

Family:
Tilletiaceae

FAMILY: TILLETIACEAE TULASNE

Ann. Sci. Nat. Bot. ser III, 7: 112, 1887.

The family Tilletiaceae is mainly separated on the basis of teliospore germination. The sori developed in the vegetative as well as reproductive parts of the host. Sori inconspicuous to conspicuous. Cylindrical to irregular and produced a hypertrophy to the part affected. The spores may be embedded in host tissue. The spores are in mass and agglutinated or separate, single or intercellularly combined into more or less permanent spore balls with the sterile elements. The spores are comparatively larger in size as compared to the spores produced by the Ustilaginaceae taxa; except in *Cintractia* Cornu. The sterile cells may form a cortex around fertile spores or in various combinations. The spores germinate with aseptate promycelium, rarely septate may be produced with terminal clusters of the sporidia (= basidiospores). The sporidia may or may not fuse in pair producing the secondary sporidia or may germinate directly into the infectious hyphae. The members of this family are mainly graminicolus. In addition to Poaceae they generally attack the members of Cruciferae, Amaryllidaceae, Acanthaceae and Liliaceae etc.

TYPE GENUS: *TILLETIA* L.-R and C.Tulasne

Key to the genera of the family Tilletiaceae studied:

- A Teleutospores single.....B
- A" Teleutospores organized into spore balls..... C
- B Sore mass powdary, teleutospores without mycelial appendages; sporidia less than 12 um long and infection systematic..... *Tilletia*
- B" Sori not powdary at maturity, spores embedded in the host tissue, sori forming spots, spores dark coloured.....*Melanotaenium*
- C Spore balls with the cortex of the sterile cells, sori errumpent, spore balls dark....*Urocystis*
- C" Sori non-errumpent, spore balls with pseudoparenchymatus central core of the sterile cells and outer cortex of the fertile cells..... *Doassansia*

- I. GENUS: *TILLETIA* L.-R and C. Tulasne, *Ann. Sci. Nat. Bot.* Ser. III, 7: 112, 1847.

The genus *Tilletia* Tul. was established by Louis and

Charles Tulasne brothers in 1847 to honour Tillet, M. Methe-
 iu du, noted the difference between the 'stinking smut' and
 'Loose smut'. There are about 100 species of *Tilletia*
 (Zundel 1953; Fischer and Duran, 1961 Vanky, 1985)

Sori mostly developed in the ovaries, occasionally in
 the vegetative tissues. The exospore marking of *Tilletia*
 species fall into several general pattern, i.e. smooth,
 reticulate, striate etc. The spores are formed by intercal-
 ary cells of the sporogenous hyphae, commonly encased in
 hyaline to tinted gelatinous sheath. The spores are compara-
 tively large. The sterile cells accompanied with the fertile
 spores with varied morphology and play important role in
 taxa and serve as important taxonomical criterion.

Seventy six species have been described by Duran and
 Fischer (1961) in their monograph, out of these 37 species
 have been reported from India (Mundkur and Thirumalachar,
 1952; Butler and Bisby, revised by Vasudeva, 1960; Sorbhoy
et al., 1975). Only four species have been recorded from the
 Maharashtra State (Kamat *et al.*, 1971; Bhide *et al.*, 1985;
 Patil, 1992). Duran and Fischer (1961) have provided an
 analytical and host genus based key to identify the species
 of *Tilletia*. The genus is strictly graminicolous except one
 species which occurs on Polygonaceae.

(1) *Tilletia eleusine* Sydow. *Ann. Mycol.* 32: 287, 1934.

HABIT

In the ovaries of *Setaria intermedia* (Rott.) R. and S. (Family - Poaceae), 4.11.85 Nimgaon (Malegaon, Nasik), M.S. Patil and on *Dactylactenium aegypticum* (L.) P. Beauv. (Family-Poaceae), 2.6.85: Panhala (Kolhapur), S.R. Yadav, HCIO Nos. 30290 and 30291.

REMARKS

Sydow, P. (1934) has reported this species on *Dactylactenium aegypticum* (L.) P. Beauv. from Pusa (Bihar), Mundkur (1939) has also reported this species on the same host from Coimbatore (T.N.), Kanpur (U.P.) and Delhi. Joshi *et al.* (1959) has reported it on the *Eleusine varticillata* Roxb. from Ajmer (Rajasthan). Pavgi and Thirumalachar (1952) have reported it as a new species as *Tilletia setaricola* on *Setaria intermedia*. The spore mass is enclosed in evanescent and fragile pericarp in case of *Dactylactenium aegypticum*, While pericarp is hard in case of *Setaria*. There is not much difference in spore morphology. So Pavgi and Thirumalachar's species is being considered as a synonym of *Tilletia eleusine* Sydow, by Duran and Fischer (1961). Microscopically this species closely resembles to *T. tumefaciens* H. and P. Sydow except gall formation but this has been considered a host influence and not due to genetic differences.

Present collections have been collected from the host *Setaria intermedia* (Roth.) R. and S. and *Dactylactenium aegypticum* (L.) P. Beauv. are found to be identical in respect of the morphological characters and thus, referred to it. It is a new record to the fungi of the Maharashtra State.

(2) *Tilletia sehima* sp. nov., Pl. Fig. 22; Text Fig: 22-25.

Sori in ovariiis; conspicui, tantum, ovaria Pauca, inflorescentis, infecta hypertrophoid globulares, massa sporarum brunnea utra vel usque atraet pulvorea, teleutospores opaquae, cinnamomae et brunnea, globosae, 14.4-18 μ m in diametro, ornamentae opaque, episporae projectae truncatae, cellulis sterilis immixtae, hyalines et flavidobrunnea, globosis, sub-globosis at lacrimiformis, 9.3-16.5 μ m in diametra.

HABIT

Typus Lectus in ovariiis vivis *Sehima nervosus* (Rott.) Stapf (Family - Poaceae), S.U.C., Kolhapur (M.S.), 18.10.93, M.S. Patil.

