. Jørstad 1958).

Uromyces linearis Berk. & Br., J. Linn. Soc. London 14: 92, 1875.

On *Panicum repens* L.

Roadside between Funchal and Monte, A. (21) II.

This is a new rust species in Macaronesia. Described from Sri Lanka it is known on the present host from Morocco, Mallorca and Uganda to the Philippines and Japan (Cummins 1971).

Uromyces setariae-italicae Yoshi., Bot. Mag. Tokyo 20: 247, 1906.

Syn. *Uromyces leptodermus* H. & P. Syd. Annal. mycol. 4: 430, 1906.

On *Setaria adhaerens* (Forssk.) Chiov.

Ca. two km W of Funchal, G. (64) II + III.

This rust has previously been reported from Madeira on *S. viridis* (L.) PB. In the Canaries it has been found on *S. glauca* (L.) PB. *S. adhaerens* is a new host in Macaronesia. Acc. to Flora Europaea, vol. 5, it is a variant of *S. verticillata* (L.) Beauv. on which the rust has been reported from Mallorca, Cyprus, India and scattered all over Africa.

Uromyces trifolii-repentis Liro. Acta Soc. Fauna Flora Fenn. 29: 6: 15, 1906.

On *Trifolium repens* L.

Ca. 1 km E of Caniçal, G. (45), 0 + I + II + III.

This rust has previously been reported from Madeira on the same host. In the Canary Islands it has been found on *T. stellatum* L.

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