RUST FUNGI FROM EAST AFRICA

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ABSTRACT. An enumeration is given of forty-one rust fungi from East Africa. Many of the species from higher altitudes are conspecific with, or closely related to, Eurasian taxa.

The rust fungi of any area of the world are amongst the first to be explored and enumerated probably because of the apparent simplicity in their identification. The present account of rusts and a few other fungi collected in magnificent condition by R. F. Cain, H. D. Griffin and J. C. Krug in the course of a collecting trip in 1966 to East Africa has yielded two particular points of interest*. No new taxa are recorded. This may indicate that to some extent the flora is relatively well known or alternatively and, perhaps more probably, that outsiders unfamiliar with the flora see and collect only what is previously known. It would not be surprising, however, if the rust flora is now relatively well-known because a number of mycologists keenly interested in the rust fungi have been resident for many years in East Africa. C. G. Hansford, P. O. Wiehe, G. B. and M. Wallace have all collected and collaborated with E. M. Wakefield, G. R. Bisby and G. B. Cummins in preparing accounts of the rust flora. The flora of East Africa is continuous with that of S Africa whose rust fungi are well documented by a series of papers by E. M. Doidge. That much can be achieved by poring over herbarium specimens of African phanerogams in European herbaria is demonstrated by the late I. Jørstad's paper on the rusts found by Lagerheim on specimens in Swedish herbaria. The other point of interest in this collection stems from the considerable proportion of rusts indistinguishable from Northern Eurasian species. These species, for example, *Puccinia galii-verni*, *Uromyces geranii* and *Uromyces polygoni-avicullariae*, represent the temperate Eurasian element at high levels where they parasitise the same host genera as in northern latitudes.

ACANTHACEAE

Aecidium acanthacearum Cooke in Grevillea 10: 124 (1882).

On *Hypoestes triflora* (Forsk.) R. & S. Kenya: Aberdare Mts, Kimale, 8,800 ft, 6 vii 1966, *Cain, Griffin & Krug* 66.247 and 66.246b. Tanzania: nr. Ngurdota Crater, 3000 ft, 10 viii 1966, *Cain, Griffin & Krug* 66.1570.

Aecidia in small groups of 6–30 on non-hypertrophied leaf spots; aecidiospores globose, 15–18 μm diameter, wall almost smooth, with refractive granules but no visible pores. The aecidial sori of this collection are very heavily infected with *Eudarluca caricis* (Fr.) Eriks. which often entirely encircles them with several rows of ascocarps.

Another collection on an unidentified member of the Acanthaceae from the Aberdare Mts, *Cain, Griffin & Krug* 66.38, probably also belongs here.

This is probably the same rust as Laundon (1963) disposed of as *Aecidium* sp. on *H. triflora* from Ethiopia in his revision of rusts on Acanthaceae.

* Sets 1 and 3 are at TRTC; set 2 at E; set 3 at IMI.

Puccinia isoglossae Doidge in Bothalia 2: 72 (1927).

On *Hypoestes verticillaris* (L.f.) Roem. & Sch. Kenya: Mt Kenya, Hombe, 6600 ft, 12 vii 1966, *Cain, Griffin & Krug* 66.465.

Telia only, leptosporic, pulvinate, compact, brown; teliospores fusoid hyaline, 26–38 × 10–12 μm, pedicels persistent up to 50μm long.

This collection comes from the same locality and is on the same host as that recorded by Jørstad (1956). Laundon (1963) recognised this rust on *Hypoestes cumingiana* Benth. & Hook., *H. verticillaris* R.Br. and *Hypoestes* sp. from Congo, Formosa, Ghana, Kenya, S Africa and Sudan.

Puccinia thunbergiae Cooke in Grevillea 10: 125 (1882).

On *Dicliptera* sp. Tanzania: Mt. Meru, Arusha, 7000 ft, 9 viii 1966, *Cain, Griffin & Krug* 66.1548.

This collection has strongly stromatic telia which exactly match Laundon's recent account of the species (Laundon, 1963) on *Dicliptera* in India. The fungus does not seem to have been recorded on this host genus in Africa.

Uromyces hypoestis Tarr & Laundon, Mycol. Papers, CMI 89: 81 (1963). Syn.: *Uredo hypoestis* (Cooke) De Toni in Sacc., Syll. Fung. 7: 850 (1888).

On *Hypoestes antennifera* S. Moore. Tanzania: Mt. Kilimanjaro, W of Loitokitok, 7000 ft, 17 viii 1966, *Cain, Griffin & Krug* 66.1644 and Naro Maru track, 7500 ft, 16 viii 1966, *Cain, Griffin & Krug* 66.1630; Usambara Mts, Shume Forest, Magamba, 13 viii 1966, *Cain, Griffin & Krug* 66.1600.