Sorus in ovary, only one carpel was found infected in the inflorescence; infected ovary conspicuously, enlarged many a times due to infection i.e. hypertrophoid in the axil of glume, to expose pushing the outer glumes large, greenish

shining and intact spore mass dusty and containing matured black spores, immature golden yellow spores and sterile cells; teleutospores globose to sub-globose, or oval; dark chestnut-brown to black and opaque, epispore thick and covered by truncated projections at the margin showing as a hyaline band (ring) at low power due to opaque nature of spore body; sheath absent, spores measured 14.4-18 μ m in diameter, sterile cells are of various shapes, spherical, lacrimiform and dumbbell-shaped, measuring 14.4-18 μ m and 12-14.4 X 6-12 μ m in diameter, a mycelial thread is found attached to both i.e. sterile as well as to fertile spores. The wall of the fertile teleutospores is 1.8-2.5 μ m thick and the wall of sterile cell is 1.5-2 μ m thick and striated. The scale or projections measured about 1.2-1.5 μ m.

HOLOTYPE

In the ovary of *Sehima nervosus* (Rott.) Stapf (Family-Poaceae), S.U.C, Kolhapur, 18.10.93, M.S. Patil HCIO No. (a typus).

REMARKS

So far the review of the literature is seen, there is no record of any species of the genus *Tilletia* on the species of the host genus *Sehima*. Therefore, the present collection has been compared with the type species and the ovaricolous species of the genus *Tilletia*. The present collection shows

many similarities especially morphological, with *T. themidicola* Mishra and Thirumalachar in respect of nature of the infection, a few carpels are infected in the spike, infected carpels showed a marked hypertrophy, spore mass dusty, a mixture of matured immatured teleutospores with sterile cells, teleutospores are dark-brown to opaque, immatured spores amber coloured and the sterile cells are of various size, hyaline and dark brown, thick-walled, laminated and with a small fragment of mycelium to both fertile spores as well as sterile cells; the gross morphology of fertile spores also appear identical at low power, the diamensions of the sterile cells are also somewhat similar, but on an average, slightly smaller but of two distinct types have been observed; mainly spherical and lachrymiform which are not known in *Tilletia themidicola* Mishra and Thirumalachar. The teleutospores of the present collection are smaller in size and their detail ornamentation is also quite different, which is not coarse, tinted, curved scale like processes giving echinulate appearance in the median view but made up of distinct, regular, truncated scales. Moreover, there is no record of the genus *Tilletia* on this host genus *Sehima*.

Therefore, a new species has been proposed here to accommodate the present collection as *Tilletia sehimae* sp. nova.

(3) *Tilletia spodiopogonae* sp. nova, Pl. Fig.: 20-21; Text Figs. 26-29.

Sori in ovariiis, conspicui, tantum ovaria Pauca, inflorescenti, infecta, hypertrophoides, globulares, massa sporarum, nigrum, put varatum includentes, teleutosporae opaqceae, cinnamomae et brunii-nigri, globosi, 18.75-22 μ m in diametro.

HOLOTYPE

Typus lectus in ovariiis *Spodiopogon rhizophorus* (St.) Pilger (Family - Poaceae), Dandeli Forest (K.S.) 7.1.93, Miss Anjali M. Patil, HCIO No. (a typus).

Sori in the ovaries, destroyed a few ovaries in the inflorescence, the infected ovaries showed slight hypertrophy, sorus covered by the glumes, the spore mass dusty and black, teliospores one-celled, black and opaque with sterile cells which are globose, sub globose or sometimes irregular, yellowish to tinted brownish colour, the epispore of the teliospores thick and showed truncated projections at the margin, hyaline, sheath absent, 18.75-23 μ m in diameter, sterile cells smooth thin-walled, 7.75-23 μ m in diameter and wall not striated.

HOLOTYPE

In the ovaries of *Spodiopogon rhizophorus* (St.) Pilger

TABLE: 4

Comparison of the present material with the Type Species.

Species	Teliospores	Sterile cells	Colour and ornamentation	Host and locality
<i>Tilletia caries</i> (D.C.)	14-23.5 μ m in diameter	9.8-18.2 μ m in diameter,	Pale yellow to reddish-brown or gray and	<i>Agilops</i>
Tul. (Type)	(or 25 μ m in diameter)	thin-walled, smooth hyaline	reticulate	umbellata

Present Collection

I.	18.6-21.7 μ m in diameter	Two types, 9.3-15.5 μ m in diameter and 12-14.4 μ m	Dark brown to black truncated at the margin	<i>Sehima nervosus</i> (Rott.) Stapf (M.S.)
		X 6-12 μ m, thin-walled hyaline to brownish striated		
II.	18.75-22.5 μ m in diameter	7.3-23 μ m in diameter, thin-walled, nonstriated	Chestnut-brown and opaque, truncated at the margin	<i>Spodiopogon rhizophorus</i> (St.) Pilger

(Family - Poaceae), Dandeli Forest (K.S.) 7.11.93, Miss Anjali M. Patil. (a type).

REMARKS

So far there is no species of the genus *Tilletia* on any species of the host genus *Spodiopogon*. Only two species were on this host belong to the genus *Sorosporium* (Patil, 1992).

The present collection appears to be quite distinct as compared with the type species (Table-4). Moreover, as to match with other graminicolous species, it agrees with *Tilletia themidicola* Mishra and Thirumalachar in respect of ornamentation which shows a distinct truncated, plate like regular outgrowths at the margin, instead of tinted curved scale like processes. Moreover, in the surface view the teliospores of *T. themidicola* Mishra and Thirumalachar show coarsely echinulate appearance which is not observed in the present collection.

There is also no any record of *Tilletia* on this host genus. Therefore, a new species has been proposed here to accommodate the present material as *Tilletia spodiopogonae* sp. nova.

(4) *Tilletia transvaalensis* Zundel, *Mycol.* 23: 299, 1931:
Pl. Figs. 25-29.

= *Tilletia bangalorensis* Pavgi and Thirumalachar, *Mycopath.*

et Mycol. 7: 285: 1956.

HABIT

In the ovaries of *Eragrostis* sp. (Family—Poaceae) S.U.C., Kolhapur (M.S.), 19.10.1992, Patil, M.S.

