

Some noteworthy Rusts. IV.

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A number of interesting rusts were collected in different regions of Mysore State, India and were found to be either new to science or new records for India. An account of the studies is presented in this paper. Type specimens of the new species have been deposited in Herb. Crypt. Ind. Orient, New Delhi, Herb. C. M. I., Kew England, Purdue University Arthur Herbarium, Lafayette Indiana, U.S.A., and Mycological Herbarium, Hebbal, Bangalore (MYSP).

1. *Cerotelium terminaliae-paniculatae* sp. nov.

Syn. *Uredo terminaliae-paniculatae* Ramakrishnan T. S. and K. in Proc. Indian Acad. Sci. (B) 29, p. 56, 1949.

Sori uredosporiferi dispersi vel gregorii, in maculis minutis, irregularibus, purpureis, hypophyllis evoluti, $84-154 \times 49-126 \mu$, paraphysibus marginalibus incurvatis, clavatis, ad basim connexis praeditae; uredosporae ovoideo-ellipsoideae, $13-26 \times 13-25 \mu$, luteo-brunneae, echinulatae; germinationis pori indistincti; sori teleutosporiferi subepidermales, ceraceo-crustacei, erumpentes, teleutosporae in catenis lateraliter congestis, in apice pulverulentis evoluae, hyalinae, subglobose vel cuboideae, tenuiter tunicatae, $10-29 \times 6.5-13 \mu$, promycelio exteriorae 4-loculari germinantes.

Spermogonia and aecia unknown. Uredia in minute irregular purple spots, hypophyllos, scattered or gregarious, subepidermal, $84-154 \times 49-126 \mu$, paraphyses marginal, incurved, clavate, united at the base; Urediospores ovate-elliptic, $13-26 \times 13-25 \mu$ in size, yellowish-brown, echinulate, germ pores indistinct. Telia occurring as subepidermal waxy crusts, erumpent. Teliospores developing in chains of hyaline spores, chains compacted together laterally and pulverulent at the apex, thin-walled, subglobose to cuboid, $10-29 \times 6.5-13 \mu$, germinating at maturity, promycelium external, 4-celled.

On living leaves of *Terminalia paniculata* Roth., Coffee Research station, Balehonnur, Mysore, 24. 1. 1961, leg. T. R. Nagaraj (Type). I. M. I. 95832 (C. M. I.), PURF 16524 (Purdue University), MYSP 778 (Hebbal Bangalore).

2. *Cerotelium trichosanthes* (Ramakrishnan and Sundaram) Comb. nov.

Syn. *Kuehneola trichosanthes* (Petch) Ramakrishnan and Sundaram in Proc. Indian Acad. Sci. (B) 35, p. 114, 1952.

Uredo terminaliae Petch. in Ann. Roy. Bot. Gard. Peradeniya, 5, 249, 1912.

Infection spots pale yellow, angular; uredia hypophyllous or amphigenous, gregarious, often confluent, orange yellow, subepidermal and pulverulent, with marginal hyaline paraphyses. Urediospores ovate to globose, pedicellate, walls hyaline, sparsely echinulate, $26-39 \times 19-26 \mu$ germ pores indistinct. Telia pale-yellow, orange coloured when fresh, waxy, subepidermal; teliospores developed in chains, compact at the bottom, 3 to 5 spores in chain, $9.5-32 \times 11-17 \mu$, which on becoming erumpent germinate at apex. Promycelium external 4-celled.

On living leaves of *Trichosanthes palmata* Roxb. Coffee Research Station, Balehonnur, Mysore, 16. 12. 1959, leg. T. R. N a g a r a j. IMI-95829, PURF-16525 and MYSP-779.

The lack of teliospore chains being separate and germination by the prolongation of spore apex indicated that it is not a species of *Kuehneola*. The compactly grouped columnar telia, with the spores becoming pulverulent at the apex is a character of *Cerotelium*. Examination of the type material of Petch showed no telial stage and hence it cannot be considered as type. Hence the new combination based on the type collected by Ramakrishnan and Sundaram is proposed.

