Family: Ustilaginaceae

FAMILY: USTILAGINACEAE Schroeter

Pilze Schles. 1: 266, 1887.

The family was established by Schroeter based on the type genus *Ustilago* in 1887. Sori in leaves, stem or inflorescences. It may be developed in anther too. The teliospores are conspicuous or inconspicuous. It may produce hypertrophy to the organ infected. The spores are produced as semiagglutinized, agglutinized or powdery mass. Large number of spores are produced in single sorus. The spores are single or sometimes united into semipermanent spore balls. The spores are sometimes mixed with sterile cells (= partitioned cells). The sterile cells may be in group or in chains, single, sometimes absent or free. The spores are also mixed with the fragments of mycelium or peridial cells. The spores germinate with the septate promycelium with lateral and terminal sporidia or basidiospores directly on sterigmata or sometimes only form infectious hyphae.

The members of the family Ustilaginaceae are generaly restricted mainly to the members of the family Poaceae (= Graminae), Cyperaceae, Caryophyllaceae, Portulacaceae, Polygonaceae, Acanthaceae etc. There are about 14 genera described from this family from India (Mundkur and Thirumalachar, 1952). Kalman Vanky (1985) included all the smut

genera under the only family Ustilaginaceae. He studied 31 genera and 234 species under the single family Ustilaginaceae from Carpathian parts of Europe.

Type Genus: *Ustilago* (Persoon) Roussel

Key to the genera of the family Ustilaginaceae:

A Spores single..... B

A" Spores in sporeballs ..... F

B Sori only with fertile spores and long fascicles of sterile hyphae ..... *Farysia*

B" Sori containing fertile spores without long fascicles of sterile hyphae C

C Spore mass powdery ..... D

C" Spore mass not powdery ..... E

D Sori naked or covers with host tissue; without central columella (rarely present in some species ..... *Ustilago*

D" Sori not naked but covered by peridial membrane of fungus tissue with central columella ..... *Sphacelotheca*

E Spores developed basipetally around central

columella; without partition cells; mostly on Cyperaceae ..... *Cintractia*

E" Spores not developed basipetally around central columella; spores with partitioned cells ..... *Sporisorium*

F Spore ball persistent; spores with curious folding externally and all fertile ..... *Tolyposporium*

F" Spore ball not persistent; spores without curious foldings and all fertile ..... *Sorosporium*

I. GENUS: *USTILAGO* (Persoon) Roussel, *Fl. Clavados* 2: 47, 1806.

The genus *Ustilago* was established by Persoon (1806) based on the type species *Ustilago hordei* (Persoon) Lagerh. of the family Ustilaginaceae. It is one of the largest and commonest genus of the smut fungi. Sori are almost and never enveloped by fungal peridium, nor found around columella of the host tissue, except *Ustilago scitaminae* Zundel (Thirumalachar and Mundkur, 1952) and *Ustilago polytoco-barbarata* Mundkur in which columellae found well developed. Zundel (1953) observed that the genus is cosmopolitian in distribution.

About 350 species have been reported from the world (K.

Vanky,1985) of which 220 are recorded on the members of the family Poaceae. In India, there are about 67 species (Thirumalachar and Mundkur, 1952; Butler and Bisby revised by Vasudevan, 1960; Vasudenvan, 1962, Mukerji and Juneja, 1974; Sorbhoy *et al.* 1975; Bilgrami *et al.*, 1971; Bhide *et al.*, 1986).

TYPE SPECIES: *Ustilago hordei* (Pers.) Lagerh.

(1) *Ustilago eugenula* Syd. and Butler, *Ann. Mycol. Berl.* 10: 251, 1912.

HABIT

In the ovaries of *Eragrostis* sp. (Family-Poaceae), S.U.C., Kolhapur (M.S.), 11.10.1991, M.S. Patil.

REMARKS

Sydow, P. and Butler (1912) have recorded this species from Pusa (Bihar) in the ovaries of *Eragrostis natans* Nees. Ahmad (1939) has also collected it on *Eragrostis japonica* Trin. from West Panjab (Pakistan).

The present collection has been also collected on the same host genus from S.U.C., Kolhapur and found to be identical in respects of morphology and dimensions of the teliospores and thus, referred to it. It makes a new record to

the fungi of the Maharashtra State.

(2) ***Ustilago cruss-galli*** Tracy and Earle, *Bull. Torrey. Bot. Cl.* 22: 175, 1895.

HABIT

In the inflorescence of *Echinocloa colonum* (L.) Link.(Family-Poaceae), S.U.C., Kolhapur (M.S.) 10.9.88, M.S. Patil, and Clums of *Echinocloa frumentacea* (Roxb.) Link., Nerle (Dist. - Sangli), 16.10.85, B.J. Patil.

REMARKS

Tracy and Earle (1895) have collected this species from Belgium on *Echinochloa frumentacea* (Roxb.) Link. and Thirumalachar and Pavgi (1943) have also collected it on the same hosts from Pusa (Bihar).

The present collections have been found morphologically identical in all respects and thus, referred to it. It is a new record for the Maharashtra State.

(3) ***Ustilago idonia*** Syd. and Syd., *Ann. Mycol. Berl.*, 37: 442, 1939.

HABIT

In the inflorescence of *Dactylactenium aegypticum* (L.)P. Beauv. (Family-Poaceae), Kolhapur, 8.9.1988, M.S.Patil, HCIO No. 30246.

REMARKS

Sydow, H. and Sydow, P.(1939) have recorded this species from Shaikapur (Punjab) in the inflorescence of *Dactylactenium scindicum* Boiss. Present collection has been recorded on *Dactylactenium aegypticum* (L.) P.Beauv. and matched in all respects, and so referred to it. *Dactylactenium aegypticum* (L.) P.Beauv. is an additional host and it is a new record to the fungi of Maharashtra State.

(4) ***Ustilago montagnei*** Tul. var. major Dasmazieres, *Pl. Crypt. France* ed. 1: 2126.
(=ed II, 1726), 1850.Pl. Figs. 3-4, Text Figs. 4-6.

Sori in the inflorescence, generally each carpel gets affected and whole inflorescence, the carpel showed an hypertrophoid condition and burst to expose black dusty spore mass. Teliospores are yellowish-brown, one-celled, thick-walled, smooth-walled, 1-1.5 µm thick and 13-17.5 µm in diameter.

HABIT

In the inflorescence of *Rhynchospora wightiana* Steud. (Family -Cyperaceae), Sawantwadi (M.S.), 22.10.91, S.R. Yadav.