REMARKS

Zundel (1931) has reported this species on *Eragrostis aspera* Nees from South Africa (Transvaal). Thirumalachar and Pavgi (1952) also reported it on *E. plumosa* Stapf. from Banaras Hindu University, (U.P.). They have collected a species on *E. plumosa* Link and *E. tenuifolia* Hochst. From Habbal and Mysore respectively from Karnataka State and identified it as a new species viz. *T. bangalorensis* on the basis of their colour of the spores which is pale yellow, the number, shape and spore markings. They also distinguished it from *T. transvaalensis* on the basis of scarcity or smallness of quantity of sterile cells (frequency). But Duran and Fischer (1961) have considered it as a synonym of *T. transvaalensis* Zundel on the basis of comparative morphology and soral characters which are very minor and also occur on the same host genus viz. *Eragrostis*.

Therefore, present collection has been also recorded on *Eragrostis* species and is identical in every respect with *T. transvaalensis* Zundel and therefore, referred to it. Thus, it is considered as a new record to the fungi of Maharashtra

State.

II. GENUS: *DOASSANSIA* Cornu, *Ann. Sci. nat. Bot.* Ser. VI
15: 285, 1883.

Cornu (1883) established this genus based on the type material *Sclerotium alismatis* Nees Van Esenbeck in leaves of *Alisma nutans* (= *A. plantago aquatica*).

The genus is characterised by the sori developed in the leaves, petiole and stems of the paludal or aquatic plants. The spore balls are permanently embedded into the host tissue. Spore balls large conspicuous, firm and differentiated into the central mass of teleutospores. Surrounded by more or less evident cortex of the sterile cells.

The spores in the type species i.e. *Doassansia alismatis* are compacted into the bundles or spore balls which are surrounded by coat or cortex of the sterile cells. De Toni (1888: vide Fischer and Holton 1957) revised the genus *Doassansia* and added two new species. According to him, the genus can be split up into three sub-genera viz. *Eudoassansia*, *Pseudodoassansia* and *Doassansiopsis* on the basis of their spore ball development. The spore germination *in situ* and *Tilletia* type.

Above 25 species have been reported from the world

(Fischer and Holton, 1957; Duran, 1973; Vanky, 1985). Only three species are known from India (Zundel, 1944; Thirumalachar, 1947, 1950; Mundkur and Thirumalachar, 1957; Raghunath, 1968 and Patil and Gandhe, 1978) of which only two species are known from Maharashtra on the members of the Family Acanthaceae (Thirumalachar, 1946; Raghunath 1968 and Patil and Gandhe, 1978). The genus shows its limited host range by attacking members of families particularly plants growing in marshy places or in water. For example, Cyperaceae, Lythraceae, Nymphyaceae and Zostaraceae, etc.

Type species: *Doassansia alismatis* (Nees) Cornu

(1) *Doassansia hygrophilae* Thirumalachar, *Lloydia* 9: 24-30 1946.

= *Doassansia khandalensis* Patil and Gandhe, *M.V.M. Patrica*, 10 (1&2): 30-34, 1975.

HABIT

In the leaves of *Hygrophia angustifolia* R. Br. (Family-Acanthaceae), S.D. Patil, Sept. 1968, Khandala (M.S.).

REMARKS

So far the review of literature is seen it is found that the species of *Doassansia* on the members of the Acanthaceae are only known and reported from India and i.e. from Maha-

ashtra State by Thirumalachar (1949) and Gandhe and Patil (1975). On the basis of morphology of the present collection which is also collected on the members of the family Acanthaceae and i.e. to the genus *Hygrophia* and thus compared with these species as given in Table-5.

The comparison does not show much variation in the morphology and dimensions of the spore balls, cortical sterile cells and fertile teleutospores, but overlapping to each other. Moreover, both species have been recorded on the three different species of the same host genus viz. *Hygrophilla* as per the recent nomenclature. *Asteracantha longifolia* Nees is now a synonym of *H. auriculata* (K. Schum.) Heyne. It is claimed by the authors that *D. khandalensis* Patil and Gandhe differs in respect of its infection pattern, soral development and formation of tertiary sporidia. This may be the behavioural change of pattern and different host reactions and not the sound criteria to raise the new species. The host on which they collect their species, i.e. *Hemiadelphus polysperma* Nees is also a synonym of *Hygrophilla polysperma* Nees and therefore, *Doassansia khandalensis* Patil and Gandhe is being considered here as a synonym of *Doassansia hygrophillae* Thirumalachar and *H. angustifolia* R. Br. is an additional host.

Thirumalachar (1946) also observed the germination in *D. hygrophillae*. Fertile spores germinate by means of one or

two septate promycelium bearing a terminal whorl of 5-7 sporidia, which spread out in a radiating manner, matured sporidia fusiform, broader at the base, asymmetric forming secondary sporidia after separating from promycelium.

In *Doassansia hygrophillae* on *H. auriculata* (K. Schum.) Heyne (= *Aster^{acanthu} longifolia* Nees), we also observed the germination *in situ*. Promycelium 1-2 septate bearing terminal sporidia generally 4 in a whorl. Some promycelia produced more than 4 sporidia or occasionally only one which is quite larger.

III. GENUS: *MELANOTAENIUM* de Bary, *Bot. Zig.* 32: 105, 1874.

The genus *Melanotaenium* was established by de Bary (1874) as a member of the family Tilletiaceae. It resembles closely with *Entyloma* in the spore development and germination. Beer (1920) found the differences between these two. *Melanotaenium* spores are spread over a wider area of the host tissue producing dark sori and spores of this species which usually has thick-walled and larger spores (Vanky, 1985).

There are about 15-20 species (Zundel, 1953; Fischer and Holton, 1957 and Vanky 1985). The species of the genus *Melanotaenium* reported to attack the members of the families viz. Euphorbiaceae, Geraniaceae, Labiatae, Poaceae, Ranunculaceae, Scrophulariaceae, Selaginallaceae (Fischer

TABLE: 5

Comparison of the present collection with the Type species and another species recorded on Acanthaceous Host.