Uredinia only, hypophyllous; uredospores subglobose, 28–32 × 26–30 μm rather prominently echinulate, wall 2 μm thick with two equatorial pores.

Several workers have examined this rust on several acanthaceous hosts (*Hypoestes*, *Isoglossa* and *Justicia capensis*) without obtaining evidence of any relation to either telial or aecidial bearing rusts. Tarr & Laundon (1963) however have found *Uromyces* telia on one collection from Sudan on *H. verticillaris* and have included the uredo-perennating race in their *Uromyces hypoestis*.

Amaranthaceae

Puccinia cyathulicola Cumm. var **kenyensis** Cumm. in Bull. Torr. Bot. Cl. 79: 218 (1952).

On *Cyathula uncinulata* (Schrad.) Schinz. Kenya: W of Endebers, Mt Elgon Forest Station, 8000 ft, 2 viii 1966, *Cain, Griffin & Krug* 66.1204.

Uredinia amphigenous, large, pulvinate, 2–4 μm diameter, brown; uredospores broadly ellipsoid, 32–40 × 28–32 μm, wall echinulate, dark brown, 3–4 μm thick with two equatorial pores each with a surrounding smooth area. Telia leptosporic, teliospores 95–110 × 20–23 μm, wall smooth, up to 8 μm thick at apex, rather pale brown, pore of upper cell apical, of lower cell superior; pedicel 50–65 μm long.

P. cyathulicola occurs on *C. uncinulata* in Malawi (Cummins, 1952, Bisby & Wiehe, 1953).

On *Cyathula schimperiana* Moq. Tanzania: Mt Meru, Arusha, 7000 ft, 9 viii 1966, *Cain, Griffin & Krug* 66.1551.

Uredinia brown, pulvinate, mostly hypophyllous, 1–3 mm diameter; uredospores 40–50 × 30–35 μm, wall dark brown, 5–6 μm thick, up to

8–10 μm at base and apex, multilaminate with hyaline spines up to 3 μm long, germ pores two, equatorial.

On *Cyathula polycephala* Bak. Kenya: Aberdare Mts, Kerita, 7800 ft, 5 vii 1966, *Cain, Griffin & Krug* 66.37; Muguga 6800 ft, 7 vii 1966, *Cain, Griffin & Krug* 66.257.

ANNONACEAE

Puccinia popowiae Cooke in Grevillea 10: 126 (1882).

On *Popowia gracilis* Oliver ex Engl. & Diels subsp. *gracilis*. Kenya: Shimba Hills, 1400 ft, 24 viii 1966, *Cain, Griffin & Krug* 66.2080

Spermogonia epiphyllous, aecidia hypophyllous on large, bullate purplish red spots; peridia long and yellow; aecidiospores 32–44 × 18–22 μm, apex 8–10 μm thick.

P. popowiae was described on *Popowia caffra* from Inanda, Natal. Doidge (1950) recorded it on *Popowia caffra* from several localities in South Africa.

COMMELINACEAE

Uromyces commelinae Cooke in Trans. Roy. Soc. Edinb. 31: 342 (1888).

On *Commelina* sp. Kenya: Muguga, 6800 ft, 5 viii 1966, *Cain, Griffin & Krug* 66.905.

Uredinia only; uredospores subglobose, 28–33 × 22–24 μm, wall echinulate with two equatorial pores with a smooth area around the pores.

The world and host distribution of *Uromyces* on *Commelina* and allied genera has been ably surveyed by Viennot-Bourgin (1953, p. 220). *U. commelinae* is of world-wide distribution in the warmer zones and does not appear to have differentiated morphologically on the various host genera—*Commelina, Cyanotis, Aneilema, Murdannia*.

COMPOSITAE

Aecidium conyzae-pinnatilobatae Sydow, Mon. Ured. 4: 32 (1924).

On *Conyza steudelii* Sch. Bip. ex A. Rich. Kenya: Muguga, 6800 ft, 5 viii 1966, *Cain, Griffin & Krug* 66.910

Aecidia in large diffuse groups, peridia laciniate and revolute; aecidiospores subglobose, 17–21 μm diameter, wall minutely verruculose, about 1 μm thick but up to 4·5–5 μm thick at upper end, without refractive bodies.

Aecidium conyzae-pinnatilobatae Sydow, *A. hoffmannii* Sydow, *A. conyzae* P. Henn. and *A. conyzae-auriculiferae* Jørstad (1956) all inhabit *Conyza* and have apically thickened aecidiospore walls. The last species has much larger aecidiospores (33–45 × 27–33 μm) whereas the second and third species have much (up to 8 and 11μm) thicker apical walls in the aecidiospores than *A. conyzae-pinnatilobatae*.

