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Check-list for scientific names of common parasitic fungi. Series 2b: Fungi on field crops: cereals and grasses

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Abstract

This list is a continuation of Series 2a (Neth. J. Pl. Path. 82 (1976) 193–214), an account of the nomenclature of common parasitic fungi on field crops as used in official publications of the Netherlands Society of Plant Pathology and the Netherlands Ministry of Agriculture and Fisheries.

Introduction

In the first series of the check-list, the common parasitic fungi on trees and shrubs have been treated (Boerema and Verhoeven, 1972, 1973). The second series deals with the scientific names of the fungal parasites on field crops. In the first paper of this second series (Series 2a; Boerema and Verhoeven, 1976) the nomenclature of the fungi on beet, potato, caraway, flax and oilseed poppy is documented.

The present publication, Series 2b, gives an account of the nomenclature of common parasitic fungi on cereals and important cultivated grasses. The fungi have again been selected in agreement with the Committee for Dutch Names of Plant Diseases ('Commissie voor Nederlandse Namen van Planteziekten') of the Netherlands Society of Plant Pathology.

The hosts include:

barley	(various subspp. of *Hordeum distichon* L. and *H. vulgare* L.)
maize	(*Zea mays* L.)
oats	(*Avena sativa* L.)
rye	(*Secale cereale* L.)
wheat	(*Triticum aestivum* L.)

bent grasses, e.g.:	(*Agrostis* spp.)
common bent	(*A. tenuis* Sibth.)
creeping bent	(*A. stolonifera* L.)
velvet bent	(*A. canina* L.)
cat's-tails, e.g.:	(*Phleum* spp.)
small (lesser) cat's-tail	(*Phl. bertolonii* DC.)
timothy (grass)	(*Phl. pratense* L.)
cocksfoot	(*Dactylis glomerata* L.)
crested dog's-tail	(*Cynosurus cristatus* L.)
fescues, e.g.:	(*Festuca* spp.)
meadow fescue	(*F. pratensis* Huds.)
red fescues	(various subspp. of *F. rubra* L.)
sheep's fescues	(various subspp. of *F. ovina* L.)
tall fescue	(*F. arundinacea* Schreb.)
meadow foxtail	(*Alopecurus pratensis* L.)
meadow grasses, e.g.:	(*Poa* spp.)
(smooth-stalked) meadow grass	(*P. pratensis* L.)
rough (-stalked) meadow grass	(*P. trivialis* L.)
wood(land) meadow grass	(*P. nemoralis* L.)
rye grasses, e.g.:	(*Lolium* spp.)
Italian/Westerwolds rye grass	(*L. multiflorum* Lam.)
perennial rye grass	(*L. perenne* L.)
tall oat grass	(*Arrhenatherum elatius* (L.) P. B. ex J. & C. Presl)

To simplify the text various symbols and abbreviations are used. These are fully explained in the preceeding paper of this series (Boerema and Verhoeven, 1976). The Articles referred to in this paper are to be found in the International Code of Botanical Nomenclature ('Seattle Code', Stafleu et al., 1972).

Generally only well-known synonyms, including their basionyms, are listed. The notes in the text give additional information on the nomenclature and refer to recent papers containing descriptions and data on pathogenicity and hosts. The recognized scientific names should be used in the official publications of the Netherlands Society of Plant Pathology and the Netherlands Ministry of Agriculture and Fisheries.

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CLADOSPORIUM PHLEI (C. T. Greg.) de Vries

Cladosporium phlei (C. T. Greg.) de Vries, Contrib. Knowl. Cladosporium 49. 1952.

≡ *Heterosporium phlei* C. T. Gregory *in* Phytopathology **9**: 580. 1919.

Note: Causes oval, purple-bordered leaf spots (Am.: Eye Spot) on cat's-tails, especially timothy. For descriptions see Sprague, Dis. Cereals Grasses N.Am. 400–401. 1950, Sundheim & Aarvold *in* Meld. Norg. LandbrHøgsk. **48** (26): 1–10. 1969, Årsvoll *in* Meld. Norg. LandbrHøgsk. **54** (9): 14–15. 1975, and Ellis, More Dematiac. Hyphom. 334–336. 1976. For disease symptoms see Frauenstein *in* NachrBl. dt. PflSchutzdienst, Berl. II, **22** [= I, **48**]: 12. 1968 and Sundheim & Aarvold l.c.

CLAVICEPS PURPUREA (Fr.) Tul.

