

THE USTILAGINALES OF SOUTH AFRICA.

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The following paper is an attempt to monograph partially the smuts or Ustilaginales of South Africa and adjacent territories. Besides species found wholly within the Union of South Africa, there are included species from South West Africa, Portuguese East Africa, the Tanganyika Territory, Rhodesia and Nyassaland Protectorate.

Original descriptions of South African smuts are to be found in various publications, principally German. Paul Hennings and later the Sydows have described most of the new species found in South Africa. Recently the author has described new species of South African smuts.

In 1926, Len Verwoerd of the University of Stellenbosch made the first attempt at monographing South African smuts. It is the hope of the writer that sometime in the future he will be able to enlarge and complete the present paper as more specimens are collected and become available. Specimens used for descriptions in the present paper are mostly from the Mycological Herbarium, Union Department of Agriculture. Many type specimens of species described herein were not available for examination, in fact the writer has not been able to locate the type specimens of some of the very early South African collections.

Acknowledgment and thanks are hereby made to the Director of the Royal Botanic Gardens, Kew, Surrey, England, for supplying type material of *Tilletia Ayresii* Berk. for study; to Miss Claribel Barnett, Librarian, and Mr. J. A. Stevenson, Mycologist, both of the United States Department of Agriculture for furnishing original descriptions of some of the species and for the loan of books; to Dr. George Perkins Clinton for the loan of type specimens from his personal herbarium. The genus descriptions have followed very closely, in some cases verbatim, those previously published by Dr. Clinton. Dr. Robert E. Dengler, Professor of Classical Languages, The Pennsylvania State College, has kindly written the Latin descriptions of new species. The host identification and nomenclature have been revised according to the latest usage by Miss L. Chippendall of the South African National Herbarium, Pretoria.

The asterisk (*) after a host plant name or locality indicates that the record has been secured from literature and that no specimen has been seen.

CHARACTERIZATION OF THE USTILAGINALES.

This group of fungi belongs to the sub-group Hemibasidiomycetes with the single order Ustilaginales containing two families: (1) Ustilaginaceae, and (2) Tilletiaceae.

The Ustilaginales consist of nearly 600 species. All of them are obligate parasites usually attacking herbaceous plants. The mycelium is internal, slender, hyaline, somewhat septate and branched. It is either uninucleate, binucleate or occasionally multinucleate.

The hyphae are usually intercellular with capitate or racemoid haustoria penetrating the host cells for food. Most of the smuts attacking cereals, however, have intercellular mycelium without haustoria and obtain food direct from the host cells by the process of osmosis. A third class of smut fungi, e.g. *Ustilago Zeae*, has mycelium that penetrates the individual host cells causing death.

At maturity the hyphae enter certain organs of the host and form thick celled chlamydospores which are the common smut spores or winter spores. These are produced singly, in pairs or in balls, usually forming a dark powder at maturity. In the genera *Entyloma*, *Tracya*, *Burrillia*, and *Doassansia*, however, the spores are produced within the host tissues and are light coloured. In the early stages of development, all of the spores are binucleate. At maturity each spore is uninucleate but is produced from a binucleate hypha. Each mature spore has a thin endospore and a thicker variously colored and sculptured exospore. At maturity the spore masses produce various effects on the host, e.g. a shredding of the leaves of the host; a destruction of the inflorescence; the replacing of the pollen by smut spores and the utilization of the pollen distributing apparatus for the distribution of smut spores; stimulating the development of staminoids in pistillate flowers; the formation of boils or gall-like tumor growths; the destruction of the seed, etc.

Usually the mycelium is annual, however, in some cases it is perennial and hibernates in the roots of the host.

The Ustilaginales are divided into two families based on the method of producing the promycelium and basidiospores. In both families, previous to the production of a promycelium, the nucleus divides and one of the daughter nuclei leaves the interior of the spore and migrates into the promycelium.

The first family is the Ustilaginaceae. Here the daughter nucleus in the primary promycelium divides twice forming four nuclei. Following these divisions three septa, or cross walls, are formed thus forming a four celled promycelium. Basidiospores are produced laterally at the cross walls. As the basidiospores are formed, the nucleus in the promycelial cell divides and one migrates into the basidiospore. This process continues as long as basidiospores are produced. The infection tubes are produced by the basidiospores.

The second family is the Tilletiaceae. As the promycelium develops, one of the daughter nuclei together with some of the protoplasm migrates from the interior of the germinating spore into the base of the young aseptate promycelium. This is followed by at least four and sometimes more nuclear divisions, thus forming at least eight nuclei which together with the protoplasm migrate to the distal end of the mature promycelium. The lower empty part of the promycelium is then cut off by three septa. Eight basidiospores are then produced terminally and usually conjugate before separation from the promycelium.

Conjugation seems to be necessary in order for the smut fungus to infect its host plant, i.e. there are apparently basidiospores and promycelium cells with two genders. The conjugation process may take place in any of the following ways:—

- (1) A basidiospore may conjugate with another basidiospore.
- (2) A basidiospore may conjugate with a cell of a promycelium.
- (3) A promycelium cell may conjugate with another promycelial cell.
- (4) Occasionally two promycelia are produced from one smut spore and promycelial cells of one promycelium may conjugate with cells of the other promycelium.

Infection tubes are produced by the conjugated parts of the basidiospores or promycelia. There are three principal types of infection:—

Type 1. The chlamydospores attach themselves to the seed of the host and do not grow until the host seed germinates. In this manner there is a seedling infection. The germ tube penetrates the tissues of the entire host plant.

- Type 2.* The chlamydospores attach themselves to the stigma of the flower of the host, where they germinate at once, sending mycelial threads down the style into the young ovary where the mycelium becomes dormant without deforming the seed, and resting there until favorable conditions for seed germination arrive. As the seed germinates and grows, the dormant hibernating mycelium becomes active and penetrates the entire host tissue, finally replacing the inflorescence with smut spores.
- Type 3.* In this type the chlamydospores produce promycelia and basidiospores in decaying vegetation. The basidiospores are then carried by the wind to the young host plants where local infection takes place. The mycelium penetrates the host cells only locally.

During the short time of basidiospore formation, the smuts are facultative saprophytes forming colonies of yeast-like sporidia. Most of them can be cultivated on nutrient agar but few if any can complete their life history on artificial media.

CLASSIFICATION OF THE USTILAGINALES.

The Ustilaginales are parasitic fungi that attack various parts of herbaceous plants. Infection nearly always takes place through very young tissues, either through germinating seed or other special parts of the host. This group can usually best be recognized by the sooty mass of spores that are produced, singly, in pairs, or as spore balls. The black smuts are represented by such genera as *Ustilago*, *Sphacelotheca*, *Sorosporium*, *Urocystis* and *Tilletia*, while the so-called white smuts are mostly leaf inhabiting and are included in such genera as *Burrillia*, *Doassansia*, *Entyloma* and *Tracya*.

Two families are included in the order Ustilaginales, (1) the Ustilaginaceae, and (2) the Tilletiaceae. They are separated by the manner in which the promycelium and sporidia are produced as follows:—

Promycelium usually with lateral sporidia at septa... Ustilaginaceae.

Promycelium with clustered terminal sporidia..... Tilletiaceae.

In the classification of the smut fungi the viewpoint is held that morphological characters rather than host susceptibility or the use of biometry must be the basis for determining species. The concept of species as used in this paper is very broad. Many recently described species are merely physiological or pathological strains that have adapted themselves to specific hosts. Such species should be relegated to synonymy.

Within the last few years technique has been perfected whereby it is now possible to hybridize the smut fungi and thus study gender and species relationship as is done in the higher plants. Extensive work of this nature has been done by workers in the United States Department of Agriculture and of the several state Agriculture Experiment Stations, also by workers in Canada and Wales. A brief summary of a few of the numerous papers follows:—

Reed¹ in 1928 reported four physiological races of *Tilletia laevis* and six physiological races of *Tilletia Tritici*. Each physiological race varied in its ability to attack different varieties or even strains within a given variety of wheat.

Flor² working in Washington State reported in 1932 that *Tilletia Tritici* and *Tilletia laevis* were heterothallic. He also reported that he hybridized *Tilletia Tritici* and *Tilletia laevis* and had obtained evidence that hybridization occurred in nature. Examination of over 10,000 bunted heads revealed that there were all degrees of reticulations on spore

¹ Reed, George M. Physiological races of wheat bunt. Am. Jour. Bot. **15**: 157-170. 1928.

² Flor, H. H. Heterothallism and hybridization in *Tilletia Tritici* and *T. laevis*. Jour. Agr. Res. **44**: 49-58. 1932.

of *Tilletia Tritici*. In some cases the reticulations were so fine that it was almost impossible to see them; on the other hand the reticulations were so coarse that they appeared almost spiny.

In 1924, Faris³ showed that there was physiological specialization of *Ustilago Hordei* and that each physiologic form attacks only certain specific varieties of barley.

Holton⁴ in 1932, reported that he had hybridized *Ustilago Avenae* and *Ustilago levis*. He found that factors such as echinulation of spores, growth of the fungi in artificial culture, appearance of the smut in the panicle, all followed in general a Mendelian ratio and furthermore a buff colored smut with hyaline spores was produced by crossing monosporidial lines hybrid chlamydospores. Later he found⁵ that the buff smut resulted from a mutation in *Ustilago levis*. He further found that pathologic strains of *U. Avenae* and *U. levis* were produced by hybridization and segregation.

In a more recent paper,⁶ Holton reported that when *U. Avenae* and *U. levis* were hybridized that (1) the factor for brown is dominant over the factor for hyaline chlamydospores; (2) the factor for echinulate spore walls is dominant over the factor for smooth spore walls and that these characters generally segregate in a Mendelian ratio.

Reed and Stanton⁷ in 1936, reported that a distinct strain of loose smut (*U. Avenae*) occurs on Red Rustproof oats. This strain of smut also attacks various strains of *Avena fatua* and *Avena strigosa*, also the variety Canadian (a variety of *Avena sativa*).

Rodenhiser⁸ working with *Sphacelotheca Sorghi* and *Sphacelotheca cruenta* found physiologic forms in both species. He produced an intermediate type of smut by hybridizing *S. Sorghi* and *S. cruenta* which had a sorus different from either parent with two kinds of sterile cells, the small sterile cells of *S. Sorghi* and the large spherical type of *S. cruenta*. In culture, numerous mutants were observed to arise. It was possible for him to produce new physiologic forms by hybridization and segregation.

In view of these results it seems that H. Sydow⁹ in 1924, when he made a study of *Cintractia Caricis* (Pers.) P. Magn. on *Carex* spp., and finally described ten new species based on host species, had in reality only ten physiologic forms of *Cintractia Caricis* (Pers.) P. Magn. that by natural hybridization and segregation were pathologic to specific species of *Carex*.

Likewise Liro¹⁰ in 1924 in his study of the smuts attacking *Polygonum* spp. and Ciferri¹¹ in 1928, in his new sub-species of *Entyloma compositarum* Farlow are dealing with physiological forms.

Fisher¹² has recently reported the natural infection of *Agropyron tenerum* in central Washington by *Tilletia Tritici* and notes that the size of the sorus varies with the size of the ovary of the host. In other words, the morphology of the fungus varies with the host.

³ Faris, James A. Physiologic specialization of *Ustilago Hordei*. Phytopath. **14**: 537-557. 1924.

⁴ Holton, C. S. Studies in the genetics and the cytology of *Ustilago Avenae* and *Ustilago levis*. Univ. Minn. Exp. Sta. Tech. Bull. **87**: 1-34. 1932.

⁵ Holton, C. S. Origin and production of morphologic and pathologic strains of the oat smut fungi by mutation and hybridization. Jour. Agr. Res. **52**: 311-317. 1936.

⁶ Holton, C. S. Inheritance of chlamydospore characters in oat smut fungi. Jour. Agr. Res. **52**: 535-540. 1936.

⁷ Reed, George M. and Stanton, T. R. Reaction of oat varieties to physiologic races of loose and covered smuts of red oats. Jour. Agr. Res. **52**: 1-15. 1936.

⁸ Rodenhiser, H. A. Studies on the possible origin of physiologic forms of *Sphacelotheca Sorghi* and *S. cruenta*. Jour. Agr. Res. **49**: 1069-1086. 1934.

⁹ Sydow, H. Notizen über Ustilagineen. Ann. Myc. **22**: 277-291. 1924.

¹⁰ Liro, I. J. Die Ustilagineen Finlands. I. Ann. Acad. Sci. Fenn. A. **17**: XVIII-636 pp. 1924.

¹¹ Ciferri, R. Quarta contribuzione allo studio Ustilaginales. Ann. Myc. **26**: 1-68. 1928.

¹² Fischer, George W. The susceptibility of certain wild grasses to *Tilletia Tritici* and *Tilletia laevis*. Phytopath. **26**: 876-886. 1936.

KEY TO GENERA OF USTILAGINALES REPORTED FROM SOUTH AFRICA.

I. Spores single :—

A.—Usually forming a dusty sorus at maturity—

1. Large, usually 15–35 μ *Tilletia*.
2. Small to medium, usually 5–18 μ —
 - (a) Sorus covered with a false membrane of fungoid cells... *Sphacelotheca*.
 - (b) Protecting membrane, if any, of plant tissue *Ustilago*.

B.—More or less firmly agglutinated at maturity—

1. Firmly agglutinated into irregular nodules *Melanopsichium*.
2. Developed around a central columella (rarely becoming dusty) *Cintractia*.

C.—Imbedded in leaves at maturity—

1. Usually hyaline or light colored *Entyloma*.

II. Spores in more or less regular balls :—

A.—Forming a dusty or granular sorus at maturity—

1. Spore balls consisting only of fertile cells—
 - (a) Usually evanescent, olivaceous or black brown *Sorosporium*.
 - (b) Quite permanent, spores adhering by folds of outer coat *Tolyposporium*.
2. Spore balls with outer sterile cortex *Urocystis*.

B.—Implanted in plant tissue at maturity—

1. Spore balls without definite cortex or sterile cells *Tubercinia*.

Family I.—USTILAGINACEAE.

Ustilago (Pers.) Roussel¹³, Fl. du Calvados ed. 2. 47. 1806.

Necrosis Paulet, Traite Champ. 1 : 584. 1793.

Ustilago Pers. Syn. Fung. 224. 1801. (sub-genus.).

Ustilagidium Heré. Zopf Beitr. Phys. Morph. Org. 5 : 7. 1895.

Sori on various parts of the hosts, at maturity forming dusty, usually dark colored spore masses; spores single, produced irregularly in the fertile mycelial threads which early entirely disappear through gelatinization; small to medium in size; germination by means of a septate promycelium producing only infection threads or with sporidia formed terminally and laterally near the septa; sporidia in water usually germinating into infection threads but in nutrient solutions multiplying indefinitely, yeast fashion.

Type: *Ustilago segetum* Pers., on Gramineae, France.

¹³ Clinton, N. Am. Flora 71 : 3. 1906, points out that "J. Bauhin, Hist. Pl., 418, 1651, is really the founder of *Ustilago*. Fries or Persoon is ordinarily cited as authority for the genus. Fries used *Ustilago* as a genus in his Syst. Myc., 3 : 517. 1832, with *U. grandis* as the first species. Persoon used *Ustilago* as a subgenus under *Uredo* with *Uredo segetum* as the first species, having five varieties of which *U. Hordei* is first, and this may be taken as the actual type now that *U. segetum* has been broken up into several species. Roussel merely adopted *Ustilago* from Persoon, but raised it to full generic rank, giving three of Persoon's four species, of which *U. segetum* is one. Paulet's name, *Necrosis*, cannot be regarded as a true generic name, but was used more as a descriptive term."

* Spores smooth.

Ustilago Elionuri P. Henn. and Pole-Evans, Bot. Jahrb. (Engler) **41** : 270. 1908

Sori in the ovaries, 1-1.5 cm. long, covered with a dark-brown membrane of host tissue which dehisces apically revealing a semi-agglutinated brown spore mass; spores globose—ellipsoidal, irregular, somewhat angled, dark olive-brown, 5-7 μ diam., smooth under oil immersion.

Type host and locality: On *Elionurus argenteus* Nees, Pretoria, Transvaal, Union of South Africa.

On Andropogoneae: *Elionurus* (*Elyonurus*) *argenteus* Nees, Transvaal.¹ (M.H. 102, 9316, 17268.)

Distribution: Transvaal and Argentina.

Ustilago Hordei (Pers.) Lagerh.² Mitt. bad. bot. Ver. 70. 1889.

Reticularia segetum Bull. Hist. Champ. pl. 472, flg. II. 90. 1791.

Uredo segetum Hordei Pers. Tent. Disp. Fung. 57. 1797.

Uredo carbo DC. Fl. Fr. 6 : 76. 1815. p.p.

Ustilago segetum Link, Ditm. in Sturm's Deutsch. Fl. III. 1 : 67. 1817. p.p.

Caecoma segetum Link, Willd. in Sp. Pl. 52 : 1. 1825. p.p.

Erysibe vera Hordei Wallr. Fl. Crypt. Germ. 2 : 217. 1833. p.p.

Uredo Carbo-Hordei Phillipar, Mem. Soc. Roy. Agr. Arts, Seine-et-Oise 37 : 195. 1837.

Ustilago Carbo vulgaris Hordeacea Tul., Ann. Sci. Nat. Bot. III. 7 : 80. 1847. p.p.

Ustilago segetum var. *Hordei* f. *tecta* Jens. Om Korn. Brand. 61 : 1888.

Ustilago tecta hordei Jens. Charb. Cereals 4. 1889.

Ustilago hordei Kell. and Sw. Ann. Rep. Kans. Agr. Exp. Sta. 2 : 268. 1890.

Ustilago Jensenii Rostr. Overs K. Danske Vid. Selsk. Forh. 1890 : 12. 1890.

Sori in the spikelets, destroying the inflorescence, forming a rather permanent purple-black spore mass covered by a permanent membrane, about 5-8 mm. long: Spores globose-subglobose, occasionally ellipsoidal, olivaceous-brown, 5-7 μ diam. or slightly larger, smooth.

Type host and locality: On *Hordeum vulgare* Linn., Europe.

On Hordeae: *Hordeum vulgare* Linn., Cape Colony, Transvaal, Orange Free State. (M.H. 1181, 7080, 9823.)

Distribution: Co-extensive with the cultivation of barley.

Ustilago levis (Kell. and Sw.) P. Magn. Abh. Bot. Ver. Prov. Brandenburg 37 : 69. 1896

Ustilago Avenae var. *levis* Kell. and Sw. Ann. Rep. Kansas Agr. Exp. Sta. 2 : 259. 1890.

Ustilago Kolleri Wille, Bot. Notiser 1893 : 10. 1893.

Sori in spikelets, more or less destroying basal and inner glumes; spores globose-subglobose, light olivaceous-brown, usually lighter colored on one side, 5-7 μ diam., sometimes slightly larger, smooth.

Type host and locality: On *Avena sativa* Linn., Kansas, United States.

On Aveneae: *Avena sativa* Linn., Cape Colony, Transvaal, Rhodesia.* (M.H. 538, 940, 7094, 8352, 10971.)

Distribution: Co-extensive with the cultivation of oats.

Ustilago affinis Ellis and Ev. Bull. Torrey Club 20 : 297. 1893.

Ustilago Hilariae P. Henn. Hedwigia 37 : 267. 1898. Not *Ustilago Hilariae* Ellis and Tracy, 1890.

Ustilago Stenotaphri P. Henn. Hedwigia 37 : 293. 1898. (Type from Windhoek, South West Africa, on *Stenotaphrum glabrum* = *Stenotaphrum secundatum* (Walt) Kuntze.) Not *U. Stenotaphri* McAlpine, 1895.

¹ M.H. = Mycological Herbarium, Union Dept. Agric.

² Wakefield and Moore in Trans. Brit. Myc. Soc. 20 : 97, 1936, call attention to the fact that the authority for this smut species should be (Pers.) Lagerh. and not (Pers.) Kell. Swingle.

Ustilago americana Speg. Anal. Mus. Nac. Buenos Aires 6 : 201. 1899.

Ustilago Henningsii Sacc. and Sydow, Sacc. Syll. Fung. 16 : 368. 1902.

Sori in the spikelets, usually infecting every ovary in a spikelet, at first more or less hidden by the surrounding leaves, at first covered by a thin, delicate olive-brown membrane which ruptures revealing an olive-brown spore mass which soon disperses leaving a naked rachis ; spores oblong-ovate, chiefly globose-subglobose, somewhat irregular, light reddish brown (almost hyaline), $5.5-8\ \mu$ diam., smooth.

Type host and locality : On *Stenotaphrum americanum* Schrank., Mandeville, Jamaica

On Paniceae : *Stenotaphrum secundatum* (Walt.) Kuntze, South-West Africa. (M.H. 6879.)

Distribution : West Indies, South America, South Africa.

Ustilago Scitaminea H. Sydow,³ Ann. Myc. 22 : 281. 1924.

Sori transforming the floral stem into a long, curved, leafless, stem-like growth covered by a thin membrane of host tissue, the lower part of the sori concealed by the sheath ; spores globose-subglobose, reddish brown, $5-12\ \mu$ diam., smooth ; groups of hyaline thin walled cells scattered through the sori.

Type locality and host : On *Saccharum officinarum* Linn., India, Java, Philippines.

On Andropogoneae : *Erianthus saccharoides* Michx., Natal ; *Imperata arundinacea* Cyrilli, Natal ; *Saccharum officinarum* Linn., Natal. (M.H. 11111.)

Ustilago puellaris Sydow, Ann. Myc. 33 : 231. 1935.

Sori entirely destroying the inflorescence, concealed by the glumes, cylindrical, usually 1 mm. long, occasionally 1-4 mm. long, covered by dark brown membrane which ruptures, disclosing a dark brown powdery spore mass ; spores globose-subglobose, rarely ellipsoidal, regular, olivaceous brown with a narrow reddish brown epispore, $7-9\ \mu$ diam., smooth but sometimes indistinctly verruculate under the oil immersion.

Type host and locality : On *Hyparrhenia hirta* Stapf, Research Station, Nelspruit, Transvaal.

On Andropogoneae : *Hyparrhenia hirta* Stapf, Transvaal. (M.H. 26646.)

Distribution : Reported only from type locality.

Ustilago Crameri Korn. Jahrb. Nassau. Ver. Naturk. 27-28 : 11. 1875.

Sori in the ovaries, completely destroying them, ovoid, covered with a delicate membrane which when ruptured reveals a brownish, granular spore mass ; spores globose-subglobose, reddish-brown, $7-10\ \mu$ diam., smooth even under oil immersion.

Type host and locality : On *Setaria italica* (Linn.) Beauv., Zurich, Switzerland.

On Paniceae : *Setaria italica* (Linn.) Beauv., Transvaal, Zululand*, Orange Free State. (M.H. 2204, 9817, 11716.)

Ustilago Cynodontis P. Henn.⁴ Bot. Jahrb. (Engler) 14 : 369. 1891.

Sori destroying the inflorescence converting it into a mass of spores along the rachis, at first covered with a whitish-black membrane which breaks away revealing a black spore mass 2-4 cm. long, sometimes slightly longer ; spores globose-subglobose, regular, reddish-brown, $7-10\ \mu$ diam., smooth or almost smooth but granular.

Type host and locality : On *Cynodon Dactylon* Pers., Abyssinia, Africa.

³ Sydow in 1924 (l.c.) pointed out that the smut on cultivated sugarcane was not *Ustilago Sacchari* Rab. and therefore proposed the name *Ustilago scitaminea* Syd. for the smut that attacks sugarcane.

⁴ Verwoerd in Ann. Univ. Stellenbosch, A. 4 : 19. 1926, confuses *Ustilago Dregeana* Tul. and *U. Cynodontis* P. Henn. These are two very distinct species. *U. Dregeana* Tul. has papillate spores, $4-5\ \mu$ diam. (See Appendix A.), while *U. Cynodontis* P. Henn. has smooth spores, $7-10\ \mu$ diam.

On Hordeae: *Cynodon Dactylon* Pers., Orange Free State (M.H. 9752), Transvaal (M.H. 947, 112, 5636, 11005, 11014), Cape Province (M.H. 12953); *Cynodon incompletus* Nees, Transvaal (M.H. 1957, 8843), Orange Free State (M.H. 904), Cape Province (M.H. 25442).

Distribution: North America, Europe, Asia, Africa.

Ustilago Vaillantii Tul. Ann. Sci. Nat. III. 7: 90. 1847.

Ustilago scillae Ciferri, Ann. Myc. 29: 24. 1931.

Sori in pistils and anthers, perianth of diseased flowers persistent, somewhat enlarged and filled with spores, spores globose-ellipsoidal, sometimes angled, light reddish-brown, 7-11 μ diam., smooth but contents somewhat granular.

Type host and locality: On *Muscari comosum* (Linn.) Mill., Europe.

On Liliaceae: *Albuca altissima* Dryand., Cape Province (M.H. 15450); *Eucomis punctata* L'Herit., Cape Province (M.H. 2001); *Scilla Kraussii* Baker,* Inanda, Natal (M.H. 9525); *Scilla* sp., Cape Province,* Natal (M.H. 12956).

Distribution: United States, Europe, Africa.

Ustilago Dactyloctenii P. Henn. Die Pflanzenwelt Ost-Afrika, Nachbar. C: 48. 1895.

Sori entirely destroying the inflorescence, at first covered by a membrane which flakes away revealing a dark purplish spore mass, at first slightly agglutinated but later powdery; spores globose-subglobose, regular, light olivaceous-brown, 7-14 μ diam., granular, smooth, epispore 1-2 μ .

Type host and locality: On *Dactyloctenium aegyptium* (L.) Richt. (= *Dactyloctenium aegyptiacum* Willd.), Zanzibar, Africa.

On Chlorideae: *Dactyloctenium aegyptium* (L.) Richt., Cape Province (M.H. 9114); *Dactyloctenium geminatum* Hack., Portuguese East Africa (M.H. 14175).

** Spores not smooth.

Ustilago Avenae (Pers.) Jens. Charb. Cereales 4. 1889.

Reticularia segetum Bull. Champ. pl. 472, flg. II. 90. 1791. p.p.

Uredo carbo Avenae DC., Fl. Fr. 6. 76.

Ustilago segetum Link, Ditm. in Sturms Deutsch. Fl. III. 1: 67. 1817. p.p.

Caecoma segetum Link, Willd. Sp. Pl. 62: 1. 1825.

Erysibe vera Avenae Wallr. Fl. Crypt. Germ. 2: 217. 1833.

Uredo carbo-avenae Phillipar, Mem. Soc. Roy. Agr. Arts Seine-et-Oise 37: 194. 1837.

Ustilago carbo-vulgaris avenae Tul. Ann. Sci. Nat. Bot. III. 7: 80. 1847.

Ustilago segetum Avenae Jens. Om Korns. Brand 61. 1888.

Ustilago Avenae f. *foliicola* Almeida, Revista Agron. (Lisbon), 1: 20. 1903.

Sori in the spikelets, 5-12 mm. long, usually destroying the inflorescence rather completely and most of the spores finally being blown away, rarely on the leaves or culms; spores spherical to subspherical or sometimes more elongate, olivaceous-brown, sometimes lighter colored on one side of the spore, 5-7 μ diam., minutely echinulate.

Type host and locality: On *Avena sativa* Linn., Europe.

On Avenae: *Avena sativa* Linn., Cape Province, Transvaal. (M.H. 8923.)

Distribution: Co-extensive with cultivated oats.

Ustilago Holubii Sydow, Ann. Myc. 33: 230. 1935.

Sori entirely destroying the panicle and sometimes extending into the end of the culms usually 2-4 cm. long, covered by a dark colored membrane which flakes away revealing a brown spore mass; spores globose-subglobose, olivaceous-brown, 5-7 μ diam., apparently smooth but minutely verruculate under oil immersion.

Type host and locality : On *Echinochloa Holubii* Stapf, Pretoria, Transvaal, Union of South Africa.

On Panicaceae : *Echinochloa (Panicum) Holubii* Stapf, Cape Province,* British Bechuanaland, Transvaal.* (M.H. 24942 (type), 17042.)

Distribution : South Africa.

Ustilago Tritici (Pers.) Rostrup, Overs. Danske. Vid. Selsk. Forh. 1890 : 15. Mr. 1890.

Lycoperdon Tritici Bjerk. Kgl. Schmedisch Akad. Wiss. Abhandl. 37 : 326. 1775.

Uredo segetum Tritici Pers. Disp. Meth. Fung. 57. 1797.

Uredo carbo Tritici DC. Fl. Fr. 6 : 76. 1815.

Ustilago setum Ditm. Sturm's Deuts. Flore III. 1 : 67. 1817.

Caecoma segetum Link, Willd. Sp. Pl. 62 : 1. 1825.

Erysibe vera Tritici Wallroth, Fl. Crypt. Germ. 2 : 217. 1833.

Uredo Carbo-Tritici Philippar, Soc. Roy. Agr. Arts Seine-et-Oise 37 : 197. 1837.

Ustilago Carbo vulgaris Triticea Tul. Ann. Sci. Nat. Bot. III. 7 : 80. 1847.

Ustilago segetum var. *Tritici* Jens. Om Korn. Brand 61. 1888.

Ustilago Hordei Bref. Nach. Klub. Landw. Berl. No. 1593. 1888.

Ustilago Tritici Jens. Kellera and Swingle in Ann. Rep. Kansas Exp. Sta. 2 : 262. 1890.

Ustilago Tritici foliicola P. Henn. Zeitschr. Pflanzen. 4 : 139. 1894.

Ustilagidium Tritici Herzb. Zopff. Beitr. Phys. Morph. Neiderer Org. 5 : 7. 1895.

Ustilago Vavilovi Jacz. (Ann. State Inst. Exp. Agr. III. 2-4 : 106-109. 1925. Transl. Title).

Sori in the spikelets, forming a dusty olive-brown spore mass, eventually destroying all of the inflorescence and the spores are blown away leaving only the naked rachis ; spores spherical or subspherical, sometimes more elongated and irregular, light olive-brown, usually lighter colored on one side of the spore, 5-9 μ diam., minutely but distinctly echinulate. While the entire wheat spike is usually destroyed and only the naked rachis left, yet partial destruction of the spike is not uncommon. Under rare conditions the sorus develops on the sheaths and leaves.

Type host and locality : On *Triticum vulgare* Vill., Europe.

On Hordeae : *Triticum vulgare*, Cape Colony*, Orange Free State, Transvaal. (M.H. 1068, 9821.)

Distribution : Co-extensive with the cultivation of wheat.

Ustilago Fingerhuthiae Sydow, Ann. Myc. 33 : 230. 1935.

Sori in the ovaries, 2-5 mm. long, scattered throughout the spike, covered with a yellowish membrane that dehisces revealing a brownish, granular, spore mass ; spores globose-subglobose, regular, olivaceous-brown 5-10 μ diam., densely but minutely verruculose-echinulate.

Type host and locality : On *Fingerhuthia africana* Lehm., Pretoria, Transvaal, Union of South Africa.

On Festuceae : *Fingerhuthia africana* Lehm., Transvaal. (M.H. 1085, 7405, 8909.)

Distribution : Not reported except from type locality.

Ustilago trichophora (Link) Kunze, Flora 1 : 369. 1830.

Caecoma trichophora Link, Willd. Sp. Pl. 62 : 3. 1825.

Uredo trichophora Körn. Hedwigia 16 : 36. 1877.

Sori as small nodules in the individual ovaries, scattered in the panicle, singly or in groups, 2-5 mm. long, covered by a yellowish tough, hispid membrane, spore mass at first hard, agglutinated but later powdery ; spores globose-subglobose, light reddish-brown (some immature spores almost hyaline), 7-8 μ diam., abundantly echinulate under oil immersion.

Type host and locality : On *Echinochloa colona* (= *Panicum colonum* Linn.), Egypt.
 On Paniceae : *Echinochloa Crus-galli* Beauv. (= *Panicum Crus-galli* Linn.), Cape Province. (M.H. 9424.)
 Distribution : Africa.

Ustilago Trachypogonis Zundel n. sp.

Sori in the ovaries, protected by the outer glumes, about 1 cm. long, spore mass granular, dark brown ; spores globose-subglobose, occasionally ellipsoidal, brown with a distinctly reddish-brown epispore, 7-9 μ diam., echinulate.

Hab. in the ovaries of *Trachypogon plumosus* Nees., Kaalfontein, Transvaal, Union of South Africa, Coll. A.O.D. Mogg, Feb. 22, 1918. (M.H. 11709.)

Latin description :—

Soris in ovariiis, glumis externis tectis, ca. 1 cm. longis, globis sporarum grandularibus, atro-brunneis ; sporis globosis v. sub-globosis, interdum ellipsoideis, brunneis, 7-9 μ diam., echinulatis ; episporio conspicue rubro-brunneo.

Hab. in ovariiis *Trachypogonis plumosi* Nees., Kaalfontein, Transvaal, Unione Africae Australis, Coll. A. O. D. Mogg, Feb. 22, 1918. (M.H. 11709.)

Ustilago Schlechteri P. Henn. Hedwigia **34** : 325. 1895.

Sori in the panicles, 8 or more cm. long, deforming and destroying the inflorescence, at first covered with a membrane which ruptures revealing a dark spore mass ; spores globose-subglobose or sometimes ellipsoidal, deep olivaceous-brown with a deeper almost reddish-brown epispore, 7-10 μ diam., or sometimes slightly larger, minutely echinulate-verruculose under oil immersion.

Type host and locality : On *Sporobolus* sp., Tweedie, Natal. (M.H. 11644.)

On Agrostideae : *Sporobolus* sp., Natal. (M.H. 11644.)

Distribution : Union of South Africa.

Ustilago Crus-galli Tracy and Earle, Bull. Torrey Club **22** : 175. 1895.

Sori surrounding the stem at nodes or place of inflorescence, attacking both stem and leaves, nodular, elongated, swollen, several cm. long, surrounded by a tough hispid membrane, spore mass brown, powdery ; spores ovoid to spherical, occasionally more elongate, olivaceous-brown, 7-10 μ diam., bluntly echinulate.

Type host and locality : On *Panicum crus-galli* Linn., Salt Lake City, Utah, United States.

On Paniceae : *Echinochloa Holubii* Stapf, Transvaal. (M.H. 2247.)

Distribution : United States, Europe, Asia, Africa, Australia.

Ustilago Zeae (Beckm.) Unger. Einfl. Bodens 211. 1836.

Lycoperdon zeae Beckm. Hannov. Mag. **6** : 1330. 1768.

Uredo segetum Mays Zeae DC. Fl. Fr. **2** : 596. 1805.

Uredo Zeae Mays DC., Lamarck Enc. Meth. Bot. **8** : 229. 1808.

Uredo maydis DC. Fl. Fr. **6** : 77. 1915.

Uredo Zeae Schw. Fung. Car. No. 71. 1815.

Caeoma Zeae Link, Willd. Sp. Pl. **62** : 2. 1825.

Erysibe Maydis Wallroth, Fl. Crypt. Germ. **2** : 215-16. 1833.

Ustilago Maydis Corda, Corda Icon. Fung. **5** : 3. 1842.

Ustilago Schweinitzii Tul. Ann. Sci. Nat. Bot. III. **7** : 86. 1847.

Ustilago Zeae-Mays Wint. Rab. Krypt.-Fl. **11** : 97. 1881.

Ustilago Euchlaenae Arcang. Erb. Critt. Ital. **11** : 1132. 1882.

Ustilago Mays zeae Magnus, Deuts. Bot. Monatschr. **13** : 50. 1895.

Sori forming on any part of the host above ground as irregular pustules measuring a few mm. to large boils several dm. in diam., at first covered with a membrane composed of host tissue intermixed with fungous threads which later breaks revealing an olive-brown spore mass; spores globose to subglobose or sometimes ellipsoidal, regular, reddish-brown, 7–10 μ diam., bluntly echinulate.

Type host and locality: On *Zea Mays* Linn., Europe.

On Andropogoneae: *Zea Mays* Linn., Cape Colony (M.H. 1178, 14699, 11632), Natal,* Transvaal.*

Distribution: North America, Europe, Asia, Africa, Philippine Islands.

Ustilago bromivora (Tul.) Fisch. de Waldh. Bull. Soc. Nat. Moscow **40**¹: 252. 1867.

Ustilago carbo vulgaris bromivora Tul. Ann. Sci. Nat. Bot. III. **7**: 81. 1847.

Cintractia patigonica Cooke and Masee, Grevillea **18**: 34. 1899.

Ustilago Brachypodii Maire, Bull. Soc. Hist. Nat. Afr. Nord **9**: 46. 1918.

Ustilago Brachypodii-distachyi Maire, Bull. Soc. Hist. Nat. Afr. Nord **10**: 46. 1919.

Ustilago bromivora Tul. forma *Brachypodii* Hariot, Bull. Soc. Hist. Nat. Afr. Nord **12**: 192–1921.

Ustilago bromi-arvensis Liro, Ann. Acad. Sci. Fenn. A. **17**: 93. 1924.

Ustilago Bromi-mollis Liro, Ann. Acad. Sci. Fenn. A. **17**: 94. 1924.

Sori in the spikelets, usually confined within the glumes, sometimes infecting base of glumes, covered with a delicate white membrane, usually bullate, agglutinated then powdery; spores globose-subglobose, occasionally broadly ellipsoidal, dark reddish-brown to olivaceous-brown, chiefly 7–11 μ diam., abundantly verruculose.

Type host and locality: On *Bromus secalinus* Linn., Europe.

On Festuceae: *Bromus unioloides* H.B.K., Cape Colony (M.H. 544, 1248, 11004, 12832), Orange Free State (M.H. 2091), Transvaal (M.H. 280, 284, 285, 195, 429, 6933).

Distribution: North America, Europe, Asia, Africa, Australia, New Zealand.

Ustilago Andropogonis-finitimi Maub. Bull. Soc. Myc. (France) **22**: 74–75. 1906.

Sori in the ovaries, long linear, 5–7 mm. long, covered with a membrane of host tissue; spore mass brown, agglutinated, surrounding a well developed columella; spores globose-subglobose, semi-opaque, dark reddish-brown, 9–12 μ diam., abundantly echinulate under oil immersion.

Type host and locality: On *Andropogon finitimus* Hochst. Portuguese East Africa

On Andropogoneae: *Andropogon finitimus* Hochst., Portuguese East Africa.

Distribution: Reported only from type locality.

Ustilago Rabenhorstiana Kuhn, Hedwigia **15**: 4. 1876.

Caeoma Syntherismae Schw. Trans. Am. Phil. Soc. II. **4**: 290. 1834.

Ustilago Setariae Rabenh. Univ. itin. Krypt. No. 1866. Year *

Ustilago destruens var. *Digitariae* Sacc. Nuo. Giorn. Bot. Ital. **8**: 167. 1876.

Ustilago Cesati Fisch. de Waldh. Apercu **25**: 1877. p.p.

Ustilago Syntherismae Auct. p.p. Cke. Grevillea **6**: 138. 1878.

Sori usually destroying the entire inflorescence, linear-oblong, 3–5 cm. long, at first concealed by the enveloping glumes but finally becoming visible as a black-brown dusty spore mass surrounding the elongate remnants of the inflorescence; spores globose-subglobose, occasionally somewhat angled, olivaceous-brown, 10–13 μ diam., verruculose.

Type host and locality: On *Panicum sanguinale* Linn., Europe.

On Paniceae: *Digitaria ternata* Stapf, Natal (M.H. 11703); *Digitaria* sp., Rhodesia (M.H. 13999), Transvaal (M.H. 11704).

¹ This species is similar to, if not identical with *Ustilago sphaerogena* Burrill, found in North America.

Ustilago Peglerae Sydow and Bubak, Ann. Myc. 12: 264. 1914.

Sori destroying the anthers, olivaceous-black; spores ellipsoidal to oblong, seldom globose to subglobose, frequently irregular, olivaceous-brown, 10–14 μ long, verruculose.

Type host and locality: On *Ornithogalum lacteum* Jacq., Cape Province, Union of South Africa.

On Liliaceae: *Ornithogalum lacteum* Jacq., Cape Colony (M.H. 7101).

Distribution: Cape Province.

Ustilago Evansii P. Henn. Bot. Jahrb. (Engler) 41: 270. 1908.

Sori destroying all ovaries on the spike, 2–3 mm. long, covered with an olivaceous membrane; spore mass granular, olive-brown; spores globose-subglobose, regular, olivaceous-brown, light colored almost hyaline, spores abundant throughout the sorus, various sizes, 14–21 μ diam., abundantly and coarsely echinulate, bifurcate conidiophores abundant.

Type host and locality: On *Setaria sphacelata* Stapf and Hubb. (= *Setaria aurea* A. Br.), Zoutpansberg, Transvaal, Union of South Africa.

On Paniceae: *Setaria sphacelata* Stapf. and Hubb., Natal (M.H. 7757), Transvaal (M.H. 7797), Rhodesia (M.H. 14003), Zululand (M.H. 15441, 17044, 17045); *Setaria nigri-rostris* Dur. and Schinz., Transvaal, Rhodesia; *Setaria* sp., Southern Rhodesia.

Farysia Raciborski, Sci. Cl. Sci. Math. Nat. 1. 1909: 354. 1909.

Elateromyces Bubak, Houby Česká Dil. II. 1912: 32. 1912.

Sori in various parts of the host, at maturity forming dusty, usually dark spore masses, intermixed with parallel, elater-like strands of host tissue and sterile hyphae; spores single, produced in chains as in *Ustilago* but intermixed with sterile hyphae and strands of host tissue which function as elaters.

Farysia olivacea DC. H. and P. Sydow, Ann. Myc. 17: 41. 1919.

Uredo olivacea DC. Fl. Fr. 6: 78. 1815.

Caeoma olivaceum Schlecht. Fl. Berol. 2: 130. 1824.

Erysibe olivacea Wallr. Fl. Crypt. Germ. 2: 215. 1833.

Ustilago olivacea Tul. Ann. Sci. Nat. III. 7: 88. 1847.

Ustilago catenata Ludw. Zeits. Pflanz. 3: 139. 1893.

Cintractia caricicola P. Henn. Hedwigia 34: 325. 1895.

Ustilago caricicola Tracy and Earle, Bull. Torrey Club 26: 493. 1899.

Ustilago subolivacea P. Henn. Ann. R. Istit. Bot. Roma 6: 84. 1897.

Elateromyces olivacea Bubak, Houby Cesky Dil. II. 1912: 32. 1912.

Farysia americana Ciferri, Ann. Myc. 29: 73. 1931.

Sori in occasional ovaries, often at first partly concealed by the perigynium, ovate, 2–6 mm. in diam., at first with agglutinated spores which later become powdery, with conspicuous elaterlike threads intermixed with the spores; spores olivaceous-brown, irregular, varying from globose to oblong or linear but sometimes more regular and then chiefly 7–9 μ diam., the most elongate about 12 μ long and about 4 μ wide, abundantly but minutely verruculate.

Type host and locality: On *Carex riparia* Curtis, France.

On Cyperaceae: *Carex ethiopica* Schkuhr., Cape Province; *Carex phacota* Spreng., Cape Province. (M.H. 8812.)

Distribution: North America, South America, West Indies, Europe, Asia, South Africa, New Zealand, Tasmania, Australia.

Sphacelotheca De Bary, Verg. Morph. Biol. Pilée 187. 1884.

Sporisorium Ehrenb. Link Willd. Sp. Pl. 62: 86. 1825.

Endothlaspiis Sorokin, Rev. Myc. 12: 4. 1890.

Sori usually in the inflorescence, often limited to the ovaries, provided with a definite (more or less) temporary false membrane covering a dusty spore mass and a central columella of plant tissue; false membrane composed largely or entirely of definite sterile fungous cells which are hyaline or slightly tinted; oblong to spherical, and usually more or less firmly bound together; spores simple, usually reddish-brown, developed in a somewhat centripital manner as in *Cintractia*, small to medium in size; germination as in *Ustilago*.

Type: *Uredo Hydriopiperis* Schum., on *Polygonum Hydriopiper* Linn., Europe.

Sphacelotheca Anthephorae (Syd.) Zundel n.n.

Ustilago Anthephorae Syd. Ann. Myc. **12**: 197. 1914.

Sori completely destroying the inflorescence hidden by the glumes, about 1 cm. long, surrounded by a delicate membrane which dehisces apically revealing an agglutinated brown spore mass surrounding a well formed columella and breaking up into sterile cells; sterile cells subglobose-irregular, hyaline, singly or in chains, about 7 μ diam.; spores globose-subglobose, reddish-brown, 3.5–4.5 μ diam., smooth.

Type host and locality: On *Anthephora pubescens* Nees, Grootfontein, South West Africa.

On Zoysiae: *Anthephora pubescens* Nees, South West Africa,* Transvaal (M.H. 2249, 5151), Orange Free State (M.H. 26644).

Distribution: Southern Africa.

* Spores smooth.

Sphacelotheca Sorghi (Link) G. P. Clinton, Jour. Myc. **8**: 140. 1902.

Sporisorium Sorghi Link, Willd. Sp. Pl. **62**: 86. 1825.

Tilletia Sorghi-vulgaris Tul. Ann. Sci. Nat. III. **7**: 116. 1847.

Ustilago sorghi Pass. Thum. Hedwigia **12**: 114. 1873.

Cintractia Sorghi-vulgaris G. P. Clinton, Bull. III. Agr. Exp. Sta. **47**: 404. 1897.

Sori destroying the ovaries which are elongated about twice the normal length of the seed, covered with an evident false membrane which ruptures revealing a brown spore mass surrounding a short, thick, well developed columella; false membrane usually breaking up into chains of small hyaline sterile cells, subglobose-ellipsoidal, 3–10 μ diam.; spores globose-subglobose, reddish-brown, 3–8 μ diam., mostly about 5 μ diam., smooth.

Type host and locality: On *Sorghum vulgare* Pers., Egypt.

On Andropogoneae: *Sorghum vulgare* Pers. v. *caffrorum* (Thun.) Hubb. et Rehder (= *S. caffrorum* Beauv. and = *Andropogon sorghum* Brot. var.), Cape Province, Natal (M.H. 17271), Transvaal (M.H. 315, 316, 5635, 2088, 7786).

Distribution: Co-extensive with cultivated sorghums.

Sphacelotheca Moggii Zundel, Mycologia **22**: 130. 1930.

Sori in the inflorescence, long linear, 5–10 mm. long, at first usually hidden by the outer leaf sheath, later protruding, covered with a false tissue which flakes away revealing a dark brown, agglutinated spore mass surrounding a well developed, often forked, columella; sterile tissue very fragile and "tissue like," somewhat effervescent, adhering more or less to the sori and breaking up into groups or balls of sterile cells which are tinted brown, vacuolated and granular, 7–12 μ diam., sterile-cell balls containing 4 or more cells, globose-subglobose, 15–22 μ diam.; balls of sterile cells are scattered throughout the sori; spores globose-subglobose, regular, tinted olivaceous-brown to almost hyaline, vacuolated, 4–6 μ diam., under oil immersion, smooth.

Type host and locality: On *Cymbopogon plurinodis* Stapf, Armoedsvlakte, British Bechuanaland.

On Andropogoneae: *Cymbopogon plurinodis* Stapf, British Bechuanaland. (M.H. 19859.)

Distribution: Not reported except from type locality.

Sphacelotheca cruenta (Kuhn) Potter, *Phytopath.* **2** : 98. 1912.

Ustilago cruenta Kühn, Hamburg Gart. Blumenztig. **28** : 177-178. 1872.

Ustilago Tulasnei Kühn, Rab. Fungi Eur. No. 1997. 1875.

Sphacelotheca cruenta Bubak, Archiv Pirod. Vyck. Cech. **15** : 27. 1912. Archiv. Naturw. Landes. Bohmen **15** : 26. 1916.

Sori destroying the ovaries, which are scarcely larger than normal, covered by an evident membrane which flakes away into globose sterile cells revealing a brown granular spore mass surrounding a long, curved, well developed columella; groups of large globose sterile cells scattered throughout the sori; sterile cells hyaline, globose-subglobose, singly or in groups, 9-14 μ diam.; spores globose-subglobose, light reddish-brown, 5-8 μ diam., smooth.

Type host and locality: *Sorghum vulgare* Pers., Halle, Germany.

On Andropogoneae: *Sorghum halepense* Pers., Tanganyika Territory; *Sorghum vulgare* Pers., Tanganyika Territory; *Sorghum* sp., Tanganyika Territory.

Distribution: North America, Europe, West Indies, Africa.

Sphacelotheca Vryburgii Zundel, *Mycologia* **23** : 298. 1931.

Sori in the inflorescence, long linear, 5-10 mm. long, at first hidden by the glumes but later protruding, covered by a reddish-brown, delicate false membrane which flakes away revealing an agglutinated black spore mass surrounding a well developed much branched columella; sterile cells hyaline, globose, usually in groups, 9-15 μ diam.; spores globose-subglobose, occasionally angled, very light reddish-brown, 4-8 μ diam., smooth, contents finely granular with a hyaline to light coloured wall under oil immersion.

Type host and locality: On *Themeda triandra* Forsk. (= *Themeda Forskalii* Hack.), Vryburg, British Bechuanaland.

On *Themeda triandra* Forsk., British Bechuanaland (M.H. 9733.)

Distribution: Reported only from type locality.

Sphacelotheca concentrica Zundel, *Mycologia* **22** : 138. 1930.

Sori in the inflorescence, broadly elongate, 1 cm. or less in length, at first concealed by the glumes, covered by an evident light coloured false membrane which flakes away revealing a partially agglutinated dark spore mass surrounding a well formed columella; sterile tissue breaking up into hyaline cells, globose, somewhat variable in size, ranging from 10-21 μ diam.; spores globose-subglobose, under oil immersion the spore is divided into four concentric parts, an outer dark brown area, then a light reddish-brown area and an inner vacuolated, light coloured area, surrounded by a second dark brown area, 6-8 μ diam. but sometimes 4-8 μ diam., smooth.

Type host and locality: On *Cymbopogon plurinodis* Stapf, Pretoria, Union of South Africa.

On Andropogoneae: *Cymbopogon plurinodis* Stapf, Transvaal (M.H. 10708).

Distribution: Not reported except from type locality.

Sphacelotheca densa (McAlp.) Ciferri, *Ann. Myc.* **26** : 32. 1928.

Cintractia densa McAlp., Smuts of Australia 168. 1910.

Sori destroying the inflorescence and forming a long rachis, covered with a greyish membrane which flakes away exposing a dark spore mass; spores globose-subglobose, light olivaceous-brown, 6-7 μ diam., smooth.

Type locality and host: On *Rottboellia compressa* Linn., Burnley near Melbourne, Victoria, Australia.

On Andropogoneae: *Rottboellia compressa* Linn., Natal (M.H. 12957).

Distribution: Australia, South Africa.

Sphacelotheca Doidgeae Zundel, *Mycologia* **22** : 131. 1930.

Sori in the inflorescence usually involving the entire spikelet along the rachis, long linear, frequently irregularly branched or compound, 3-8 mm. long, covered with an evident,

thick, brown, false membrane, which dehisces from the apex disclosing a brown, agglutinated mass of spores surrounding a well developed irregular columella; sterile tissue breaking up into groups or chains of hyaline sterile cells, 6–10 μ diam.; groups of large globose sterile cells through the sori; spores globose-subglobose, thick walled, olivaceous brown, 6–10 μ diam., under oil immersion, smooth and finely granular.

Type host and locality: On *Bothriochloa glabra* A. Camus, Edendale, Natal, Union of South Africa (M.H. 1997).

On Andropogoneae: *Bothriochloa* sp. Transvaal (M.H. 15058); *Andropogon intermedius* R. Br., Natal (M.H. 8939); *Bothriochloa glabra* A. Camus, Natal (M.H. 1997).

Distribution: Southern Africa.

Sphacelotheca tenuis (H. and P. Sydow) Zundel, Mycologia 22 : 137. 1930.

Ustilago tenuis H. and P. Sydow, Ann. Myc. 4 : 425. 1906.

Sori destroying the inflorescence, $\frac{1}{2}$ –1 cm. long, covered with a more or less permanent false membrane which flakes away revealing a semi-powdery spore mass surrounding a well developed columella; cells of sterile membrane are inclined to fuse and largely lose their cellular structure, appearing as a more or less amorphous mass, however, some globose cells retain their identity; spores globose-subglobose, somewhat irregular and angular, thick walled, olivaceous-brown, 6–10 μ diam., smooth and finely granular under oil immersion.

Type host and locality: On *Bothriochloa pertusa* A. Camus (= *Andropogon pertusus* Willd.), Hunsur, Mysore, India.

On Andropogoneae: *Hyparrhenia* sp., Natal (M.H. 11862).

Distribution: India, South Africa.

Sphacelotheca columellifera (Tul.) Ciferri, Ann. Myc. 26 : 32. 1928.

Ustilago carbo var. *columellifera* Tul. Ann. Sci. Bot. III. 7 : 81. 1847.

Cintractia columellifera (Tul.) McAlpine, Smuts of Austr., 166. 1910.

Sori destroying the inflorescence, long linear, 5–7 cm. long, at first concealed by the sheath but later protruding, covered by an evident yellowish-white, false membrane which flakes away revealing a dark brown agglutinated spore mass surrounding a well developed, hollow columella; false membrane disintegrating into groups or chains of globose, hyaline sterile cells, 7–12 μ diam.; spores generally globose, regular but occasionally subglobose, light reddish-brown, usually 7 μ diam., but occasionally 9 μ , under oil immersion, smooth with vacuolated contents.

