

## ADDITIONS TO FUNGI OF MADRAS—IV\*

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### (16) *Bulgariastrum tumifaciens* Ramakrishnan T. S. and K. sp. nov.

On pedicels and young fruits producing dark gall-like outgrowths; on leaves forming thickened, brown, isolated to confluent spots; *apothecia*, amphigenous on the leaves, clustered, sub-turbinata, black, disc-shaped, slightly concave at the top, with short stout stalks, 400–700  $\mu$  in diameter; *asci* cylindrical to clavate, narrowed at the base, hyaline 80  $\times$  12  $\mu$  (65–115  $\times$  10–17  $\mu$ ), 8-spored, paraphysate, paraphyses branched at the tip, forming thick-walled dark brown cells which become compacted into a dark epithecium; *ascospores* elliptical, two-celled, constricted at the septum, hyaline, 13  $\times$  5.4  $\mu$  (10–19  $\times$  4.8–9.6  $\mu$ ), more or less uniseriate; *pycnidia* mixed with the apothecia more numerous on the galls on the inflorescence, often developing on the stalks of the apothecium, flattened, immersed in the stroma, or on the surface, covered by arching, black layers of cells which rupture easily and expose the pycnidiospores; sometimes the ruptured pycnidia resemble acervuli; *pycnidiospores* produced on short stalks, 2-celled, fusiform to clavate, light olive, lower cell usually more elongated than the upper cell, 18  $\times$  7  $\mu$  (15–22  $\times$  4–9  $\mu$ ).

On living leaves and inflorescence of *Capparis sepriaria* L. Hasanur (Coimbatore District) 16–8–1946, C. R. Venkataraman and Kallar (Coimbatore District) 9–10–1946, T. S. Ramakrishnan and K. Ramakrishnan.

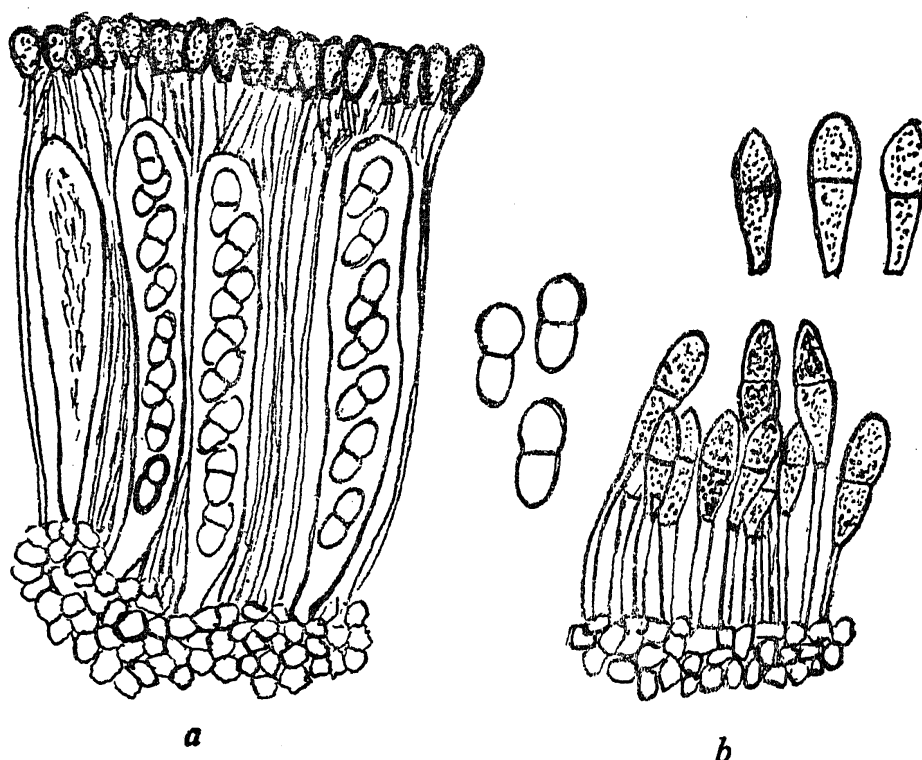
*Ascomata* amphigena, in incrassatis maculis foliorum, gregaria, turbinata, nigra, brevistipitata, 400–700  $\mu$  diam. *asci* cylindrici vel clavati, hyalini, octosporiati, 80  $\times$  12  $\mu$  (65–115  $\times$  10–17  $\mu$ ), *ascosporidia* duocellata, hyalina, oblique uniseriata, paraphysata 13  $\times$  5.4  $\mu$  (10–19  $\times$  4.8–9.6  $\mu$ ), termini paraphyses ramifacti, rami juncti in fuscum epithecium; *pycnidia* in excrescentiis formata in inflorescentiis et fructibus, etiam ascomatibus mixta, cum irregulari tecto, quod erumpit variæ; *pycniosporidia* duo cellata, clavata levis olivacei colores.

\* 1947, Part III of this series was published in the *Proceedings of the Indian Academy of Sciences*, 26, No. 1.

Type specimens of all the fungi described have been deposited in the Herbarium of the Government Mycologist, Coimbatore, and the *Herb. Crypt. Ind. Orient.*, New Delhi.

In vivis foliis et inflorescentiis *Capparidis sepiariae* L. Hasanur (Coimbatore District) 16-8-1946, C. R. Venkataraman et Kallar (Coimbatore District) 9-10-1946, T. S. Ramakrishnan et K. Ramakrishnan.