Claviceps purpurea (Fr.) Tulasne *in* Annls Sci. nat. (Bot.) III, **20**: 45. 1853.

≡ *Sphaeria purpurea* Fries, Syst. mycol. **2** [Sect. 2]: 325. 1823.

stat. con. *SPHACELIA SEGETUM* Lév.

Sphacelia segetum Léveillé *in* Mém. Soc. linn. Paris **5**: 578. 1827.

Note: The Ergot *C. purpurea* has been recorded from nearly 200 species of 50 genera of Gramineae, see Langdon *in* Univ. Qd Pap. (Bot.) **3**: 61–68. 1954. Observation of distinct differences in conidial characters among collections from grasses, however, suggests that the width of the reputed host range of *C. purpurea* may be the result of arbitrary identifications, see Loveless *in* Trans. Br. mycol. Soc. **47**: 205–213. 1964. Among cereals the fungus is only common on rye. For descriptions of both states and the biology see Butler & Jones, Pl. Path. 445–451. 1949. For the morphology of the hyphae and sclerotia and apparent relationship to the production of various alkaloids (e.g. ergotamine) see Mantle & Tonolo *in* Trans. Br. mycol. Soc. **51**: 499–505. 1968.

COCHLIOBOLUS SATIVUS (Ito & Kuribay.) Drechsl. ex Dast.

Cochliobolus sativus (Ito & Kuribay.) Drechsler ex Dastur *in* Indian J. agric. Sci. **12**: 733. 1942 [genus name introduced by Drechsler *in* Phytopathology **24**: 973. 1934].

≡ *Ophiobolus sativus* Ito & Kuribayashi apud Kuribayashi *in* Trans. Sapporo nat. Hist. Soc. **10**: 138. 1929.

stat. con. *BIPOLARIS SOROKINIANA* (Sacc.) Shoem.

Bipolaris sorokiniana (Sacc.) Shoemaker *in* Can. J. Bot. **37**: 884 [879–888]. 1959.

≡ *Helminthosporium sorokinianum* Saccardo apud Sorokin *in* Trav. Soc. Nat. Univ. Kasan **22**: 15. 1890.

≡ *Drechslera sorokiniana* (Sacc.) Subramaniam & Jain *in* Curr. Sci. **35**: 354 [352–355]. 1966.

= *Helminthosporium sativum* Pammel, King & Bakke *in* Bull. Ia agric. Exp. Stn **116**: 180 [178–190]. 1910.

= *Helminthosporium acrothecioides* Lindfors *in* Svensk bot. Tidskr. **12**: 227. 1918.

Note: This fungus, commonly known as *Helminthosporium sativum*, occurs on a wide range of Gramineae, see the list of hosts given by Sprague, Dis. Cereals Grasses N. Am. 376–381. 1950. In countries with warm and dry summers it is important as

a cause of Seedling Blight, Foot Rot and Leaf Spot of barley, wheat and turf grasses (Am.: Zonate Eye Spot). Although in cooler regions it is often considered to be harmless, it should be noted that the symptoms caused by the fungus are rather unspecific and may be disguised by the symptoms of other pathogens, see Skou *in* Friesia **8**: 57–75. 1966 and Mäkelä *in* J. scient. agric. Soc. Finland **47**: 203–211. 1975. For a detailed description of the rarely seen perfect state see Shoemaker *in* Can. J. Bot. **33**: 562–576. 1955. He observed in association with ascocarps also large pycnidia with small spores acting as spermatia (unnamed state). The taxonomy of the conidial state of *Cochliobolus sativus* and other conidial states formerly included in *Helminthosporium* Auct. has received considerable attention, see the discussion by Leonard & Suggs *in* Mycologia **66**: 287–289. 1974. Some authors reject *Bipolaris* Shoemaker (1959 l.c.) and accept *Drechslera* Ito as defined by Subramaniam & Jain (l.c.). For descriptions of the conidial state see Drechsler *in* J. agric. Res. **24**: 690–704. 1923, Mäkelä *in* Karstenia **12**: 25–27. 1971, and Ellis, Dematiac. Hyphom. 448–449. 1971. Cultures of the fungus are described by Drechsler l.c., Shoemaker 1955 l.c., Mäkelä 1971 l.c. and Ammon *in* Phytopath. Z. **47**: 261–262. 1963. For disease symptoms see Sprague l.c., Drechsler l.c. and Olofsson *in* Meddn St. Växtsk-Anst. **16** (172): 400–416, 422. 1976. For diagnosis on seeds see Malone & Muskett *in* Proc. int. Seed Test. Ass. **29** (2) [= Handb. Seed Health Test. Ser. 4, Fasc. 1]: 251–253. 1964, Handb. Seed Health Testing [Ed. Int. Seed Test. Ass.] III, Working Sheet 8. 1964 and Chidambaram, Mathur & Neergaard *in* Friesia **10** (3) [Handb. Seed Health Testing II B(3)]: 180, 181, 189, 190. 1973.