Aecidium vernoniae-podocomae Doidge in Bothalia 2: 212 (1927).

On *Vernonia auriculifera* Hiern. Uganda: Impanga forest SW of Kampala, 4500 ft, 29 vii 1966, *Cain, Griffin & Krug* 66.1172.

Several aecidial-forming rusts are known on *Vernonia* in E Africa: *Aecidium banketensis* Hopkins on *Vernonia shirensis* in Malawi and described from S Rhodesia with spores 13–18 μm diameter and wall 1 μm thick

(Bisby & Wiehe, 1953); *Aecidium vernoniae-appendiculatae* from Madagascar (Bouriquet & Bassino, 1965) with remarkably verrucose aecidiospores; *Aecidium vernoniae-podocomae* Doidge from Uganda (Cummins, 1945, Wakefield & Hansford, 1949) and Malawi (Bisby & Wiehe, 1953) with thick-walled aecidiospores (2·5–3 μm, closely and delicately verruculose). *Aecidium vernoniae-podocomae* was first described from S Africa on *Vernonia podocoma*.

Puccinia aecidiiformis Thuem. in Flora 33: 378 (1875).

On *Microglossa densiflora* Hook. f. Tanzania: Mt Kilimanjaro, W of Loitokitok, 7000 ft, 17 viii 1966, *Cain, Griffin & Krug* 66.1 59.

Telia forming large confluent yellowish sori; teliospores leptosporic, 65–77 × 28–35 μm, wall pale, smooth apex unthickened, pore of upper cell apical, of lower cell superior; pedicel long and persistent.

This species has been noted on *M. densiflora* from Kenya (Jørstad, 1956) and on *M.* (*Nidorella*) *mespilifolia* DC, the type host from the Cape and Natal (Doidge, 1950). Most of the species of *Microglossa* are probably best allocated to other genera of Compositae, e.g. *Psiadia*, but I can trace no records of rusts on these host genera which might be related to *P. aecidiiformis*.

On *Microglossa pyrifolia* (Lam.) O. Kuntze. Tanzania: Mt Kilimanjaro, N of Lyamungu, 6000 ft, *Cain, Griffin & Krug* 66.1590 and Naro Maru track, 16 viii 1966, 66.1637 and N of Lyamungu, 11 viii 1966, 66.1580. Kenya: Muguga, 6800 ft, 5 viii 1966, *Cain, Griffin & Krug* 66.915.

Puccinia africana Cooke in Grevillea 8: 71 (1879).

On *Spilanthes mauritana* (Rich ex Pur.) DC. S Africa: Natal, Pongola flood plain, 8 vi 1969, *Pooley* 575.

Telia only. *Puccinia africana* is a microcyclic species morphologically indistinguishable from *Puccinia cnici-oleracei* of the northern hemisphere. However, these microcyclic forms have probably originated quite independently from long cycle heteroecious species so perhaps are best regarded as good species. The species is known from several E African countries on a plant which is probably *Blainvillea acmella* (L.) Philipson (= *Spilanthes acmella*). The type of *P. africana* is on '*Spilanthes africana* leg. J. M. Ward from Natal'.

Puccinia erlangeae Grove in Kew Bull. 1916: 270 (1916).

On *Erlangea tomentosa* S. Moore. Tanzania: Mt Kilimanjaro, Naro Maru Track, Loitokitok, 7500 ft, 16 viii 1966, *Cain, Griffin & Krug* 66.1636; W of Loitokitok, *Cain, Griffin & Krug* 66.1643.

Uredinia densely covering the under surfaces of the leaves; uredospores ubglobose, 24–30 μm diameter, wall echinulate, 2–2·5 μm thick with two equatorial pores without associated smooth patches. Telia brown, 1–2 mm diameter mostly hypophyllous; teliospores ellipsoidal, not constricted, 32–40 × 27–32 μm, wall regularly and distantly verrucose, 2 μm thick, pore of upper cell apical, of lower cell basal; pedicel usually deciduous.

P. erlangeae is otherwise known from Uganda (Wakefield & Hansford, 1949) and Kenya (Duke, 1926). In his original description of a collection from Nairobi, Grove noted that the teliospores are similar to those of *Puccinia hieracii* but did not see uredospores which are rather different.

Uromyces bidenticola Arthur in Mycologia 9: 71 (1917).

On *Bidens pilosa* L. var. *minor* (Bl.) Scherff. Kenya: Muguga, 6800 ft, 5 viii 1966, *Cain, Griffin & Krug* 66.909.

Uredinia only; uredospores 27–30 × 22–25 *µm* with two equatorial pores, wall echinulate with a smooth patch below each pore.

Uromyces bidenticola seems to follow its pantropical weedy host, *Bidens pilosa*, throughout its range in Asia, Africa and America.