REMARKS

This variety has been reported from Poland on *Rhynchospora alba* (L.) Vahl and *Rhynchospora glauca* Valh and *R. podosperma* Wight (= *R. alba* L.), *R. caucana* L. from Europe, Africa and America (Kochman, Josef and Mojewski, Tomasz, 1973)

Two species have been initially reported on the host genus *Rhynchospora* (Kochman, J. and Mojewski, 1973) viz. *U. rhynchospora* Sautt. and *U. montagnei* Tul. which differed from each other on the basis of their spore dimensions. *U. rhynchosporae* Sauter. having large spores (15-20 X 13-17 µm) and *U. montagnei* Tul. having smaller spores size (12-17 X 10-14 µm). Present collection having smaller spores and thus, belonged to *U. montagnei*. This species having two varieties other than type (K. Vanky, 1985). Present material matches well in respect of morphology and dimensions of teleutospores with *U. montognei* L. R. and C. Tulasne Var. major Desm. and thus, referred to it. It makes a new record to the fungi of India and *R. wightiana* Steud. is an additional host.

(5) ***Ustilago operata*** Syd. and Butler, *Ann. Mycol. Berl.*, 4:420, 1906.

HABIT

In the ovaries of *Brachiaria reptans* (L.) Gard. and C.E.Hubb. (Family-Poaceae), S.U.C., Kolhapur, 19.11.85, M.S.

Patil. WIF No.- 1257.

REMARKS

Sydow and Butler (1906) recorded this species on *Brachiaria* sp. from Europe. Same species has been also reported by Thirumalachar and Mundkur (1952) in the ovaries of *Brachiaria villosa* (Lamk.) A. camus and *B. samilandulata* L. from Ootakmand, Madras and Darjiling (India).

Present collection is found to be morphologically identical and thus, referred to it. It is a new record to the fungi of the Maharashtra State and *Brachiaria reptans* (L.) Gard. and C.E. Hubb. is an additional host record.

(6) ***Ustilago sparsa*** Underwood, *Bull. Tarrey. Bot. Cl.* 24: 86, 1897.

HABIT

In the ovaries of *Dactylactenium aegypticum* (L.) P. Beauv. (Family-Poaceae), 28.8.88, S.U.C., Kolhapur, M.S. Patil, HCIO No.: 30298.

REMARKS

Underwood (1897) has collected this species on *Dactylactenium aegypticum* (L.) P. Beauv. from America, India and Japan (Zundel, 1953).

The same species of the same host has reported by Ahmad

and Subramanium (1935) from Pusa (Bihar) and Mundkur (1969) from New Delhi.

There are two species of *Ustilago* on this host viz. *Ustilago idonea* and *U. sparsa*. These two collections were collected from the same locality. Though these collections are on the same host, these are differentiated mainly on the basis of their spore surface ornamentation. The spores are punctate in case of *U. idonea* and of chestnut-brown colour. While in the present collection the spores are highly verrucose and yellowish-brown in colour.

The peresent collection on *Dactylactenium aegypticum* (L.) P.Beauv. found to be identical in respect of morphology and dimensions of *U. sporsa* and thus, referred to it. This is a new record to the fungi of the Maharashtra State.

(7) *Ustilago utriculosa* (Nees) Tulasne, *Ann Sci. Nat. Bot.* III 7: 102, 1847.

HABIT

In the inflorescence of *Polygonum serrulatum* Lag.(Family - Polygonaceae), 9.2.1958, Karad (Dist. Satara), S.D. Patil.

REMARKS

This species was recorded on the floral parts of the *Polygonum barbatum* Woodv. by Ahluwaliya from Lahore (West Panjab) and by Chawdhary (1944) from Assam on *Polygonum orientales*

Linnaeous.

This species is often confused with *U. cordai* Liro because of the teilospores which are more or less similar. But the nature of the sori are different in this species, which are chocolate-brown and affected part showed a pronounced hypertrophy.

Sphacelotheca hydropiperis (Schum.) deBary has been also reported from India on the same host, but it differs from the present species by the ornamentation of the teliospores and absence of columella.

Ustilago utriculosa (Nees) Tulasne has a wide range of distribution. But in Maharashtra, this species has been restricted to only Koyana region of the Western Ghats (Kamat *et al.*, 1971). the reason not known.

The present collection is identical with this species in all respects and thus, referred to it. The host viz. *Polygonum serrulatum* Lag. is recorded as an additional host.

(8) ***Ustilago brevifoliae*** Sp. nova, pl. figs. 1-2 Text Figs. 1-3.

Ovaria inflorescentia, Pauca infecta, subhypertrophice, inconspicui, nigrescentes: 1-2 mm diametro, sori tunica matricis, in maturitata disrumpentes et sporarum massam,

pulverutenium, nigrescentate, sporae globosae, sub-globosae, vel ovoideae, verruculosa et spinulosa, episporio, crassusculo, lutenscentes brunneae, 8.6-11.4 µm, plerumque 9.5 µm in diametro.

HOLOTYPE

Typus lectus in ovariis *Eleusine brevifolia* Wild. (Family-Poaceae). 19.11.87, S.R.Yadav, Madurai (T.N.), HCIO No. (a typus).

Sori in the inflorescence; a few ovaries in the inflorescence have been affected and showed slight hypertrophy; sori inconspicuous to conspicuous, blackish, 1-2 mm in diameter, covered by a membrane of a host tissue, which burst at maturity by exposing black, dusty powdary spore mass. Teliospores one celled, globose to subglobose or oval, verrucose to spinulose, thick-walled, yellowish-brown, 8.6-11 µm in diameter with mean 9.5 µm.

HABIT

In the ovaries of *Eleusine brevifolia* Wild. (Family - Poaceae), 19.11.87, S.R. Yadav, Madurai (T.N.), HCIO No. (a type).

REMARKS

Mundkur and Thirumalachar (1946) renamed *Ustilago eleusineae* as *Melanopischium eleusines* Mundk. and Thirum. recorded on the host *Eleusine coracana* Goertn. which was reported origi-

TABLE: 1

Comparison of the present collection with the species.

Species	Diamensions of teliospores	Ornamentation of the teliospores	colour of of the spores	Host and locality
Ustilago hordei (Pers.) Lag.	5.5 to 9µm in diameter or mean 7 µm in diameter	smooth	carboe brown	**Hordeam vulgare** Lout. Loc.
Ustilago pavgie-nsis Patil and Gandhe	8-10.4 µm in diameter or. mean 9.2 µm in diameter	densely and prominently verrucose	yellowish-brown	**Eleusine coracona** Gaer. Pune (M.S.)
Present collection	8.6-11.4 µm in diameter or mean 9.5 µm in diameter	verrucose to spinulose	yellowish-brown	**Eleusine brevifolia** Wild Madurai (T.N.)

nally by Kulkarni (1922). There was no record of the species of the genus *Ustilago* on this host genus *Eleusine* (Zundel, 1953; Fischer and Holton, 1957). But Gandhe and Patil, (1976) have described a new species on *Eleusine coracona* viz. *Ustilago pavgiensis* (not published but in thesis of Gandhe).

The present collection is also quite different from the description of the type species and it shows the powdary spore mass in contrast to the spore mass of Malanopischium which is agglutinied. The present collection shows no more difference in dimensions and colour of the teliospore but there is difference in the spore surface ornamentation, which is verucose to spinulose where as the species described by Gandhe and Patil showed highly verucose spores. The present collection has been collected on the different host species i.e. *Eleusine brevifolia* Wild. and the locality is also different. It is found quite distinct (Table:1) and thus to accomodate it, a new species has been proposed.

II. GENUS: *SOROSPORIUM* Rudolphi, *Linneae*, 4: 116, 1929.

Sori developed in various parts of the host plants. Spore mass dark coloured, pulverulent, organized into spore balls, covered by pseudomembrane with simple or compound central columella. The genus shows close resemblance with *Tolyposporium* Woron. in composition of the spore balls. Both

have only fertile spores. The species of the genus *Sorosporium* attack mostly to the members of the families Poaceae and Caryophyllaceae. About 115 species have been recorded from the world (Fischer and Holton, 1957; Zundel, 1953) and of these 103 species have been recorded only on the members of the family Poaceae. Ciferri (1938) has divided the genus *Sorosporium* into two sub-genera viz. *Eusorosporium* Cif- accommodating the graminicolous smuts and *Sorosporiopsis* Cif- for the different species occuring on the other members of the families viz. Caryophyllaceae etc. Recently Vanky (1985) treated the genus *Sorosporium* as a monotypic one. In some species, along with the spore balls, some separate or group of partition cells (= sterile cells) have been also present. Germination *Ustilago* type.

TYPE SPECIES: ***Sorosporium saponariae*** **Rudolphi**

(1) ***Sorosporium andropogonicola*** sp. nova, pl. Figs. 5-8; Text Figs. 7-11.

Sori inflorescentiam, semiferti, vel amnino destuentibus, cylindraces, 0.5 cm elongata, brunnei, membrana falsa, in maturitata globosa, dilabats tecti, tune sporarum massae abscarum, sub-globosa, ellipsoidia, 28-80 X 56-118 µm in diametro, teleutosporae globosae, rubra brunneae, spirulosa, velverruculosa, 9.5-10 µm in diametro, cellulae, intreiores, absculre brunnean, teniiter, tunicate, polygonae, leves vel

trinntissime, verruculosa, columellae centrali, recta vel curvali et, simplisibus, mono et pluribus.

HOLOTYPE

Typus lectus in ovariis vivis *Andropogon pumilus* Roxb. (Family -Poaceae), Pune (M.S.), 7.9.60, S.D. Patil, HCIO No. (a typus).

Sori in the inflorescence, almost all the floral parts in the inflorescence get attacked, sori cupular to cylindrical, 0.5 cm long, conspicuous when young, later on protruding out the glumes exposing the black, granular spore mass with central, delicate, single or many columellae; spore ball many spored, black to dark-brown subglobose, ellipsoidal to irregular, 28-80 X 56-118 µm in diameter, teleutospores one-celled, sub-globose, 9.5 - 10 µm in diameter, thick-walled, inner spores pale brown, thin-walled, polygonal and smooth; the outer spores showed verrucose to spinulose ornamentation especially on the outer, exposed spore wall surface.

HOLOTYPE

In the ovaries of *Andropogon pumilus* Roxb. (Family - Poaceae), Pune (M.S.), 7.9.60, S.D. Patil, HCIO No. (a type).

REMARKS

The genus *Sorosporium* Rudolphi is comparatively a large one having more than 115 species and mainly graminicolous. The

present collection is also graminicolous. There are many smuts infecting to the host genus *Andropogon*; but there is no species that belongs to the genus *Sorosporium* except *Sorosporium taiarum* (Syd.) Zundel, which resembles in the soral characters, but differs from this collection in respects of smooth and smaller teliospores and larger spore balls. Comparision with the type species (Table-II) also shows its distinctness and therefore, a new species *Sorosporium andropogonicola* Sp. nova has been proposed here to accommodate the present collection.

(2) *Sorsporium spirocolumellae* Sp. nova, pl. Figs. 9-12 and Text Fig. 12-15

Sori ovariicoli, omnino destrents, elongata, cylindraces, 5-10 cm longi, vaginatolii, portim inclusi, membrana lutea, tenuiter glurarita, disputa, massam nigram, columellam tratuosum circinatibus, 5-10 cm longum, opices, bifercatus; sporarum massam glomerali, rectangularis et cylindraces, 36-70 X 50-140 µm, brunnae, sporae globosae angulosae, crasse tunicatae, levigatus, 7.75 - 15.5 µm et 9.-9.5 µm in diametre, cellulae sterilae non-visa.

HOLOTYPE

Typus lectus in inflorescent; vivis unknown grass sedge sp. (Family — Cyperaceae Poaceae), Lanza (Dist.-Ratnagiri, M.S.); 10.11.1956; P.N. Deshmukh. HCIO No. (a typus).

Sori in the ovaries, destroying all the inflorescence elongated, cylindrical, 5-10 cm long, enclosed by the thin membrane, the spore mass dark, powdary, the whole inflorescence get affected and leaving only spiral columellae a part of host, 5-10 cm long, bifercated at the apex, spore-balls rectangular to cylindrical or elliptical, 36-70 X 50-140 µm, dark brown to black in colour, many spored; spores globose, angular, dark brown in colour, 7.75 - 15.5 µm in diam. with mean 9-9.5 µm. the spores thick-walled, both inner and outer spores are smooth walled.

HABIT

In the infloresence of unknown grass sedge species (Family - Poaceae) Cyperaceae), Lanza (dist.-Ratnagiri, M.S.); 10.11.1966, P.N. Deshmukh, HCIO No. (a type).

REMARKS

Very few species of the genus *Sorosporium* are known to infect the members of the family Cyperaceae. There is only one species of the genus *Sorosporium* known from India viz. *Sorosporium apparaoi* G. Koteswhar Rao who reported it from Hyderabad (A.P.) on the species of *Kylinga*. Present collection is quite distinct in respects of the made of the infection which completely destroyed the whole inflorescence and remained only columellae which are quite long, spirally coiled and apically bifuracated; morever, this

material/collection has been also compared (Table-2) with the type species which showed a quite distinctness in respects of the spore balls, which are larger and teliospores which are smooth.

Therefore, a new species viz. *Sorosporium spirocolumellae* Sp. nov. has been proposed here to accomodate the present material. But it requires to confirm the host really it belongs to the family Cyperaceae or Poaeceae.

Comparision of new species of *Sorosporium* with the type species is given in Table 2.

(3) ***Sorosporium contortum*** **Griffith,** *Bull. Torrey. Bot. Cl.*, 31: 83, 1904.

HABIT

In the ovaries of *Heteropogon contortus* (L.) P. Beauv. (Family - Poaceae), S.U.C., Kolhapur, M.S. Patil, 24.9.92.

REMARKS

Griffith (1904) has reported this species from America in the inflorescence of *Heteropogon contortus* (L.) P. Beauv. and from Australia by Zundel (1953) and from India by Burkill (1931) on the same host.

The present species has been also recorded on the same host and found morphologically identical in all respects and

TABLE: 2

Comparison of new species of Sorosporium with the type species.

Species	Diamensions of the spore balls	Diamensions of the teliospores	Ornamentation and colour	Host and Locality
Sorosporium saponoriae Rudolphi (a type)	40-100 µm in diameter	12-18 X 10-14 µm in diameter	brown and verrucose	**Saponaria officinales** L. (Caryaphyllaceae), Loc-Germany
Collcetion-I	28-80 X 115-156 µm diameter	9.5 - 10 µm in diameter	brown-outer spores spinulose, inner smooth	**Andropogon pumilus** (Poaceae), Loc.-Pune
Collection-II	36-70 X 50-140 µm in diameter	7.5 X 1205 µm in diameter	brown to black smooth	Unknown sedge sp. (Cyperaceae), Lanza ?

thus, referred to it. It is a new record to the fungi of the Maharashtra State. It is a very common species of this region.

(4) ***Sorosporium holstii*** P. Henn., *Hedw. Rep.* 7: 22, 1896.

HABIT

In the ovaries of *Themeda* sp. (Family - Poaceae), Satara (M.S.), 26.1.86; M.S. Patil, WIF No. 1220.

REMARKS

Hennings, P. (1896) has reported this species in the inflorescence of *Themeda forsskalii* Hack. from Tropical Africa. Bagcher and Sing (1960) have also collected the same species on *Themeda strigosa* (Ham.) A.camus from India.

Present collection has been recorded on *Themeda* sp. and is found to be morphologically similar and thus, referred to it. It is a new record to the fungi of the Maharashtra State. This is also a very common species and collected from various localities of South Western Maharashtra.

(5) ***Sorosporium apludae*** Mishra, *Mycologia* 48: 872-876, 1956.

HABIT

In the ovaries of *Apluda mutica* L. (Family - Poaceae), Gokul Shirgaon, 26.11.85 and S.U.C., Kolhapur (M.S.), 9.12.1992, M.S. Patil, WIF Nos. 1212 and 1213.

REMARKS

Two species of the genus *Sorosporium* viz. *Sorosporium apludae* Mishra and *S. Apludae-aristatae* Patil and Thirumalachar have been recorded from Bihar and Maharashtra State respectively. Present collection recorded on *Apluda mutica* L. shows similar type of witches broom like symptoms and the morphology and the measurments of the spore balls and teliospores which are also identical to *Sorosporium apludae* Mishra and therefore, referred to it. *A. mutica* L. is an additional host record, this is also a very common species and occurs from November and December and easily recognized by its symptoms in the field.

(6) ***Soroporium tumefacience*** Mc Alpine, *Smuts of Australia*: 184, 1910.

HABIT

In the ovaries of *Chrysopogon asciculatus* Trin. (Family - Poaceae), Sawantwadi (M.S.), S.R. Yadav, 25.9.92.

REMARKS

Mc Alpine (1910) has originally recorded this species on *Stipa* sp. from Australia. But this host is wrongly identified. The host of this species was later on identified as *Chrysopogon* (Blacke, 1910). Mundkur (1939) has reported a new species viz. *Sorosporium azmatii* on *Chrysopogon coeruleus* (Steud.) Watson, which appears to be identical to *Soros-*

porium tumefacience Mc Alpine (Thirumalachar, 1952). So Thirumalachar has considered this new species as synonym.

The present collection has been also recorded on *Chrysopogon asciculatus* Trin., which is identical in respects of its solitary sorus, enclosed by basal sheath, but here the sori are shorter, 1-1.5 cm long, very conspicuous and columellae are simple many and fibrous, teleutospores are smooth. Thus, the present collection has been referred to it. It makes new record to the fungi of the Maharashtra State.

III. GENUS: ***CINTRACTIA*** Cornu, *Ann. Sci. Nat Bot. Ser.* VI 15: 279, 1883.

The sori developed in various parts of the host, usually in the ovaries. The species of the genus *Cintractia* Cornu mostly attacks the peduncle and pedicels. This genus is based on the type species viz. *Cintractia axicola* (Berk.) Cornu which attacks the species of the host genus *Fimbristylis* (Zundel, 1953). The detailed account of soral morphology has been given by Thirumalachar (1950, 56). The sorus develops centripetally around the central columella. The sori containing compact, usually agglutinated amorphous spore mass, at first covered by thin, sterile hyphal membrane. The genus sometimes resembles with *Sphacelotheca* in soral characters and teleutospore which are one-celled and formed

centripetally. The genus *Cintractia* mainly attacks the members of the family Cyperaceae.

Fischer and Holton (1957) listed 58 species from the world. There are about 13 species recorded from India and only two known from Maharashtra State (Mundkur and Thirumalachar, 1952; Bilgrami *et al.*, 1979, 1981; Kamat *et al.*, 1971 and Bhide *et al.*, 1986).

TYPE SPECIES: *Cintractia axicola* (Berk.) Cornu

Cintractia minor (Clinton) Jackson, *Mycologia*, 12: 153, 1920.

HABIT

In the ovaries of *Cyperus carymbosus* Rottb. (Family - Cyperaceae), August 191 , Dhule (M.S.), S.D. Deoray.

REMARKS

Jackson (1920) has reported his species on *Cyperus rotundus* Linneus. Later on Mundkur and Thirumalachar (1944) have also reported it on *Cyperus compressus* Clarke from Mysore (K.S.)

The present collection is found to be identical in all respects with this species and thus, referred to it. The host *Cyperus carymbosus* Rottb. is an additional host. It makes a new record to the fungi of the Maharashtra state.

IV. GENUS: *FARYSIA* Rocibarski, *Bull. Acd. Sci. Cracovie,*

354, 1909.

Sori in the various parts of the host and containing an agglutinated spore mass, covered with pseudomembrane of fungal tissue and mixed with numerous elaters which are parallel in sorus. This genus shows close resemblance with *Cintractia* Cornu in soral characters, but differs in the development; the soral development is vertical at the apex of the thallamus where as it is lateral in case of *Cintractia* Cornu.