DILOPHOSPORA ALOPECURI (Fr.) Fr.

Dilophospora alopecuri (Fr.) Fries, Summ. Veg. Scand. [2] 419. 1849.

≡ *Sphaeria alopecuri* Fries, Elench. Fung. **2**: 90. 1828.

= *Dilophospora graminis* Desmazières *in* Annls Sci. nat. (Bot.) II, **14**: 5. 1840.

Note: Causal organism of Twist of cereals (esp. wheat) and certain wild and cultivated grasses. For a record of hosts see e.g. Sprague, Dis. Cereals Grasses N. Am. 168–169. 1950, and Walker & Sutton *in* Trans. Br. mycol. Soc. **62**: 234–236. 1974. Description and other synonyms of the fungus can be found in Walker & Sutton l.c. There may be a relationship with the ascomycete *Lidophia graminis* (Sacc.) J. Walker & Sutton (l.c.).

DRECHSLERA PHLEI (Graham) Shoem.

Drechslera phlei (Graham) Shoemaker *in* Can. J. Bot. **37**: 881. 1959.

≡ *Helminthosporium dictyoides* var. *phlei* Graham *in* Phytopathology **45**: 228. 1955.

≡ *Helminthosporium phlei* (Graham) Scharif *in* Trans. Br. mycol. Soc. **44**: 217(–229). 1961.

Note: Causes irregular necrotic streaks and blotches (Am.: Leaf Streak) on timothy. Occurrence on other grasses has been reported, see e.g. Ammon *in* Phytopath. Z. **47**: 265. 1963, and Mäkelä *in* Karstenia **12**: 17–19. 1971. For detailed description of the disease symptoms and the morphological characteristics of this seed-borne fungus see Scharif l.c. See also Shoemaker *in* Can. J. Bot. **40**: 826–827. 1962, Ammon l.c., Mäkelä l.c., and Ellis, Dematiac. Hyphom. 433–434. 1971.

DRECHSLERA POAE (Baudyš) Shoem.

Drechslera poae (Baudyš) Shoemaker *in* Can. J. Bot. **40**: 827. 1962.

≡ *Helminthosporium poae* Baudyš *in* Lotos **64**: 81. 1916.

= *Drechslera vagans* (Drechsl.) Shoemaker *in* Can. J. Bot. **37**: 881. 1959.

≡ *Helminthosporium vagans* Drechsler *in* J. agric. Res. **24**: 688. 1923.

Note: Commonly known as *Helminthosporium vagans*. Causal organism of leaf-spots (Am.: Purple Spot) and footrot (Melting-out) of meadow grasses, especially smooth-stalked meadow grass. In inoculation experiments numerous other grasses also appeared to be susceptible, see Moore & Couch *in* Pl. Dis. Reptr **45**: 616–619. 1961 and Mäkelä *in* Karstenia **12**: 23–24. 1971. For disease symptoms and descriptions see Mäkelä l.c., Smith, Fung. Dis. Turf Grasses ed. 2 [revised by Jackson & Smith], 58–59. 1965, and Teuteberg *in* Z. PflKrankh. [PflPath.] PflSchutz **81**: 693–694. 1974. For the characteristics of *D. poae* see also Ammon *in* Phytopath. Z. **47**: 266. 1963 and Ellis, Dematiac. Hyphom. 436–437. 1971.

EPICHLOE TYPHINA (Pers. ex Hook.) Tul.

Epichloe typhina (Pers. ex Hook.) Tulasne apud Tulasne & C. Tulasne, Sel. Fung. Carpol. **3**: 24. 1865.

rn ≡ *Sphaeria typhina* Pers. ex Hooker, Fl. scot. **2**: 6. 1821.
: Fries, Syst. mycol. **2** [Sect. 2]: 553. 1823 [under *Dothidea typhina*, see below].

dn ≡ *Sphaeria typhina* Persoon, Icon. Descr. Fung. **1**: 21. 1798; Syn. meth. Fung. 29–30. 1801.