Convolvulaceae

Puccinia holosericea Cooke in Grevillea 10: 126 (1882).

On *Ipomoea wightii* (Wall.) Choisy var. *kilimandschari* (Dammer) Verdc. Tanzania: Mt Kilimanjaro, W of Loitokitok, 17 viii 1966, *Cain, Griffin & Krug* 66.1652. Kenya: Muguga, 6800 ft, 7 vii 1966, *Cain, Griffin & Krug* 66.256 and 5 viii 1966, 66.914.

Telia only, usually forming a ring round a central group, cinnamon; teliospores smooth, pale brown, slightly thickened at the apex.

On *Ipomoea* sp. Uganda: Jinja, 4000 ft, 1 viii 1966, *Cain, Griffin & Krug* 66.1199. Kenya: Muguga, 6800 ft, 4 vii 1966, *Cain, Griffin & Krug* 66.1.

The collections cited from Tanzania and Kenya have light cinnamon to cinnamon coloured telia whereas those from Uganda are the dark purplish-brown described by Cooke (loc. cit.) and Doidge (1927). Apart from colour, I can see no significant difference between the two.

Euphorbiaceae

Aecidium phyllanthii P. Henn. in Engl. Bot. Jahrb. 15: 6 (1892).

On *Phyllanthus engleri* Pax. Kenya: Shimba hills, 1400 ft, 24 viii 1966, *Cain, Griffin & Krug* 66.2077.

Hypophyllous spermogonia and aecidia on orange spots; aecidia immersed; aecidiospores subglobose, 17–20 *µm* diam., wall c. 1 *µm* thick, very finely verruculose, lacking refractive granules and pores.

The discrimination of the various species of *Aecidium* on *Phyllanthus* has been well discussed by Viennot-Bourgin (1958) who has also given a good description of *A. phyllanthii*.

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

On *Euphorbia schimperiana* Scheele. Kenya: Muguga, 6800 ft, 4 vii 1966, *Cain, Griffin & Krug* 66.8 [Uredinia only].

Melampsora ricinii Noronha, Agron. Lusit. 14: 229 (1952).

On *Ricinus communis* L. Kenya: Muguga, 6800 ft, 5 viii 1966, *Cain, Griffin & Krug* 66.902 [Uredinia only].

Uromyces cluytiae Kalch. & Cooke in Grevillea 11: 20 (1882).

On *Cluytea robusta* Pax. Tanzania: Mt Kilimanjaro, W of Loitokitok, 7000 ft, 17 viii 1966, *Cain, Griffin & Krug* 66.1655.

Telia with teliospores and uredospores. Uredospores 30–35 × 25–27 μm, wall echinulate, 2 μm thick with scattered pores; teliospores 26–44 × 26–29 μm, wall verrucose, 3–4 μm thick, apex up to 7·5 μm thick with one apical pore, pedicel persistent, stout, 30–45 μm long.

It is of interest that this rust on a member of the Euphorbiaceae is almost certainly a microform derived from a heteroecious species with aecidia on *Euphorbia* and dicaryont stages on Leguminosae. It has a similar origin therefore to the Eurasian microforms of the *U. proeminens*, *U. sublevis* affinity.

GERANIACEAE

Puccinia pelargonii-zonalis Doidge in Bothalia 2: 203 (1927).

On *Pelargonium zonale* Willd. Kenya: Muguga, 6800 ft, 5 viii 1966, *Cain, Griffin & Krug* 66.900.

On *Pelargonium* sp. Kenya: Mtito Andei, 2700 ft, 27 viii 1966, *Cain, Griffin & Krug* 66.2106.

Uromyces geranii (DC.) Lév. in Ann. Sci. Nat. Bot. ser. 3, 8: 371 (1847).

On *Geranium simense* Hochst. ex A. Rich. Tanzania: Mt Kilimanjaro, W of Loitokitok, 7000 ft, 17 viii 1966, *Cain, Griffin & Krug* 66.1653.

Uredinia only; uredospores subglobose, 21–25 μm diameter, wall distantly echinulate, 1·5 μm thick with one equatorial pore. This rust is recorded on the same host from Uganda and Tanzania. Its very distinct uredospores suggest that the African collections are almost certainly conspecific with the Eurasian rust which parasitises many members of *Geranium*.

GRAMINEAE

Phakopsora apoda (Har. & Pat.) Mains in Mycologia 30: 45 (1938).

On *Pennisetum clandestinum* Chiov. Kenya: Muguga, 6800 ft, 4 vii 1966, *Cain, Griffin & Krug* 66.7(a).

Uromyces peglerae Pole Evans in Ann. Mycol. 12: 263 (1914).

On *Digitaria* sp. Kenya: Muguga, 6800 ft, 5 viii 1966, *Cain, Griffin & Krug* 66.920.

HYPERICACEAE

Puccinia keniensis Jørstad in Ark. f. Bot. 3, 17: 578 (1956).

On *Hypericum revolutum* Vahl. Kenya: Aberdare Mts, S Kinangop, 6400 ft, 8 vii 1966, *Cain, Griffin & Krug* 66.273.

Telia pulvinate, leptosporic, whitish; teliospores fusiform, centrally constricted, 60–68 × 18–23 μm, wall smooth, hyaline, pore of upper cell apical, of lower cell superior; pedicel persistent, up to 80 μm long.

Jørstad (1956) described this species on *Hypericum leucoptychodes* and *H. quartinianum* from Mt Kenya. Our material exactly matches his description. He also, subsequent to 1956, determined material in herb CMI bearing uredinia which matches the following collection.

On *Hypericum keniense* Schweinf. Kenya: Mt Kenya, Naro Maru track, 9000 ft, 13 vii 1966, *Cain, Griffin & Krug* 66.499.

Uredinia pulvinate, aparaphysate, 1–2 mm diameter, light cinnamon; uredospores subglobose, 28–32 × 25–30 μm, wall echinulate 1–2·5 μm thick with six pores often three in the upper and three in the lower half of the spore.

Iridaceae

Uromyces transversalis Wint. in Flora 42: 263 (1884).

On *Gladiolus psittacinus* Hook. f. Kenya: Aberdare Mts, S Kinangop, 6000 ft, 8 vii 1966, *Cain, Griffin & Krug* 66.264.

Uredinia and telia; uredospores with thin walls (1–1·5 μm) and 6–8 scattered pores each with a rather distinct marginal rim; telia strongly stromatic.

U. transversalis belongs to the group of the difficult species on members of the Iridaceae. It occurs on *Freesia* (*U. freesiae*), *Gladiolus*, *Crocosmia* and *Watsonia*. The group was revised by Doidge (1948) but Jørstad (1956) combined some of the species she recognised.

Labiatae

Puccinia leonotidicola P. Henn., Bot. Ergebnisse Kunene-Sambesi Exped. 3 (1902).

On *Leonotis* sp. Kenya: Aberdare Mts, Kimale, 8800 ft, 6 vii 1966, *Cain, Griffin & Krug* 66.244b.

Aecidia sparse, hypophyllous; aecidiospores subglobose, 21–24 μm diameter, wall minutely reticulate. Uredospores subglobose, 22–26 μm diameter, wall echinulate 1·5 μm thick with 3(4) sub-basal pores.

This rust has most unusual uredospores with three (rarely four) pores grouped around the base of the spore next the point of attachment. It is noteworthy that this feature occurs in other rusts on the Labiatae (e.g. *Salvia*) and points to their common origin. *P. leonotidicola* occurs on *Leonotis dysophylla* in S Africa, *L. mollissima* in Uganda and *L. nepetifolia* in Uganda and Madagascar.

Puccinia ocimii Doidge in Bothalia 2: 203 (1927).

On *Ocimum suave* Willd. Kenya: Mt Kenya, Hombe, 6600 ft, 12 vii 1966, *Cain, Griffin & Krug* 66.471.

This collection, bearing only aecidia, undoubtedly belongs to Doidge's species described on *O. suave* and *O. americanum* from S Africa and also recorded on *O. basilicum* from Madagascar.

Leguminosae

Aecidium crotalariae P. Henn. in Engler, Die Pflanzenwelt Ost-Africas, Teil C, 52 (1895).

On *Crotalaria agatiflora* Schweinf. subsp. *agatiflora*. Kenya: Muguga, 6800 ft, 5 viii 1966, *Cain, Griffin & Krug* 66.903.

Aecidia in groups of 30–40, peridia laciniate and deeply revolute, peridial cells closely verrucose, aecidiospores globose, 25–30 μm, wall 1 μm thick, finely verruculose with smooth patches 5–10 μm diameter bearing large refractive granules 4–6 μm in diameter.

Maravalia crotalariae Sydow in Ann. Mycol. 35: 250 (1937).

On *Crotalaria agatiflora* Schweinf. subsp. *agatiflora*. Tanzania: Mt Kilimanjaro, 7000 ft, 17 viii 1966, *Cain, Griffin & Krug* 69.1641.

Maravalia crotalariae is represented by several collections in Herb. CMI from East Africa mostly on *C. agatiflora*. It was described originally from Malaya on *C. usaramoensis* Baker, a plant introduced earlier from tropical East Africa.

Ravenelia indigoferae Tranzschel in Hedwigia 33: 369 (1894).

On *Indigofera emarginella* Steud. ex A. Rich. var. *emarginella*. Uganda: Kasambya, 3800 ft, 1 viii 1966, *Cain, Griffin & Krug* 66.889.

Uredinia only. The sori have the typical paraphyses of this species; *R. mananguensis* Cummins also on *Indigofera* (*I. arrecta*) from Africa differs in having a ring of gelatinised tissue bearing the paraphyses.

Uromyces harmsianus Doidge in Bothalia 2: 207 (1927).

On *Crotalaria mauensis* Bak. f. Kenya: Muguga, 6800 ft, 4 vii 1966, *Cain, Griffin & Krug* 66.10.

Uredinia only, rusty brown; uredospores ellipsoid to subglobose, 27–30 × 21–24 μm, wall echinulate, 1·5–2 μm thick with 6–7 scattered rather large (c. 2 μm diameter) pores.

Uredo crotalariicola P. Henn. also has uredospores with about six scattered pores but the wall is credited with being much thicker (5–6 μm). *Uromyces decoratus* Sydow also infects *Crotalaria* but has rather small inconspicuous uredospore pores.

Liliaceae

Puccinia ferruginea Lév. in Vaillant, Voyage de la Bonite 264 (1839–46).

On *Smilax kraussiana* Meiss. Kenya: Shimba hills, 24 viii 1966, *Cain, Griffin & Krug* 66.2083.

In a previous paper, *Puccinia ferruginea* on *Smilax china* collected in Hongkong was discussed (Henderson, 1969) and was accepted as conspecific with *Puccinia prainiana* from India and *P. kraussiana*. The present collection bearing resting and leptosporic teliospores and uredinia is certainly indistinguishable from my previous collection from Hongkong. As *P. kraussiana* this rust is known on *Smilax goetzeana* in Kenya and on *S. kraussiana* from Uganda and French Congo.

Polygonaceae

Uromyces polygoni-avicolariae (Pers.) Karst. in Bidr. Kanned. Finl. Nat. Folk 4: 12 (1879).

On *Polygonum setosulum* A. Rich. Uganda: Ruwenzori Mts, Ibanda, 5000 ft, 19 vii 1966, *Cain, Griffin & Krug* 66.1130a.

Uredinia only. Recorded on *Polygonum tomentosum* from Uganda (Wakefield & Hansford, 1949).

RANUNCULACEAE

Coleosporium clematidis Barclay in Journ. As. Soc. Bengal 59: 89 (1890).

On *Clematis hirsuta* Guill. & Perr. Kenya: Muguga, 6800 ft, 5 viii 1966, *Cain, Griffin & Krug* 66.916.

Uredinia only. This collection belongs to the European group of *Coleosporia* rather than to the Japanese species-group described by Saho (1966); the uredospores have relatively small warts (less than 1·5 μm high), rather densely scattered (40–50/10μm^2). Unfortunately, I have not seen Barclay's material to ensure that his species belongs to the same group. A *Coleosporium* on *Clematis* in E Africa must either be a uredo-perennating race or a race which has entered E Africa since the introduction of pines for there are no species of *Pinus* native to the area. *Clematis simensis* and *C. incisodentata* are recorded as infected in Kenya and Uganda respectively.

Uromyces wiehei Cummins in Bull. Torrey Bot. Cl. 79: 233 (1952).

On *Thalictrum rhynchocarpum* Dill. & Rich. Kenya: Aberdare Mts, Kimale, 8800 ft, 6 vii 1966, *Cain, Griffin & Krug* 66.243.

Uredinia only, thin-walled paraphyses present, uredospores with 6–8 scattered pores each with a rather prominent margin.

Cummins described this species from collections on the same host in Nyasaland. Although this gathering lacks teliospores there seems little doubt that it belongs in *U. wiehei*.

RHAMNACEAE

Endophyllum macowanii Pole Evans in Rept. S. Afr. Ass. Adv. Sci. 1908: 252 (1909).

On *Rhamnus prinoides* L'Hérit. Tanzania: Mt Kilimanjaro, W of Loitokitok, 7000 ft, 17 viii 1966, *Cain, Griffin & Krug* 66.1657.

This collection is heavily infected by *Tuberculina persicina*.

RUBIACEAE

Aecidium vangueriae Cooke in Grevillea 10: 124 (1882).

On *Vangueria* sp. Kenya: Shimba Hills, 1400 ft, 24 viii 1966, *Cain, Griffin & Krug* 66.2078.

Aecidium vangueriae has been collected and recorded many times in S Africa, Madagascar, Mauritius, Uganda, Malawi, Tanzania and Ghana on many species of *Vangueria*. The aecidia, produced in large numbers on spots up to an inch across, are undoubtedly conspicuous in nature.

Hemileia vastatrix B. & Br. in Gard. Chron. 1157 (1869).

On *Gardenia jovis-tonantis* Hiern. Uganda: Kasambya, 3800 ft, 1 viii 1966, *Cain, Griffin & Krug* 66.896.

Puccinia galii-verni Ces. in Klotsch, Herb. Viv. 1092 (1846).

On *Galium chloroionanthum* K. Schum. Uganda: Ruwenzori Mts, Nyamaleju Hut, 10800 ft, 20 vii 1966, *Cain, Griffin & Krug* 66.1139.

Telia pulvinate, pale brown, leptosporic; teliospores 40–50 × 13–17 μm, wall smooth, thin (1 μm), pale, up to 3 μm at apex; pedicels stout, persistent, 50–80 μm long.

There seems little doubt that this fungus is conspecific with the circumboreal *P. galii-verni*. The nearest records of any rusts of the *Puccinia punctata* group on *Galium* appear to be in North Africa (*P. punctata*, *P. difformis* and *P. crucianellae*). There are, however, species of the same affinity on *Rubia cordifolia*—*Puccinia rubiicola* Syd. and *P. dimorpha* Syd. in Uganda. Whether these fungi have specialised on their hosts in isolation or have independent origins may not be solved even by intensive examination, they are so similar morphologically.

RUTACEAE

Puccinia tecleae Pass. in N. Giorn. Bot. Ital. 7: 184 (1875).

On *Teclea simplicifolia* (Engl.) Verdoorn. Tanzania: Mt Kilimanjaro, Loitokitok, 7800 ft, 16 viii 1966, *Cain, Griffin & Krug* 66.1628a.

This species develops pulvinate subconfluent telia in distinct groups of up to 120 sori together bounded by a distinct brown margin of host tissue. The rust was described from Ethiopia on *Teclea nobilis* and has been recorded on the same host in Uganda (Wakefield & Hansford, 1949). This rust is so remarkably similar to *Puccinia pilocarpi* Cooke on the genus *Pilocarpus* in South America that it suggests that these species have been on their respective hosts since they occupied a common territory.

TILIACEAE

Ravenelia atrides Sydow in Ann. Myc. 10: 438 (1912).

On *Grewia mollis* A. Juss. Uganda: Kasambya, 3800 ft, 1 viii 1966, *Cain, Griffin & Krug* 66.894.

Uredinia only (heavily infected by *Darluca filum*), 1–2 mm diameter with surrounding brown, tapering paraphyses, 35–50 × 5–6 μm, wall c. 1·5 μm thick; uredospores subglobose, 15–19 × 13–15 μm, wall sparsely echinulate c. 1 μm thick, pores not observed.

This purely uredosporic race probably belongs to *R. atrides*. An isolated uredospore race originally described from S Africa as *Uredo grewiae* Pat. & Har. has larger uredospores (20–28 × 15–21 μm). *R. atrides* was described by Sydow on *Grewia caffra* from S Africa, where it has been recorded also on *G. kwekensis*, *G. monticola* and *G. occidentalis* by Doidge.

UMBELLIFERAE

Aecidium peucedani-raiblensis Maire in Oest. Bot. Zeitschr. 57: 330 (1907).

On *Peucedanum runssoricum* Engl. Uganda: Ruwenzori Mts, Bujuku hut, 13100 ft, 25 vii 1966, *Cain, Griffin & Krug* 66.1162.

On *Peucedanum kerstenii* Engl. Uganda: Ruwenzori Mts, Lower Bigo kog, 11300 ft, 21 vii 1966, *Cain, Griffin & Krug* 66.1151. *ibid;* Nyabitaba hut, 8700 ft, 20 vii 1966, *Cain, Griffin & Krug* 66.1135.

This aecidium probably belongs with those discussed by Jørstad (1956) but until more stages of the life cycle are discovered the correct name must remain in some doubt.

EPIPARASITE

Eudarluca caricis (Fr.) Eriks. in Bot. Notiser 119: 35 (1966).

On *Aecidium acanthaceanum* Cke. on *Hypoestes triflorum* (Forsk.) R. & S. Kenya: Aberdare Mts, Kimale, 8800 ft, 6 vii 1966, *Cain, Griffin & Krug* 66.247.

The perfect stage is abundantly present in this collection. Eriksson (loc. cit.) records the epiparasite from several rust hosts from localities scattered throughout Africa.

Fungus Index

Aecidium acanthacearum	*Hypoestes triflora*
— *conyzae-pinnatilobatae*	*Conyza steudelii*
— *crotalariae*	*Crotalaria agatiflora* subsp. *agatiflora*
— *peucedani-raiblensis*	*Peucedanum kerstenii*
— —	*Peucedanum runssoricum*
— *phyllanthi*	*Phyllanthus engleri*
— *vangueriae*	*Vangueria* sp.
— *vernoniae-podocomae*	*Vernonia auriculifera*
Coleosporium clematidis	*Clematis hirsuta*
Endophyllum macowanii	*Rhamnus prinoides*
Hemileia vastatrix	*Gardenia jovis-tonantis*
Maravalia crotalariae	*Crotalaria agatiflora* subsp. *agatiflora*
Melampsora euphorbiae	*Euphorbia schimperiana*
— *ricini*	*Ricinus communis*
Phakopsora apoda	*Pennisetum clandestinum*
Puccinia aecidiiformis	*Microglossa densiflora*
— —	— *pyrifolia*
— *africana*	*Spilanthes mauritana*
— *cyathulicola* var. *kenyensis*	*Cyathula polycephala*
— — —	— *schimperiana*
— — —	— *uncinulata*
— *erlangeae*	*Erlangea tomentosa*
— *ferruginea*	*Smilax kraussiana*
— *galii-verni*	*Galium chloroionanthum*
— *holosericea*	*Ipomoea wightii* var. *kilimandschari*
— —	*Ipomoea* sp.
— *isoglossae*	*Hypoestes verticillaris*
— *keniensis*	*Hypericum keniense*
— —	— *revolutum*
— *leonotidicola*	*Leonotis* sp.
— *ocimii*	*Ocimum suave*
— *pelargonii-zonalis*	*Pelargonium zonale*
— — —	— sp.
— *popowiae*	*Popowia gracilis* subsp. *gracilis*
— *tecleae*	*Teclea simplicifolia*
— *thunbergiae*	*Dicliptera* sp.
Ravenelia atrides	*Grewia mollis*
— *indigoferae*	*Indigofera emarginella*
Uromyces bidenticola	*Bidens pilosa* var. *minor*
— *cluytiae*	*Cluytea robusta*
— *commelinae*	*Commelina* sp.
— *geranii*	*Geranium simense*
— *harmsianus*	*Crotalaria mauensis*
— *hypoestis*	*Hypoestes antennifera*
— *peglerae*	*Digitaria* sp.
— *polygoni-avicularіae*	*Polygonum setosulum*
— *transversalis*	*Gladiolus psittacinus*
— *wiehei*	*Thalictrum rhynchocarpum*

Host Index

Bidens pilosa var. *minor*
Clematis hirsuta
Cluytea robusta
Commelina sp.
Conyza steudelii
Crotalaria agatiflora subsp. *agatiflora*
— — —
— *mauensis*
Cyathula polycephala
— *schimperiana*
— *uncinulata*
Dicliptera sp.
Digitaria sp.
Erlangea tomentosa
Euphorbia schimperiana
Galium chloroionanthum
Gardenia jovis-tonantis
Geranium simense
Gladiolus psittacinus
Grewia mollis
Hypericum keniense
— *revolutum*
Hypoestes antennifera
— *triflora*
— *verticillaris*
Indigofera emarginella var. *emarginella*
Ipomoea wightii var. *kilimandschari*
Ipomoea sp.
Leonotis sp.
Microglossa densiflora
— *pyrifolia*
Ocimum suave
Pelargonium zonale
Pelargonium sp.
Pennisetum clandestinum
Peucedanum kerstenii
— *runssoricum*
Phyllanthis engleri
Polygonum setosulum
Popowia gracilis subsp. *gracilis*
Rhamnus prinoides
Ricinus communis
Smilax kraussiana
Spilanthes mauritana
Teclea simplicifolia
Thalictrum rhynchocarpum
Vangueria sp.
Vernonia auriculifera

Uromyces bidenticola
Coleosporium clematidis
Uromyces cluyteae
— *commelinae*
Aecidium conyzae-pinnatilobatae
— *crotalariae*
Maravalia crotalariae
Uromyces harmsianus
Puccinia cyathulicola var. *kenyensis*
— — —
— — —
— *thunbergiae*
Uromyces peglerae
Puccinia erlangeae
Melampsora euphorbiae
Puccinia galii-verni
Hemileia vastatrix
Uromyces geranii
— *transversalis*
Ravenelia atrides
Puccinia keniensis
— —
Uromyces hypoestis
Aecidium acanthacearum
Puccinia isoglossae
Ravenelia indigoferae
Puccinia holosericea
— *holosericea*
— *leonotidicola*
— *aecidiiformis*
— —
— *ocimi*
— *pelargonii-zonalis*
— — —
Phakopsora apoda
Aecidium peucedani-raiblensis
— — —
— *phyllanthi*
Uromyces polygoni-avicularlae
Puccinia popowiae
Endophyllum macowanii
Melampsora ricinii
— *ferruginea*
— *africana*
— *tecleae*
Uromyces wiehei
Aecidium vangueriae
Aecidium vernoniae-podocomae

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