CONTRIBUTIONS TO THE FLORA OF NANDI HILLS

Part I. Some Interesting Smuts and Rusts

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In a previous paper* on the flora of Nandi Hills, an account of the flowering plants was given by the authors (1942). During the course of these studies, collections of cryptogamic flora were also made. In the present account some of the interesting smuts and rusts are described. Detailed morphological and cultural studies of rusts were undertaken by one of the authors and some new species and new combinations have been proposed. The type specimens of the new species have been deposited in the Herb. Crypt. Ind. Orient., of the Imperial Agricultural Research Institute, New Delhi, and in the Herbarium, Dept. of Botany, Central College, Bangalore.

Puccinia peraffinis H. Syd.

Infection spot yellow, round. Telia hypophyllous, densely aggregated in concentric rings; teliospores two-celled, associated with mesospores, oblong-ellipsoid, rounded at the apex, constricted at the septa, base rounded or attenuated, smooth, yellowish-brown, 28–40 × 16–22 μ, epispore 1.5 to 2.5 μ. Mesospores numerous, ovate, measuring 19-33 μ. Pedicel hyaline, persistent up to 100 μ.

Hab.—On leaves and rarely twigs of Justicia diffusa Willd. common on the hill top (Figs. 9 and 10). The type specimen of this rust, on the basis of which Sydow erected the new species, was collected in Nandidroog by R. D. Anstead.

Puccinia leiocarpum (Syd.) Thirumalachar

Pyenia subepidermal, amphigenous, orange-yellow, with ostiolar paraphyses. Aecia supepidermal, cupulate, yellow, erumpent with well-developed peridia. Peridial cells rugose, 22 × 17 μ; aeciospores angular, smooth, thin-walled, germ pore indistinct, measuring 17 × 14 μ. Telia subepidermal


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developing as warty excrescences, black, and aparaphystae; teliospores stipitate, pedicel measuring up to $29 \mu$, two-celled, yellowish-brown, slightly constricted at the septa with a single distinct germ pore in each cell, measuring $25 \times 11 \mu$, germinating without a period of rest.

**Fig 1.** Twig of *Acacia leucophleba* showing tumor formed by *Hapalophragmium ponderosum* Syd. H. and P., and E. J. Butler. **Fig. 2.** Teliospore or *Nyssopsora Thwaitesii* (Berk. and Br.) Syd. **Fig. 3.** Teliospore of *Hapalophragmium ponderosum*, showing the terminal odd spore. **Fig. 4.** Pycnium of *Hapalophragmium ponderosum*. **Fig. 5.** Urediospore of *Hemileia vastatrix* Berk. et Broome.

**Hab.**—On leaves and twigs of *Ocimum adscendens* by the side of fort wall on the hill top. (Figs. 11 and 12).

The rust was identified by Sydow as *Aecidium Ocimi* P. Henn. on the basis of the material collected by McRae near Koilpatti. Later he made the collection of the type of the new species *Aecidium leiocarpum* Syd. due to the fact that the Koilpatti specimens had smaller peridial cells and...
spores. The perfect stage was first observed near Bangalore and the rust has been placed under *Puccinia*.

*Puccinia Chomelie Thirumalachar*

Telia hypophyllous subepidermal, black and a paraphysate. Teliospores two-celled $35-38.8 \times 20-30 \mu$, slightly constricted at the septa, germinating without a rest period, wall yellowish-brown, $3.5-5 \mu$ cr., laminated, hygroscopic, pedicel hyaline, upto $42-87 \mu$. long. Basidiospores thin-walled measuring $12 \times 7 \mu$. 

Fig. 6. Teliospore of *Trochodisc Sampathense* Thirumalachar. Fig. 7. Shoot of *Bryonia rhamnoides* showing the spore tendrils of *Masseella Brynie Thirumalachar*. Fig. 8. Telial column of *Masseella Brynie*, showing the spores embedded in gelatinous matrix. Fig. 9. Teliospores (including the mesospore) of *Puccinta peraffinis* Syd. Fig. 10. Leaves of *Justicia diffusa* infected by *Puccinta peraffinis*.
Hab.—On leaves and twigs of *Chomelia asiatica* O.Kze. on the rocky ridges of the Hill top.

*Puccinia heterospora* Berk. and Curtin.

Sori minute, hypophyllous, aggregated into concentric patches, pulverulent, brownish-black. Teliospores elongated or sub-globose, smooth, 15–27 μ in diam. two-celled or one-celled pedicels long and hyaline.

Fig. 11. *Ocimum adscendens* infected by *Puccinia leiocarpum* (Syd.) Thirumalachar. Fig. 12. Section through the telium of *Puccinia leiocarpum*. Fig. 13. Teliospore of *Uromyces Hobsoni* Vize. Fig. 14. Twig of *Jasminum grandiflorum* Lin. infected by *U. Hobsoni*.

Hab.—On leaves of *Sida humilis* Willd., growing along with the under-shrubs on the Hill top.
Infection spot in purple streaks, sori irregular, aggregated urediospores ovate, stipitate, $35 \times 25-30 \mu$, yellowish brown; teliospores 2-celled, brown, pedicellate, $40-45 \times 22-25 \mu$, slightly constricted at the septa.

_Hab._—On leaves of _Andropogon sorghum_ Brot.

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Fig. 15. _Crotalaria juncea_ leaves, showing infection spots of _Uromyces decoratus_ Syd
Fig. 16. Teliospore of _Uromyces decoratus_ Syd. Fig. 17. Leaf of _Ricinus communis_ infected by _Melampsorella Ricini_. Fig. 18. Urediospore of _Melampsorella Ricini_.

**Uromyces Commelinae Cooke**

Sori compact, covered by epidermis, hypophyllous, teliospores obovate, long pedicelled, smooth, measuring $30 \times 18 \mu$, pedicel hyaline and persistent.

_Hab._—On leaves of _Cyanotis tuberosa_ Schultes.
Uromyces Hobsoni Vize. (Uromyces Cunninghamianus Barc.)

Pycnia subepidermal, amphigenous, distributed on hypertrophied leaves, young twigs and flower buds, orange-yellow, flask-shaped with well-developed ostiolar filaments. Aecia amphigenous, erumpent, cupulate, yellowish white, aeciospores thin-walled, angular, yellow, minutely verrucose, germ pore indistinct, measuring $14 \times 24 \mu$. Telia subepidermal, developing within aecial cups, replacing aeciospores, aparaphysate, black; teliospores one-celled, wall layer three partite, $20 \times 35 \mu$, yellowish-brown, germinating without a rest period, basidiospores thin-walled, ovate to spherical, measuring $10 \times 13 \mu$ (Figs. 13 and 14).
Hab.—On leaves, twigs, flower buds and fruits of *Jasminum grandiflorum* L., by the side of the nursery, Nandi Hills.

*Uromyces decoratus* Syd.

Urediosori hypophyllous, infection spot minute, yellow, sparse or aggregated, erumpent, pulverulent, pale brown, urediospore globose or subglobose, or ellipsoid, echinulate, pale brown 21×25 μ diameter, epispore 1 μ cross. Telia follow uredia in development, teliospores oblong, ovate, chestnut-brown, minutely tuberculate which are arranged in longitudinal rows, 20–28×14–20 μ, epispore 1·5 to 2 μ cross, pedicel hyaline and persistent (Figs. 15 and 16).

Hab.—On leaves and stem of *Crotalaria juncea* L.

*Uromyces Bidentis* Lagerh.

Telia subepidermal, hypophyllous, sparse, and aparaphysate; teliospores ovoid-oblong, pedicellate, 40–54×15–20 μ. Pedicel hyaline, persistent. Spores germinating immediately.

Hab.—On leaves and rarely on petioles of *Bidens pilosa* L.

*Masseeella Breynia* Thirumalachar

Pycnia subcuticular, amphigenous, conical, numerous, and densely grouped. Aecia are cupulate, hypophyllous, white, with well-developed peridia, æciospores spherical, polyhedral, hyaline, measuring 16–24×12–14 μ. Uredia subepidermal, infection patches not hypertrophied, minute, sparse, or densely aggregated, aparaphysate, urediospores stipitate, white, ovate or ellipsoid, minutely verrucose, germ pore indistinct, measuring 16·21×9–14 μ. Telia mostly epiphyllous, flask-shaped, deeply sunk in the host tissue, spores abstricted off in chains from the base, and these are exerted out in long columns embedded in the gelatinous matrix, secreted by the hyphe lining the sorus. Spore tendrils filiform, up to 1 to 2 mm. in length, mucous swelling in water, becoming horny when dry. Teliospores one-celled, angular, ovate ellipsoid, wall layers three partite, yellowish brown, and minutely and longitudinally striate, germ pore indistinct, apical, measuring 20–43×14–17 μ. Spores germinate without a resting period, basidium curved, typically four-celled, sporidia globular, thin-walled, and germinating in situ (Figs. 7 and 8).

Hab.—On leaves of *Breynia rhamnoides* Muell., Nandi. *Aecidium Breynia* Syd. has been shown to be the aecial stage of *Masseeella Breynia*.
Melampsorella ? Ricini (Biv.) de Toni

Uredia hypophyllous rarely epiphyllous, sorus somewhat round or hemispherical, confluent, erumpent, spores yellow, pedicellate, minutely verrucose (Figs. 17 and 18).

Hab.—On Ricinus Communis, L.

Hemileia vastatrix Berk. and Broome

Infected patches orange yellow, uredia hypophyllous, in patches, hyphae in fascicles, exserted through stomata, pulverulent, spores 35-40 μ diameter, convex side echinate.

Hab.—On leaves of Coffea arabica L. (Fig. 5).

Nyssopsora Thwaitessi (Berk. et. Broome) Syd.

Telia amphigenous, black and pulverulent; teliospores black, stipitate, three-celled, odd spore being at the base, with glochidiate processes, and two distinct germ spores in each cell (Fig. 2).