Species	Dimensions of spore balls	Sterile cells (measurements)	Fertile spores (measurements)	Host and Locality
<i>Doassansia alismatis</i> (Nees) Cornu (Type)	110-220 (250) μm in diameter	5-13 X 8-25 μm in diameter	7-11 X 9.5-15 μm in diameter	<i>Alisma nutans</i> Liro. (Germany)
<i>D. hygrophilae</i> Thirum.	120-200 μm in diameter	16.6-25 X 9.5 μm	10-15 μm in diameter	<i>Hygrophilla</i> sp. and <i>Asteracantha longifolia</i> Nees.
<i>D. khandalensis</i> Patil and Gandhe	112-144 μm in diameter	16-17.6 X 11.2-12.8 μm	9.6-12.3 μm in diameter	<i>Hemiadelphus polysperma</i> Nees Pune (M.S.)
Present collection	60-70 μm in diameter or 90 X 125.5 μm	16-20 X 10 μm	7.5 X 8.5-11 μm	<i>Hygrophilla angustifolia</i> R.Br, Khandala (M.S.)

and Holton, 1957). Twelve species have been reported from India (Mundkur and Thirumalachar, 1974; Butler and Bisby, 1960; Mujerji and Juneja, 1974; Sorbhoy *et al.*, 1987 and Patil 1992). The sori developed in the leaves, stems or roots of the host, the spores single, often aggregated, not powdery, dark-coloured and thick-walled. Spore germination is very rare and difficult.

TYPE SPECIES: *Malanotaenium endogenum* (Unger) deBary

(1) *Melanotaenium eragrostidis* sp. nova, Plate Fig. 23: Text Figs. 30-33.

Infection in foliis; causans meallg, linearis a brunneis at nigri coloreum, 1.5 X 3 mm. Sori explanti; teleutosporis, inter cellularis, solitoriae et aggregati, globosae, sub-globosae, ellipsoidia et angulatae compressae, brunnies, sub-opaque, lavibus, 7 X 13 μ m et (6-10 μ m in diametro)

HOLOTYPE

Typus Lectus in foliis, vivis *Eragrostis* sp. (Family - Poaceae), Khandala (M.S.), 17.2.57, S.D. Patil.

Sori in the leaves; produced small, linear, separate, tuberculate, black spots or pustules, showing slightly swellings, 1.5 X 3 mm and sometimes lower epidermis is being ruptured (erumpent) to expose the black spore mass; teleuto-

TABLE: 6

Comparison of the present collection with the type species.

Species	Dimensions of teleutospores	Wall thickness & colour of spores	Host and locality
<i>Melanotaenium endogenum</i> (Unger) de Bary	13-21.5 X 17-24 μm	1-3 μm thick dark reddish-brown smooth	<i>Galium mollugo</i> L. (Rubiaceae), Europe
Present collection	6-10 μm in diameter or 7 X 13 μm	1.5-5 μm thick dark brown and smooth	<i>Eragrostis</i> (Poaceae), Khandala (M.S.)

spores in the intercellular space of the mesophyll cells, solitary or crowded, globose, sub-globose, ellipsoidal or sometimes angular, dark brown, thick-walled, wall 1.5-5 μm thick, smooth, 7 X 13 μm or 6-10 μm in diameter, spore may remain united in groups.

REMARKS

The comparison of the present collection with the type species (Table - 6), shows that the present collection is quite distinct in respect of the teleutospores wall thickness and size. The teliospores are smaller and wall is comparatively more thicker. Patil (1992) has reported very recently four new graminicolous species of the genus *Melanotaenium*. Present collection resembles with *M. tuberculata* Patil in respect of the size of the teliospores and wall thickness, but the present collection recorded on a quite distinct host genus viz. *Eragrostis* on which so far, there is no record of the species of *Melanotaenium*. Moreover, at maturity the epidermis ruptures and exposed the spore mass which is never observed in *M. tuberculatae* Patil and therefore, a new species has been proposed here to accommodate the present collection as *M. eragrostidis* sp. nova.

IV. GENUS: *UROCYSTIS* Robenhorst ex Fuckel, *Herb. Mycol.* 2: 309, 1856.

Sori mostly in the leaves and stems, occasionally in

the flowers or seeds, very rarely in roots, forming dark brown or blackish-brown streaks. Spore mass is usually powdery; spore balls permanent, composed of the one to several dark, fertile central spores and enveloped by cortex of paler and smaller sterile cells; sterile cells are generally wedge-shaped tuberculate, hyaline or brown and thin-walled. Anamorph may present in some species (Vanky, 1985).

The genus *Urocystis* matches with *Ustasystis* in every respect, except spore germination, i.e. in *Ustacystis* the germination is *Ustilago* type while in *Urocystis* it is *Tilletia* type.

About 130 species are known (Zundel, 1939; Fischer and Holton, 1957; Duran 1973; Vanky, 1985). The species parasitizing a great number of host plants. In India the genus is represented by 11 species (Mundkur and Thirumalachar, 1952; Butler and Bisby revised by Vasudeva, 1960; Mukerji and Juneja, 1974; Sorbhoy *et al.*, 1975). Only one species viz. *Urocystis hypoxylis* Thaxt. has been reported from Maharashtra State (Patil, 1956).

TYPE SPECIES : *Urocystis occulata* (Wallroth) Robenhorst

1. *Urocystis curculigoidis* sp. nova, Text Fig. 24, Pl. Fig. 34-37.

Sori ovariicoli, amniono destitutibus, hypertrophoidia, membrana falsa, brunnei, sporarum massae; agglutinata, globosa, sub-globosa, 16.5-45 μ m in diametre, sporae compactae, globosa, tunicate, brunnae, 5.5-9 μ m in diametro, cellulae steriliae, in visa 6.5-7 μ m in diametro, pale brunnae.

HOLOTYPE

Typus lectus in ovariis vivis *Curculigo orchioidea* Gaertn.

(Family - Amaryllidaceae); S.D. Patil, Panchgani (M.S.), /
16.10.1968, HCIO No. (a typus).

Infection ovariicolous; ovary slightly swollen; spore balls crowded in the locules of the carpels with no ovules, waxy, brown, of various shapes due to crowding, 16-45 μ m in diameter; Teliospores in the center of the spore balls, covered with sterile cell envelope, spherical, rectangular, ellipsoidal, oval or angular, 1-8 in number, thick-walled, brown, 8-9 μ m in diameter; sterile cells which form an outer envelop of the spore ball are generally spherical, hemispherical, wedge-shaped, thin-walled, yellowish brown or pale yellow, comparatively thin-walled, smooth; cell number varies per spore ball and measured 6.5-7 μ m in diameter. Conidial state not known, no germination of spores observed.