3. *Endophyllum cassiae* sp. nov.

Sori teleutosporiferi aecidiiformes, hypophylli vel amphigeni, subepidermales, cupuliformes, $160-300 \times 140-308 \mu$; peridii cellulae hyalinae, crassiuscule tunicatae, extrinsecus rugulosae, $11-26 \times 10-21 \mu$; sporae subglobose vel angulosae, catenulatae, aurantiacae, minute verruculosae, germinationis poro indistincto praeditae, promycelio exteriori 4-loculari germinantes; sporidia globosa vel piriformia, $9-12 \times 5.5-8 \mu$.

Spermogonia absent. Aecia teloid, hypophyllous, amphigenous, subepidermal, cupulate and peridiate, $160-300 \times 140-308 \mu$. Peridial cells hyaline, thick-walled, strongly rugose on the free side, $11-26 \times 10-21 \mu$. Mature spores subglobose to angular, developed in chains as in aecia, orange-yellow, minutely verrucose, with indistinct germ pores. Germinating at maturity by external 4-celled promycelium bearing globular sporidia. Sporidia globose to pyriform, $9-12 \times 5.5-8 \mu$.

On living leaves of *Cassia tora* L., Coffee Research Station, Balehonnur, Mysore, State 25. 11. 1962, leg. T. R. N a g a r a j (Type).

The rust incites formation of yellowish sunken spots on leaves and pods of *Cassia tora* in the coffee estates. Sy d o w and B u t l e r,

(Ann. Mycol. 11, 56, 1913) recorded *Aecidium torae* P. Henn. (= *A. cassiae* Bres.) based on collections made by Butler (No. 870) in coffee estates in Mysore. The spores of *A. cassiae* are smaller than those of the present rust and in the absence of germination studies cannot be considered as an *Endophyllum* species. Butler's collection appears identical with the present rust and in view of the above observations is presented as a new *Endophyllum* species.

4. *Endophyllum emiliae-sonchifoliae* sp. nov.

Sori teleutosporiferi aecidiiformes, amphigeni, subepidermales, cupulati, $170-250 \times 170-310 \mu$; peridii cellulae crassiuscule tunicatae, angulosae vel polygoniae, extrinsecus rugosae, $17-23 \times 11-17 \mu$; sporae catenulatae, globosae vel polygoniae, $15-21 \times 14-19 \mu$, aurantiaeae, verrucosae, germinationis poro indistincto praeditae, promycelio exteriore biloculari germinantes; sporidia globosa $8-12.5 \times 5.5-8 \mu$.

Spermogonia absent. Aecia teloid, amphigenous, subepidermal, cupulate, peridiate, $170-250 \times 170-310 \mu$ in size; peridial cells strongly developed, thick-walled, angular to polygonal, rugose on the free side, $17 \times 23 \times 11-17 \mu$. Aeciospores teloid, developed in chains, globose to polygonal, $15-21 \times 14-19 \mu$, orange-yellow fresh, verrucose, germ pores indistinct. Spores germinating at maturity with an external two-celled promycelium bearing globular sporidia which measure $8-12.5 \times 5.5-8 \mu$.

On living leaves of *Emilia sonchifolia* DC., Coffee Research Station Balehonnur, Mysore State, 10. 12. 1960, leg. T. R. Nagaraj (Type). IMI-59830, PURF-16523, MYSP-781.

The rust forms large pale yellow spots with mass of spores erupting from the sorus. The spores germinate by a two-celled basidium and hence would be interesting cytologically. Sydow (Ann. Mycol. 11, 56, 1913) has recorded *Aecidium formosanum* on this host from Formosa (Taiwan). Sydow's material was not available to us. Mr. Laundon at C. M. I., Kew England compared it and found it agreed with our material. Cummins concurring with Laundon, further added, that *A. gynurae* Petch is also similar and that Petch mistook the identity of the host for *Gynura*. The true identity of *A. formosanum* and *A. gynurae* will remain obscure until fresh collections are made in the type localities and germination studies are carried out.

5. *Endophyllum kaernbachii* (P. Henn.) Stevens and Mandioli. Philippine Jour. Sci.

Spermogonia not seen. Aecia teloid, hypophyllous, subepidermal, cupulate and peridiate. Peridial cells $18-27 \times 7-17 \mu$, thick-walled, rugose. Aeciospores, subglobose to polygonal, minutely echinulate, with indistinct germ pores, $13-24 \times 10-14 \mu$, germinating at maturity with

promycelium and sporidia. Sporidia ovate to pyriform, $11-14 \times 8-10 \mu$.

On living leaves of *Ipomoea* sp., Bison valley, Coffee Research Station, Balehonnur, 13. 6. 1963, leg. T. R. Nagaraj.

6. *Hemileia mysorensis* Thirum. and Gopalkr. in Mycologia 39, 231, 1947.

The rust was described by Thirumalachar based on the uredial stages occurring on the asclepiadaceous host *Gymnema sylvestre* in Balehonnur, Mysore. Since the teliospores were seen both in the type and in fresh collections made, the description of the rust is completed.

Telia associated with uredia, superstomal teliospores hyaline, lemon yellow, thin-walled, pyriform, crescentic to spherical, often lobate in contour, $13-30 \times 16-32 \mu$ pedicel short and fragile, germinating at maturity by a four-celled promycelium and sporidia.

Teleutospori et uredosori consociati, supra stomata evoluti; teleutosporae hyalinae vel pallide luteae, tenuiter tunicatae, piriformes, seleniformes vel globosae, raro lobatae, $13-30 \times 16-32 \mu$, pedicello brevi et fragili praeditae, promycelio, 4-loculari germinantes.

Aecidium gymnematis Ramakrishnan and Sundaram occurs on the same host (Proc. Indian Acad. Sci. (B) 38, 190, 1953), often associated with *Hemileia mysorensis*. All attempts to connect the two by aeciospore or sporidial inoculations have been unsuccessful.

7. *Phakopsora sterculiae* sp. nov.

Sori uredosporiferi subepidermales, erumpentes, pallide brunnei, paraphysibus cincti, $70-112 \times 70-154 \mu$; paraphyses hyalinae, incurvatae, antice $5-7 \mu$ craessae; uredosporae ovoideae vel angulosae, catenulatae, pallide brunneae, $22-35 \times 11-16 \mu$; germinationis pori indistincti; sori teleutosporiferi hypophylli, dispersi vel gregarii, tunc saepe plus minusve confluentes, subepidermales, non erumpentes, $84-182 \times 112-336 \mu$; teleutosporae $6-8$ superpositae, melleo-brunneae vel castaneo-brunneae, ovoideo-ellipsoideae vel cubicae, leves $16-30 \times 10-16 \mu$.

Spermogonia and aecia unknown. Uredia hypophyllous, subepidermal, erumpent, light brown, with marginal incurved paraphyses, $70-112 \times 70-154 \mu$. Paraphyses hyaline, incurved, $5-7 \mu$ broad at apex. Urediospores ovate to angular, pale-brown, echinulate, indistinct germ pores, measuring $22-35 \times 11-16 \mu$. Telia hypophyllous, scattered, gregarious, often confluent, subepidermal, non-erumpent, $84-182 \times 112-336 \mu$, black in mass. Spores amber-brown to chestnut-brown in colour, ovate-elliptic to cuboid, developed in irregular succession, 6 to 8 spores in a row, smooth, measuring $16-30 \times 10-16 \mu$. Germination after a period of rest.

On living leaves of *Sterculia guttata* Roxb., Coffee Research Station, Balehonnur, Mysore 21. 2. 1961, leg. T. R. N a g a r a j (type), MYSP 785.

8. *Uredo bombacis* Petch. in Annal. Royal Bot. Gard. Paradeniya, V, part IV, p. 247, 1912.

On living leaves of *Salmalia* (= *Bombax*) *malabaricum* (DC) Schott., Balehonnur, Mysore, leg. T. R. N a g a r a j, Oct. 1962.

The rust incites the defoliation of the plant to considerable extent.

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