Hab.—On the leaves of Heptapleurum venulosum Seem.

Trochodium Sampathense Thirumalchar

Pycnidia amphigenous, sunken in the host tissue, arranged in concentric rings, orange-yellow, with ostiolar filaments. Aecia subepidermal, amphigenous, surrounding pycnia, erumpent, yellow, with well-developed peridia; aeciospores angulary globose, yellow, minutely spinescent, with indistinct germ pores, measuring 20 × 17 μ. Telia subepidermal, erumpent and pulverulent, chestnut brown to black, slightly flattened or almost round, broader than long, stipitate, measuring 26 × 20 μ, germ pore apical, situated in a ridged pit, exospore with longitudinal striations which radiate from the apex and converge towards the base, stalk persistent, hyaline, inflated only at the place of attachment. Teliospores germinate after a period of rest. Basidium four-celled. Basidiospores thin-walled, germinating in situ and forming secondary and tertiary sporidia (Fig. 6).

Hab.—On leaves of Lettsonia elliptica Wight., near the secret passage, Nandi Hills.

The type specimen of this rust was recorded by one of the authors on Argyreia cymosa Sweet, near Hiriyar. Aecidium Argyreia recorded by Sydow and Butler on Argyreia cymosa and Lettsonia elliptica is the aecial stage of Trochodium Sampathense. This is the only other species known for the genus Trochodium, apart from the type species of Trochodium Ipomææ (Thüm.)
Syd. on *Ipomea Argyreoides* in S. Africa. Cultural studies have indicated that the rust is monoeccious and heterothallic.

**P. phragmitelium** Thirumalachar and Mundkur

Pycnia epiphyllous, subcuticular, without ostiolar filaments. Aecia of the caecoma type, covered with long cylindric paraphyses; aeciospores spherical or ovate, yellow, minutely verrucose, with 3 germ pores, measuring $16 \times 10^{-6} \mu$. Uredia hypophyllous, associated with telia, minute, sparsely distributed, infected patches not hypertrophied, surrounded by incurved cylindric paraphyses, echinulate, with an indistinct germ pore, measuring $16 \times 11 \mu$. Telia erumpent, pulverulent, paraphysate, black; teliospores stipitate, 5-7 celled, slightly constricted at the septa. 5-celled spore measuring $64.5-73.5 \times 32.2 \mu$, and 7-celled spore $82-88 \times 23.4 \mu$, smooth thin-walled, with two indistinct germ pores in each cell, stalk hyaline, persistent, 40-48 $\mu$ long, not swelling in water, spores germinating intra soro immediately. Basidiospores spherical, thin-walled, measuring $11 \times 10^{-5} \mu$ (Figs. 21 and 23).

*Hab.*—On leaves of *Rubus lasiocarpus* Smith., Type specimen collected on Nandi Hills.

**Hapalophragmium ponderosum** Syd., H. and P., and Butler E. J.

Pycnia subepidermal, hyaline, applanate, without conspicuous ostiolar paraphyses. Telia subepidermal, profoundly immersed, ap paraphysate; teliospores stipitate, three-celled, the odd spore being terminal, yellowish brown, with a single distinct germ pore in each cell measuring $15-25 \times 10-15 \mu$, epispore $1.5 \mu$. Pedicel hyaline, small, and fragile. Spores germinating immediately (Figs. 1, 3 and 4).

*Hab.*—On twigs and flower buds, of *Acacia leucophleba* Willd. The rust forms large tumours which anatomically resemble those of crown gall.

**Sphacelotheca Sorghi** (Link) Clinton

Sori in individual grains which are transformed to cylindric spore sacs, the columella in the centre is conspicuous. The spores are spherical yellowish brown, with a greenish tinge, smooth, up to $5 \times 9 \mu$ diameter.

*Hab.*—On earheads of *Andropogon Sorghum* Brot.

**Sorosporium filiferum** (Busse) Zundel.

Individual grains are affected being transformed into sori. Spores united into balls which are firm and do not get separated easily. Spores...
are 12-16 $\times$ 11-16 $\mu$, spherical or ovate, slightly angular on the contiguous sides and minutely verrucose on the free side.

_Hab._—On the inflorescence of _Andropogan Sorghum_ Brot.

*Ustilago cynodontis* P. Henn.

Sori in young inflorescence entirely destroying it while still being enclosed within the leaves. Sori erumpent with black powdery mass. Spores olive-black, spherical, smooth measuring 9-10 $\times$ 5-7 $\mu$.

_Hab._—On _Cynodon dactylon_ Pers. (Figs. 19 and 20).

_Cintractia axicola_ (Berk) Cornu.

Sori on peduncles and pedicles, sowllen, covered by brownish-white membrane, sori pulverulent, spores mass dark and carbonaceous. Spores formed successively from sterile stroma, spores measuring 13-16 $\times$ 8-14 $\mu$, agglutinated for a considerable time, and yellowish brown (Fig. 22).

_Hab._—On the peduncles and pedicels of _Fimbriostylis_ sp.?