HOLOTYPE

In the ovaries of *Curculigo orchiodes* Gaertn, (Family-Amaryllidaceae), 16.10.1968, S.D. Patil, Panchagani (M.S.).

REMARKS

Genus *Urocystis* having 130 species and worldwide in distribution and parasitizing a great number of host plant families (flowering plants). Delimitation of the species is often a difficult task because of the scanty morphological characters (spore balls, fertile and sterile cells). Therefore, fungus morphology and host (if possible at family level) have been used (Vanky, 1985). The present fungus parasitized the ovary of the genus *Curculigo* belonging to the family Amaryllidaceae which has been merged with Lilliaceae (Cronquist, 1981). There are about 12 species of *Urocystis* infecting the members of the family Lilliaceae (11 genera) and family Amaryllidaceae (4 genera). Keeping the view that family Amaryllidaceae is valid family (conservatively) or merged with Lilliaceae (recent concept) it is better to compare the present collection with the species parasitizing the members of the host families.

It is found that the concept of the speciation of the species of *Urocystis* which infect to monocotyledonous host genera, i.e. one host genus one species, has been accepted and key has been provided but morphological characters of the pathogen have never been used as key characters. From India Patil (1956) has reported *U. hypoxys* Thaxt. on *Hypox-*

is aurea Lour. (Amaryllidaceae- now Liliaceae) from Pune (M.S.). It has been tried to match the present collection. Comparision of the present collection with the type species as well as the species parasitizing the members of the families Amaryllidaceae and Liliaceae, it is found (Table-7.) that there are only two species from each family which occassionally infect the ovaries because present collection in which infection is found only in the ovaries and these are viz. *U. paridis* (Urgar) Thumen on *Paris* (Liliaeeae). But the morphological features of the present collection viz. spore balls, number of fertile spores/spore balls number of sterile cells/spore ball, colour, wall thickness, ornamentation, measurment etc., as to compare with the type species as well as to all the species parasitizing the members of Amaryllidaceae and Liliaceae does not match in any respect and, therefore, species has been proposed here to accomodate the present collection as *U. curculigoid* sp. nov.

Now the family Amaryllidaceae is no more considered as a separate and distinct family but merged with Liliaceae (Conquist, 1981).

TABLE: 7

Table of comparison of present collection with type species and species parasitizing the members of the family Amaryllidaceae and Liliaceae.

Species	Dimensions of Spore ball	No. of fertile Spore/spore ball and dimension	No. of sterile cells/spore ball and dimension	Host	Distributi	Part infected of the host
Urocystis Occulata (Wals) Rabenh. (Type)	(10.5) 13.5-20 X (12) 16-30 (40) μ m	1-4(6) spores/sp. ball (8) 10-13.5 (10) X (11) 13-20 (22.5) μ m	many to a few or absent, 6-13.5 μ m in diameter	Secale ceseale L. (Poaceae)	England	sori in leaves
U. hyporysis Thaxt. I.	5-60 μ m in diameter	1-10(14-15)spore/ sp.ball 13-15 μ m in diameter	few or absent 8-15 μ m in diameter	Hypoxis erecta Acith (Amaryllidaceae)	-	sori in leaves
U.		2-9 spores/spore ball 6.5-13.3 μ m in diameter	8-15 μ m in diameter	Hypoxis aurea Lour. (Amaryllidaceae)	India	sori in leaves
Urocystis galanthi Pace.	21-51 μ m in diameter	1-3 (4) spores/ spore ball 11.5-16.5 X 16.5-23.5 μ m (reddish brown)	many, 17.14 μ m long irregular, elongated to globose	Balanthus nivalis L. (Amaryllidaceae)	Europe	sori in the Sheath & scape.
U.leucoji Buback	24-38 μ m in diameter	1-2 spores/ spores ball 13-18.5 X 14-22 μ m	many, 7-13 μ m long	Leucojum (Amaryllidaceae)	Europe	sori in leaves
U. sternbergiae Moesz.	20-32 (37) X 21-40 (48) μ m	1-3 spore/spore ball 12-17.5 X 13.5-21.5 μ m (Reddish-brown)	many, 4-9.5 X 5-13.5 (-16) μ m	Sternbergia colchiciflora Waldst. and Kit (Amaryllidaceae)	Europe	mainly in leaves, pseudobulbs and ovaries
U. magica Passarini	12-25 μ m in diameter	1-2 Spore/spore ball 10.5-13.5 X 13-16 (19) μ m	many, (3) 5-10 μ m in diam. Yellowish-brown	Allium cepa L. & other sps. (Liliaceae)	World-wide	sori in leaves and bulbs

Table Cont.....

<i>U. bulbucadii</i> Vanky	20-40 X 15 - 37 um	1-5 (9) Spores/ spore ball 12-18 X 10-14 um	many, 7-10 X 5- 7 um	<i>Bulbocodium</i> <i>vernum</i> L. (Liliaceae)	Europe (Britain, Natherland & Sweden)	sori in leaves and petiole
<i>U. colchici</i> (Schlecht) Rabenh.	(16) 20-40 um in diameter	1-3 (4) Spores/ spore ball 9-14.5 (5) X (11) 12-20 (23) um (reddish-brown)	many 5-10 X 6- 15 um	<i>Colchicum</i> sp. (Liliaceae)	Europe, Asia & N. America	sori in leaves and petiole
<i>U. picbaueri</i> Souckova- Tankova	15-22.5 X 17.5-30 um	1 (2) Spore/spore ball 10-17 X 15- 22.5 um	2.5-7.8 X 2.5- 10 um (Yellowish, chestnut-brown)	only on <i>Lloydia</i> <i>serotina</i> (L.) Raichenb (Liliaceae)	Czechos- lovakia	sori in leaves
<i>U. muscaridis</i> (Niessi) Moesz	20-40 X 20 -48 um	1-5 (9) Spore/spore ball 10.5-16 X 14- 22.5 (24) um	many, 4-12 X 6 -20 um	<i>Muscaria</i> spp. (Liliaceae)	Europe and Asia	Sori in leaves
<i>U. ornithog- ali</i> Kornic- ke	20-32 X 23- 44 um	1-3 (4) Spores/ spore balls 11-17 X 14.5-20 um (Reddish brown)	many, 5-13 um in diameter	<i>Ornithogal- ium</i> spp. (Liliaceae)	Europe and S. Africa	sori in leaves
<i>U. paridis</i> ‡ (Unger) Thunen	20-64 X 22- 80 um	1-30 Spores/spore ball 10.5-14.5 X 12 -10 um	many, 4-8 X 4 -13.3 um	<i>Paris</i> spp. (Liliaceae)	Europe, Asia	sori in mainly stem, occasionally in fruit and leaves
<i>U. polygonati</i> Moesz & ulbrich	16-24 (43) um in diameter	1-3 (4) Spores/ spore ball 12-20 um in diameter	5.5-13.5 um long	<i>Polygonatum</i> spp. (Liliaceae)	Europe, Asia & America	sori in leaves and stem
<i>U. scilliae</i> (Cif.) Zundel	-	(1) 2-4 (5) Spores /spore ball 8-16 um in diameter	many, 4-8 um in diameter	<i>Scilla</i> spp. (Liliaceae)	Europe, Asia & N. Africa	sori in leaves
Present collection	16.5-45 um in diameter	1-4 (8) Spore/spore ball 8.5-9 um in	2-6 (6) 6.5 -7 um in diameter.	<i>Curculigo</i> <i>orchloides</i> Gaertn	India	sori in ovary

‡ *U. paridis* (Unger) Thunen produces occasionally sori in ovary.

EXPLANATION OF TEXT FIGURES: 22-25

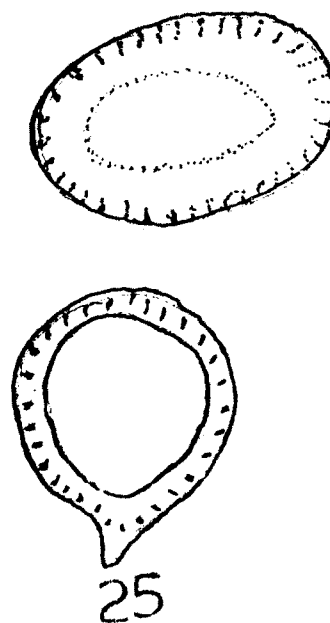
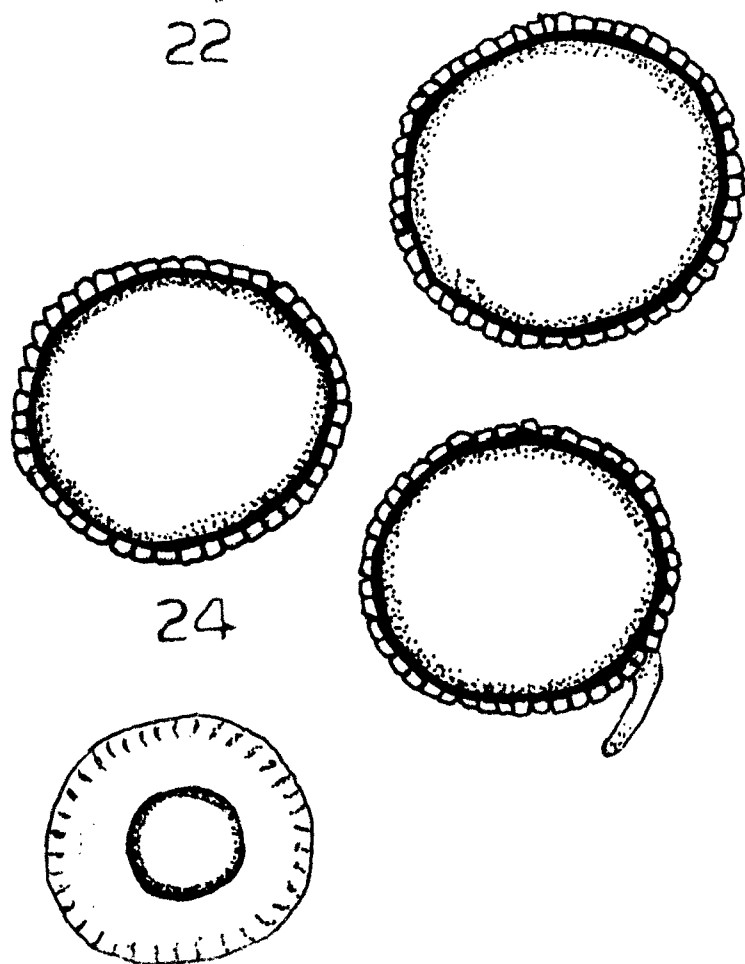
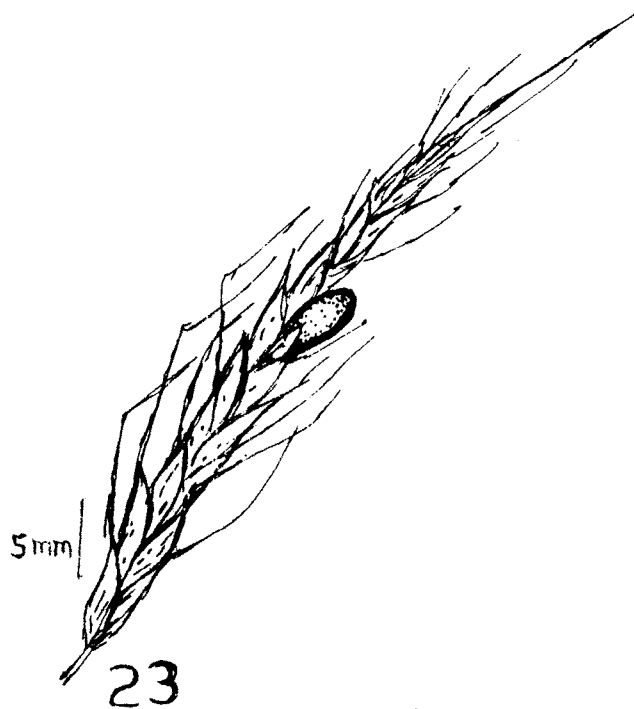
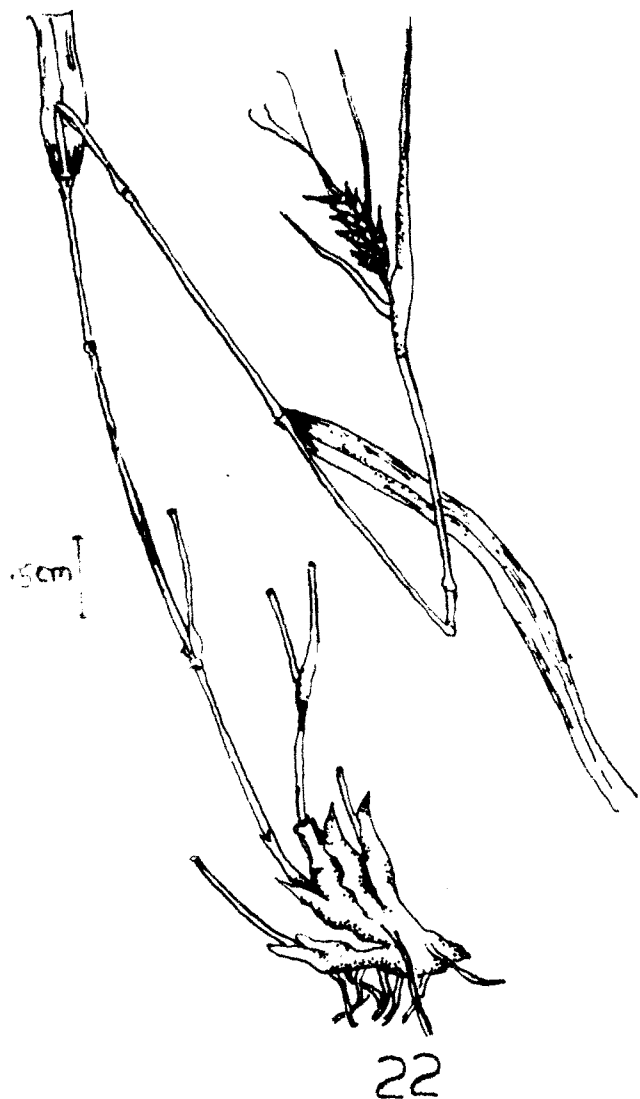
Tilletia sehi~~mae~~ sp. nov. on *Sehima nervosus* Stapp

(22) Habit

(23) Enlarged sorus

(24) Teleutospores

(25) Sterile cells



EXPLANATION OF TEXT FIGURES: 26-29

Tilletia spodiopogonae on *Spodiopogon rhizophorus* (St.)

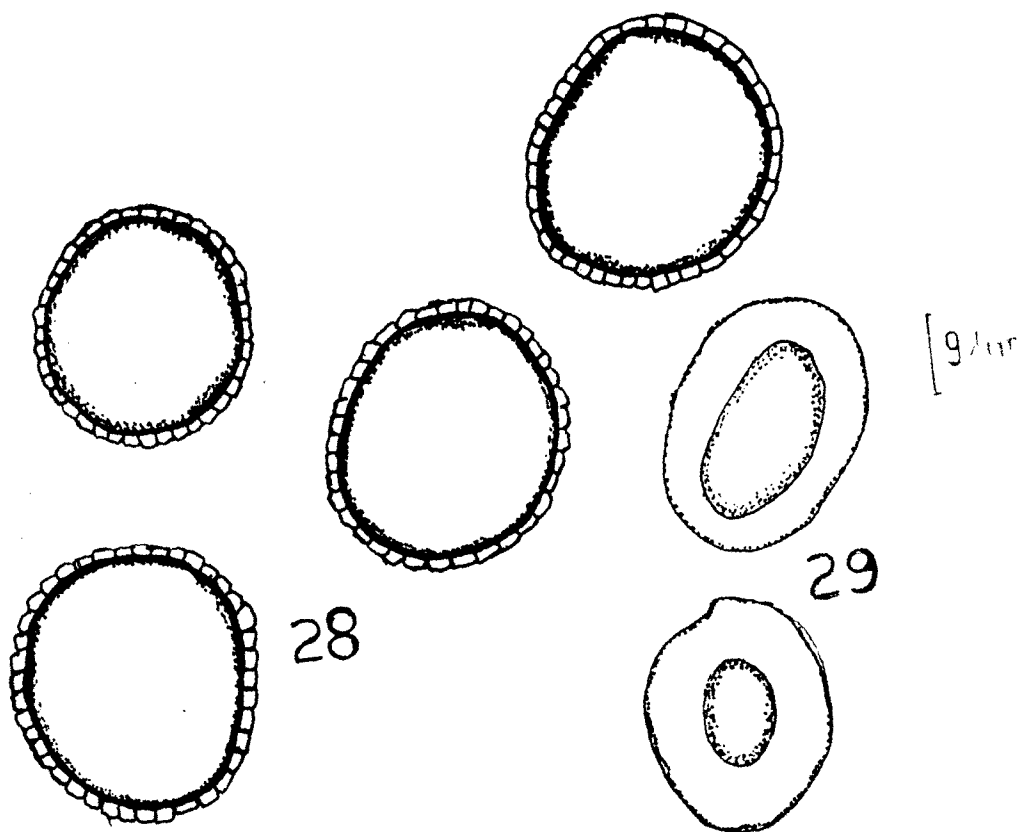
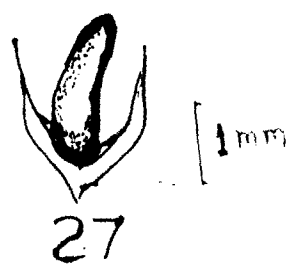
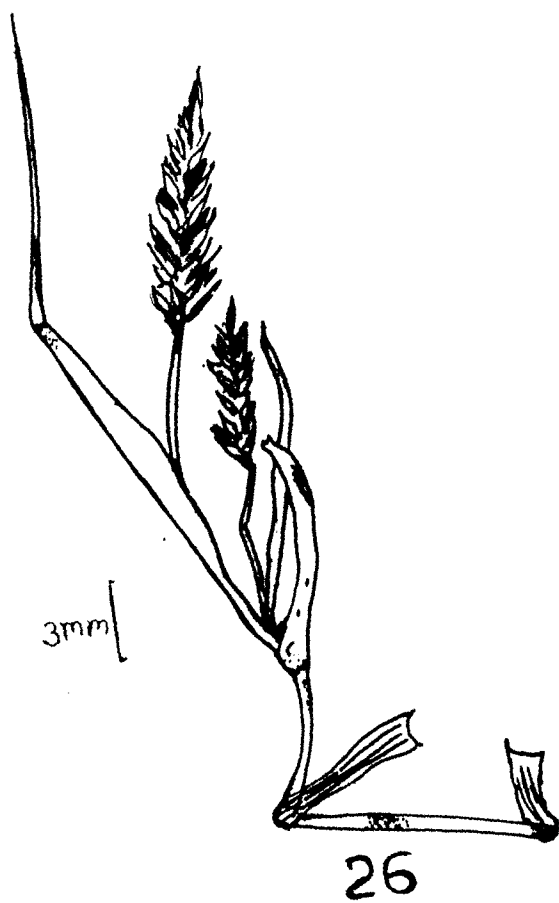
Pilger

(26) Habit

(27) Enlarged spores

(28) Teleutospores

(29) Sterile cells



EXPLANATION OF TEXT FIGURES: 30-33

Melanotaenium eragrostidis sp. nov. on *Eragrostis* sp.

30. Habit

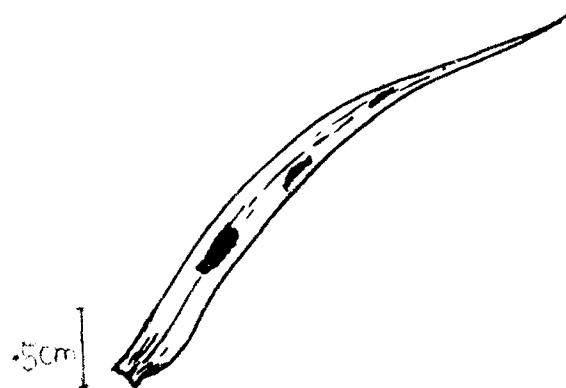
31. Infected leaf

32. Enlarged part of infected leaf

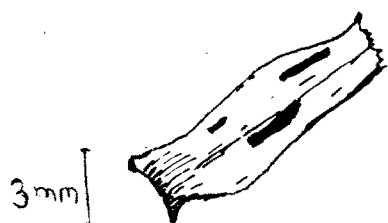
33. Teleutospores



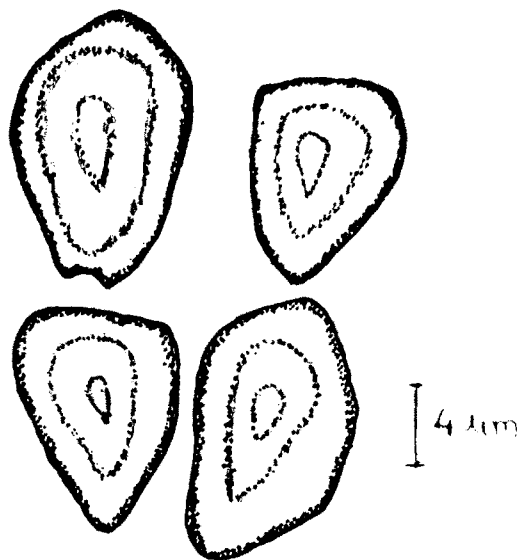
30



31



32



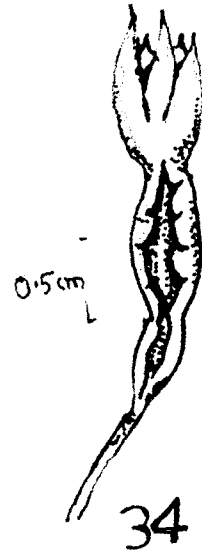
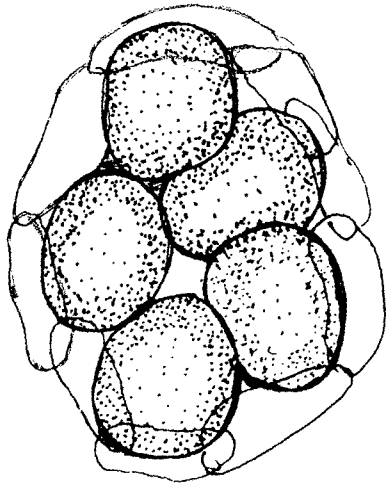
33

EXPLANATION OF TEXT FIGURES: 34-35

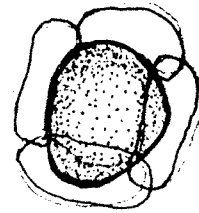
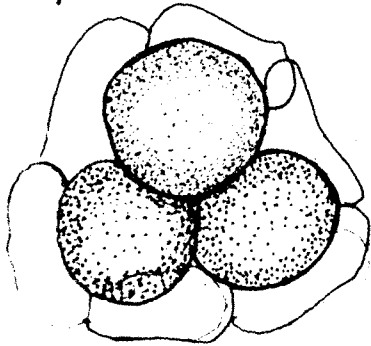
Urocystis curculigoidis sp. nov. on *Curculigo aristida*

(34) Habit

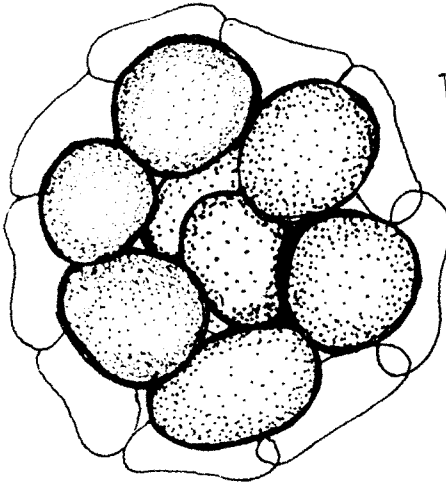
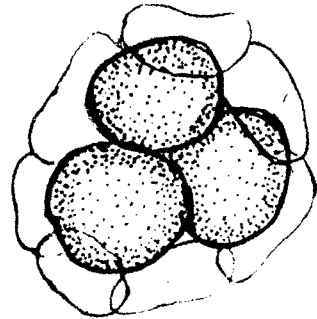
(35) Teleutospores in spore balls with sterile cells



34



35



7 km