*Bulgariastrum caespitosum* Syd. has been recorded from the Philippines on *C. sepiaria*. But this fungus forms ascomata on the lower surface of the leaves. Further the pycnidia produce hyaline spores measuring  $26-45\mu$ . The fungus under study produces galls on the inflorescence also. The pycnidiospores are coloured and measure only  $15-22\mu$ , and thus it is different from the former. Dr. Mundkur to whom the type specimen was sent for comparison with *B. caespitosum*, available at the Herbarium Cryptogammæ Indiæ Orientalis, New Delhi, also found that the fungus under study was different. *B. africanum* Syd. has been recorded on *C. rudatis* from Natal. This fungus affects leaves only, producing ascomata, on both sides of the leaf. But it does not produce galls on the inflorescence. The pycnidial stage of this species has not been observed. For these reasons the present fungus is considered to be a new species and named *B. tumifaciens*.



TEXT-FIG. 1. *Bulgariastrum tumifaciens*.—(a) Section through a portion of apothecium showing asci and paraphyses; (b) Pycnidiospores ( $\times 600$ ).

(17) *Achroella plectroniæ* Ramakrishnan T. S. and K. sp. nov.

Stromata black, pulvinate, glomerulate, erumpent, amphigenous, developed in the middle of a circular, thickened, brown spot which forms a ring-like structure round the stroma, sparse or crowded, sessile attached by a

broad base to the leaf-tissue, subepidermal in origin; *perithecia* half immersed in the stroma, with a black outer wall, ovate to globose, ostiolate,  $240 \times 170 \mu$ , paraphysate, with fine filiform paraphyses; *asci* clavate, hyaline, with gelatinising wall, rounded at the ends and with a short narrow foot,  $82 \times 15 \mu$  ( $72-91 \times 14-19 \mu$ ); *ascospores* 8, fascicled, fusoid, tapering towards the ends, one-septate, light yellowish brown,  $44 \times 3 \mu$  ( $38-50 \times 2.5-3.5 \mu$ ).

*Pycnidia* of two kinds, one type resembling *Hemidothis*, developed in the stroma, associated with the perithecia or not, loculi sunk in the stroma, ostiolate; pycnidiospores long fusoid, curved, hyaline, one-celled,  $63 \times 3.5 \mu$  ( $40-76 \times 2-4.5 \mu$ ), produced on short hyaline stalks. The second type of pycnidium forms isolated, crowded, innate, erumpent, subepidermal, globose, ostiolate, dark structures; spores numerous, minute, spermatia-like; obviously these pycnidia function as spermogonia.

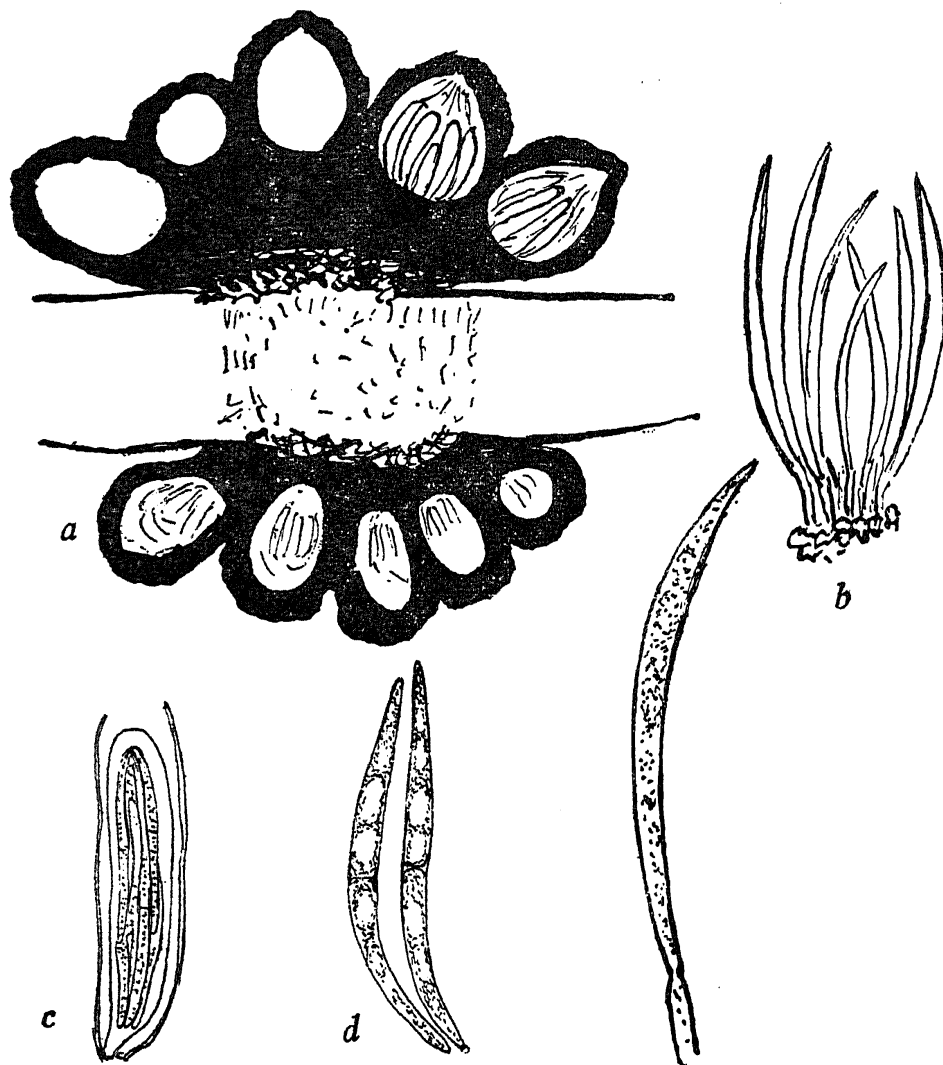
On living leaves of *Plectronia didyma* Kurz. Kallar (Coimbatore District), November 1946. T. S. Ramakrishnan.

Maculae amphigenae, orbiculares, incrassatae; stromata nigra, glomerulata, amphigena; *perithecia* pars dimidia immersa, muris externi nigris, ovata vel globosa, ostiolata,  $240 \times 170 \mu$ , paraphysata, paraphyses filiformes; *asci* clavati, hyalini, murus asci gelatinus,  $82 \times 15 \mu$  ( $72-91 \times 14-19 \mu$ ); *ascosporidia* 8, fasciculata, fusoidea, angustata ad terminum, uniseptata, levis brunnei colores,  $44 \times 3 \mu$  ( $38-50 \times 14-19 \mu$ ).

Duo genera *pycnidium*, (1) sociata cum perithecia, immersa, ostiolata; *Pycnidiosporidia* longa, fusoidea, curvata, hyalina, unicellata,  $63 \times 3.5 \mu$  ( $40-76 \times 2-4.5 \mu$ ), pedicelli hyalini, brevi, (2) isolata amphigena, gregaria, innata, erumpentia, subepidermia, globosa, ostiolata, nigra; pycnidiosporidia numerosa, minuta, hyalina, baculoformia.

In vivis foliis *Plectroniae didymae* Kurz. Kallar (Coimbatore District), November 1946, T. S. Ramakrishnan.

The *Hemidothis*-like pycnidia are the most conspicuous. Perithecia are rare. Sydow (1916) in his description of *Hemidothis* has stated that it represents only the imperfect stage of a Dothidiaceous ascomycete, probably *Bagnisiopsis* or some related genera. In the present instance the perfect stage is represented by a fungus belonging to the Dothidiaceae. Considering the structure of the stroma, asci and ascospores it has to be identified as *Achroella*. No allied fungus has been recorded on the present host. This fungus is considered to be a new species and named *A. plectroniae*.



TEXT-FIG. 2. *Achroella plectronia*.—(a) Section through stromata (diagrammatic); (b) Pycnidiospores ( $\times 500-1000$ ); (c) ascus and paraphyses ( $\times 300$ ); (d) ascospores ( $\times 500$ ).

(18) *Hysterostoma pavettae* Ramakrishnan T. S. and K. sp. nov.

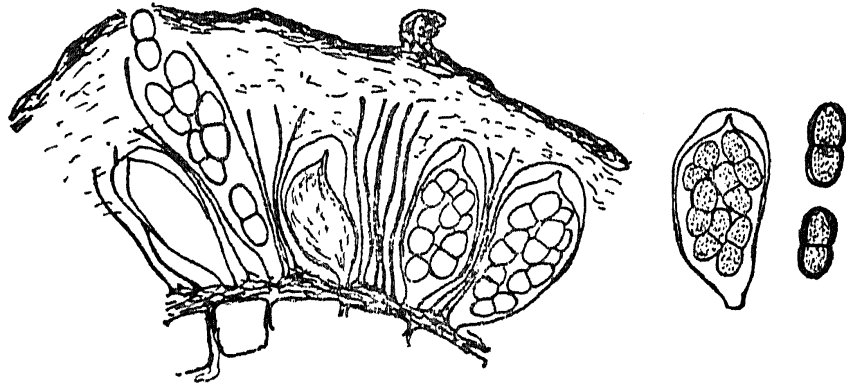
Spots yellowish, amphigenous, circular; stromata superficial, epiphyllous, dark; hypostroma subcuticular; haustoria sent into the epidermal and palisade cells, the tissue of the stroma gelatinises when moistened; asci stout, club-shaped, with rounded apex, and narrow base, wall-thickened and gelatinising near the top,  $50 \times 24 \mu$  ( $40-59 \times 19-33 \mu$ ), paraphysate, paraphyses fine, filiform; ascospores 8, smoky brown, 2-celled, oblong, constricted at the septum,  $21 \times 9 \mu$  ( $18-26 \times 7-11 \mu$ ).

On living leaves of *Pavetta indica* L. on the road from Kallar to Burliar (Coimbatore District), November 1946, T. S. Ramakrishnan.

Maculae amphigenae, flavidae, orbiculares; stromata superficialia, epiphylla, fusca, hypostroma subcuticulare, haustoria penetrantia in cellae epidermes et paliformes; stroma gelatinum in aqua; asci crassi, clavati,

apice rotundato, basi attenuato, murus incrassatus et gelatinans ad summum,  $50 \times 24 \mu$  ( $40-59 \times 19-33 \mu$ ), paraphysata, paraphyses fragiles, filiformes; *ascosporidia* 8, fumide brunnei colores, duo cellata, oblonga, medio constricta,  $21 \times 9 \mu$  ( $18-26 \times 7-11 \mu$ ).

In vivis foliis *Pavettæ indicæ* L. in via de Kallar ad Burliar (Coimbatore District), November 1946, T. S. Ramakrishnan.



TEXT-FIG. 3. *Hysterostoma pavettæ*.—Stroma, ascus and ascospores ( $\times 300$ ).