≡ *Dothidea typhina* (Pers. ex Hook.) Fries, Syst. mycol. **2** [Sect. 2]: 553. 1823.

stat. con. *SPHACELIA TYPHINA* Sacc.
Sphacelia typhina Saccardo *in* Michelia **2** (2): 297. 1881; *in* Sylloge Fung. **4**: 666. 1886 [as '(Pers.) Sacc.'; 'Status conidicus *Epichloës typhinae* (Pers.) Tul.'].

Note: Causal organism of the Choke disease of grasses. For hosts see e.g. Kohlmeyer & Kohlmeyer *in* Mycologia **66**: 77–86. 1974. On the surface of culms the fungus produces a stomatic sheath which 'chokes' and prevents the emergence of the inflorescence. The detrimental effect of the disease on seed production has been recorded for timothy and cocksfoot, see Sampson & Western, Dis. Br. Grasses herb. Leg., ed. 2, 33–36. 1954, and Mühle & Frauenstein *in* Z. PflKrankh. [PflPath.] PflSchutz **77**: 177–185. 1970. Descriptions of disease and fungus, and data on the biology are to be found in Butler & Jones, Pl. Path. 473–479. 1949, and Sampson & Western l.c. For transmission [by seed, vegetative propagation, conidia and ascospores and the hyperparasitic fly *Phorbia phrenione* Séguy, respectively] see also Mühle & Frauenstein, l.c., and Kohlmeyer & Kohlmeyer, l.c.

ERYSIPHE GRAMINIS DC. ex Mérat

rn Erysiphe graminis DC. ex Mérat, Nouv. Fl. Env. Paris, ed. 2, **1**: 133. 1821.

dn ≡ *Erysiphe graminis* de Candolle *in* de Candolle & de Lamarck, Fl. fr. [ed. 3] **5** [6]: 106. 1815 ["1805"].

≡ *Blumeria graminis* (DC. ex Mérat) Speer *in* Sydowia **27** [1973/74]: 1, 2. 1975.

Note: Powdery Mildew of cereals and grasses. Species of more than 100 genera of Gramineae have been recorded as hosts, see Hirata, Host Range geograph. Distr. Powdery Mildews 42–65. 1966. The fungus differs from other species of *Erysiphe* Hedw.f. ex Fr. by haustoria with finger shaped appendages, secondary mycelium with thick-walled rather rigid bristles and a somewhat deviating structure of the wall of the (large) cleistothecia, which bear only rudimentary appendages. On the basis of these differences Golovin *in* Sb. Rab. Inst. prikl. Zool. Fitopat. **5**: 124. 1958 and Speer l.c. have proposed to classify the mildew of Gramineae in a separate genus, *Blumeria* Golov. ex Speer [= *Erysiphe* section *Monilioides* Blumer, Echte Mehltaupilze 173. 1967]. We have maintained the well-known name *Erysiphe graminis* pending the opinion of the various specialists of Erysiphaceae on the status of *Blumeria*. Other synonyms of *E. graminis* can be found in Speer l.c. For detailed descriptions see Blumer l.c. and Kapoor *in* C.M.I. Descr. pathog. Fungi Bact. 153. 1967. In many areas mature ascospores have been observed only rarely or not at all, see the discussion of this mildew by Parmelee *in* Fungi Can. 71. 1975. Within the species various specialized pathogenic forms occur. Only the forms distinguished on cereals are listed below. Among the cereals powdery mildew is particularly important for barley and wheat. The literature on research and breeding for resistance is very extensive, see e.g. the review on the genetics of barley mildew by Wolfe *in* Rev. Pl. Path. **51**: 507–522. 1972. The mildews of cereals apparently possess a widely overlapping host range among grasses, which however may differ geographically, see Eshed & Wahl *in* Phytopathology **60**: 628–634. 1970. In this case therefore, the distinction of formae speciales does not imply strict parasitic differentiation of the organisms concerned, but rather their preferred adaptability to certain hosts. The specifically adapted forms of *E. graminis* on grasses appear to be much more specialized than the cereal forms, and generally do not infect cereals, see e.g. Eshed & Wahl *in* Phytopathology **65**: 57–63. 1975.

f. sp. *AVENAE* [Em. Marchal]

Erysiphe graminis f. sp. *avenae* Em. Marchal *in* C. r. hebd. Séanc. Acad. Sci., Paris **135**: 211. 1902.

f. sp. *HORDEI* [Em. Marchal]

Erysiphe graminis f. sp. *hordei* Em. Marchal *in* C. r. hebd. Séanc. Acad. Sci., Paris **135**: 211. 1902.

f. sp. *SECALIS* [Em. Marchal]

Erysiphe graminis f. sp. *secalis* Em. Marchal *in* C. r. hebd. Séanc. Acad. Sci., Paris **135**: 211. 1902.

f. sp. *TRITICI* [Em. Marchal]

Erysiphe graminis f. sp. *tritici* Em. Marchal *in* C. r. hebd. Séanc. Acad. Sci., Paris **135**: 211. 1902.

FUSARIUM CULMORUM (W. G. Sm.) Sacc.

Fusarium culmorum (W. G. Sm.) Saccardo *in* Syll. Fung. **11**: 651. 1895.

≡ *Fusisporium culmorum* W. G. Smith, Dis. Field Garden Crops 209. 1894.

[≡ *Fusarium roseum* 'Culmorum', or (if pathogenic to cereals):

Fusarium roseum f. sp. *cerealis* 'Culmorum' according to the "cultivar concept" proposed by Snyder, Hansen & Oswald *in* J. Madras Univ. **27**: 185–192. 1957 for "morphologically different strains" of the collective species *Fusarium roseum* Link emend. Snyder & Hansen *in* Am. J. Bot. **32**: 663–664. 1945.]

Note: This is one of the *Fusarium* species involved in Seedling Blight, Brown Foot Rot and Ear Blight of cereals, and one of the fungi which may cause the death of grass seedlings. Established turf may also be attacked: Leaf Blight. Furthermore this is apparently the most frequent cause of Stalk Rot and Ear Rot of maize in Europe. For descriptions of *F. culmorum*, host range and notes on physiologic specialization see Booth & Waterston *in* C.M.I. Descr. pathog. Fungi Bact. 26. 1964 and Booth, Genus Fusarium 173–176. 1971. See also Booth, Fusarium Lab. Guide Ident. 49–50. 1977, and Malone & Muskett *in* Proc. int. Seed Test. Ass. **29** (2) [= Handb. Seed Health Test. Ser. 4, Fasc. 1]: 269–270. 1964. Descriptions of the disease symptoms on cereals are to be found in e.g. Butler & Jones, Pl. Path. 389–396. 1949, Moore & Moore *in* Bull. Minist. Agric. Fish., Lond. **129**: 22–23. 1950 and Colhoun & Park *in* Trans. Br. mycol. Soc. **47**: 559–572. 1964. For leaf blight of turf grasses, see Couch & Bedford *in* Phytopathology **56**: 781–786. 1966. For the occurrence on maize, see Rintelen *in* Phytopath. Z. **60**: 141–165. 1967 and Focke *in* Wiss. Z. Univ. Rostock **15**: 219–228. 1966. Other species of *Fusarium* are listed under their perfect state names in *Gibberella* and *Monographella*.

GAEUMANNOMYCES GRAMINIS var. *AVENAE* (E. M. Turner) Dennis

Gaeumannomyces graminis var. *avenae* (E. M. Turner) Dennis, Br. Cup Fungi 202. 1960.

≡ *Ophiobolus graminis* var. *avenae* E. M. Turner *in* Trans. Br. mycol. Soc. **24**: 279. 1940.

Note: Known as causal organism of Take-all or Whiteheads of oats; the 'oat take-all fungus'. However, it can also attack wheat and barley, and is furthermore strongly pathogenic to grasses, particularly to bent grasses: Patch Disease of turf. A comprehensive host list is given by Nilsson *in* LantbrHögsk. Annlr **35**: 436–475. 1969. The oat take-all fungus has longer ascospores than the 'wheat take-all fungus', *Gaeumannomyces graminis* var. *tritici* J. Walker (see below), and *Gaeumannomyces graminis* (Sacc.) von Arx & Olivier var. *graminis* [formerly confused with the wheat take-all fungus] which commonly occurs in tropical and subtropical areas. The take-all fungi belong to the Diaporthales with unitunicate asci, and therefore could not be maintained in *Ophiobolus* [Pleosporaceae, bitunicate asci]. In culture the three varieties of *Gaeumannomyces graminis* produce phialoconidia similar to those produced by some *Phialophora*-like fungi recorded from roots of *Gramineae*; see e.g. Wong & Walker *in* Trans. Br. mycol. Soc. **65**: 41–47. 1975. Some of these *Phialophora*-like fungi may interact with the take-all fungi, see Deacon *in* Pl. Path. **22**: 149–155. 1973 and **23**: 85–92. 1974. For the description of *Gaeumannomyces graminis* var. *avenae* see Walker *in* C.M.I. Descr. pathog. Fungi Bact. 382. 1973. For history, differentiating characters and pathology of the fungus see the review of recent work on the take-all diseases of Gramineae by Walker *in* Rev. Pl. Path. **54**: 113–144. 1975. The patch disease of grasses is treated by Smith, Fung. Dis. Turf Grasses ed. 2 [revised by Jackson & Smith], 54–57. 1965.

GAEUMANNOMYCES GRAMINIS var. *TRITICI* J. Walker

Gaeumannomyces graminis var. *tritici* J. Walker *in* Trans. Br. mycol. Soc. **58**: 439 (427–457). 1972.

Note: The common causal organism of Take-all or Whiteheads of wheat and barley; the 'wheat take-all fungus'. Rye is only occasionally attacked. Oats can be regarded as practically immune to the wheat take-all fungus, but are susceptible to *Gaeumannomyces graminis* var. *avenae* (E. M. Turner) Dennis, the 'oat take-all fungus' (see above). The latter, which is characterized by longer ascospores, may also cause take-all of wheat and barley. Grasses vary greatly in their susceptibility to the wheat take-all fungus, see Nilsson *in* LantbrHögsk. Annlr **35**: 436–475. 1969. Reports on severe damage on grasses generally concern seed crops. Take-all of wheat and barley was formerly ascribed to *Ophiobolus graminis* (Sacc.) Sacc. var. *graminis*, presently known as *Gaeumannomyces graminis* (Sacc.) von Arx & Olivier var. *graminis* [*Ophiobolus:* Pleosporaceae, bitunicate asci; *Gaeumannomyces:* Diaporthales, unitunicate asci; see von Arx & Olivier *in* Trans. Br. mycol. Soc. **35**: 29–33. 1952]. However, Walker (l.c.) pointed out that Saccardo's species was not the same as the wheat take-all fungus, but refers to a different fungus, especially common in the warmer parts of the world and among others known as a weak pathogen of rice. All three varieties of *G. graminis* have a *Phialophora*-like conidial state, see the note under *G. graminis* var. *avenae*. For description of the wheat take-all fungus see Walker *in* C.M.I. Descr. pathog. Fungi Bact. 383. 1973 and Shoemaker *in* Fungi Can. 37. 1974. For history, differentiating characters and pathology of the fungus see the review of recent work on the take-all diseases of Gramineae by Walker *in* Rev. Pl. Path. **54**: 113–144. 1975.

GIBBERELLA AVENACEA R. J. Cook

Gibberella avenacea R. J. Cook *in* Phytopathology **57**: 735. 1967.

stat. con. *FUSARIUM AVENACEUM* (Fr.) Sacc.

Fusarium avenaceum (Fr.) Saccardo *in* Syll. Fung. **4**: 713. 1886.

≡ *Fusisporium avenaceum* Fries, Syst. mycol. **3** [Sect. 2]: 444. 1832.

[≡ *Fusarium roseum* 'Avenaceum', or (if pathogenic to cereals): *Fusarium roseum* f. sp. *cerealis* 'Avenaceum' according to the "cultivar concept" proposed by Snyder, Hansen & Oswald *in* J. Madras Univ. **27**: 185–192. 1957 for "morphologically different strains" of the collective species *Fusarium roseum* Link emend. Snyder & Hansen *in* Am. J. Bot. **32**: 663–664. 1945.]

Note: This is one of the fungi causing Seedling Blight, Brown Foot Rot and Ear Blight of cereals. Further it may cause Stalk Rot of maize. For descriptions, host range and notes on physiologic specialization and pathogenicity see Booth & Waterston *in* C.M.I. Descr. pathog. Fungi Bact. 25. 1964, and Booth, Genus Fusarium 91–94. 1971 [conidial state in both cases erroneously listed with the author citation '(Corda ex Fr.) Sacc.'; pers. information Dr. Booth]. See also Booth, Fusarium Lab. Guide Ident. 39. 1977, and Malone & Muskett *in* Proc. int. Seed Test. Ass. **29** (2) [= Handb. Seed Health Test. Ser. 4, Fasc. 1]: 268–269. 1964. For disease symptoms on cereals see e.g. