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EDITI IN NOTITIAM

SCIENTIAE MYCOLOGICAE UNIVERSALIS

HERAUSGEGEBEN UND REDIGIERT

VON

H. SYDOW

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Some Philippine Entomogenous Fungi.

By T. Petch.

Through the kindness of Dr. Sydow, I have had the opportunity of examining numerous specimens of entomogenous fungi on leaves, collected by Mary Strong Clemens in the Philippines. Though the collection consisted of seventy-two numbers, it contained only nine species, and with one exception (*Aschersonia Coffeae* P. Henn.), these are all parasitic on Aleyrodidae. Except where otherwise stated, the localities cited are in Luzon. The list may serve to give some idea of the relative abundance of the different species of *Aschersonia* parasitic on Aleyrodidae in that country.

The chief interest of the collection lies in the occurrence of many specimens of a new species, which is described below as *Aschersonia philippinensis,* and its perithecial stage, *Hypocrella philippinensis.* This has been known to occur in the Philippines for many years, but the specimens collected previously have never been in a fit condition for description. The species is remarkable in that it often forms flat, circular, tomentose or radially fibrillose, white or cream-coloured stromata, up to 7 mm diameter, with a fimbriate margin, without any pycnidia or perithecia. With the help of the present specimens, it is now possible to refer the following previous gatherings to *Aschersonia philippinensis,*—On *Schizostachyum,* Norzagaray, Prov. Bulacan, May 1910, Hb. Bureau of Science, no. 10 838; on *Astronia sp.,* Mt. Maquiling, Luzon, September 1910, Merrill no. 7150; on *Astronia,* Mt. Maquiling, February 1914, C. F. Baker, Fungi Malayana, no. 8; on *Derris heptaphylla,* Lamao, H. A. Lee, no. 59. Some of these specimens were referred to under *Hypocrella Mollii* in the Genera Hypocrella and Aschersonia, Annals of the Royal Botanic Gardens, Peradeniya, VII, 240. Immature specimens resemble immature *Hypocrella Mollii,* but are more tomentose and usually have a fimbriate margin.

In general, the stromata of *Aschersonia philippinensis* are at first plane and circular. Subsequently they develop, in the centre, a group of columnar tubercles, each of which bears a single, widely open, circular pycnidium at the apex. When, however, the tubercle is oblique, the pycnidium opens obliquely and the orifice is usually vertically compressed into a narrow slit. In some stromata, the centre is occupied by a raised disc up to 2 mm in diameter, instead of a group of tubercles, and the pycnidia open on the vertical face of the disc, their orifices being overhung by its upper edge. Other stromata may have neither tubercles nor disc, the pycnidia occurring in the stroma, vertical or oblique, the orifice being surrounded by a slightly raised rim.

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In the dimensions of its pycnospores and paraphyses, and in the compressed orifice of some of its pycnidia, *Aschersonia philippinensis* resembles the *Aschersonia* of *Hypocrella tubulata*, but the internal structure of the pycnidium is different. Specimens in which the tubercles or disc is lacking resemble forms of *Aschersonia placenta* in which the pycnidia are not regularly arranged.

Hypocrella philippinensis Petch, n. sp. — Stromatibus albis vel pallido-flavis, planis, tenuibus, interdum margine fimbriato vel membranaceo, usque 3 mm diam., tubercula sparsa vel conferta ferentibus; tuberculis cylindraceis vel ovoideis vel subglobosis, usque 0,5 mm alt., 0,35 mm diam., tomentosis, singulo perithecio in quoque tuberculo; peritheciis angusto-ampullaceis, 450 μ alt., 150 μ diam., ostiolis minutis, impressis, flavis; ascis 240 μ longis, 8 μ diam., cylindraceis, capitatis, octosporis; articulis sporarum angusto-ovalibus, rectis vel curvatis, 8—12 ⩽ 2—2,5 μ. On an Aleyrodid on undetermined leaves, Asingan, Pangasinan Prov., November 1923, no. 3144; ditto, on Apocynaceae, Bambang, Nueva Vizcaya Prov., January 1924, no. 3458; in both cases with *Aschersonia philippinensis* Petch in the same or separate stromata. Also no. 6214, on Ficus, Cebu, Cebu Island, May 1924.

Aschersonia philippinensis Petch, n. sp. Stromatibus albis vel pallido-flavis, planis, tenuibus, tomentosis, usque 8 mm diam., margine saepius fimbriato, centro tubercula sparsa vel conferta, cylindracea, 0,36 mm diam., 0,25 mm alt., recta vel obliqua, singulo pycnidio in quoque tuberculo, ferentibus; vel stromatibus centro discoideis, ostiolis pycnidiorum obliquis margine disci; vel stromatibus omnino planis, pycnidiis sparsis immersis marginatis. Pycnidiis concavis, 0,25 mm diam., 0,15 mm altis, ostiolis rotundatis vel compressis, sporis coacervatis flavis. Pycnosporis angusto-fusoideis, fine acutis, 9—11 ⩽ 1,5—2 μ. Paraphysibus usque 150 μ longis. The pycnidial stage of *Hypocrella philippinensis*. On Aleyrodidae. On *Rourea erecta* (Blco.) Merrill, Isabela Prov., December 1923, no. 2921.

Also no. 217, on unknown leaves, Mt. Arayat, Pampanga Prov., February 1923; no. 720, on *Lunasia amara, loc. cit.*, April 1923; no. 744, on *Memecylon, loc. cit.*, April 1923; no. 785, *Eugenia, loc. cit.*, April 1923; no. 806, on unknown leaves, Orion, Bataan Prov., May 1923; no. 834, on unknown leaves, *loc. cit.*, March 1923; no. 2199, on unknown leaves, Stotsenberg, Pampanga Prov., March 1923; no. 2411, on leguminous leaves, Olongapo, Zambales Prov., March 1924; no. 2412 (part) on *Hydnocarpus subfalcata* Merr., *loc. cit.*, March 1924; no. 2420, on *Ficus, loc. cit.*, March 1924; no. 2440, on unknown leaves, *loc. cit.*, March 1924; no. 2472 (part) on ? Guioa, *loc. cit.*, March 1924; no. 2808, on *Symphorema luzonicum* (Blco.), Solana, Cagayan Prov., January 1924; no. 2827 (part), on *Zingiber*, Cagayan Prov., January 1924; no. 2862, on *Aganosma acuminata* (Roxb.), Tuguegarao, Cagayan Prov., January 1924; no. 3118 (part), on *Ficus*, Asingan, Pangasinan Prov., November 1923; no. 3167, on *Illigera luzo-*

uensis (Presl) Merr., *loc. cit.*, November 1923; no. 3298, on *Callicarpa*, Castillejos, Zambales Prov., March 1924; no. 3378, on *Adenia coccinea* (Blco.), Angeles, Pampanga Prov., October 1923; no. 4749, on unknown leaves, Cagayan Prov., January 1924; no. 6257, on *Premna odorata*, Gerona, Tarlac Prov., January 1925; no. 6375, on *Pterospermum niveum* Vahl, La Paz, Tarlac Prov., December 1924; no. 6381, on *Allaeanthus luzonicus* (Blco.), *loc. cit.*, December 1924; no. 6496, on *Jasminum Sambac*, Calumpit, Bulacan Prov., October 1924; no. 7113 (part), on *Ichnocarpus volubilis*, Florida Blanca, Pampanga Prov., October 1925; no. 22 119 (part), on *Cyathea*, Mt. Isarog, Camarines Prov., coll. M. Ramon, November 1913.

Hypocrella Raciborskii Zimm. No. 1855, on unknown leaves, Manila, February 1924; no. 2275 (part), on *Premna*, Castillejos, Zambales Prov., March 1924; no. 4697, on *Ficus*, Isabela Prov., January 1924; no. 5656, on *Strongylodon*, Mt. Apo, Davao, Mindanao, June 1924; no. 6210, on *Ficus*, Cebu, Cebu Island, May 1924.

In nos. 1855, 2275, 4697, with *Aschersonia placenta* B. et Br.

Aschersonia placenta B. et Br. No. 1847 (part), on *Premna*, Manila, February 1924; no. 2341 (part), on unknown Rubiaceae, Stotsenberg, Pampanga Prov., October 1923; no. 2909 (part), on *Zizyphus talanai*, Nueva Ecija Prov., December—January 1923—24; no. 2639, on *Ficus*, Polo, Bulacan Prov., September 1923; no. 2646 (part), on *Phyllanthus reticulatus*, *loc. cit.*, September 1923; no. 2649, on *Premna odorata* Blco., *loc. cit.*, September 1923; no. 2657, on *Premna*, *loc. cit.*, September 1923; no. 2972, on *Ficus ulmifolia* Miq., Del Norte, Manila, September—October 1923; no. 3364, on *Premna odorata*, Angeles, Pampanga Prov., October 1923; no. 3430 (part), on *Oreocnide trinervis* (Wedd.), Bambang, Nueva Vizcaya Prov., January 1924; no. 4906 (part), on *Lepidopetalum Perrottetii*, Tarlac, Tarlac Prov., December 1924; no. 5392, on *Clemensia macrantha*, Mt. Apo, Davao Prov., Mindanao, June 1924; no. 6028, on *Glochidium rubrum* Bl., Santa Maria, Bulacan Prov., November 1924; no. 7102 (part), on *Ficus*, Florida Blanca, Pampanga Prov., October 1925.

Aschersonia badia Pat. No. 2275 (part), on *Premna*, Castillejos, Zambales Prov., March 1924; no. 2945, on *Premna nauseosa*, Iligan, Isabela Prov., December 1923; no. 3151 (part), on *Piper*, Asingan, Pangasinan Prov., November 1923; no. 4503, on *Ficus*, Iba, Zambales Prov., February 1924; no. 6156 (part), on *Premna nauseosa*, Angat, Bulacan Prov., November 1924; no. 6571, on *Premna nauseosa*, Paniqui, Tarlac Prov., January 1925; no. 7308 (part), on *Pilea melastomoides*, Baguio, Benguet Prov., December 1925.

Aschersonia samoensis P. Henn. No. 922 (red and yellow forms) on *Canarium villosum* (Bl.) Vill., Orani, Bataan Prov., May 1923; no. 1847 (part), on *Premna*, Manila, February 1924; no. 2341 (part), on unknown Rubiaceae, Stotsenberg, Pampanga Prov., October 1923; no. 2408 (part), on *Ardisia*, Olongapo, Zambales Prov., March 1924; no. 2646 (part) on

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ovember 1923; no. 3298, on *Callicarpa,*
ch 1924; no. 3378, on *Adenia coccinea*
., October 1923; no. 4749, on unknown
1924; no. 6257, on *Premna odorata,* Ge-
5; no. 6375, on *Pterospermum niveum*
ber 1924; no. 6381, on *Allaeanthus luzo-*
1924; no. 6496, on *Jasminum Sambac,*
1924; no. 7113 (part), on *Ichnocarpus*
a Prov., October 1925; no. 22 119 (part),
Prov., coll. M. Ramon, November 1913.
No. 1855, on unknown leaves, Manila,
n *Premna,* Castillejos, Zambales Prov.,
ıbela Prov., January 1924; no. 5656, on
ndanao, June 1924; no. 6210, on *Ficus,*

schersonia placenta B. et Br.
No. 1847 (part), on *Premna,* Manila,
nknown Rubiaceae, Stotsenberg, Pam-
09 (part), on *Zizyphus talanai,* Nueva
923—24; no. 2639, on *Ficus,* Polo, Bu-
346 (part), on *Phyllanthus reticulatus,*
, on *Premna odorata* Blco., *loc. cit.,*
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is (Wedd.), Bambang, Nueva Vizcaya
on *Lepidopetalum Perrottetii,* Tarlac,
92, on *Clemensia macrantha,* Mt. Apo,
no. 6028, on *Glochidium rubrum* Bl.,
ber 1924; no. 7102 (part), on *Ficus,*
tober 1925.
(part), on *Premna,* Castillejos, Zam-
on *Premna nauseosa,* Iligan, Isabela
ırt), on *Piper,* Asingan, Pangasinan
Ficus, Iba, Zambales Prov., February
auseosa, Angat, Bulacan Prov., No-
auseosa, Paniqui, Tarlac Prov., Ja-
lea melastomoides, Baguio, Benguet

No. 922 (red and yellow forms) on
Bataan Prov., May 1923; no. 1847
1924; no. 2341 (part), on unknown
rov., October 1923; no. 2408 (part),
., March 1924; no. 2646 (part) on

Phyllanthus reticulatus, Polo, Bulacan Prov., September 1923; no. 2740, on *Homonoia riparia* Lour., Bosoboso, Rizal Prov., February 1924; no. 2803, on *Ficus,* Tuguegarao, Cagayan Prov., January 1924; no. 2827 (part), on *Zingiber,* Cagayan Prov., January 1924; no. 3060 (part), on *Antidesma bunius* (L.), Del Norte, Manila, January—February 1924; no. 3088 (part), on *Psychotria luzoniensis* (Cham. & Schlecht.), *loc. cit.,* January—February 1924; no. 3118 (part), on *Ficus,* Asingan, Pangasinan Prov., November 1923; no. 3169, on *Litsea, loc. cit.,* November 1923; no. 3430 (part), on *Oreocnide trinervis* (Wedd.), Bambang, Nueva Vizcaya Prov., January 1924; no. 4653 (part), on *Streblus asper* Lour., Porac, Pampanga Prov., October 1923; no. 4846, on unknown leaves, Nueva Ecija Prov., January 1924; no. 4906 (part), on *Lepidopetalum Perrottetii,* Tarlac, Tarlac Prov., December 1924; no. 5944, on *Celastrus paniculata,* Rosales, Pangasinan Prov., February 1925; no. 6019 (part), on *Premna nauseosa* Blco., Santa Maria, Bulacan Prov., November 1924; no. 6566 (part), on *Flemingia strobilifera,* Paniqui, Tarlac Prov., January 1925; no. 7113 (part), on *Ichnocarpus volubilis,* Florida Blanca, Pampanga Prov., October 1925; no. 22 119 (part), on *Cyathea,* Mt. Isarog, Camarines Prov., coll. M. Ramon, November 1913.

Aschersonia flava Petch. No. 2584, on unknown Urticaceae, Stotsenberg, Pampanga Prov., October 1923.

Aschersonia Coffeae P. Henn. No. 2959, on *Psidium Guajava* L., Iligan, Isabela Prov., December 1923.

Torrubiella luteorostrata Zimm. Sterile stromata only. No. 609, on *Streblus asper* Lour., Tarlac Prov., March 1923; no. 2583 (part), on *Semecarpus,* Stotsenberg, Pampanga Prov., October 1923.

Peziotrichum Lachnella Sacc. No. 2583 (part), on *Semecarpus,* Stotsenberg, Pampanga Prov., October 1923; no. 4653 (part), on *Streblus asper* Lour., Porac, Pampanga Prov., March. 1923.

Aegerita Webberi Fawcett. No. 970, on unknown Rubiaceae, Orani, Bataan Prov., May 1923; no. 2408 (part), on *Ardisia,* Olongapo, Zambales Prov., March 1924; no. 2412 (part), on *Hydnocarpus subfalcata* Merr., *loc. cit.,* March 1924; no. 2472 (part), on ?Guioa, *loc. cit.,* March 1924; no. 2909 (part), on *Zizyphus talanai,* Nueva Ecija Prov., December—January 1923—24; no. 3060 (part), on *Antidesma bunius* (L.), Del Norte, Manila, January—February 1924; no. 3088 (part), on *Psychotria luzoniensis* (Cham. & Schlecht.), *loc. cit.,* January—February 1924; no. 3151 (part), on *Piper,* Asingan, Pangasinan Prov., November 1923; no. 6019 (part), on *Premna nauseosa* Blco., Santa Maria, Bulacan Prov., November 1924; no. 6156 (part), on *Premna nauseosa,* Angat, Bulacan Prov., November 1924; no. 6566 (part), on *Flemingia strobilifera,* Paniqui, Tarlac Prov., January 1925; no. 7102 (part), on *Ficus,* Florida Blanca, Pampanga Prov., October 1925; no. 7308 (part), with sporodochia, on *Pilea melastomoides,* Baguio, Benguet Prov., December 1925.

The criteria for definition of species in mycology.

By R. Ciferri.

It is by no means the author's intention to discuss again the apparently insoluble problem of what really constitutes a plant species. From what experience he has had with phanerogamic plants, he is forced to admit the existence of those units called „Linnean" species, although it seems to him that taxonomists only too often have to depend upon trained eyesight in order to recognize them. Nevertheless, in some groups, „species" in the ordinary sense scarcely exist. If the conception of species may thus fail when applied to certain phanerogamic genera, it is easy to imagine what will happen when it is applied to the lower cryptogams. The further one descends into the realms of the microscopic organisms, the vaguer becomes the definition of species, until at last all ends in chaos. What one actually has to deal with is not a number of well-defined species or genera in the phanerogamic sense, but rather groups of innumerable organisms, closely allied the one with the other, with almost only hypothetical links between them, or none at all. Every cryptogamist admits the essential truth of this broad statement, as applied to the lower cryptogams.

The necessity of some kind of nomenclature, however, even for the most primitive or rudimentary organisms, obliges one to cling to the customary taxonomic conceptions, be they ever so difficult of application.

A priori, as in the case of the phanerogams, the basic unit of taxonomy applied to fungi is always the species, but a kind of „species", which is not necessarily the same as among the phanerogams. Evidently mycologists seem to have extended the conception of species to the fungi without questioning the feasibility of so doing. For two phanerogamic plants to be recognized as belonging to separate species, certain requirements must be fulfilled. Primarily, they must differ in a certain, but not too small number of characteristics. In addition there should be no intermediate forms. Furthermore, hybrid forms, if any exist, should be more or less sterile. When the levelling effect of intraspecific crossfertilization is excluded, there appears the phenomenon known as Jordanism, i. e. the Linnean species resolve into numerous smaller, more or less recognizable units, which are necessarily constant, since reproduction is apogamous.

How much of all this is applicable to fungi? Evidently the fathers of mycology, being fundamentally phanerogamists, having in most cases only widely distinct forms and isolated specimens for study, described as

species everything which they could recognize on „habitus“[1]). In the case of parasitic fungi, similar forms were lumped together with small attention to the host plant, in accordance with the admitted universal pleophagy. The growing amount of material for study tempered the second requirement for phanerogamic species, and forms not so well marked were described as, first, forms, or varieties, then, as species. When the tendency to distinguish the fungi according to their host plant came into vogue, the application of the first requirement was also greatly limited, at least for certain groups of fungi. As far as we know, the third requirement for specific rank in the higher plants (surely, the crucial criterion in the taxonomy of the phanerogams), is of but doubtful application in mycology. A strict interpretation of this law for fungi is nonsense. On the other hand, the true significance, in Nature, of heterothallism and of pleomorphism is still unknown. Brierley's point of view on the inapplicability to fungi and bacteria, of genetic concepts derived from the study of the highest organisms, is to a high degree justified. We can admit in fungi the existence of pure lines or cross-fertilized generations, alone or combined, with every transitional stage between these extremes.

The transference of the conception of species from the phanerogamic plants to the fungi, leads to the conclusion that true Linnean species or Jordanian species, in a phanerogamic sense, do not exist in mycology. The last recognizable group in mycology is that of a more or less artificially distinguished, small aggregate of individuals, resembling, in most cases, Jordanons rather than Linneons, to use the traditional phanerogamic terminology.

From this fundamental ambiguity in the interpretation and, of course, in the limitation of the specific unit in mycology, comes the greatest individual variation in the selection and use of criteria for specific rank in creating species of fungi, polarized in two opposite extremes, the „pure“ morphologic, and the „pure“ biologic, with every intermediate shading. The first and oldest was gradually subjected, according to the criterion of most mycologists, to the interference of the second, but the tendency to multiply species according to the host plant has reached such proportions that a general review of the situation may well be demanded. Dr. Butler recently illustrated (Proc. Int. Congr. Plant Sc., Vol. II, pp. 1590—1597; 1929) the confusion produced by the multiplicity of the criteria employed, which has given rise to the species created during the last twenty years.

The critical point in the classification in mycology is the taxonomy of parasitic species of fungi, involving the biologic interpretation of the species, the „cultural“ criteria being derived from and included in the former. For these, the problem can be reduced to a fundamental question: Must we accept a biologic interpretation in the taxonomy of the parasitic fungi? If so, can specific rank be maintained for biologic units?

[1]) „Habitus“ is unterstood both from macroscopic and microscopic point of view.

An exclusive morphologic application applied to obligate parasitic fungi, as defined by the group of neo-morphologists (Cunningham, et al.), is, according to our views, scarcely justified. One cannot return to the primordia of mycology, and renounce the application of those principles in classification derived from fifty or more years of investigation of the mutual relation between fungus and host plant. In the parasitic fungi, as well as in fungi with highly developed biochemical activities (such as the yeasts), all phases of their life are subordinate to their biological functions, a complex morphologic development frequently being sacrificed to a more perfect adaptation to the host. The consequence is the primitiveness of many parasitic fungi (caused by a regressive evolution or by a non-evolution), whose uniformity of morphology is not correlated with the range and exaltation of biological function. A classification of parasitic fungi on purely morphological grounds takes a one-sided view, perhaps that of the least important side, compared with the synthetic picture offered by utilizing all characteristics of the organisms[1]).

In conclusion, the writer's opinion is that no rules can be concerted for, nor limitations imposed upon the use of one or another or all criteria for the definition and delimitation of systematic entities in mycology. The present chaotic situation in this science, as illustrated by Butler, is not due to the multiplication of systematic units (this multiplication being the natural outcome of the development of our knowledge), but to their inadequate taxonomic expression. In the solution of the latter problem, two courses are open: (1) The adoption of specific rank for all systematic units in mycology, independent of the criterion or criteria employed, but with an expressed distinction between different kinds of species; or (2) the adoption of specific rank for morphological units only, with one or more inferior ranks for units established from criteria other than morphologic.

The adoption of one of these two solutions, sanctioned by an international agreement, while not bearing upon the actual relationship between the species, would, at least, tend to make their taxonomy less bewildering.

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[1]) An exclusive application of morphologic characteristics to the classification of parasitic fungi, e. g., to the Ustilaginales, as demanded by Cunningham, beginning with the aggregation of the loose smuts of barley and wheat, might end in the partial reconstruction of *Ustilago carbo* and a few old „Sammelspecies", which would include most of the smut species, and affect members of all families, from Graminaceae to Compositae. Furthermore, if host specialization should be valueless for the classification of parasitic fungi, it is very doubtful whether any more weight should be attached to the localization of the parasite of the plant host. As rightly expressed by Dr. Butler: „If we refuse to accept the one in the classification, it is difficult to justify the use of the other". Consequently, the classification of certain groups, e. g., Dothideales, as presented by Theissen and Sydow, should not be considered.

A. **Morphological characteristics** upon which the originally recognized and more easily distinguished species were based. This is the oldest as well as the most important criterion, when dealing with herbarium material. All morphological characteristics, however, are not of the same importance. One can distinguish between:

1. **Macro-morphological characteristics,** based on well-defined and easily recognized structural differences.
2. **Micro-morphological characteristics,** based on relatively small differences in shape of any formed element.
3. **Biometric characteristics,** based on small, but still statistically recognizable differences in size only.

B. **Biological characteristics,** including all other than morphological ones. The biological criteria, originally most neglected, are now widely used in distinguishing species[3]).

They are of several kinds:

1. **Matrical characteristics,** based upon the study of the symbiotic phenomenon between fungus and living host plant. According to the nature of the different manifestations of their parasitism, they may be subdivided into:
   A. **Specialization characteristics,** based on the range of the parasitic adaptation of each fungus. According to the nature of the methods employed, we can distinguish:
      a) Specialization capable of direct proof from the outcome of cross-inoculation with positive result.
      b) Specialization capable of indirect proof by cross-inoculation with negative result (inability to infect a definite host plant under experimental conditions), or by failure to produce natural infection under natural conditions (e. g., in the field).
      c) Supposed specialization, not directly or indirectly proved, but based on a probable or possible analogy of behavior with a specialized fungus of known host range.

      These three criteria are arranged in order of their importance.
   B. **Ecological characteristics,** based on the study of the localization of the fungus in or upon definite organs of the plant host.
   C. **Pathographic characteristics,** based upon the study of the effect of the parasitic fungus (mechanical, teratological, metamorphic, hystolytic, etc.) on the host plant, as well as on the reaction of the same to the parasite. This characteristic is, for the most

[3]) A classification based upon the interrelation between two organisms, and taking into consideration the complex fungus plus the host plant, is a phytopathological classification rather than a mycological one. Of course, this remark may affect the classification only from a philosophical point of view.

characteristics combined (e. g., *Ustilago longissima* [Schlecht.] Mey., type on *Glyceria aquatica;* the variety *dubiosa* Liro on *Triticum repens* with the additional characteristic of producing perforation of the leaves).

Some varieties have been based on ecological characteristics (e. g., *Ustilago tritici* [Pers.] Jens. on the spikelets of *Triticum vulgare,* with the variety *foliicola* P. Henn. on the leaves of the same plant host). The sub-variety as a taxonomic unit has not been employed in the Ustilaginales, nor the sub-form. Only a few forms have been proposed, more or less with the same criteria as those of the varieties, generally based on ecological and matrical characteristics (e. g., *Entyloma linariae* Schr. on *Linaria vulgaris,* with the form *veronicae* Wint. on *Veronica,* with amphigenous sori as an additional characteristic).

Only one author has used race as a taxonomic entity, based on micro-morphologic and matrical characteristics combined (e. g., *Urocystis anemones* [Pers.] Wint., on *Anemone nemorosa,* with the slightly morphologically distinct race *ranunculi-repentis* Bub., on *Ranunculus repens).*

Nomina nuda were frequently created by the earlier authors as varieties or forms, based, as a rule, only on matrical characteristics or on some supposed specialization.

In conclusion, new entities have been described promiscuously as species more often than units of inferior rank, with the result that there is a considerable amount of confusion as to the real meaning of „species" as applied to the Ustilaginales.

In order to illustrate recent splitting of some classical species, the writer has arranged the elements diagrammatically, according to the principal characteristics upon which they have been based. Figure 1 shows the species derived from *Ustilago violacea* [Pers.] Rouss., as recently described, chiefly on the basis of experimental cross-inoculation as presented by Liro. Of eleven species listed, including *U. violacea* s. stricto reduced to the smut attacking the type host plant, nine were based upon the results of cross-inoculations, and two are micro-morphologic and matrical species (Fig. 1). Of the six species derived from *U. hypodytes* [Schlecht.] Fr. (Fig. 2), three were based on morphologically differentiated characteristics and on a supposed specialization on some unstated host plant; one on pathographic characteristics combined with the variation in the host plant; one on ecological characteristics and host plant; one on a supposed host plant specialization. Of the many species derived from *Ustilago striaeformis* [West.] Niessl. or the cycle thereof, today divided almost entirely according to the host plant parasitized, Figure 3 illustrates the actual situation of ten species. Three species were based on morphological differences, as well as on a supposed host plant specialization; four species were isolated upon the basis of ascertained host specialization; all other species upon a supposed specialization. *Sorosporium saponariae* Rud. was recently sub-divided into four species, in-

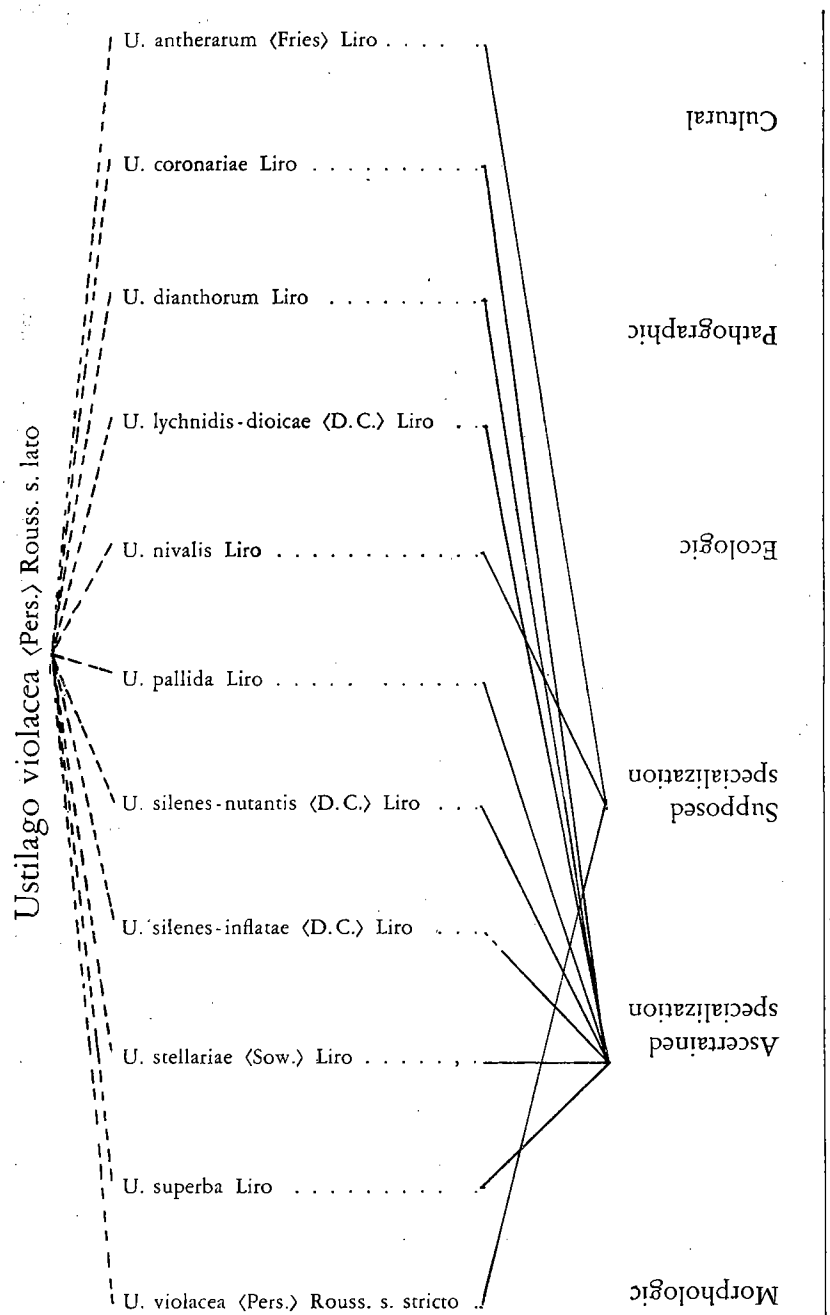

Fig. 1. — Species derived from or allied to Ustilago violacea ⟨Pers.⟩ Rouss.