Type host and locality: *Andropogon australis* Spreng., Queensland, Australia.

On Andropogoneae: *Heteropogon contortus* R. and S. (= *Heteropogon hirtus* Pers.), Tanganyika Territory.

Distribution: Australia, Africa.

Sphacelotheca Ruprechtii Sydow, Ann. Myc. 33 : 232. 1935.

Sori entirely destroying the inflorescence, cylindrical, 4–8 mm. long, at first concealed by the glumes but later protruding, covered by a leathery, olivaceous false membrane which ruptures disclosing a dark agglutinated spore mass surrounding a well developed simple or bifurcate columella; sterile cells globose-subglobose, hyaline, in pairs or in groups, rarely in chains, 10–14 μ diam., spores globose-subglobose, regular, olivaceous-brown 7–10 μ diam., smooth but granular under the oil immersion lens.

Type host and locality: On *Hyparrhenia Ruprechtii* Fourn. (*Andropogon Ruprechtii* Hack.), Marikana, Rustenburg, Transvaal, Union of South Africa.

On Andropogoneae: *Hyparrhenia Ruprechtii* Fourn., Transvaal (M.H. 27377).

Distribution: Southern Africa.

Sphacelotheca Evansii Zundel, Mycologia 22 : 133. 1930.

Sori in the inflorescence, hidden by the glumes, inconspicuous, 5–10 mm. long, covered by an evident membrane which flakes away revealing a dark brown spore mass surrounding

a well developed columella; false tissue rather permanent, breaking up into large groups or chains of sterile cells; groups of sterile cells through the sorus; sterile cells hyaline, irregular, globoid, 9–12 μ diam.; spores globose-subglobose, regular, olivaceous-brown, 8–10 μ diam., under oil immersion, smooth and vacuolated.

Type host and locality: On *Hyparrhenia Ruprechtii* Fourn., Olifants River, Transvaal, Union of South Africa.

On Andropogoneae: *Hyparrhenia Ruprechtii* Fourn., Transvaal (M.H. 14174).

Distribution: Transvaal.

Sphacelotheca Andropogonis (Opiz) Bubak, Naturw. Landes. Böhmen, **15**: 25. 1916.

Ustilago Ischaemi Fuckel, Enum. Fung. Nass. **22**: 1861.

Ustilago cylindrica Peck, Bot. Gaz. **7**: 55. 1882.

Cintractia Ischaemi Syd. Oesterr. Bot. Zeitsch. **51**: 12. 1901.

Sphacelotheca Ischaemi Clint. Jour. Myc. **8**: 140. 1902.

Sori usually involving entire inflorescence, hidden by the sheath, long linear, 10–40 mm. long by 1–4 mm. wide, covered by a false membrane which flakes away disclosing a brown spore mass surrounding a well developed columella; false membrane rather permanent, breaking up into large masses of tissue rather than individual sterile cells, sterile cells through the sori; sterile cells globose-subglobose, flattened when in contact with each other, hyaline or when en masse, tinted brown, 7–16 μ diam.; spores globose-subglobose medium reddish-brown, minutely granular, 8–10 μ diam. smooth.

Type host and locality: On *Andropogon Ischaemum* Linn., Prag, Czechoslovakia.

On Andropogoneae: *Bothriochloa glabra* A. Camus. Natal (M.H. 1080, 7759), Transvaal (M.H. 1073, 1921); *Cymbopogon Schoenanthus* Spreng., Transvaal (M.H. 1921); *Hyparrhenia Ruprechtii* Fourn., Transvaal (M.H. 1156, 10096).

Distribution: North America, Europe, Asia, Africa, Philippine Islands.

Sphacelotheca Dinteri (H. and P. Sydow) Zundel, Mycologia **22**: 140. 1930.

Ustilago Dinteri H. and P. Sydow, Ann. Myc. **13**: 37. 1915.

Sori destroying the entire inflorescence, almost entirely hidden by the terminal sheath, long linear, 2–4 cm. long, covered by an evident brown false membrane which flakes away revealing a semi-powdery, brown, spore mass surrounding a well formed columella; sterile cells globose-subglobose or sometimes ellipsoidal, individually or in groups, tinted brown, 7–12 μ diam.; spores globose-subglobose or occasionally ellipsoidal, frequently angular, thick walled, finely granular, olivaceous brown, 9–12 μ diam., smooth.

Type host and locality: On *Dicanthium papillosum* Stapf (= *Andropogon papillosus* Hochst.), Pijikwara-Okaharni, South West Africa.

On Andropogoneae: *Dicanthium papillosum* Stapf, South West Africa.

Distribution: South West Africa.

Sphacelotheca natalensis Zundel, Mycologia **22**: 139. 1930.

Sori in the inflorescence, long linear, 3–6 mm. long, covered by an evident brown false membrane which flakes away revealing an agglutinated spore mass surrounding a well developed, simple, columella; sterile cells globose, usually hyaline, mostly in groups or short chains, reddish-brown en masse, variable in size, 12–15 μ diam.; spores globose-subglobose, thin walled, light reddish-brown, 10–12 μ diam., smooth even under oil immersion.

Type host and locality: On *Cymbopogon excavatus* Stapf, Mooi River, Natal, Union of South Africa.

On Andropogoneae: *Cymbopogon excavatus* Stapf, Natal (M.H. 11705).

Distribution: Not reported except from type locality.

Sphacelotheca transvaalensis Zundel, Mycologia **22**: 139. 1930.

Sori destroying the inflorescence, broadly linear, 5–10 mm. long, covered by a thick, dark brown, false membrane which flakes away revealing a black spore mass surrounding

a large, well developed, branched, root-like, central columella and numerous surrounding smaller columellae. (Resembling a small root system of an herbaceous plant); sterile cells globose-subglobose, hyaline, delicate, large, single or in short chains, 11–12 μ diam.; spores globose-subglobose, regular, reddish-brown, 10–12 μ diam., smooth but finely granular under oil immersion.

Type host and locality: On *Sorghum versicolor* Anderss., Onderstepoort, Pretoria, Transvaal, Union of South Africa.

On Andropogoneae: *Sorghum versicolor* Anderss. Transvaal (M.H. 17047).

Distribution: South Africa.

** Spores not smooth.

Sphacelotheca Milbraedii (H. and P. Sydow) Zundel, *Mycologia* 22: 135. 1930.

Ustilago Milbraedii H. and P. Sydow, *Wissensch. Ergebn. Deutsch Zentral. Exped.* 1907–1908: 95. 1911.

Sori in the ovaries, long linear, 3–5 cm. long, covered with an evident false membrane which flakes away disclosing a semi-powdery spore mass surrounding a well formed columella, outer false membrane rather persistent, breaking up into large groups of sterile cells, rectangular, tinted brown, groups of sterile cells through the sori, subglobose, tinted brown, 9–12 μ diam.; spores globose-subglobose, irregular, somewhat angular, thin walled, light brown with a darker coloured centre, 3–8 μ diam., under oil immersion faintly echinulate.

Type host and locality: On *Cymbopogon Schoenanthus* Spreng. (= *Andropogon Schoenanthus* Linn.), Mpororo, Tanganyika Territory.

On Andropogoneae: *Cymbopogon Schoenanthus* Spreng., Tanganyika Territory.

Distribution: Tanganyika Territory.

Sphacelotheca Amphilophis Sydow, *Ann. Myc.* 33: 232. 1935.

Sori destroying the entire inflorescence, 1–2 cm. long, at first covered by a false membrane which flakes away revealing a dark brown agglutinated spore mass surrounding a large, well developed, simple or bitrifurcate columella; sterile cells scattered throughout the sori, usually in rather agglutinated groups but occasionally single or in groups of two or three, hyaline, globose-subglobose, regular, 7–13 μ diam.; spores globose-subglobose, rarely ellipsoidal, regular, olivaceous-brown, 5–7 μ diam., apparently smooth but under the oil immersion lens sometimes indistinctly verruculose.

Type host and locality: On *Bothriochloa insculpta* A. Camus (= *Amphilophis insculpta* Stapf), along Crocodile River at Schagen, Barberton, Transvaal.

On Andropogoneae: *Bothriochloa insculpta* A. Camus, Transvaal (M.H. 26023).

Distribution: Reported only from type locality.

Sphacelotheca Ritchiei Zundel, *Mycologia* 22: 138. 1930.

Sori in the inflorescence, long linear, 5–8 mm. long, sometimes gregarious, at first concealed by the glumes, later protruding, covered by an evident dark brown false membrane which flakes away apically, revealing a brown spore mass surrounding a well developed columella; sterile cells hyaline, in pairs, in short chains or in groups (usually in pairs) usually larger than the spores, 9–12 μ diam., sometimes up to 15 μ , thin walled and somewhat fragile; spores globose-subglobose, regular, reddish-brown, 6–10 μ diam., under oil immersion minutely verruculate.

Type host and locality: On *Hyparrhenia cymbaria* Stapf, Morogoro, Tanganyika Territory.

On Andropogoneae: *Hyparrhenia cymbaria* Stapf, Tanganyika Territory (M.H. 20650).

Distribution: Not reported except from type locality.

Sphacelotheca Holci H. S. Jackson, *Monogr. Univ. Puerto Rico, Ser. B.*, No. 2: 259. 1934.

Sori in the ovaries, concealed by and not exceeding the glumes, covered by a membrane which flakes away as sterile cells (not found in sori of old specimens) revealing a granular

spore mass surrounding a well formed columella ; sterile cells throughout the sorus, globose-ellipsoidal, singly, in pairs or groups, slightly tinged very light brown, 9-17 μ diam. ; spores globose-subglobose, olivaceous-brown with a dark reddish-brown epispore, 7-10 μ diam., finely but evident verruculose to echinulate.

Type host and locality.

On Andropogoneae : *Sorghum vulgare* Pers. v. *caffrorum* (Thun.) Hubb. et Rehder. (= *Sorghum caffrorum* Beauv.), Tanganyika Territory.

Distribution : Venezuela and Tanganyika Territory.

Sphacelotheca Zilligii Zundel, *Mycologia* **22** : 142. 1930.

Sori in the inflorescence, solitary, long linear, at first concealed by the sheath, 1-3 cm. long, covered by an evident brown false membrane which flakes away revealing a dark brown, granular spore mass surrounding a well developed, much branched, columella ; sterile cells globose-subglobose, hyaline, usually in groups or chains, angular by compression, variable in size, 8-14 μ diam. ; spores globose-subglobose, semi-regular, light reddish-brown, 7-10 μ diam., medium echinulate under oil immersion.

Type host and locality : On *Cymbopogon* sp., Vryburg, Cape Province, Union of South Africa.

On Andropogoneae : *Cymbopogon* sp., Cape Province (M.H. 20666).

Distribution : Reported only from type locality.

Sphacelotheca Pappophori (Pat.) Zundel n.n.

Ustilago Pappophori Pat. Bull. Soc. Myc. (France) **22** : 199. 1906.

Ustilago Pappophori Sydow, Ann. Myc. **24** : 265. 1926.

Sori in the ovaries, causing complete destruction, ovoid, about 1-1.5 by 5-8 mm., covered by a false membrane which flakes away as sterile cells revealing a dark brown spore mass surrounding a columella ; sterile cells abundant, subglobose-ellipsoidal, often irregular, about the size of the spores, singly or in groups, hyaline or tinged yellow ; spores globose-subglobose, occasionally ellipsoidal, light olivaceous-brown with a narrow, dark, reddish-brown epispore, 7-11 μ diam., finely but abundantly verruculate.

Type host and locality : On *Pappophorum scabrum* Kunth, Selah ad Ahaggar, Algeria.

On Festuceae : *Enneapogon* sp. (M.H. 17279), South West Africa ; *Pappophorum scabrum* Kunth,* South Africa.

Distribution : Algeria, Tunis, South Africa.

Sphacelotheca Nyassae (H. and P. Sydow) Zundel, *Mycologia* **22** : 133. 1930.

Ustilago Nyassae H. and P. Sydow, Ann. Myc. **18** : 156. 1920.

Sori in the ovaries which remain about normal size, inconspicuous, concealed by the glumes, 5 mm. long, covered by an evident false membrane which ruptures revealing a brown, powdery spore mass surrounding a simple columella ; false membrane disintegrating into hyaline, globose sterile cells, 11-16 μ diam. ; spores globose-subglobose, sometimes angular, reddish-brown, 9-12 μ diam., under oil immersion finely verruculose and coarsely vacuolated.

Type host and locality : On *Andropogon* sp., Nyassa-Hochland, Station Kymbila, Nyasaland Protectorate.

On Andropogoneae : *Andropogon* sp., Nyasaland Protectorate.

Distribution : Not reported except from type locality.

Sphacelotheca monilifera (Ellis and Ev.) G. P. Clinton, Jour. Myc. **8** : 141. 1902.

Ustilago monilifera Ellis and Ev. Bull. Torrey Club **22** : 362. 1895.

Sori in the ovaries of the spikelets, 5-7 mm. long or about the length of the glumes, at first concealed by the glumes, covered with an evident false membrane that flakes away revealing a brownish-black spore mass with evident columella ; cells of the false membrane

adhering semi-permanently, interior sterile cells globose-subglobose, singly, in pairs or in groups, 9–14 μ diam., tinted light yellowish-brown; spores globose-subglobose, usually regular but sometimes angular, olivaceous-brown, 9–14 μ diam., under oil immersion minutely verruculose or echinulate.

Type host and locality: On *Heteropogon contortus* (L.) Roem. et Schultz (= *Andropogon contortus* Linn.), Tucson, Arizona, United States.

On Andropogoneae: *Heteropogon contortus* (Linn.) Roem. et Schultz, Tanganyika Territory.

Distribution: South-Western United States, Mexico, Hawaii, Tanganyika Territory

Sphacelotheca pretoriense (Pole-Evans) Zundel n.n.

Ustilago pretoriense Pole-Evans, Ann. Myc. 12: 263. 1914.

Sori destroying the inflorescence, 1.5–2 cm. long, tubular, covered with a dark brown membrane which dehisces apically revealing a brown spore mass surrounding a well formed columella; sterile cells 7–13 μ diam., globose-ellipsoidal, somewhat irregular, usually granular, hyaline; spores globose—broadly ellipsoidal, regular light reddish-brown, 7–13 μ diam. but chiefly 10–13 μ , echinulate to spiny.

Type host and locality: On *Urochloa helopus* Stapf, Pretoria, Transvaal, (M.H. 7408)

On Paniceae: *Urochloa helopus* Stapf. (= *Panicum Helopus* Trin.), Transvaal (M.H. 7799, 8926).

Distribution: Transvaal.

Sphacelotheca modesta (Sydow) Zundel n.n.

Ustilago modesta Sydow, Ann. Myc. 33: 231. 1935.

Sori in the ovaries, causing complete destruction, covered by a delicate yellowish membrane which flakes away as sterile cells disclosing a dark brown spore mass surrounding a columella; sterile cells abundant, subglobose-ellipsoidal, singly, in pairs or in chains, hyaline, vacuolated, usually $5 \times 7 \mu$, occasionally larger; spores globose-subglobose, rarely ellipsoidal, olivaceous-brown with a reddish-brown epispore, 10–14 μ diam., abundantly but minutely verruculose.

Type host and locality: On *Enneapogon brachystachyus* Stapf, Prieska, Cape Province Union of South Africa.

On Festuceae: *Enneapogon brachystachyus* Stapf, Cape Province (M.H. 23506).

Distribution: Reported only from type locality.

Sphacelotheca flagellata (Sydow) Zundel n.n.

Ustilago flagellata Sydow, Ann. Myc. 9: 144. 1911.

Sori destroying the inflorescence, forming along the rachis as a long columella, 8–30 cm. long, at first covered by a brown membrane which later flakes away as sterile cells and revealing a dark brown spore mass; spores globose-subglobose, dark brown, 10–14 μ diam., minutely echinulate; sterile cells globose-subglobose, in groups or chains, hyaline, 10–14 μ diam.

Type host and locality: On *Rotboellia exaltata* Linn., Province Rizal, Luzon, Philippine Islands.

On Andropogoneae: *Rotboellia exaltata* Linn., Tanganyika Territory; *Rotboellia compressa* Linn. f. Transvaal (M.H. 20331.)

Distribution: Philippine Islands and Tanganyika Territory, South Africa.

This species differs from *Sphacelotheca columellifera* (Tul.) Cif. mainly in having larger darker coloured and finely echinulate spores.

Sphacelotheca Stuhlmanni (P. Henn.) Zundel, Mycologia 22: 136. 1930.

Sori in the ovaries, long linear, usually 7–10 cm. long, covered with an evident brown false membrane which flakes away disclosing a brown, somewhat agglutinated spore mass

sterile tissue disintegrating into large groups of sterile cells ; often in chains which sometimes collapse, tinted brown ; spores globose-subglobose, sometimes angular, thick walled, reddish-brown, 9–14 μ diam., under oil immersion minutely echinulate.

Type host and locality : On *Andropogon* sp., Ukami, Mrigogo, Central Africa.

On Andropogoneae : *Andropogon* sp., Tanganyika Territory.

Distribution : Central Africa and Tanganyika Territory.

Melanopsichium G. Beck, Ann. Nat. Hofmus. Wien 9 : 122. 1894.

Sori on various parts of the host, firmly agglutinated and conspicuous spore masses ; spores simple, developed in irregular chambers or groups arising from a mixture of plant tissue and fungous threads, thus giving a tubercular character to the sorus, enveloped by a more or less permanent gelatinous envelope, discharging from spore mass by absorption of water, of medium size ; germination as in *Ustilago*.

Type : *Ustilago austro-americanum* Speg.¹, on *Polygonum incarnatum* auct., ²Missouri, United States. (Rabenh. Fungi Eur. No. 3501.)

Melanopsichium austro-americanum (Speg.) G. Beck, Ann. Nat. Hofmus. Wien 9 : 122, 1894.

Ustilago austro-americanum Speg. Anal. Soc. Ci. Argent. 12 : 63. 1881.

Sphacelotheca austro-americanum Liro, Anal. Acad. Sci. Fennicae, Ser. A., 17 : 124. 1924.

Sori usually in the inflorescence, occasionally on the leaves and then smaller, forming irregular lobed masses arising from fusion of infected parts, forming a hard agglutinated spore mass mixed with plant tissue ; spores subglobose-ellipsoidal, often irregular with more or less evident gelatinous envelopes, light golden brown, chiefly 7–14 μ diam., smooth.

Type host and locality : On *Polygonum acre* HBK., Argentina.

On Polygonaceae : *Polygonum lapathifolium* L. v. *glabrum* Burt Davy, Natal (M.H. 20435).

Distribution : North America, South America, Europe, Asia, Africa.

The South African specimen is a rather unusual form with the sori on the leaves.

Cintractia Cornu, Ann. Sci. Nat. VI. 15 : 279. 1883.

Anthracoidea Bref. Unters. Gesammt. Myk. 12 : 144. 1895.

Sori on various parts of the host, often in the ovaries, forming a black, usually rather firm, agglutinated, spore mass ; spores simple, usually of medium or large size and of reddish-black colour, formed in a centripetal manner from fertile stroma usually surrounding a central columella of plant tissue, often freed from sorus by absorption of water ; germination apparently of a modified *Ustilago* type.

Type : *Ustilago axicola* Berk., on *Cyperus* sp.³, North America.

Cintractia Melinis Zundel n. sp.

Sori destroying the ovaries, about 1 mm. long, at first agglutinated but later somewhat powdery ; spores globose-ellipsoidal, irregular, somewhat angled, reddish-brown, 7–11 μ diam., apparently smooth but minutely echinulate under oil immersion lens.

Hab. in ovaries of *Melinis tenuinervis* Stapf, Capetown, Cape Province, Union of South Africa, Coll. C. W. Malley, June 12, 1914. M.H. 19860.

Latin description :—

Soris ovaria destruentibus, ca. 1 mm., primum conglutinatis, deinde subpulverulentis ; sporis globosis v. ellipsoideis, irregularibus, subangularibus, rubro-brunneis, 7–11 μ diam., specis levibus sed minute echinulatis (sub oleo visis).

Hab. in ovariis *Melinis tenuinervis* Stapf, Capetown, Cape Province, in Unione Africae australis, Coll. C. W. Malley, June 12, 1914. M.H. 19860.)

¹ The original type of *U. austro-americanum* was described from South America by Spegazzini in Anal. Soc. Ci. Argent. 12 : 63. 1881.

² *Polygonum incarnatum* Auct. is now considered to be *P. lapathifolium* Linn.

³ Clinton suggests, Proc. Boston Soc. Nat. Hist. 31 : 397. 1904, that this was really *Fimbristylis*.

Sorosporium Rudolphi, Linnaea 4: 116. 1829.

Sori in various parts of the host, forming dusty dark coloured spore masses; spore balls composed of numerous fertile cells; often rather loosely united and frequently at maturity completely separating, of medium size; spores usually olive or reddish-brown, of medium size; germination similar to that of *Ustilago*, sometimes with elongated germ thread and no sporidia.

Type: *Sorosporium Saponariae* Rud., on *Saponaria officinalis*. Germany.

* Spores smooth.

Sorosporium pretoriaense Zundel, Mycologia 22: 146. 1930.

Sori in the inflorescence, 3–8 mm. long, broad at the base, covered by a delicate false membrane which flakes away revealing a brown granular spore mass surrounding a well developed columella; spore balls broadly ellipsoidal, opaque, dark reddish-brown, many spored, temporary, usually 38–66 μ , rarely 85 μ diam.; spores globose-subglobose, light olivaceous-brown with a thick yellowish wall, 5–7 μ diam., smooth, contents granular to vacuolated.

Type host and locality: On *Cymbopogon plurinodis* Stapf, Pretoria, Union of South Africa.

On Andropogoneae: *Cymbopogon plurinodis* Stapf, Transvaal (M.H. 10045).

Distribution: Reported only from type locality.

Sorosporium Holstii P. Henn. Pflanzenw. Ost-Afrikas Nachb. C: 49. 1895.

Sori in the inflorescence, long linear, 7 mm. long, covered by an evident false membrane which flakes away revealing a brown granular spore mass surrounding a well developed columella; spore balls subglobose–broadly ellipsoidal, opaque, many spored, 50–114 μ diam.; spores globose–subglobose, light reddish-brown, 5–8 μ diam., smooth.

Type host and locality: On *Themeda triandra* Forsk. (= *Themeda Forskalii* Hack.), Tanganyika Territory (German East Africa).

On Andropogoneae: *Cymbopogon elegans* Spreng., Nyasaland Protectorate; *Themeda triandra* Forsk. (= *Themeda Forskalii* Hack.), Nyasaland Protectorate, Transvaal, Tanganyika Territory, Transvaal (M.H. 9315).

Distribution: Eastern and Southern Africa.

Sorosporium consanguineum Ellis and Ev. Jour. Myc. 3: 56. 1887.

Ustilago Aristidae Peck, Bull. Torrey Club 12: 35. 1885. Not *Sorosporium Aristidae* Neger. *Sorosporium Bornmulleri* P. Magn., Ver. Zool.-Bot. Gesell. (Wien), 50: 434. 1900.

Sori in the ovaries, almost entirely concealed by the glumes though often somewhat visible through them; spore balls subglobose–broadly ellipsoidal, often irregular, at first firm but with age and in old specimens separating and becoming entirely broken down, usually 60–130 μ diam.; spores ovoid-subglobose but chiefly polyhedral, reddish-brown, mostly 6–8 μ diam., smooth.

Type host and locality: On "*Aristida Rusbyi*" (*A. arizonica* Vasey).

On Agrostideae: *Aristida junciformis* Trin. et Rupr., Natal (M.H. 1592, 9763).

Distribution: Central and South-Western United States, Australia, South Africa.

Sorosporium Cenchrhi (Bref.) Zundel n.n.

Tolyposporium Cenchrhi Bref., Unters. Gesamt. Myk. 12: 156. 1895.

Sori in the ovaries, destroying and filling them with spores, concealed by the glumes, covered by a membrane which breaks away revealing a granular spore mass; spore balls subglobose–ellipsoidal frequently irregular, opaque, permanent, relatively few spored, small, 25–35 μ long, occasionally 60 μ ; spores globose–subglobose, frequently angled due to compression within the spore ball, olivaceous-brown, usually 7–8 μ diam., occasionally 10 μ , smooth.

Type host and locality : On *Cenchrus echinatus* Torrey, Rio de Janeiro, Brazil.
 On Paniceae : *Cenchrus ciliaris* L., Transvaal (M.H. 8893).
 Distribution : Brazil and South Africa.

Sorosporium inconspicuum (Pole-Evans) Zundel n.n.

Ustilago inconspicua Pole-Evans in herb.

Sori destroying the ovaries and filling them with a brown, granular mass of spores, about 2 mm. long ; spore balls dark-brown, opaque, many spored, semi-permanent, generally ellipsoidal or irregular, 100–120 μ long ; spores globose-subglobose, often angular, light olivaceous-brown, 7–9 μ diam., smooth.

Type host and locality : On *Digitaria monodactyla* Stapf.

On Paniceae : *Digitaria monodactyla* Stapf, Transvaal (M.H. 9416, 10716).

Distribution : Reported only from type locality.

This species is very closely related to *Sorosporium setariae* McAlpine, but differs in having smaller spores.

Sorosporium Everhartii Ellis and Gall. Jour. Myc. 6 : 32. 1890.

Uredo Syntherismae Rav. (not Schw.) Rav. Fung. Car. II. 90. 1853.

Ustilago Cesati Fisch. v. Waldh. Aperçu 25. 1877. p.p.

Tolyposporium Everhartii Diet. Nat. Pflanz. 11 : 14. 1897.

Sori in the ovules of the spikelets, long linear, 1–2 cm. long, $\frac{1}{2}$ cm. wide, at first concealed by the glumes, covered with an evident false membrane which dehisces from the apex revealing a granular dark brown spore mass ; spore balls globose-ellipsoidal, opaque, dark reddish-brown, rather permanent, many spored, usually 40–125 μ diam. or occasionally 140 μ ; spores globose-subglobose, somewhat irregular and angled, reddish-brown (spores on inner part of spore ball lighter coloured, sometimes almost hyaline), 7–12 μ diam., free surface of outer spores verruculose otherwise smooth.

Type host and locality : On *Andropogon virginicus* Linn., Newfield, New Jersey, United States.

On Andropogoneae : *Hyparrhenia Ruprechtii* Fourn., Transvaal (M.H. 7770).

Distribution : Eastern United States, Congo, South Africa.

Sorosporium¹ verecundum (Sydow) Zundel n.n.

Ustilago verecunda Sydow, Ann. Myc. 33 : 231. 1935.

Sori entirely destroying the ovaries, about 2 mm. long, almost entirely concealed by the glumes, covered by a lemon-yellow false membrane which flakes away revealing a dark brown agglutinated spore mass ; spore balls subglobose-ellipsoidal, many spored, opaque, disintegrating at maturity, 42–66 μ long, occasionally 102 μ long ; spores globose-subglobose, somewhat angled by compression, olivaceous-brown with a narrow reddish-brown epispore, 7–12 μ diam., rarely 14 μ smooth.

Type host and locality : On *Urochloa helopus* Stapf, Wonderboom, Pretoria, Transvaal.

On Paniceae : *Urochloa helopus* Stapf, Transvaal (M.H. 26609).

Distribution : Reported only from type locality.

Sorosporium Zundelianum Ciferri, Nuovo Giron. Bot. Ital. n.s. 40 : 268. 1933.

Ustilago tumefaciens P. Henn. Pflanzenw. Ost-Afrikas C. 5 : 48. 1895.

*Sorosporium tumefaciens*² Zundel, Mycologia 22 : 149. 1930. p.p.

Sori destroying the inflorescence, concealed by the glumes, 1–2 cm. long, long linear somewhat tubular, covered by an evident false membrane which flakes away disclosing

¹ In order to find spore balls it is necessary to secure material from the base of the sorus. The spore balls at the tip of the sorus are usually entirely disintegrated.

² Not *Sorosporium tumefaciens* McAlpine, Smuts of Austr. 184, 1910, (on *Stipa* sp. and *Stipa pubescens* R. Br. in Queensland, Australia).

a dark brown granular spore mass; spore balls globose-ellipsoidal, irregular, opaque, dark brown, many spored, semi-permanent (may be almost entirely disintegrated in old mature specimens), 35–95 μ long; spores globose-ellipsoidal, irregular, often angular, 9–12 μ diam., outer spores echinulate to verruculate on free surface, inner spores mostly smooth.

Type host and locality: On *Hyparrhenia rufa* Stapf (= *Andropogon rufus* Kunth), Kilimandscharo, Rombo, Tanganyika Territory (formerly German East Africa).

On Andropogoneae: *Hyparrhenia rufa* Stapf (= *Andropogon rufus* Kunth), Tanganyika Territory; *Hyparrhenia Tamba* Anders., Natal (M.H. 14167).

Distribution: Southern and Eastern Africa.

Sorosporium Tembuti P. Henn. and Pole-Evans, Bot. Jahrb. (Engler) **41**: 270. 1908.

Sori destroying the inflorescence, 1–3 cm. long or occasionally slightly longer, covered by a false membrane which flakes away revealing a dark brown granular spore mass surrounding a well developed columella; spore balls globose-oblong, opaque, with 60 or more spores, dark brown, 40–90 μ diam.; spores globose-subglobose, sometimes angled, medium to light reddish-brown (spores on inner part of spore ball lighter in colour), 9–11 μ diam. rarely 14 μ , outer spores echinulate on free surface, inner spores smooth.

Type host and locality: On *Hyparrhenia Tamba* Anders., Waterval Onder, Transvaal. (M.H. 169).

On Andropogoneae: *Hyparrhenia Tamba* Anderss. Transvaal (M.H. 169, 1794, 1849).

Distribution: South Africa.

Sorosporium setariae McAlpine, Smuts of Australia 183. 1910.

Sori in the ovaries filling them with a brown mass of spores; spore balls dark-brown, opaque, many spored, variously shaped, globose-subglobose to ellipsoidal, often angled, usually 85–125 μ long, occasionally 160 μ long, semi-permanent; spores globose-subglobose often angular, light olivaceous-brown, 10–12 μ diam., smooth.

Type host and locality: On *Setaria glauca* Beauv., near Cloncurry, Queensland, Australia.

On Paniceae: *Setaria perennis* Hack., Transvaal (M.H. 17269).

Distribution: Australia, South Africa.

This species differs from *Sorosporium inconspicua* (Pole-Evans) Zundel principally by the larger spores.

** Spores not smooth.

Sorosporium austro-africanum Zundel, Mycologia **22**: 147. 1930.

Sori in the inflorescence, long linear, 5–8 mm. long, solitary, covered by an evident yellowish false membrane which dehisces at the apex disclosing a granular spore mass surrounding a well developed columella; spore balls semi-opaque, broadly ellipsoidal, usually 142–190 μ in length but occasionally as small as 47 μ , semi-permanent, many spored, reddish-brown; spores globose-subglobose, irregular, often somewhat angular, light reddish-brown to almost hyaline, thick walled, 6–10 μ diam., usually smooth except spores on the outer portion of spore ball which are verruculose.

Type host and locality: On *Hyparrhenia tampa* Anders., Tugela River, Natal, Union of South Africa.

On Andropogoneae: *Hyparrhenia tamba* Anders., Natal (M.H. 14168).

Distribution: Reported only from type locality.

Sorosporium Healdii Zundel, Mycologia **22**: 147. 1930.

Sori in the inflorescence, concealed by the glumes, attacking the individual flowers and en masse producing a witches' broom-like growth, 2–3 cm. long, covered with a yellowish brown false membrane which dehisces from the apex revealing numerous shreds and a dark brown granular spore mass surrounding a well formed columella; spore balls globose-

broadly ellipsoidal, somewhat irregular, opaque, dark brown, permanent, 30 or more spores, usually 40–70 μ long but occasionally 90 μ long; spores globose-subglobose or broadly ellipsoidal, reddish-brown for the outer spores to almost hyaline for the spores on the inner part of the spore ball, thick walled, 6–10 μ diam., sparingly verruculose under oil immersion.

Type host and locality: On *Hyparrhenia* sp., Pretoria, South Africa.

On Andropogoneae: *Hyparrhenia* sp., Transvaal (M.H. 9732).

Distribution: Transvaal.

Sorosporium afrum Sydow, Ann. Myc. 33: 232. 1935.

Sori entirely destroying the panicles, covered by a brown membrane which ruptures revealing numerous black shreds and spore balls intermixed, 2.5 cm long, spore mass dark brown; spore balls globose-subglobose, dense, many spored, semi-permanent; spores globose-subglobose, somewhat angled, olivaceous-brown, 7–12 μ diam., apparently smooth but under oil immersion lens showing minute echinulations.

Type host and locality: On *Panicum laevifolium* Hack., Transvaal (M.H. 6579).

On Paniceae: *Panicum laevifolium* Hack., Natal (M.H. 11706), Transvaal (M.H. 608, 8932, 8929, 20335).

Distribution: Union of South Africa.

Sorosporium Hotsonii³ Zundel, Mycologia 22: 152. 1930.

Sori in the inflorescence, solitary, 3–5 cm. long, at first hidden by the outer sheath, covered by an evident false membrane which flakes away revealing a brownish granular spore mass intermixed among the shreds; spore balls globose-subglobose, semi-opaque, semi-permanent, reddish-brown, many spored, variable in size, 50–115 μ long; spores globose-subglobose, often somewhat angular, thick walled, light reddish-brown, 8–10 μ diam., under oil immersion abundantly echinulate with vacuolated contents.

Type host and locality: On *Andropogon* sp., Hopefield, Lawley, Transvaal, Union of South Africa.

On Andropogoneae: *Andropogon* sp., Transvaal (M.H. 704).

Distribution: Reported only from type locality.

Sorosporium cryptum McAlpine, Smuts of Australia 176. 1910.

Ustilago cryptum McAlpine, Proc. Linn. Soc. New South Wales 22: 42. 1897.

Sori in the ovaries of spikelets, hidden by the glumes, about 3 mm. long, covered by a thick membrane of host tissue which ruptures revealing a black spore mass surrounding a columella of host tissue; spore balls evanescent, semi-opaque, many spored, variable in size and shape, spheroidal to ellipsoidal, 50–80 μ diam. or larger; spores globose-subglobose or sometimes ellipsoidal, regular, dark reddish-brown, 8–10 μ diam., apparently smooth but minutely echinulate under oil immersion.

Type host and locality: On *Panicum bicolor* R. Br., Braidwood District, New South Wales, Australia.

On Paniceae: *Echinochloa* sp., Transvaal (M.H. 18186).

Distribution: Australia, Union of South Africa.

Sorosporium Clintonii Zundel, Mycologia 22: 153. 1930.

Sori in the inflorescence, large, developing in clusters as a "witches broom," large, 2–6 cm. long, and often 5 mm. wide, at first concealed by the glumes, covered with a dark brown false membrane which dehisces apically revealing a granular spore mass intermixed with shreds; spore balls globose-oblong, irregular, often angled as so to appear rectangular, opaque, permanent, many spored, dark reddish-brown, ranging from 47–133 μ long, but

³ In the original description the author misspelled the species name. Since the specific name is for Dr. J. W. Hotson of the University of Washington, Seattle, the name should not be *S. Hodsonii*.

mostly 66–114 μ long; spores globose–subglobose, irregular, often angled, thick walled, about 1.5 μ , dark reddish-brown (spores on inner part of spore ball lighter colour, mostly tinted brown), 8–17 μ diam., verruculose on free surface.

Type host and locality: On *Hyparrhenia Tamba* Anders., Waterkloof, Pretoria, Transvaal, Union of South Africa.

On Andropogoneae: *Hyparrhenia Tamba* Anders., Transvaal (M.H. 9693).

Distribution: Reported only from type locality.

Sorosporium panici¹ MacKinnon, Jour. and Proc. Roy. Soc. N.S. Wales 46: 210. 1912.

Sori in the ovaries, at first concealed by the glumes but later protruding, 3 mm. long, covered by a delicate membrane which flakes away revealing a granular spore mass surrounding a well formed columella; spore balls globose–ellipsoidal, somewhat irregular, 60–105 μ long, many spored, semi-permanent, in old or mature specimens almost entirely disintegrating; spores globose–subglobose, irregular, somewhat angular, olivaceous-brown, 8.5–11 μ diam., densely echinulate.

Type host and locality: On *Panicum flavidum* Retz., Nyngan Experimental Farm, New South Wales, Australia.

On Paniceae: *Panicum maximum* Jacq., Rhodesia (M.H. 14000), Transvaal (M.H. 20).

Distribution: Australia, South Africa.

Sorosporium proliferatum Zundel, Mycologia 22: 150. 1930.

Sori as large proliferations in the inflorescence resembling miniature ears of corn (maize), 2–8 cm. long, concealed by large outer glumes, covered by an evident false membrane which flakes away revealing a dark brown, granular spore mass intermixed with shreds; spore balls globose–ellipsoidal or sometimes angular, opaque, many spored, permanent, usually 45–60 μ long, occasionally 85 μ long.

The spores in the outer part of the spore ball dense, dark reddish-brown, while the inner spores are nearly hyaline, somewhat irregular in size and shape, ranging from globose–subglobose, occasionally angled, most commonly 9–12 μ diam., abundantly verruculose under oil immersion.

Type host and locality: On *Hyparrhenia aucta* (Stapf) Stent, Waterval Boven, Union of South Africa.

On Andropogoneae: *Hyparrhenia aucta* (Stapf) Stent, Transvaal (M.H. 11336).

Distribution: Reported only from type locality.

Sorosporium Reilianum (Kuhn) McAlpine, Smuts of Australia 181. 1910.

Ustilago reiliana Kuhn, Rab. Fungi Eur. 1998. 1875.

Ustilago Reiliana Zeae Pass., Rab. Fungi Eur. 2096. 1875.

Ustilago pulveracea Cooke, Grevillea 4: 115. 1876.

Cintractia Reiliana G. P. Clinton, Bull. Ill. Agr. Exp. Sta. 57: 346. 1900.

Ustilago (Cintractia) Reiliana foliicola Kell., Ohio State Univ. Natural. 1: 9. 1900.

Sphacelotheca Reiliana G. P. Clinton, Jour. Myc. 8: 141. 1902.

Sori occurring in either ♂ or ♀ inflorescence, usually causing complete destruction, covered with an evident membrane of host tissue which ruptures disclosing a brown spore mass and numerous columellae, the sori are frequently covered by proliferations of the tassel or ear; spore balls irregular in shape, generally opaque, dark reddish-brown, easily dis-

¹ *Sorosporium Beelii* Zundel nov. comb.

Sorosporium panici Beeli, Bull. Jard. Bot. Brux. 8: 7. 1923.

Type host and locality: On *Panicum* sp., Bomba, Congo, Africa.

The name *Sorosporium panici* MacKinnon (1912) has preference over *Sorosporium panici* Beeli (1923). These species differ in size of spore balls and spores. *S. panici* MacKinnon has spore balls 60–100 μ with echinulate spores 8.5–11 μ diameter. *S. panici* Beeli has spore balls 150–180 $\times$ 100 μ with smooth spores 6–8 μ diameter. The name *Sorosporium Beelii* nov. comb. is therefore proposed in place of *Sorosporium panici* Beeli.

integrating at full maturity of spores; spore balls found only in young specimens, 76–150 μ diam.; spores globose-subglobose, occasionally somewhat angled, thick walled, reddish-brown, 9–14 μ diam., abundantly echinulate under the oil immersion.

Type host and locality: On *Sorghum vulgare* Pers., Cairo, Egypt.

On Andropogoneae: *Sorghum vulgare* Pers. v. *caffrorum* (Thun.) Hubb. et Rehd. (= *Sorghum caffrorum* Beauv.), Tanganyika Territory (M.H. 20645); *Sorghum halepense* Pers.*, Natal; *Sorghum* sp., Tanganyika Territory (M.H. 20651); *Zea Mays* Linn., Cape Province*, Natal*, Orange Free State (M.H. 10064), Transvaal (M.H. 11, 505, 1480, 2142, 6586).

Sorosporium Simii¹ P.Henn. and Pole-Evans, So. Afr. Jour. Sci. **12**: 543. 1916.

Sori destroying the inflorescence, long linear, 5–7 cm. long, 1–3 cm. wide, covered with a thick dark brown false membrane which flakes away disclosing a granular spore mass intermixed with numerous long shreds; spore balls globose-subglobose, not permanent, opaque, many spored; sterile tissue rather permanent but breaking up chiefly into groups or sometimes chains of sterile cells, rarely singly, tinted brown or dark brown; sterile cells about the size of the spores; distinctive globose groups of sterile cells consisting of 4–6 cells are scattered through the sori, 19–36 μ diam.; spores globose-subglobose, olivaceous to reddish-brown, 9–13 μ diam., under oil immersion, finely echinulate with granular contents.

Type host and locality: On *Sorghum halepense* Pers., Natal, Union of South Africa.

On Andropogoneae: *Sorghum halepense* Pers., Natal (M.H. 8978, 10031); ? *Sorghum* sp., Transvaal (M.H. 11324).

Distribution: Union of South Africa.

Sorosporium filiferum (W. Busse) Zundel.

Tolyposporium filiferum W. Busse, Arb. Biol. Abt. Landw. Forstw. Kaiserl. Gesundheit **4**: 383. 1904.

Sori destroying the ovaries, cylindrical elongate, 1–3 cm. long and 5–10 mm. wide, often curved at the end, covered by a thick membrane which ruptures apically revealing long dark brown shreds and a granular spore mass; spore balls subglobose-oblong, opaque, rather permanent, many spored, dark brown, 55–115 μ long; spores globose-subglobose, inner spores light yellowish brown, outer spores dark brown, 9–14 μ diam., inner spores smooth, outer spores papillate on free surface.

Type host and locality: On *Sorghum* cult., Kenya Colony.

On Andropogoneae: *Sorghum vulgare* Pers. v. *caffrorum* (Thun.) Hubb. et Rehder., Union of South Africa.

Distribution: Africa.

Sorosporium versatilis (Sydow) Zundel n.n.

Ustilago versatilis Sydow, Ann. Myc. **33**: 231. 1935.

Sori entirely destroying the inflorescence, oblong, 2–3 cm. long, at first covered by a brownish membrane which dehisces apically revealing a dark brown agglutinated spore mass and elator-like shreds; spore balls permanent, many spored, opaque, usually ovoid but sometimes irregular, usually 65–100 μ long; spores globose-subglobose, somewhat angled due to compression, 10–13 μ diam., dark reddish-brown, under oil immersion abundantly but minutely verruculose.

Type host and locality: On *Panicum longijubatum* Stapf. (= *Panicum proliferum* Lam. var. *paludosum* Stapf.).

On Paniceae: *Panicum longijubatum* Stapf., Cape Province (M.H. 9550.).

Distribution: Reported only from type locality.

¹ *Sorosporium Simii* is probably related to but very distinct from *Sorosporium reilianum* by the possession of large groups or chains of sterile cells throughout the sori. These groups of sterile cells are very distinctive and usually consist of from four to six cells. The sterile cells found in *Sorosporium reilianum* are from the disintegration of the false tissue that surrounds the sori, and are not scattered through the sorus.

Sorosporium Maranguense P. Henn., Pflanzenw. Ost-Afrikas Nachb. C : 49. 1895.

Sori in the inflorescence, at first covered by the leaf sheaths but later protruding, 3-6 cm. long, covered by an evident membrane which flakes away revealing a granular spore mass intermixed with shreds; spore balls subglobose, angular, many spored, semi-permanent, 35-65 μ long; spores subglobose, angular, irregular, thick walled, light reddish-brown (almost a yellow), inner spores lighter coloured, the thick wall dark reddish-brown, 10-14 μ diam., verruculose on free surface.

Type host and locality: On *Hyparrhenia Tamba* Anderss. (= *Andropogon lepidus* Nees), Tanganyika Territory (German East Africa).

On Andropogoneae: *Hyparrhenia Tamba* Anderss., Tanganyika Territory.

Distribution: Reported only from type locality.

Sorosporium pseudomaranguense Zundel n.sp.

Sori in the inflorescence, 3-5 cm. long, at first concealed by the sheath, later the tips protrude, covered by an evident membrane which flakes away revealing a dark brown spore mass; spore balls ovoid-ellipsoidal, dense, many spored, semi-permanent, 35-85 μ diam.; spores subglobose, angular, irregular, olivaceous-brown with a thick reddish-brown episporium, 10-14 μ diam., outer spores densely verruculose on the free surface, inner spores smooth.

Hab. in the inflorescence of *Andropogon* sp., Mooi River, Natal, Union of South Africa, Coll. A. O. D. Mogg, March 21, 1917. (M.H. 10073.) Host det. by Agnes Chase, Smithsonian Institution, Washington, D.C.

This species is closely related to *Sorosporium maranguense* P. Henn.

Latin description:—

Soris in inflorescentia, 3-5 cm. longis, primum spatha tectis, deinde apicibus protrudentibus, membrana conspicua tectis, membrana decadenti et atro-brunneum sporarum globum revelante; glomerulis sporarum ovoideis v. ellipsoideis, densis, multisporis, semi-permanentibus, 35-85 μ diam.; sporis subglobosis, angularibus, irregularibus, olivaceo-brunneis, 10-14 μ diam.; episporio denso, irregulari, rubus-brunneo; sporis externis in superficie dense verruculosus, sporis internis levibus.

Hab. in inflorescentia *Andropogonis* sp., Mooi River, Natal, in Unione Africae australis. Hospes ab Agnes Chase det.

Sorosporium Flanaganianum Zundel, Mycologia 22 : 155. 1930.

Sori in the inflorescence, broad, long linear, 2-4 cm. long, solitary, covered by a thick brown false membrane which flakes away revealing a brown granular spore mass intermixed with fine shreds; spore balls globose-subglobose, semi-permanent, opaque, dark reddish-brown, usually 75-95 μ long, rarely as small as 47 μ , spores subglobose, irregular, angular, reddish-brown, 10-14 μ diam., echinulate under oil immersion.

Type host and locality: On ? *Andropogon* sp., Emmasdale, Heidelberg, Transvaal, Union of South Africa.

On Andropogoneae: ? *Andropogon* sp., Cape Province (M.H. 9423), Transvaal (M.H. 713).

Distribution: South Africa.

Sorosporium harrismithense Zundel, Mycologia 22 : 154. 1930.

Sori in the inflorescence, 3-4 cm. long, 5-6 mm. wide, solitary, covered by a brown false membrane which dehisces apically revealing a granular spore mass intermixed with numerous shreds; spore balls globose-subglobose, opaque, semi-permanent, dark reddish-brown, 47-105 μ long; spores globose-broadly ellipsoidal, angular, thick walled, reddish-brown, 10-14 μ diam., echinulate under oil immersion.

Type host and locality: On *Panicum laevifolium* Hack., Harrismith, Union of South Africa.

On Paniceae: *Panicum laevifolium* Hack., Orange Free State (M.H. 1473).

Distribution: South Africa.

Tolyposporium Woronin, Abh. Senck. Nat. Ges. **12**: 577. 1882.

Sori usually in the inflorescence, more especially in the ovaries, forming a granular spore mass at maturity; spore balls dark coloured, composed of numerous spores permanently united, of medium size; spores bound together by ridged folds or thickenings of their outer walls, of small to medium size; germination about as in *Ustilago*.

(Upon rupture, by pressure, of the spore balls the thickenings or ridges often show as reticulations or as spine-like processes at the margins of the lighter coloured spores. There is a tendency to put species of *Sorosporium* with rather permanent spore balls into this genus.)

Type: *Sorosporium Junci* Schröt., on *Juncus bufonius* Linn., Germany.

Tolyposporium tristachydis (Sydow) Zundel n.n.

Sorosporium tristachydis Sydow, H. & P. Bot. Jahrb. (Engler) **45**: 263. 1910.

Sori in the ovaries, hidden by the outer glumes, at first covered by a delicate membrane which ruptures revealing a granular spore mass; spore balls permanent, held firmly together by outer folds in the spores, many spored, globose to ellipsoidal, dark reddish-brown, usually 50–80 μ diam., occasionally 109 μ ; spores globose-subglobose or ellipsoidal, somewhat angular, reddish-brown (spores on the inner part of the spore balls lighter coloured), 10–15 μ diam., smooth.

Type host and locality: On *Tristachya* sp., Leimde, Cameroon, Africa.

On *Tristachya Rehmanni* Hack., Transvaal (M.H. 9436).

Distribution: Africa.

A portion of the type specimens from the Clinton herbarium has been used for this description.

Family II.—TILLETIACEAE.

Tilletia Tulasne Ann. Sci. Nat. Bot. III. **7**: 112–113. 1847.

Sori in various parts of the host, usually in the ovaries but occasionally on the leaves, forming a dusty spore mass; spores simple, usually formed singly in the ends of the mycelial threads that disappear more or less completely through gelatinization, of medium to large size; germination usually by a short non-septate promycelium which bears a terminal cluster of elongated sporidia that usually fuse in pairs which may, in nutrient solution, give rise to a considerable mycelium bearing secondary air conidia.

Spores are formed from hyphae, which swell up in a gelatinous manner.

Type *Uredo Caries* DC. on *Triticum vulgare* Linn., Europe.

Tilletia foetans (B. & C.) Trel. Wisc. Acad. Sci. Trans. **6**: 139. 1886.

Ustilago foetans Berk. & Curt. Rav. Fungi Carol. **100**. 1860.

Ustilago foetans Berk. & Curt. Hedwigia **3**: 59. 1874.

Tilletia laevis Kuhn, Rabenh. Fungi Eur. **1697**. 1873.

Sori in the ovaries, foetid, ovate-oblong, 5–7 mm. diam., protruding between the protecting glumes, when ruptured revealing a brownish spore mass; spores globose-subglobose or elliptical, often somewhat angled, light to dark olivaceous-brown, 16–21 μ diam., smooth.

Type host and locality: On *Triticum vulgare* Vill., North Carolina, United States.

On Hordeae: *Triticum vulgare* Vill., Cape Province, Transvaal (M.H. 1909).

Distribution: Co-extensive with cultivated wheat.

Tilletia heterospora (P. Henn.) Zundel n.n.

Ustilago heterospora P. Henn. Pflanzenw. Ost-Afrikas Nachb. C. **5**: 48. 1895.

Tilletia Ayresii Berk.¹, Massee in Bull. Misc. Inf. Kew 153 : 146. 1889. (Type on *Panicum maximum* Nees, hill above Port Lewis, Mauritius. Ayes No. 4754. Type in Kew Herbarium.)

Sori in the ovaries, ovoid, inflated, 3–5 mm. diam., covered by an olivaceous, leathery membrane which ruptures revealing a dark olivaceous, semi-agglutinated spore mass; sterile spores globose-subglobose, hyaline, spiny, of two general sizes, 10–12 μ and 19–21 μ diam.; bifurcate conidiophores abundant; spores globose-subglobose, regular, light olivaceous-brown, usually 13–16 μ diam., coarsely echinulate to spiny.

Type host and locality: On *Panicum maximum* Nees, Tanganyika Territory.

On Paniceae: *Panicum laevifolium* Hack., Transvaal (M.H. 7); *Panicum maximum* Jacq., Mauritius, Natal (M.H. 15443, 17081), Portuguese East Africa (M.H. 8399), Rhodesia, Tanganyika Territory; *Panicum* sp., Transvaal (M.H. 11717).

Distribution: Africa, Islands of Indian Ocean.

Tilletia Triticici (Bjerk.) Wint. Rab. Krypt.-Fl. 11 : 110. 1881.

Lycoperdon Triticici Bjerk. Kgl. Schmed. Akad. Wiss. Abhandl. 37 : 326. 1775.

Uredo caries DC. Fl. Fr. 6 : 78. 1815.

Caeoma segetum Nees, Syst. Pilze 1 : 14. 1817.

Uredo sitophila Ditm. Sturm's Deuts. Fl. III. 1 : 69. 1817.

Uredo foetida Bauer, Ann. Sci. Nat. Bot. I. 2 : 167. 1884.

Caeoma sitophilum Link, Willd. Sp. Pl. 62 : 2. 1825.

Erysibe foetida Wallr. Fl. Crypt. Germ. 2 : 213. 1833.

Tilletia caries Tul. Ann. Sci. Nat. Bot. III. 7 : 113. 1847.

Ustilago sitophila Bon. Kennt. Con. Crypt. 27. 1860.

Sori in the ovaries, showing between the glumes, 5–6 mm. long, upon rupturing disclosing a reddish-brown spore mass; sterile cells few, subglobose, hyaline, thin walled, 14 μ diam.; spores globose-subglobose, regular, light to dark olivaceous brown, 16–20 μ diam. or slightly larger occasionally, winged reticulations about 1 μ high and 2–3 μ broad.

Type host and locality: On *Triticum vulgare* Vill., Sweden.

On Hordeae: *Triticum vulgare* Vill., Cape Province, general through region.

Distribution: Co-extensive with cultivated wheat.

Tilletia Viennotii Syd. Ann Myc. 35 : 2589 25, 1937.

Sori filling the ovaries with a dark coloured spore mass, diseased ovaries larger than normal ones, hidden by the glumes; spores globose-subglobose, regular, with irregular polygonal reticulations, dark reddish-brown, 18–25 μ diam., reticulations projecting on the margin of the spores, 3–3.5 μ .

Type host and locality: *Briza maxima* Linn., Madeira Islands.

On Festuceae: *Briza maxima* Linn., Capetown, (M.H. 14679).

Distribution: Madeira Islands, South Africa.

Tilletia transvaalensis Zundel, Mycologia 23 : 299. 1931.

Sori in the ovaries, about 1 mm. long, at first concealed by the glumes but later the tip protrudes slightly, infected spikelets scattered throughout the panicle; hyaline sterile cells smaller than the spores; spores globose-subglobose, regular, yellowish to reddish-brown, 20–26 μ diam., abundantly echinulate under oil immersion.

Type host and locality: On *Eragrostis aspera* Nees, Mucklenburg, Zebediela, Transvaal, Union of South Africa.

On Festuceae: *Eragrostis aspera* Nees, Transvaal (M.H. 25463).

Distribution: Reported only from type locality.

¹ Miss E. M. Wakefield first called attention to the fact that *Ustilago heterospora* P. Henn. and *Tilletia Ayresii* Berk. were identical in "Notes on Uganda Fungi," Bull. Misc. Inf. Kew 9 : 290, 1920. Berkeley, however, was correct in considering the fungus a *Tilletia*, in Massee, George "A Revision of the Genus *Tilletia*" Bull. Misc. Inf. Kew 153 : 146, 1899. The Royal Botanic Gardens, Kew, kindly supplied type material of *Tilletia Ayresii* Berk. for examination.

Tuburcinia (Fries)¹ Woronin, emend. Abh. Sensk. Nat. Ges. 12: 561. 1882. (Fries, Syst. Myc. 3: 439. 1829.)

Sori usually in the leaves or stems, forming dark coloured often papillate areas, rather permanently embedded in the tissues; spore balls composed entirely of firmly united fertile cells; of medium size; spores usually dark coloured, variable, of medium size; sometimes preceded by conidia², forming a conspicuous white growth on the surface of leaves, hyaline, oblong to ovate.

Type: *Tuburcinia Trientalis* B. & Br., on *Trientalis europaea* Linn., Europe.

To date no species of this genus have been reported from South Africa. They are usually found in cold climates.

Urocystis Rabenhorst, Klotzsch, Herb. Viv. Myc. ed. 2. 393. 1856.

Polycystis Lev. Ann. Sci. Nat. III. 5: 269. May 1846, not *Polycystis* Kutz., Jan. 1846.

Sori usually in the leaves or stems, occasionally in other parts, producing dark coloured usually dusty spore masses; spore balls permanent, composed of an enveloping cortex of tinted sterile cells and from one to several interior fertile cells, of small to medium size; spores usually dark coloured, variable, of medium size; the balls of spores are developed inside coils of hyphae, which become entwined together and swell up in a gelatinous manner; the central spores on germination give rise to a promycelium, with terminal sporidia which do not as a rule fuse in pairs, but grow out directly into mycelia.

Type: *Erysibe occulta* Wallr., on *Secale cereale* Linn., Europe.

Urocystis Tritici Koern. Hedwigia 16: 33. 1877.

Tuburcinia tritici Liro, Ann. Univ. Fenn. Aboensis, Ser. A. 1: 17. 1922.

Sori in the leaves, culms and leaf sheaths as long striae, covered by a leaden coloured membrane which when ruptured reveals a dark brown spore mass; spores variable in shape, globose-ellipsoidal, often irregular, usually with 1-2 fertile spores, sometimes 3-4, rarely 5, dark reddish-brown surrounded by lighter coloured sterile cells, chiefly 24-32 μ diam.; spores globose-ellipsoidal, dark reddish-brown, 10-17 μ diam., smooth; sterile cells usually completely enveloping fertile spores, globose-ellipsoidal, pale yellow, 7-12 μ diam., smooth.

Type host and locality: On *Triticum vulgare* Vill., New Holland, Australia.

On Hordeae: *Triticum dicoccum* Schrank.*: Cape Province; *Triticum durum* Desf.*, Cape Province; *Triticum turgidum* Linn.*, Cape Province; *Triticum vulgare* Vill., Cape Province, Transvaal (M.H. 12454, 13050, 13049).

Distribution: Australia, South Africa, Central United States, Japan, India, Egypt, China.

Urocystis Ornithoglossi (Sydow) Zundel n.n.

Tuburcinia Ornithoglossi Sydow, Ann. Myc. 33: 233. 1935.

Sori in the leaves as inconspicuous lead coloured pustules about 2 mm. long, sometimes becoming confluent and then longer, covered by the epidermis, spore mass dark brown, granular; spore balls usually with one (rarely two or three) spore entirely surrounded by numerous outer sterile cells, usually 17-24 μ diam., rarely 31 μ ; outer sterile cells globose-subglobose, light olivaceous-brown, about 7 μ diam.; spores globose-subglobose, dark reddish-brown, 10-14 μ diam.

Type host and locality: On *Ornithoglossum glaucum* Salisb.

On Liliaceae: *Ornithoglossum glaucum* Salisb., Transvaal (M.H. 1888).

Distribution: Reported only from type locality.

¹ Fries in 1829 was the first to use the term *Tuburcinia* as a genus name. In 1882, Woronin emended the genus so that it did not include any of Fries' original species. In 1922, Liro (Über die Gattung *Tuburcinia* Fries, Ann. Univ. Fenn. Aboensis, A. 1: 1-153, 1922) combined the two genera *Urocystis* Rabenh. and *Tuburcinia* Woronin under the one genus *Tuburcinia* Fries. In so doing he includes species that are cytologically and morphologically dissimilar and only adds confusion to the taxonomy of the Ustilaginales.

² *Tuburcinia Trientalis* B. & Br. is the only species known to produce conidia.

Entyloma De Bary, Bot. Zeit. **32** : 101. 1874.

Rhampbospora D. D. Cunningham, Sci. Mem. Med. Off. Army India **3** : 32. 1888.

Sori usually in the leaves, generally forming discoloured but little distorted areas, spores simple, produced terminally or intercalary on any part of the fertile mycelium which is intercellular and never entirely disappears through gelatinization, free (sometimes adhering irregularly through pressure), hyaline to yellowish or reddish-yellow, occasionally dark coloured, of medium size; germination by a short promycelium bearing a terminal group of sporidia which usually conjugate in pairs and produce secondary sporidia or infection hyphae: conidia often present, hyaline usually elongate formed by germination of the spores in situ; or on the mycelium produced through the stomata.

Type: *Protomyces microsporus* Ung., on *Ranunculus repens*, Germany.

Entyloma Zinniae Sydow, Ann. Myc. **33** : 233. 1935.

Sori as orbicular to irregular spots in the leaves, 2-5 mm. diam., showing best on the upper surface, at first yellowish then brown; spores globose-subglobose, regular, with a regular equal episporium about 2 μ , tinged olivaceous-brown, 8-10 μ diam., occasionally 14 μ .

Type and locality: On *Zinnia pauciflora* Linn.

On Compositae: *Zinnia pauciflora* Linn., Transvaal (M.H. 14256).

Distribution: Union of South Africa.

Entyloma Bidentis P.Henn. Pflanzenw. Ost-Afrikas C. **5** : 49. 1895.

Sori in the leaves, forming roundish brown spots visible on both upper and lower surfaces, 2-3 cm. diam., often coalescing, at first yellowish then chestnut brown; spores subglobose, irregular, contents sometimes with small greenish granules, olivaceous yellow, 10-14 μ diam., episporium 1-1.5 μ thick, smooth.

Type host and locality: On *Bidens pilosa* Linn., Tanganyika Territory.

On Compositae: *Bidens pilosa* Linn., Cape Province (M.H. 8853), Tanganyika Territory, Transvaal (M.H. 1508).

Distribution: Eastern and Southern Africa.

Entyloma australe Speg. Anal. Soc. Cien. Argent. **10** : 5. July, 1880.

Protomyces Physalidis Kalchb. Grevillea **9** : 22. Sept., 1880.

Entyloma Besseyi Farl. Bot. Gaz. **8** : 275. 1883.

Entyloma Physalidis Wint. Hedwigia **22** : 130. 1883.

Sori in the leaves and often in the inflated calyx, forming at first light coloured and later darker coloured, slightly raised (on lower side of leaf) spots, roundish, often angular, 0.5-7 mm. or more in diam.; spores globose-subglobose, sometimes angled, with a thick darker coloured episporium, light reddish-brown, 10-15 μ diam., smooth; conidia forming whitish epi- or hypophyllous growth, linear, somewhat curved, usually 30-55 $\mu \times 1-2 \mu$.

Type host and locality: On *Physalis hirsuta* Duncan, Argentina.

On Solanaceae: *Physalis minima* Linn., Transvaal (M.H. 1509, 5638, 11008, 14126); *Physalis peruviana* Linn., Cape Province (M.H. 10028), Transvaal.

Distribution: North America, South America, South Africa.

Entyloma Dahliae H. & P. Sydow, Ann. Myc. **10** : 36. 1919.

Sori as orbicular to elliptical spots on the leaves, pale but definite and conspicuous, 1-10 mm. long; spores globose, pale olivaceous-brown, evenly coloured including the episporium, 9-14 μ diam., episporium 1-2.5 μ ; conidia unreported.

Type host and locality: On *Dahlia variabilis* Desf., Harden Heights, Natal, Union of South Africa.

On Compositae: *Dahlia variabilis* Desf., Natal (M.H. 860, 19761), Transvaal (M.H. 18023).

Distribution: Europe, Central America, South Africa, South Rhodesia.

APPENDIX A.

The following species have been reported from South Africa and adjacent territory but no specimens have been available for examination.

Sphacelotheca Panici-miliacei (Pers.) Bubak, Naturw. Landes. Böhmen 15 : 26. 1916.

Uredo segetum panici-miliacei Pers. Synop. Meth. Fung. 224. 1801.

Uredo carbo Panici miliacei DC. Fl. Fr. 6 : 76. 1815.

Uredo destruens Duby, Bot. Gall. 2 : 901. 1824.

Erysibe Panicorum Wallr., Fl. Crypt. Germ. 2 : 216. 1833.

Ustilago Carbo destruens Lev. Ann. Sci. Nat. III. 8 : 372. 1848.

Ustilago destruens Schlecht. Rab. Herb. Myc. No. 400.

Ustilago panici-miliacei Wint. Rab. Krypt.-Fl. 11 : 89. 1881.

Sorosporium Panici-miliacei Tak. Bot. Mag. (Tokyo) 16 : 183. 1902.

Ustilago Panici-miliacei (Pers.) Wint. Die Pilze p. 89, Schroet. Pilze Schles. p. 268, Bref. Untersuch. V, pag. 97, tab. 7, fig. 9-24, *Uredo* (*Ustilago*) *segetum* var. *Panici-miliacei* Pers. Syn. Fung. p. 224, *Uredo Carbo* var. d. DC. Flor. Franc VI, pag. 76, *Caeoma destruens* Schlecht. Fl. Berol. II, p. 130, *Uredo destruens* Duby Bot. Gall. II, p. 216, n. 1670, *Ustilago Carbo* var. *destruens* Tul. Ann. Sci. Nat. III. 7 : 81. 1847, *Tilletia destruens* Lev. Ann. Sci. Nat. III. 8 : 372. 1848, *Ust. destruens* Schlecht. in Rabenh. Herb. Myc. nov. n. 400.— Soris atris, pulverulentis, flores destruentibus; sporis globosis vel ellipsoideis, 9-12 8-10, raro angulatis, episporio flavo-brunneo levi vel punctulato instructis; promycelio filiformi cylindraceo, plerumque 3-septulato, articulis, anastomosantibus; oblongo-ellipticis vel ovoideis.*

Hab. in floribus paniculisque *Panici-miliacei*, *P. carthaginiensis* et *P. Crus-galli*, Gallia, Germania, Amer. bor. (Ravenel) nec non pr. Montivideo Americae australis (Archaeo valeta sec. Winter). (Saccardo Syll. Fung. 7 : 454-455. 1888.)

Tolyposporium Anthistiriae Cobb. in Agric. Gaz. New South Wales, 1892, p. 1006, cum ic, Syll. XIV, p. 426, *Tolyposporium Anthistiriae* P. Henn. Hedwigia 1898, pag. 283.— Sori in spicis easque destruentibus, cylindratis, 2-5 cm. longis, epidermide dein lacerata flavescens tectis; glomerulis oblongis vel subglobosis aterrimis, 70-100 μ diam.; sporis subglobosis v. ellipsoideis, primo hyalinis, dein cinnamomeis v. atris, 9-14** 8-12, episporio minutae verrucoso-punctulato, 1 μ crasso.

Hab. in spicis *Anthistiriae* spec. in Africa centr. (Schweinfurth) et Australia (Cobb). — Sec. Cobb loc. cit. massa sporarum 40-150 μ diam.; cellulae singulae 8-14 μ . longa. Ergo species homonyma posterior cl. Henningsii eadem videtur. (Saccardo Syll. Fung. 16 : 378. 1902.)

Tolyposporium setariicolum H. et P. Sydow Ann. Myc. 10 : 77. 1912. Soris in spicis evolutis easque omnino destruentibus, haud tumefacientibus atris; glomerulis rotundatis, ellipticis v. forma irregulari, 35-70 μ diam., ex sporis numerosissimis compositis, sub-firmis; sporis angulato-globosis v. angulato-ellipsoideis, brunneis, 7-10 $\times$ 6-9, verrucis facile deciduis obsitis.

Hab. in foliis *Setariae aureae* (Graminaceae), Sadderiberg Kamerun, Africae (C. Ledermann, no. 4803, 30.7.1909) — A *Tol. pampeano* Speg. quoque in *Setaria* omnino diversum. (Saccardo Syll. Fung. 23 : 620. 1925.)

Tolyposporium Penicillariae Bref. Unters. XII, p. 154, tab. IX, fig. 35-40. — Soris in quaque spica solitariis, ovariiculis, bullam magnam globosam efformantibus, nigris, glomerulis sporarum variae magnitudinis ac formae, plerumque subglobosis v. ovoideis; sporis solitariis dilutioribus, 10-12 μ diam., vix distincte verrucosis, flavo-brunneis; promycelio gracili, 8-loculari; sporidiolis capiosissimis, ad septu evolutis.

Hab. in inflorescentiis *Penicillariae spicatae*, Simla Indae Orient. (Barclay). (Saccardo Syll. Fung. 14 : 426. 1899.)

Uredo pilulaeformis, n.s.; sporis fusco-nigris irregularibus vel subglobosis regosiusculis plus minus connatis conglomeratis immixtis minoribus effaetis massam compactam non rimosam efformatibus, Zeyher, n. 89.

Destroying the germens of some species of *Juncus*. Uitenhage. December.

Resembling very strongly *U. urceolorum*, and, like that, infesting the germen, and forming little globose or elliptic, pill-like bodies, consisting of a compact mass of deep brown, irregular, subglobose, often angular, more or less connate, slightly rugose spores, mixed with smaller globose, sub-elliptic, hyaline bodies, which appear to be abortive sporidia. They become yellow when treated with iodine, and therefore are not fecula. In the centre of the mass, towards the base, there is sometimes a pale clavate columella, extending half way up the mass, but this is not always present. The surface of the mass is not cracked, at least in the specimens before me.

This species resembles very much *U. urceolorum*, but in that the spores are distinct and echinulate, and they are not mixed with abortive spores, or if so, in a very slight degree. The two species are certainly very nearly allied, but are, I believe, distinct. (Berkeley. M. J. Enumeration of fungi collected by Herr Zeyher in Uitenhage. Jour. Bot. (London) 2: 523-524. 1843.) See *Cintractia piluliformis* (Berk.) P. Henn.

Ustilago Danthoniae Kalchbr. Grevillea 11: 18. — Sporis globosis 36 μ ., granulosi, atro-fuscus.

Hab. in spicis *Danthoniae papposae*, in summo monte Chumiberg, prope stationem Missionis evangelicae "Lovedale" dictam (Rev. T. Buchanan)—Haud procul distat *Ust.?* *Salveii*, sed haec soris linearibus folia modo occupat, non vero spicas "An potius *Tilletia?*" (Saccardo Syll. Fung. 7: 373. 1902.)

P. Hennings in Hedwigia 34: 328. 1895, adds to the description of *Ust. Danthoniae* Kalchbr. as follows: "Die sporen werden von Kalchbrenner mit 36 μ im Durchmesser angegeben. Dieselben sind jedoch wie bei den vorliegenden Original-Exemplaren, kugelig, schmutziggelblich, granuliert, 10-15 μ im Durchmesser." (Saccardo Syll. Fung. 7: 373. 1902.)

Ustilago Dregeana Tul. in Ann. Sci. Nat. 1847, p. 83, t. III, f. 13, Fisch. Apercu p. 21.

Soris atris, deformantibus; sporis globosis vel ovideo-obtusis, 4-5 μ diam., ex olivaceo brunneo-arantiacis, papillosus.

Hab. in pedunculis inflorescentiae graminis cujusdam in C. Bonae Spei (Drege) et *Cynodontis Dactyli* Somerset East Africae australis (Mac Owan) = Teste Kalchbrenner in Grevillea 11: 18 inflorescentiam, adhuc in vagina latentem prorsus deformantem, fungillus pulvere atro obducit. Sed ex Kalchbrenner l.c.; sporae sunt majores, 12-15 μ diam. leviter tuberculatae huic ad aliam speciem forte spectantes. (Saccardo Syll. Fung. 7: 467. 1888.)

Ustilago Penniseti Rabenh. in Hedwigia 1871, pag. 18, Fisch. Apercu. p. 14, p.p.

Uredo (Ustilago) trichophora var. *Penniseti* Kunze in Flora, 1830, p. 369, *Ustilago Carbo* 1 *columellifera* b. *trichophora* Tul. in Ann. Sci. Nat. 1847, p. 81. —

Soris clausis, firmulus, atris, colulella regida a basi divisa instructis; sporis magnitudine diversissimis, 5.5-12 μ diam., valde irregulariter globosis, saepe subangulosis, conglobatis non vel vix punctatis, episorio crassissimo, 1.8-2 μ crasso, brunneis.

Hab. in ovariis *Penniseti dichotomi*, *vulpini*, *cenchroidis* et *fasciculati* in Aegypto (Schwein-furth) et insula Maderia (Schroeter). (Saccardo Syll. Fung. 7: 462. 1888.)

Ustilago piluliformis (Berk.) Tul. in Ann. Sci. Nat. 1847, p. 93, t. V, f. 27-30, *Uredo piluliformis* Berk. Fungi Uitehn. p. 507, t. XXII, f. 6. —

Sori compactis, atris; sporis vel ovideo-angulatis, 16-20 $\times$ 12-16 μ diam. levibus, episorio inaequaliter incrassato, atro, partim hyalinulo.

Hab. in ovariis *Juncorum*, pr. Uitenhage in Africa meridionali (Zeyher). — A *Cintractia Junci* Trel. plane distincta. Species ob sporae maxime glomerato-coalitar, teste Tuslane firsan aptius inter *Thecaphoras militare*. (Saccardo Syll. Fung. 7: 458-459. 1888.)

See *Cintractia piluliformis* (Berk.) P. Henn. for change of name.

Ustilago Sladenii Pole-Evans nov. spec.

Soris olivaceo-atris, pulverulentis in rachidibus floribusque, eos omnino destruentibus ; sporis globosis vel subglobosis $5-6\ \mu$ diam., glabris, dilute olivaceis.

In the flowers and branches of the inflorescence of a grass (probably *Ehrharta* sp.) Garies, 1910-11.

H. H. W. Pearson, No. 6728 (Pole-Evans No. 8409).

Saccardo does not include this species in his *Sylloge Fungorum*. (South African College, Ann. Bolus Herb. 1 : 115. 1915.)

Ustilago nuda (Jens.) Kell. et Swingle II Rep. Agr. Kans. p. 215 et 277, t. II, f. 7-17,

Ust. segetum Auct. p.p., *Ust. Hordei nuda* Jens. in litt.—

Massa sporarum brunneo-olivacea, laxa mox libera ; sporis ovoideis, ellipsoideis vel subglobosis, $5-7 \times 5 \times 6.5$, subolivaceis, germinando promycelium parce ramosum, apicibus saepe inflatum gignentibus ; sporidiolis hucusque non visis.

Hab. in ovariis *Hordei vulgaris* in Europa amer. bor. Japonis. (Saccardo Syll. Fung. 9 : 283. 1891.)

Ustilago ugandensis P. Henn. Pilz Ostaf. p. 48. 1895.

Soris atro-olivaceis, epidermide tectis, dein cintis, pulverulentis, ad apicem culmorum in rhachibus floribusque, rhachidem curvam contortamque efformantibus ; sporis subglobosis, saepe acutangularis, fusco-olivaceis, sublevibus, punctulatis, $6-8 \times 5-7$.

Hab. in specieis *Panicum* in Africa trop. (Saccardo Syll. Fung. 14 : 414-415. 1899.)

Cintractia capensis (Reess) Ciferri, n. comb. Ann. Myc. 29 : 72. 1931.

Ustilago capensis Reess¹ in Sitzb. phys.-med. Soc. Erlangen 1875, pp. 70-72.

Ovariicola ; soris aureo-flavis, pulverulentis, sporis globosis, $15-16\ \mu$ diam., episporio reticulato, strato triplici, constituto, interiori tenui, flavido, lineolis areolisque subhyalinis.

Hab. in ovariis *Junci capensis* et *lomatophylli*, e Cap Bonae Spei provenientium in Bremen Germanae (Buchenau).

(Saccardo Syll. Fung. 7 : 478. 1888.)

Cintractia leucoderma (Berk.) P. Henn. 34 : 335. 1895.

Ustilago leucoderma Berk. Ann. Mag. Nat. II. 9 : 200. 1852.

Cintractia Krugiana Magn. Bot. Jahrb. (Engler) 17 : 490. 1893.

Cintractia affinis Peck, N.Y. State Mus. Bull. 67 : 28. 1903.

Ustilago leucoderma Berk. Fungi S. Domingo n. 54, Fisch. Aperçu p. 16. —

Soris atris maculis magnis insidentibus, consta albida inaequali subvelatis ; sporis rotundatis, rarius irregularibus, $13-17\ \mu$ diam., opacis, atris, levibus.

Hab. in vaginis foliorum *Caricis* et Cyperaceae (?) cujusdam in St. Domingo et in insula Borneo ; in vaginis *Rhynchosporae aureae* ad Ratnapoora. (Saccardo Syll. Fung. 7 : 460. 1888.)

Cintractia piluliformis (Berk.) P. Henn. Hedwigia 1898, p. 293.

Uredo piluliformis Berk. Fg. Uitenh. p. 507, t. XXII, fig. 6.

Ustilago piluliformis Tul. Ann. Sci. Nat. 1847, p. 93, t. V, fig. 27-30, Sacc. Syll. VII, p. 458. —

Soris compactis, stris, globosis, v. cylindricis, duris 1-2 mm. diam. ; sporis densis conglobatis, globosis, ellipticis v. ovoideis, initio hyalinis, intus granulatis v. punctatis, filamentis hyalinis intermixtis, dein brunneis, postremo atris, impellucidis, $10-17^{**} \times 9-14$.

Hab. in ovariis *Junci capensis* et *Junci* spec. in Africa austr. et meridionale. (Saccardo Syll. Fung. 16 : 373. 1902.)

¹ Reess, Max. Ueber *Ustilago ? Capensis*, einem neuen Brandpilze vom Cap der guten Hoffnung. Sitzungsber. der phys.-medic. Soc. zu Erlangen 7 : 70-72, 1875.

Cintractia tangensis P. Henn. Engl. Bot. Jahrb. XXXVIII (1905), pag. 103.

Soris in axillis foliorum globosis, primo membrana hyalina vestitis, dein pulverulentis, aterrimis, 5–6 mm. c. cr.; sporis subglobosis 8–11 μ diam. v. ellipsoideis et c. 8–12 $\times$ 7–8, μ brunneo-olivaceis, intus granulosis, episporio levi.

Hab. in axillis foliorum *Cyper*i sp., Tanga, Usambara, Africa (Tanganyika Territory). (Saccardo Syll. Fung. 21: 510. 1912.)

Cintractia togoensis P. Henn. Engl. Bot. Jahrb. XXXVIII (1905), pag. 119.

Sori in floribus globosis, duris, atris et paucis subinclusis; sporis subglobosis v. subellipsoideis, intus granulatis, 12–14** 11–13, episporio levi, olivaceo-brunneo; hyphis hyalinis intermixtis.

Hab. in floribus *Cyper*i sp. Togo Camerum, Africae. (Saccardo Syll. Fung. 21: 510. 1911.)

Cintractia usambarensis (P. Henn.) Ciferri, in Archiv f. Bot. (Stockholm) A. 23: 7. 1931.

Cintractia leucoderma (Berk.) P. Henn. Hedwigia 1895, p. 335. (syn. *C. Krugiana* P. Magn.) — Var. *usambarensis* P. Henn. Pilz. Ostaf., p. 48. 1895.

Soris cylindraceis, nigris, 1½–2 cm. longis, 14–16 mm. latis; sporis majoribus, dense verrucosis, obscurioribus, 15–17 $\times$ 14–16 μ .

Hab. in *Rhynchospora aurea* in Africa trop. (Stuhlman). (Saccardo Syll. Fung. 14: 420. 1899.)

Sorosporium Wildemanianum P. Henn. in Fl. du Bas-et Moy-Congo, Ann. Mus. du Congo V. II. fasc. II (1907), page. 87. —

Soris ovaria staminaque destruentibus, atris epidermide cinerea tectis; glomerulis ellipsoideis v. subglobosis e sporis numerosis compositis, 50–80** 50–60; sporis subglobosis v. ellipsoideis fusco-brunneis, verrucosis, 7–10 $\times$ 6–9 μ .

Hab. in foliis *Andropogonis* sp. Mbele Congo (Vanderyst). (Saccardo Syll. Fung. 21: 513–514. 1911. Sept.)

Tubercinia Eriospermi H. Sydow.

Pustulas orbiculares vel ellipticas 3–6 mm. longas formans; massa sporarum atra, pulverulenta; glomeruli sat regulares, globosi vel subglobosi, 16–22 μ diam., fere semper sporam unicam centalem tantum includentis; sporae globosae, fuscae, 10–13 μ diam., leves; cellulae peripheral numerosae, leves, pallide fuscae, 6–9 μ longae, 4–6 μ altae.

Hab. in foliis *Eriospermi latifolii*, Stellenbosch, 6. 1923. leg. P. A. van der Bijl (no. 1142). (Ann. Myc. 22: 237. 1924.)

Entyloma cissigenum P. Henn.¹ Pilz Ost-Afr. p. 49. 1895.

Maculis amphigenis, gregariis, rotundatis, circiter 2 mm. diam., saepe confluentibus, atris; sporis globosis, intus fuscis v. minute viridulis subgranulatis, 18–21 μ crasso.

Hab. in foliis vivis *Cissi* in Africa trop. (Volken). (Saccardo Syll. Fung. 14: 423. 1899.)

Entyloma Oleandrae P. Henn. Hedwigia 1895, p. 326.

Soris striiformibus, amphigenis, ca. 1 cm. longis, 2 mm. latis, atris v. atro-violaceis; sporis globosis, raro ellipsoideis, minute granulatis, subhyalinis, 8–12 $\times$ 6–10 μ ; episporio subfuscicidulo.

Hab. in foliis *Oleandrae articulatae*, Natal (Wood). (Saccardo Syll. Fung. 14: 425. 1899.)

Urocystis Anemones (Pers.) Schröt. form kerguelensis P. Henn. Deutsche Südpolar-Exped. 1901–1903, 8: 1. 1906.

Kerguelen—Station, an der Pinguinbucht, auf lebenden Stengeln und Blättern von *Ranunculus bitermatus* Sm., Dr. E. Werth, leg. 26. Dezember 1902, 9. Januar 1903. Dieser

¹ In the original description the specific name is spelled *E. cissigena*.

in ganz Europa, Nordamerika, Sibirien usw. auf verschiedenartigen Ranunculaceen verbreitete Pilz bildet auf den niederliegenden Stengeln, Blattstielen und Blättern obiger Pflanzen aufgetriebene bis etwa 2 cm. lange, von einer graubraunen Oberhaut bekliedete Brandpusteln, welche bei der Reife durch einen Längsriss aufbrechen und die tiefschwarze Sporenmasse freilegen. Dieselbe besteht aus Sporenballen von ellipsoider oder rundlicheckiger Form, die meist 20–30 μ Durchmesser besitzen. In der Mitte dieser Ballen finden sich 1–3 rundlich eckige oder ellipsoide Hauptsporen, mit dunkelbrauner, undeutlich punktierter Membran, meist 12–20 μ lang, 10–16 μ breit. Diese werden meist von zahlreichen heller getärbeten, gelblichen, halbkugeligen oder unregelmässig eckigen, 8–12 μ breiten. Nebensporen ungeben, mitunter fehlen diese ganz. Die ganze Pflanze wird durch den Parasiten unförmlich verbildet.

Durch die grösseren Hauptsporen sowie durch Nebensporen ist der Pilz von der typischen Form etwas verschieden, ebenso von *U. sorosporioides* Körn.

It is doubtful whether *Urocystis Anemones* form. *kerguelensis* described by P. Henning from Kerguelen Island differs from the species other than in slight variations due to host and climate. With further search, this species should be found in South Africa. Saccardo does not list this form in Sylloge Fungorum.

It must be noted that the authority for the species should be *Urocystis Anemones* Pers.) Winter; Rab. Krypt.-Fl. 11: 123. 1881.

Tilletia Schenckiana P. Henn. Deutsche Sudpolar-Exped., 1901–1903, 8: 2. 1906.

Sori ovariculis en destruentibus paulo deformantibus, paleis laxae circumdatis, translucentibus, ellipsoideis, firmis, membrana cinereo-fusca vestitis, ca. 1 $\times$ 0.5 mm. diam.; sporis ellipsoideis vel subglobosis, 20–30 $\times$ 20–24 μ , episporio reticulato, melleo dein fusco-brunneo, ca. 2–3 μ crasso, interdum filis hyalinis, flexuosis, 2–4 μ crassis intermixtis.

Kerguelen im Tale zwischen Station und Mittelberg, in Blüten von *Deschampsia antarctica* E. Desv. Dr. E. Werth, 19 Februar 1903. Diese äussert zierliche Art tritt in den Fruchtknoten, welcher zerstört und wenig verbildet ist, in ellipsoiden, dunklen Sori von den trockenhäutigen Spelzen locker umschlossen auf und auf dem Scheitel der Sori sind oft noch die tädigen Narben erkennbar.

Der Pilz ist sowohl von *Tilletia cerebrina* Ellis et Ev. aus Nordamerika in Ovarien von *Deschampsia caespitosa* P. B. sowie von *T. Airae* Blytt in *Deschampsia calycina* durch die kleinen sori sowie die Sporen verschieden. Der Pilz wurde bei der Bestimmung der Nährpflanze bereits von Prof. Dr. Schenck beobachtet und als, *Tilletia* erkannt.

This smut described from rocky Kerguelen Island should be found in South Africa. It is not known where the type specimen is deposited. Saccardo does not list this species in Sylloge Fungorum.

APPENDIX B.

The following is a list of doubtful and excluded species that have been reported from South Africa and nearby territory.

Ustilago Welwitschiae Bres. in Sacc. Fl. mycol. Lus. p. 68. —

Soris parvis, globosis, fuliginosis, pulverulentis, e squamis erumpentibus; sporis fusciculis, globosis, asperulis, 3½–4 μ diam.

Hab. in squamis conorum *Welwitschiae mirabilis* e Mosamedes Africae allatae in hort. bot Coimbrae (Möller). (Saccardo Syll. Fung. 14: 411. 1899.) A doubtful smut.

Sorosporium africanum Sydow, Ann. Myc. 7: 544. 1909.

Soris ovaria occupantibus easque omnino destruentibus, atris, pulverulentis; glomerulis esporis usque 8 compositis, 12–25 μ diam.; sporis globosis vel angulato-globosis, subtilissime verruculosus vel punctatis, olivaceis vel olivaceo-brunneis 5–9 μ diam.

Hab. in ovariiis *Panici trichopi* Portugiesisch-Ostafrika. 18.4.1908. leg. C. W. Howard.

The portion of the type specimen examined (M.H. 631, on *Panicum trichopus* Hochst., Portuguese East Africa, coll. C. W. Howard, April 18, 1909) is very poor since there were very few spores and these were not typical of the Ustilaginales, much less a *Sorosporium*. A portion of the type specimen in the Clinton herbarium was examined but it contained no spores.

The original description says that the spore balls are composed of 8 spores. This is not typical of a *Sorosporium*. This fungus is apparently one of the dark spored members of the fungi imperfecti. At any rate we will list it temporarily as an excluded smut until more and better material is available for examination.

Tolyposporium Chloridis P. Henn. Pilz Ostaf. p. 49. 1895.

Soris atris, firmis, bullatis, undulato-plicatis, rugulosis, interdum confluentibus; glomerulis sporarum firmis, varia magnitudine, subglobosis, acutangulis, e 3-5 sporis compositis, 10-20 $\times$ 8-15, fusco-brunneis v. atris; sporis acutangulis, sublevibus, 6-10 μ .

Hab. in fructibus *Chloridis abyssinicae* in Afric trop. (Volkens). (Saccardo Syll. Fung. 14: 426. 1899.)

A study of specimens of *Tolyposporium Chloridis* P. Henn. from various parts of southern Africa indicates that the fungus in question is not one of the Ustilaginales but rather one of the dark coloured Hyphomycetes.

The following South African specimens from the Union Department of Agriculture, Mycological Herbarium have been examined: No. 9056, collected by I. B. Pole-Evans, Feb., 1915, at Groenkloof, Pretoria, Transvaal; No. 9770, collected by P. van der Bijl, May 5, 1926, at Mid Illovo, Natal; No. 1627, collected by E. M. Doidge, June 26, 1911, at Mountain Rise near Pietermaritzburg, Natal; No. 17043, collected by A. O. D. Mogg (no. 4290), May 1, 1919, in Zululand. In each case the host was *Chloris gayana*.

Tolyposporium Volkensii P. Henn. Pilz Ostaf. p. 49. 1895.

Soris ad germina pustulatis, submesenteriformibus, atris, subgelatinosis (?), rugulosis circ. 5-8 mm. diam.; glomerulis subglobosis v. irregulariter acutangulis, firmis, 15-28 μ diam., e 3-15 sporis compositis, plus minus fuscis; sporis subglobosis, ovoideis, oblongis, e mutua pressione acutangulis, fusco-brunneis, minute granulatis, 5-11 μ .

Hab. in ovariis *Sorghorum cultorum* in Africa trop. (Volkens).

Mason¹ (1926) worked with type material of *Tolyposporium Volkensii* P. Henn. from East Africa and found that it was not one of the Ustilaginales but was *Cerebella sorghi-vulgaris* Subram. This was later confirmed by Subramanian. "Hennings' species is a true *Cerebella* having a true convoluted stroma with a surface layer of palaside-like conidiophores each bearing at its apex a conidium with septa in three planes."

Species of the Graphioliaceae are excluded. While they are closely related to the Ustilaginales, they are not a family of this order. *Graphiola phoenicis* Poit., the most common species, attacks *Phoenix* sp. both in greenhouses and in the open.

Various species of the genera *Cerebella* and *Ustilaginoidea* are sometimes confused with the smuts. These genera are members of the family Dematiaceae of the imperfect fungi. *Tuberculina*, a member of the Tuberculariaceae of the fungi imperfecti, is another genus that is sometimes put with the Ustilaginales.

¹ Mason, E. W., on two species of *Tolyposporium* Woronin recorded on cultivated *Sorghum*. Trans. British Myc. Soc. 9: 284-286. 1926.

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