This genus also restricted to the members (hosts) of the family Cyperaceae and more than 20 species have been reported from the different parts of the world (Fischer and Holton, 1957 and K.Vanky, 1985). Five species are recorded from India. There is no report of the genus *Farysia* from the Maharashtra State. (Kamat *et al.*, 1974 and Bhide *et al.*, 1986)

TYPE SPECIES: *Farysia javanica* Raciborski

Farysia butleri (Syd.) Sydow, *Ann. Mycol.* 17: 48, 1919.

HABIT

In the ovaries of *Scleria stoksiana* Boeck (Family - Cyperaceae). S.U.C., Kolhapur (M.S.), 26.9.88, M.S. Patil.

REMARKS

Sydow, P. (1919) has collected this species on *Scleria* sp.

Butler (1925) has reported it on *Scleria alata* Thw. from Assam and Subramaniam (1931) has also collected this species from Cherapunji and Syndai (Assam) on the same host.

Present collection found to be identical with this species in all respects and thus, referred to it. *Scleria stoksiana* Baedk is an additional host record.

V. GENUS: *SPORISORIUM* Ehrenberg ex link, *sp. Pl.* 6 (2) : 86, 1825

The genus *Sporisorium* was established by Ehrenberg in 1825 to accomodate *Sporisorium sorghi* a smut of *Sorghum.* Later on this species was transferred to *Sphacelotheca* by Clinton 1902. The same species was described as a new species by Passerini (1873) as *Ustilago sorghi.* This generic name i.e. *Sporisorium* was completely forgotten, untill recently, Langdon and Fullerton (1978) have studied the soral development of *Sphacelotheca* and concluded that these have different characters and thus, reinst ted this genus.

Sori developed in the ovaries and inflorescence. It destroys the ovaries completely and produce a large granular powdary spore mass around the columella.

The genus *Sporisorium* have the following special diagnostic characters (Vanky, 1985):

1. Sori covered by a peridium formed by hyphae overlaid by host tissue.
2. Columella composed of host tissue, permeated by hyphae which produce spores and sterile cells (= Partitioning cells).
3. The spores are in more or less loose spore balls, when matured, often single or dark coloured.
4. Sterile cells in groups or chains, hyaline and intermixed with fertile spore.
5. The spore germination is *Ustilago* type.

Many species belonging to the different genera viz. *Sphacalotheca*, *Ustilogo* and Sorosporium which are having sterile cells intermixed with fertile cells/spores were noted and described by different workers but their exact nature was not traced. But K. Vanky (1985) has made a suggestion based on his studies and assigned the species which have the sterile cells or partitioning cells in groups or chains to the genus *Sporisorium*.

The genus *Sporisorium* mainly infects the members of the family Poaceae and thus graminicolous. At present Vanky (1985) transferred and key out 10 species under this genus.

The transfer of the species to the *Sporisorlum* from the Indian smuts belonging the different genera viz. *Sphaceloth-eca*, *Sorosporium* and *Ustilago* which have sterile cells

intermixed with the fertile spores; it is neccessary to study the original material, but in the present study the original materials were not available. So the taxa studied in the present work showing the presence of sterile cells with the fertile spores have been transferred and new combinations have been tentatively proposed, based on the collections made.

(1) *Sporisorium pseudanthestireae* sp. nov. Pl. Figs. 13-14 and Text Figs. 16-21.

Sori inflorescencetia; ovariis primutus inclosi in albue, polite, durae brachae, deformentis, sorii rubra brunnae, durae cariaceae, teleutosporae globosae, brunnae, echinulatae, crassinusculo, 7.75-9.5 µm crassi; collumellae centralae ed simplisibus et bifercatus, cellulae sterilae hyalinae, globosae et sub globosae, catelati et aggregati, 9.6-10.2 µm in dimetro.

HOLOTYPUS

Typus lectus in ovariis vivis *Pseudanthistiria hispida* Hook, f. (Family - Poaceae), Kas (Dist. Satara, M.S.) 12.9.91; S.R. Yadav, HCIO No. (a typus).

Sori in the inflorescence, destroying almost all parts of the ovaries and covered with the glumes, exposing the browinish dusty spore mass with central, stout columella

which is bifurcated at the apex; teleutospores globose, light brown, thin-walled echinulate, 7.75-9.5 µm in diameter and the wall 0.5 µm thick; teleutospores intermixed with the sterile cells; these cells are in chains or in groups; hyaline, thin-walled and 906-10.2 µm in diameter.

HOLOTYPE

In the inflorescence of *Pseudanthistiria hispida* Hook, f. (Family - Poaceae), Kas (Dist.- Satara, M.S.), 12.9.91, S.R. Yadav HCIO No. (a type).

The same species has been also collected on this host at S.U.C., Kolhapur and Bhogavati (Dist.-Kolhapur) on 16.10.91 and 5.10.92 by M.S. Patil and Miss A.A. Yadav respectively and deposited in the mycological herbarium, Dept. of Botany, S.U. Kolhapur

REMARKS

So far there is no record of the species of the genus *Sporisorium* on this host genus viz. *Pseudanthistiria* except *Sorosporium pseudanthistiriae* Sydow and Butler collected by Bhide in 1912 from Bombay. Present collection differs from the *Sorosporium* in presence of sterile cells in groups or chains which are hyaline and thin-walled and spores are free in contrast to the copact spore balls in *Sorosporium*. Moreover, as to compared with the type species (Table - 3) it differs in respects of the size of the teliospores which are

TABLE: 3

Comparision of Sporisorium Sorghi with present materials.

Species	Measurements of Teliospore	Partitioned cells (=Sterile cells)	Teleutospores colour and ornamentation	Host	Locality
Sporisorium Sorghi Ehernberg ex Link (a type)	5.5-7 X 5.5 -8 µm	in chain or in group larger than fertile spores and hyaline	light olive brown, smooth to sparsely punctate or very finely verruculose	**Sorghum** spp. (Worldwide)	Egypt
Present collection					
I.	7.75-9.5 µm in diameter	in chain, hyaline 9.5-14.5 µm in diameter	brown echinulate wall 0.5 to 1 µm thick	**Pseudantnistirea hispida** Hook, f.	Kas (Satara) (M.S.)
II.	8-9.7 µm in diameter	in chain, hyline 12.5 µm in diameter	brown, echinulate wall 0.5 to 1 µm thick	**Pseudanthistirea hispida** Hook, f.	S.U.C. Kolhapur
III.	8-9.5 µm in diameter	in chain, hyline 12-13 µm in diameter	brown, echinulate wall 0.5 to 1 µm	**Pseudanthistirea hispida** Hook, f.	Bhogavati (Kolhapur)

smaller and the ornamentation which is echinulate. Therefore, a new species has been proposed here to accommodate the present material as *Sporisorium pseudanthistireae* sp. nova. It does not show any affinity or match to any known species of the genus *Sporisorium* other than the type species so far known.

Following is the list of some species of *Sorisporium* which were studied in the laboratory, showing partitioned cells with the fertile spores.

(1) ***Sporisorium holci-sorghi*** (Revolta) Vanky Comb. nova, *Symb. Bot. Upsal.*, 24(2): 309, 1986, Pl. Figs. 17-19.

= *Sphacelotheca relliana* (Kuhn) Clinton, *J.Mycol.*, 8: 141, 1902.

HABIT

In the inflorescence of Sorghum sp. (Family- Poaceae), 27.11.85, Gokul Shirgaon (Kolhapur, M.S.), M.S. Patil and 19.8.92; Ambap (Kolhapur, M.S.), A.M. Patil.

REMARKS

Sterile cells (=partitioned cells) in chains or group and simple, stout columella. It is a new record to the fungi of India.

(2) ***Sporisorium coicis*** (Brefeld) Patil Comb. nova.

= *Ustilago coicis* Brefeld; *Unters. Gesammt. Mycol.* **12**: 110, 1895.

HABIT

In the ovaries of *Coix lachryma-jobi* L. (Family - Poaceae), Ganesh Khind, Pune(M.S.), 27.12.56, S.D. Patil.

REMARKS

The ovaries get hypertrophoid. The columella present at the centre which is very stout, spore mass dusty and the partitioned cells present which are in group and chains. So the present material referred as a new combination.

(3) *Sporisorium flagellatum* (Syd. and Butl.) Comb. nov.

= *Sorosporium flagellatum* Syd and Butl., *Ann. Mycol. Berl.* 5: 1489, 1907.

HABIT

In the inflorescence of *Ischaemum* sp. (Family - Poaceae), S.U.C., Kolahapur (M.S.), 1.2.93, M.S. Patil.

REMARKS

Partitioned cells in groups or in chains, columella simple.

(4) *Sporisorium furcatum* (Syd. and Butl.) Comb. nova

= *Sorosporium furcatum* Syd. and Butl., *Ann. Mycol. Berl.*, 10: 254, 1912.

HABIT

In the ovaries of *Ischaemum* sp. (Family - Poaceae), S.U.C., Kolhapur (M.S.), 11.2.93, M.S. Patil.

REMARKS

Fertile spores are intermixed with the hyaline patitioned cells which are in group and forked columella is present.

(5) ***Sporisorium neglectum*** (Niessl) Vanky, Comb.nova, *Symb. Bot. Upsal.*, 24(2): 309, 1986.

= *Ustilago neglacta* Niessl, Fung. Eur. 1200, 1868.

HABIT

In the ovaries of *Setaria glauca* (L.) P. Beauv. (Family - Poaceae), S.U.C., Kolahpur (M.S.), M.S. Patil, 10.9.93.

REMARKS

Present species is decribed by Vanky on *Setaria* species in 1986 at Carpethian area. This is reported on *Setaria pumila* (Poiret) Schultes. and *S. viridis* (L.) P. Beauv. The present collection agrees well in respects of morphology and dimensions of the spores and sterile cells. It is also collected on the same host genus. Thus, referred to it. It is a new record to the fungi of India.

(6) ***Sporisorium tanglinensis*** (Zundel) Comb. nova, Pl. Fig. 16.

= *Sphacelotheca tanglinensis* (Tracy and Earle) Zundel., *Mycologia*, 36: 406, 1944.

HABIT

In the ovaries of *Sehima nervosus* (Rohl.) Stapf, (Family-Poaceae) S.U.C. Kolhapur, M.S. Patil and Miss Yadav A.A. Bhogavati (M.S.) 19.10.92 and 20.10.92 respectively

REMARKS

The smuts on *Sehima* was described as *Spha. tanglinensis* by Zundel (1944). But in *Sphacelotheca* no partitioned cells present and in the present collections sterile cells (Partitioning cells) are in groups, which is the characteristic of *Sporisorium*. So the present collection accomodated as *Spori. tanglinensis* comb. nova. This is a new record to the fungi of India.

(7) ***Sporisorium vryburgii*** (Zundel), comb. nova

= *Spha. vryburgii* Zundel, *Mycologia*, 28: 298, 1931.

HABIT

In the ovaries of *Themeda triandra* Forsk. (Family - Poaceae), 5.10.92, Miss Yadav, A.A. Bhogavati (Dist,-Kolhapur, M.S.).

REMARKS

Zundel (1931) reported *Sphacelotheca vryburgii* on *Themeda triandra* Forsk. from America. Same species on the same host has been collected by Mundkur and Thirumalachar from India in 1962.

But the present material showed the hyaline partitioned cells intermixed with fertile teliospores which are in chain. Thus present collection is referred as *Spori. vryburgii* as a new combination. This makes a new record to the fungi of India.

(8) *Sporisorium polytochae-barbatae* (Mundkur) Comb. nova., Pl. Fig. 15

= *Ustilago polytocae-barbatae* Mundkur, *Trans. Brit. Mycol. Soc.*, 24: 314, 1940.

HABIT

In the ovaries of *Chionachne koenigii* Thur. [= Polytocha barbata (R.Br.) Stapf.] S.U.C. Kolhapur, 16.10.93, M.S.Patil.

REMARKS

The smut found on *Chionachne koenigii* Thur. was described as *U. polytochae-barbatae* Mund. by Mundkur in 1940. But as the characters of *Ustilago* are different and the present collection shows the presence of stout central columella and the sterile cells which are in groups. It is the charac-

teristic feature of *Sporisorium* and thus, transferred to *Sporisorium polytochae-barbatae* (Mundkur) Comb. nova to accommodate present collection.

This is the new record to the fungi of India.

EXPLANATION OF TEXT FIGURES: 1-6

1-3 *Ustilago brevifolia* sp. nov. on *Eleusine brevifolia* R. Br.

(1) Habit

(2) Enlarged sorus

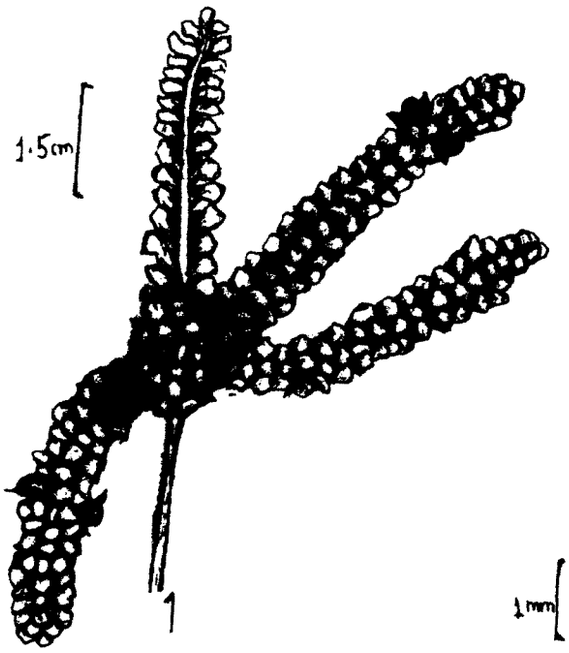
(3) Teleutospores

4-6 *U. montagnae* Tul. var. major Des on *Rhynchospora wightiana*

(4) Habit

(5) Enlarged sorus

(6) Teleutospores



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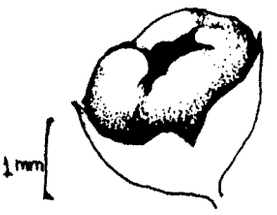

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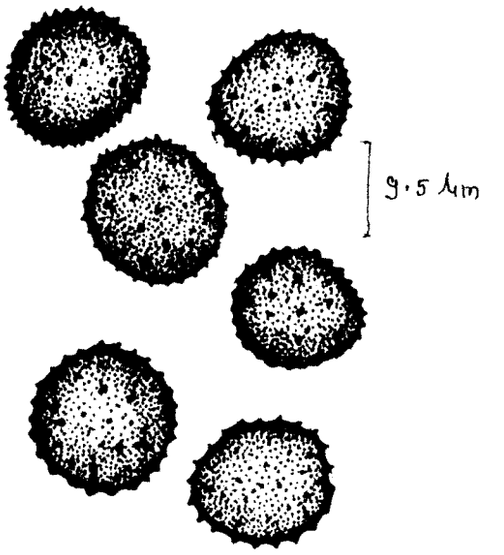

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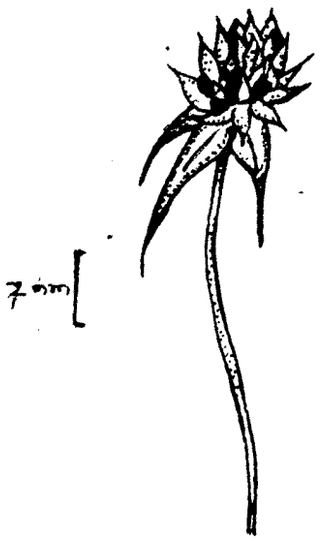

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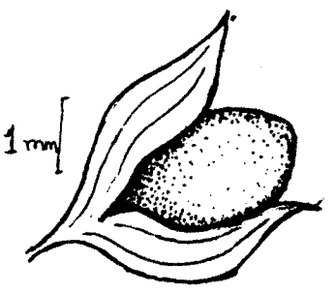

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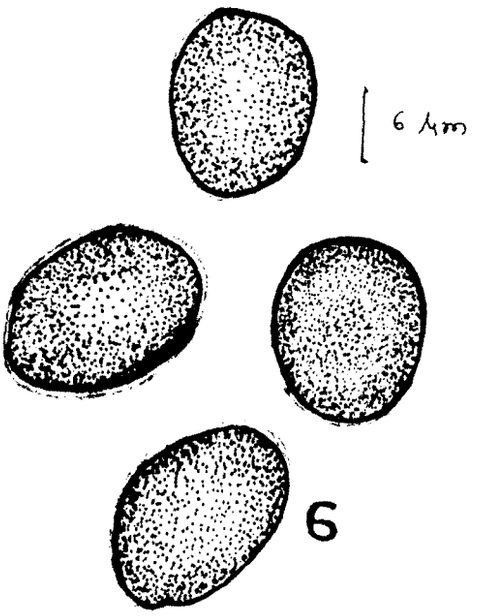

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EXPLANATION OF TEXT FIGURES: 7-11

Sorosporium andropogonocola sp. nov. on *Andropogon pumila* Roxb.

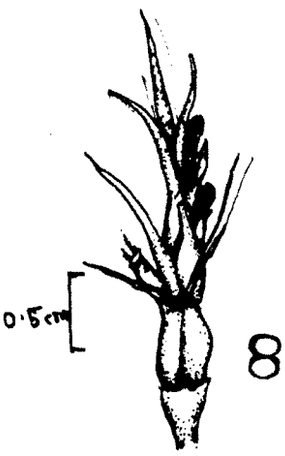
(7) Habit

(8-9) Enlarged sorus

(10) Spore ball

(11) Teleutospores

7



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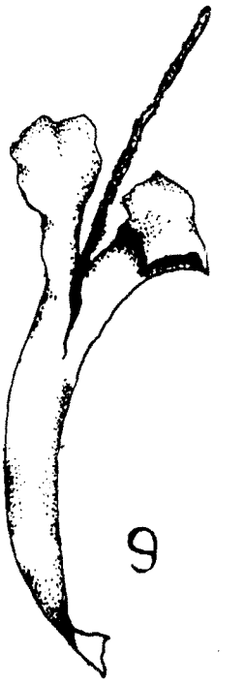

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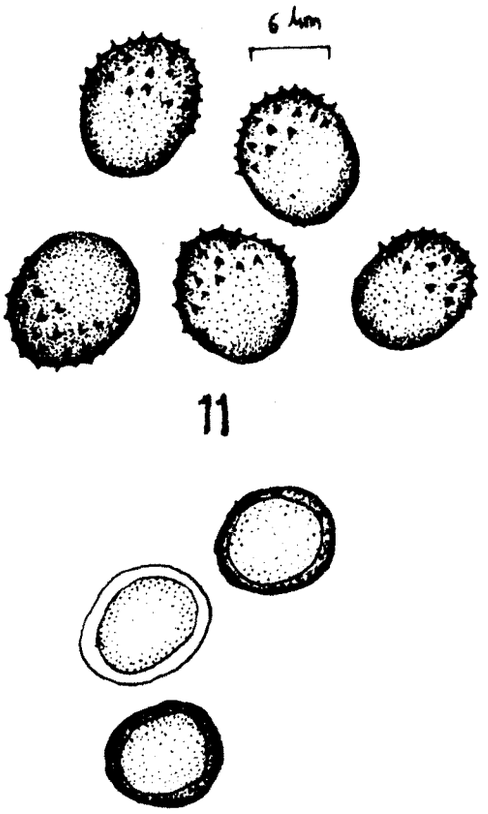

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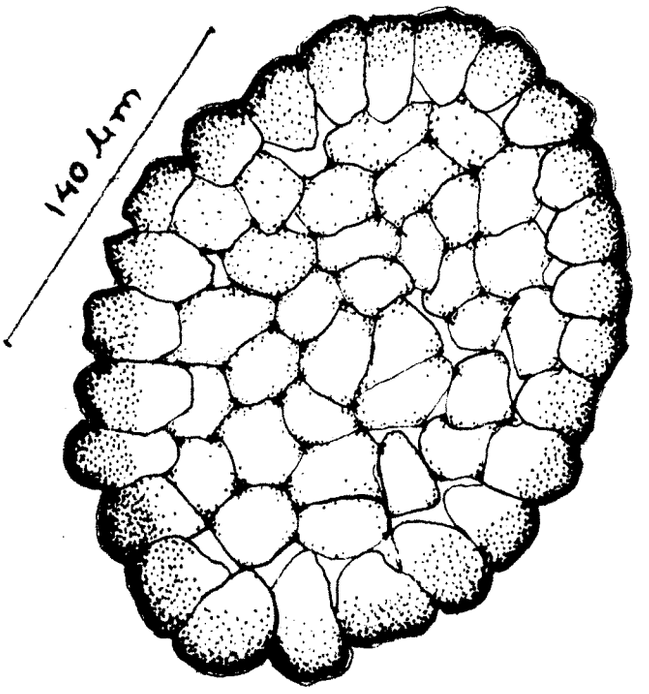

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EXPLANATION OF TEXT FIGURES: 12-15

Sorosporium spirocolumellae sp. nov. on unknown cyperous host

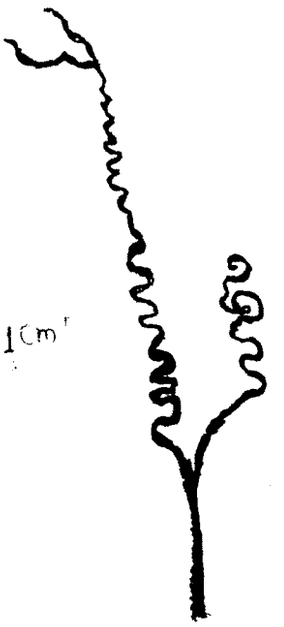
(12) Habit

(13) Enlarged sorus showing spiral columella only

(14) Spore ball

(15) Teleutospores

12



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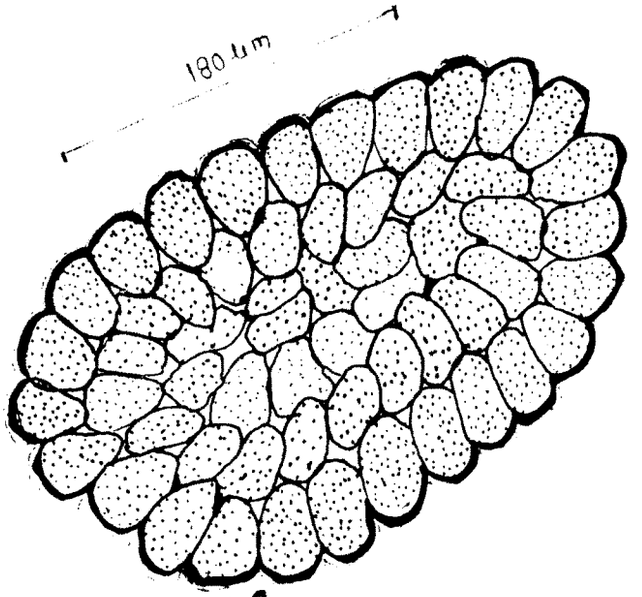

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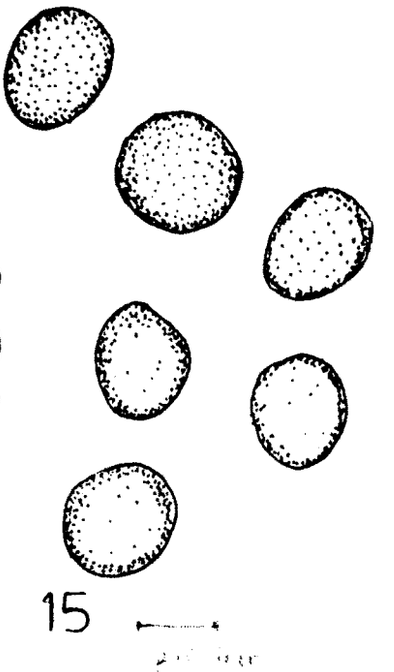


15

EXPLANATION OF TEXT FIGURES: 16-21

Sporisorium psedanthistiriae sp nov. on *Pseudarthistiria hispida* Hook. F.

(16) Habit

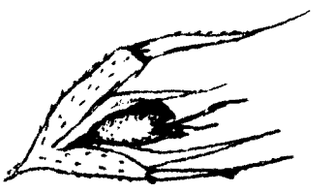
(17-18) Enlarged sorus

(19) Columella

(20) Teleutospores

(21) Partitioning cells

16



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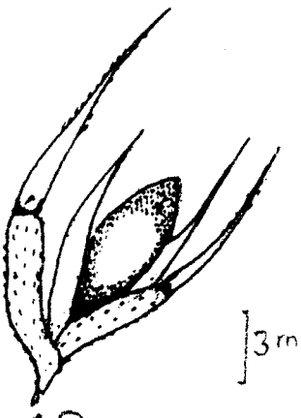

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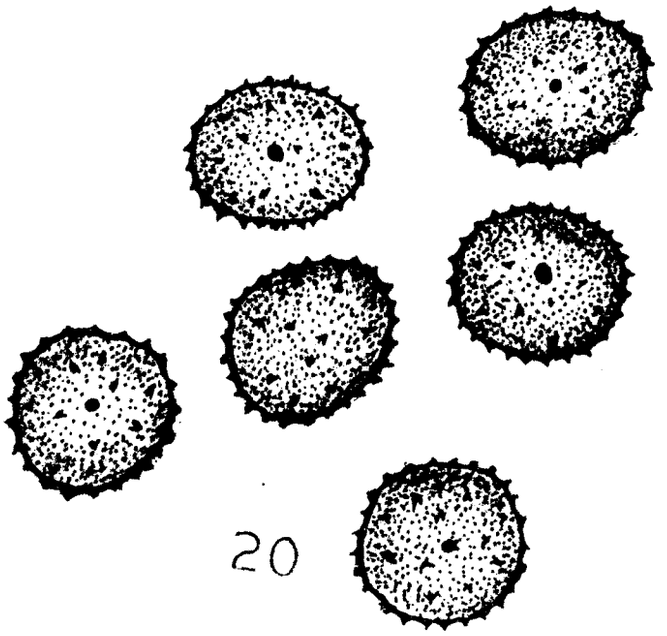

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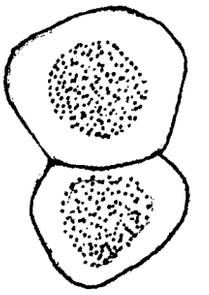

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