This genus has not been recorded on this host so far from India or elsewhere. It is described as a new species. Hansford (1946) has described several species of this genus on various hosts but there is no mention of *Pavetta* among them.

(19) *Phæochorella artocarp*i Ramakrishnan T. S. and K. sp. nov.

Stromata amphigenous on the leaves, sometimes present on the petioles also, but more pronounced on the upper side along the midrib and main veins forming long raised areas; on the lower surface stromata less prominent and occupying corresponding positions or otherwise, black shiny, subcuticular, and made up of closely packed, dark brown, vertical hyphæ; location of the perithecia indicated by conical raised projections on the upper surface, loculi conical and much flattened,  $170 \times 86 \mu$ ; *asci* cylindric, clavate, 8-spored, hyaline,  $65 \times 16 \mu$  ( $52-89 \times 11-22 \mu$ ) paraphysate; *ascospores* light olive when young, and dark brown with age, elliptic, one-celled, uniseriate,  $14 \times 7 \mu$  ( $11-17 \times 4-9 \mu$ ); *pycnidia* found in the stromata on the lower surface of the leaf, ostiolate, of varying dimensions, immersed in the stromata or not, *pycnidiosporidia* oval to elliptic, one-celled, light olive,  $5.5 \times 4 \mu$  ( $4.5-7 \times 3-5 \mu$ ).

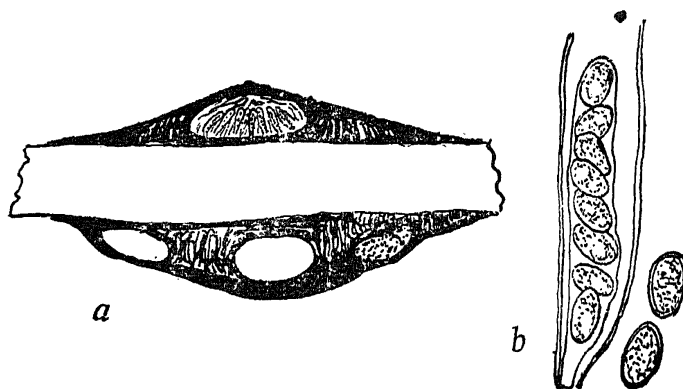
On living leaves of *Artocarpus Lakoocha* Roxb. Burliar (Nilgiris), November 1946, T. S. Ramakrishnan.

Stromata amphigena, mediam venam et prominentes venas sequentia, extanter epiphylla, nigra, micantia, sub-cuticularia, composita hyphis

verticalibus compactis; *perithecia* plurimum epiphylla, ostiolata, compressa,  $170 \times 86 \mu$ ; *asci* clavati, cylindrici, octosporiati, hyalini, paraphysati,  $65 \times 16 \mu$  ( $52-89 \times 11-22 \mu$ ); *ascosporidia* levis olivacei colores in juventute, fuscii brunnei colores in maturitate, elliptica, unicellata, uniseriata,  $14 \times 7 \mu$  ( $11-17 \times 4-9 \mu$ ).

*Pycnidia* hypophylla, immersa in stromata; *pycnidiosporidia* ovalia vel elliptica, unicellata, levis olivacei colores,  $5.5 \times 4 \mu$  ( $4.5-7 \times 3-5 \mu$ ).

In vivis foliis *Artocarp*i *Lakoochæ* Roxb. Burliar (Nilgiris), November 1946, T. S. Ramakrishnan.



TEXT-FIG. 4. *Phæochorella artocarp*i.—(a) Section through stromata (diagrammatic); (b) ascus and ascospores ( $\times 300$ ).

*Catacauma microcentum* (Berk. and Broome) Theiss. and Syd. has been recorded on *Ficus mysorensis*. The present fungus produces subcuticular stromata with closely packed vertically disposed hyphæ, but it differs from *Catacauma* in having ascospores which are coloured when mature. It is therefore placed in the genus *Phæochorella*. This genus has not been recorded on this host and the fungus is consequently named *P. artocarp*i. It is interesting to note that the pycnidial stage is confined to the lower surface of the leaf and the ascus stage to the upper surface. The tissues bordering the stromata sometimes develop a brown discolouration. Hyphal connection between the lower and upper surfaces of the leaf through the tissues is indistinct.

(20) *Puccinia luculenta* (Syd.) Ramakrishnan T. S. and K. comb. nov.

*Pycnia* not present; *æcia* sunk in the woody galls produced on both sides of the leaves; galls vary in size from 0.75-6 mm., almost spherical, dark brown, with varying numbers of *æcia* sunk in each gall; *æcia* present on both sides; each *æcium* has a definite peridium made up of one layer of thick-walled rectangular to polygonal warty cells; *æciospores* globose or angular with a coarsely verrucose unequally thickened, hyaline wall,

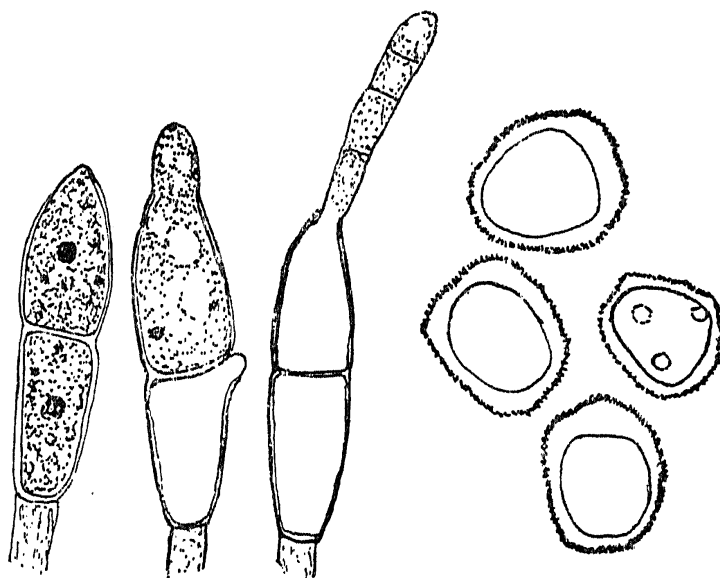
catenulate, germ-pores two or more, clearly visible in younger spores.  $40 \times 35 \mu$  ( $34-48 \times 29-38 \mu$ ), orange coloured.

*Uredia* not observed; *telia* amphigenous, waxy, erumpent, cushiony, originating 2 to 3 layers below the epidermis which is burst through. The teliospores originate from a compact plectenchyma; each spore is stalked with a prominent, gelatinising, hyaline pedicel up to  $200 \mu$  in length; *teliospores* 2-celled, cylindrical, with tapering ends, slightly constricted at the septum, wall smooth, contents orange yellow in colour, with one germ-pore in each cell; germ-pore in the upper cell at the apex while the germ-pore in the lower cell is just below the septum; spores measure  $77 \times 25 \mu$  ( $58-106 \times 19-34 \mu$ ), germinate immediately.

On living leaves of *Loranthus longiflorus* Desv. Attakatti (Anamalais), 10-4-1947, T. S. Ramakrishnan.

*Pycnia* ignota; *æcia* demersa in globosis amphigenis, lignieis excrescentiis; peridium unius strati cellularum polygonarum, crassomuratarum, echinularum; *æciosporidia* globosa vel angularia, catenulata, exstanter verrucosa, murus inequaliter incrassatus, aurantiacei colores, porum germinationis unum vel plura; *uredia* absunt; *telia* amphigena, ceracea, erumpentia, pulvinata, subepidermia; *teliosporidia* stipitata, cum pedicellis extanter gelatiantibus, hyalinis usque  $200 \mu$  longa, teliosporidia duocellata, cylindrica, angustatis terminis, medio leviter constricta, episporio levi, contenta aurantiacei flavi colores, quaque loculo porum germinationis unum gerente  $77 \times 25 \mu$  ( $58-106 \times 19-34 \mu$ ) germinantia *in situ*.

In vivis foliis *Loranthi longiflori* Desv. Attakatti (Anamalais), 10-4-1947, T. S. Ramakrishnan.



TEXT-FIG. 5. *Puccinia luculenta*—teliospores and æciospores ( $\times 300$ ).

Several rusts have been observed on *Loranthus*. From Mysore Butler and Bisby (1931) have recorded *Aecidium luculentum* Syd. of which only æcia were observed on leaves and stem of *L. longiflorus*. *Aecidium Schimperi* Bacc. has been observed on *L. Schimperi* from tropical Africa. On *Loranthus crassipes* and *Loranthus* sp., *Uromyces socius* Arth. and Holw. has been recorded from Central America. McAlpine (1906) has described *P. loranthicola* McAlp. on *L. celastroides*, from Australia. *P. loranthi* Speg. on *L. cordatus* and *P. macrocarya* Racib. on *L. pentandra* have also been reported. Cummins (1941) has recorded *P. heroica* Cumm. and *P. macrocarya* on *Loranthus* spp. from New Guinea. *P. loranthicola* produces æcia, uredia and telia. But æcia are found on separate leaves. The teliospores are intermixed with the urediospores. In these it differs from the rust under study, which does not form uredia, and the æcia and telia are formed on the same leaf. *P. loranthi* forms only telia and the spores are smaller than those of the present rust. *P. macrocarya* and *P. heroica* form pycnia. The teliospores are yellowish (or nearly hyaline in *P. macrocarya*) and the pedicels are concolorous. Spots are formed round the hypophyllous telia of *Puccinia heroica*. In the rust under study pycnia have not been found. The telia are amphigenous and no spot is visible surrounding the telium. The stalks of teliospores are hyaline while the teliospores are orange yellow in colour. Further, the stalks gelatinise readily when moistened. In these characters it differs from both the above species. A comparative statement of these rusts is given below.

	Aeciospores	Teliospores	Remarks
<i>P. heroica</i> ..	35-48 × 45-65 μ	69-26 × 18-23 μ	Pycnia present, æciospore with apical thickening, telia hypophyllous, teliospores yellowish, with concolorous stalks.
<i>P. macrocarya</i> ..	33-39 × 39-46 μ	72-89 × 23-30 μ	Pycnia prominent; æcia mostly hypophyllous, telia amphigenous, teliospores yellowish with concolorous stalks.
<i>P. luculenta</i> ..	34-48 × 29-38 μ	58-106 × 19-34 μ	Pycnia absent, æciospore with unequally thickened wall with 2 or more germ pores, telia amphigenous, teliospores, orange yellow, pedicel hyaline and gelatinising

Butler and Bisby (1931) have described *A. luculentum* on *Loranthus longiflorus* from Mysore. The æcia of the rust under study resemble those of *A. luculentum*. Since the perfect stage has now been noticed on the same host mixed with the æcia a new combination *P. luculenta* is proposed.



The gelatinisation of the stalks of the teliospores is very prominent and resembles what occurs in *Gymnosporangium*. Germ-pores are visible in the young aeciospores. These characters have not been noticed in the other species of *Puccinia* recorded on this host.

(21) *Hapalophragmium anamalaiensis* Ramakrishnan T. S. and K. sp. nov.

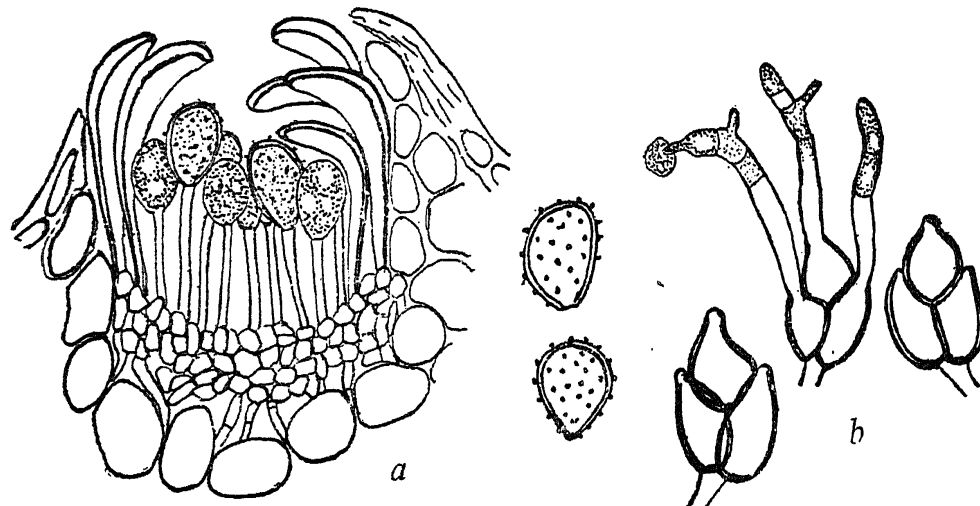
*Pycnia* and *aecia* not known; *uredia* hypophyllous, minute, scattered, light brown, erumpent, subepidermal in origin; *urediospores* stipitate, oval to elliptic, brown to orange, echinulate,  $34 \times 23 \mu$  ( $24-38 \times 19-27 \mu$ ), paraphysate, paraphyses incurved light brown, thickened on the outer side at the upper portion and not on the inner side, forming a protective covering for the sorus; *telia* hypophyllous, darker in colour than the uredia, minute, erumpent, scattered, subepidermal, in origin, paraphysate, paraphyses like those of the uredia; *teliospores* stipitate, stalk hyaline; rhomboidal in shape, three-celled, with two lower cells and one upper; stalk attached at the base of the two lower cells at the indentation; the two lower cells are elongated and are in contact for half their lengths, the top cell is wedged in between these, and rhomboidal in shape; wall smooth and thin, light brown in colour, with one germ-pore at the tip of each cell; spores measure  $43 \times 28 \mu$  ( $35-58 \times 17-34 \mu$ ), germinate immediately without a period of rest, producing one hyaline promycelium from each cell; promycelium coming out through the germ-pore, four-celled with one basidiospore from each cell.

On living leaves of *Derris eualata* Bedd. Anamalais, 10-4-1947, T. S. Ramakrishnan.

*Pycnia* et *aecia* ignota; *uredia* hypophylla, minuta, levis brunnei colores, subepidermia; *urediosporidia* stipitata, ovata vel elliptica, brunnei vel aurantiacei colores, echinulata  $34 \times 23 \mu$  ( $24-38 \times 19-27 \mu$ ), paraphysata; paraphyses incurvatæ, levis brunnei colores, externæ incrassatæ; *telia* hypophylla, fusciora quam uredia, minuta, erumpentia, subepidermia, paraphysata ut urediis; *teliosporidia* stipitata, rhomboidea, 3-cellata, 2 infra et una supra, unum porum germinationis in quaque cella in apice, brunnei colores,  $43 \times 28 \mu$  ( $35-58 \times 17-34 \mu$ ), germinantia sine quiete.

In vivis foliis *Derridis eualatæ* Bedd. Anamalais, 10-4-1947, T. S. Ramakrishnan.

*H. derridis* Syd., *H. setulosum* (Pat.) Syd., and *Triactella pulchra* (Rac.) Syd., have been recorded on *Derris uliginosa*, *Derris* sp., and *D. elliptica*, respectively. Sydow and Petrak (1931) are of opinion that *T. pulchra* has to be renamed *H. pulchrum* and that the genus *Triactella* which was founded



TEXT-FIG. 6. *Hapalophragmium anamalaiensis*. (a) uredium and urediospores ( $\times 300$ ); (b) teliospores ( $\times 300$ ).

on *T. pulchra* has to be abandoned. The rust under study is a *Hapalophragmium*, but it differs from the previously recorded species in several respects. *H. setulosum* (Miles and Traverse, 1904) and *H. pulchrum* (Sydow and Petrak, 1931) have warts near the germ pores of the teliospores, whereas in the rust under study the teliospores are perfectly smooth. The sori of *H. derridis* are amphigenous and paraphyses have not been recorded. In the rust under study, however, the sori are hypophyllous and numerous characteristic paraphyses are present. For these reasons this rust is found to be different and is, therefore, named *H. anamalaiensis*.

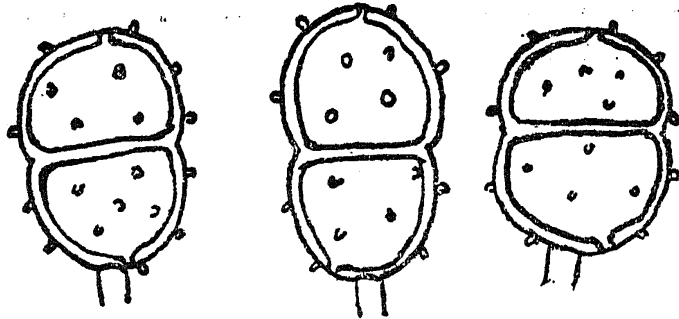
(22) *Puccinia vernoniæ-monosis* Ramakrishnan T. S. and K. sp. nov.

*Pycnia*, *æcia* and *uredia* absent; *telia* hypophyllous, sparse, erumpent, sub-epidermal, cushion-shaped, with the leaf thickened at the affected region, dark brown in colour; *teliospores* stipitate, with a short hyaline stalk, 2-celled, elliptic to subglobose, rounded at the apex and base, thick-walled, prominently echinulate, with sparse hyaline echinulations, reddish brown in colour,  $35 \times 27 \mu$  ( $29-43 \times 24-34 \mu$ ), germ pore one in each cell.

On living leaves of *Vernonia monosis* C. B. Clarke, Valparai (Anamalais), 10-4-1947, T. S. Ramakrishnan.

*Pycnia æcia* et *uredia* non cognita; *telia* hypophylla, sparsa, erumpentia, fusca; *teliosporidia* stipitata, duocellata, elliptica vel sub-globosa, exstanter sparse echinulata, rubrei brunnei colores,  $35 \times 27 \mu$  ( $29-43 \times 24-34 \mu$ ).

In vivis foliis *Vernoniæ monosis* C. B. Clarke, Valparai (Anamalais), 10-4-1947, T. S. Ramakrishnan.



TEXT-FIG. 7. *Puccinia vernoniae-monosis*.—Teliospores ( $\times 600$ ).

The host plant is arboreal in habit and represents one of the three tree species of *Vernonia* in South India. Jackson (1918, 1932) has given a list of *Puccinia* occurring on species of *Vernonia*. Over fifty species of *Puccinia* have been included in this list. These have been classified into two groups, having smooth or rough-walled teliospores. The rust under study is a microform having only the III stage. It has teliospores with prominent sparsely placed echinulations and is different from other recorded species. Further no *Puccinia* has been recorded on the present host. Therefore, the rust is considered a new species and named *Puccinia vernoniae-monosis*.

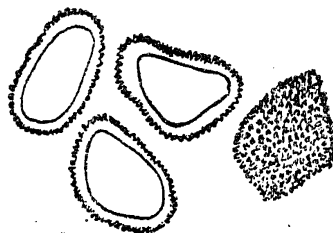
(23) *Aecidium terminaliae* Ramakrishnan T. S. and K. sp. nov.

Spots amphigenous, sparse, yellow to reddish brown, with a distinct more or less spherical, woody gall in the centre; the gall projects out on both sides of the leaf; sometimes the galls are formed along the margins of the leaves also. *Pycnia* amphigenous, subcuticular hemispherical; *pycniospores* hyaline, spindle-shaped; *æcia* sunk in the woody galls, varying numbers of cupulate hard-rimmed *æcia* present in each gall, *æcia* measure  $670 \times 360 \mu$ ; peridium ephemeral, made up of polygonal smooth-walled cells; *æciospores* catenulate, polyhedral, with thick walls, one end sometimes thicker than the other, densely and prominently verrucose, measuring  $42 \times 24 \mu$  ( $29-49 \times 19-29 \mu$ ), deep reddish brown.

On living leaves of *Terminalia bellerica* Roxb., Valparai, 10-4-47, T. S. Ramakrishnan.

Maculæ sparsæ, amphigenæ, brunnei colores, cum distincto, spherico, ligneo, excrescente projiciente ambabus lataribus; *pycnia* amphigena, subcuticularia, hemispherica; *pycniosporidia* hyalina, fusiformia; *æcia* immersa, cupulata,  $670 \times 360 \mu$ , peridii evanescentis, cellulis polygonis, pariete levi; *æciosporidia* catenulata, polyhedra, interdum inequaliter incrassata, exstanter et dense verrucosa,  $42 \times 24 \mu$  ( $29-49 \times 19-29 \mu$ ), dense rubrei-brunnei colores.

In vivis foliis *Terminalia bellerica* Roxb., Valparai (Anamalais), 10-4-1947, T. S. Ramakrishnan.



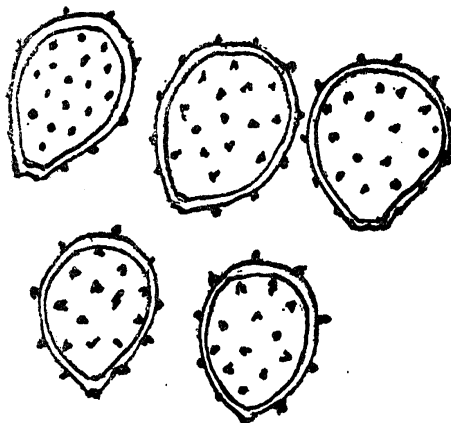
TEXT-FIG. 8. *Aecidium terminaliae* aeciospores ( $\times 300$ ).

The only rust recorded on this host genus is *Uredo terminaliae* P. Henn. on *T. argentea* and *T. hyalobotes*. In the fungus now collected only the aecial stage is observed and it is therefore for the present included under the form genus *Aecidium* and is named *A. terminaliae*.

(24) *Uredo amomi* Petch

Spots small, yellowish brown, isolated amphigenous; *uredia* hypophyllous, minute, pulverulent, one or more in a spot, whitish, subepidermal; *urediospores* ovate, globose, strongly spinulose, stipitate, hyaline to light yellow,  $28 \times 24 \mu$  ( $24-38 \times 19-29 \mu$ ).

On living leaves of *Amomum* sp., Valparai (Anamalais), 10-4-1947, T. S. Ramakrishnan.



TEXT-FIG. 9. *Uredo amomi*.—Urediospores ( $\times 600$ ).

A similar rust was prevalent on the leaves of *Flettaria cardamomum* on the Anamalais during the same period. Yellowish brown spots are visible on the upper surface. Minute uredia develop in clusters on the lower surface of the spots. The uredia are whitish to pale brown in colour. Urediospores are oval to globose, strongly spinulose, hyaline to light yellow and measure  $22-32 \times 20-28 \mu$ .

A comparison of the above two rusts exhibited complete agreement in all characters.

*Phakopsora elettariae* (Rac.) Cumm. has been recorded on *Amomum* sp. from New Guinea. Cummins (1941) had concluded that the description of the telia of *Schroeteriaster elettariae* Rac. indicated that it was really a *Phakopsora*. *S. elettariae* was recorded on *Elettaria cardamomum* by Raciborski 1900. *Uredo amomi* Petch has been described from Ceylon (Petch, 1911-14) on *Amomum involucreatum*. A comparative statement of *P. elettariae*, *U. amomi* and the two present rusts is given below.

	Urediospore dimensions	Remarks
<i>P. elettariae</i> ..	24-30 × 15-20 μ	Orange yellow, finely verruculose
<i>U. amomi</i> ..	25-38 × 20-28 μ	Strongly spinulose, hyaline
Rust on <i>amomum</i> ..	24-38 × 19-29 μ	Hyaline to light yellow, strongly spinulose
Rust on <i>Cardamomum</i> ..	23-32 × 20-28 μ	Hyaline to light yellow, strongly spinulose

It is evident from the above statement that the present rusts are identical with *U. amomi* in spore size, and shape and in the nature of the wall. Some of the spores in the present rusts have a light yellowish colour, which however cannot be taken as a valid differentiating character. It is very probable that all the three rusts represent only the uredial stage of *P. elettariae*. But since only the uredia have been seen they are tentatively placed in *U. amomi*.

(25) *Uredo colebrookiana* Barclay.

On leaves of *Colebrookia oppositifolia* Sm., Valparai (Anamalais), 10-4-1947, T. S. Ramakrishnan.

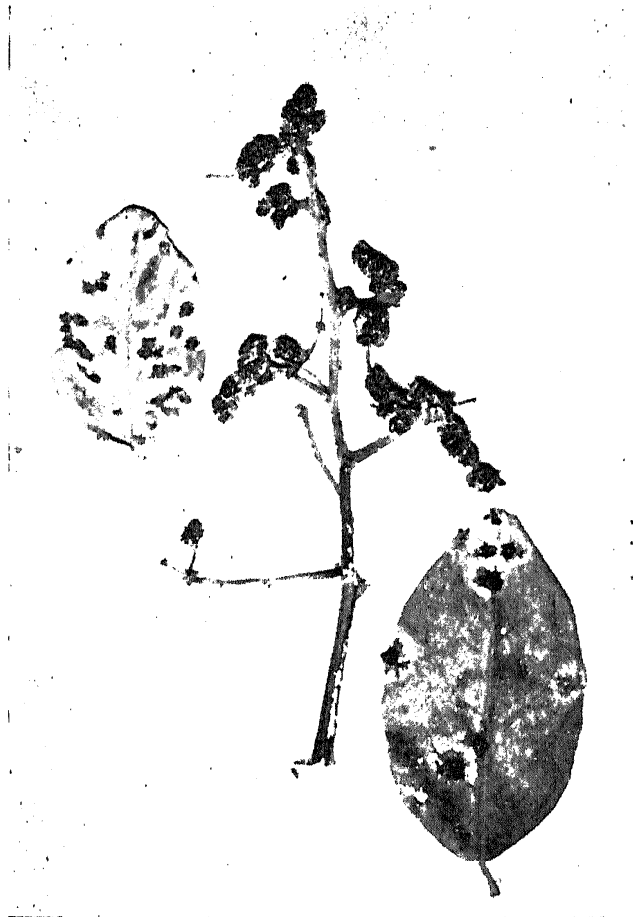
This rust has not been observed in South India before.

ACKNOWLEDGEMENT

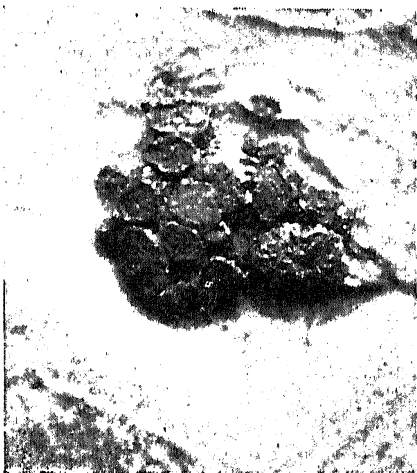
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1



2



3

*Bulgariastrum tumefaciens*

1. Leaves and inflorescence of *Capparis sepiaria*, showing galls
2. Apothecia (  $\times 10$  )
3. Section of Apothecium (a) and Pycnidium (b) (  $\times 100$  )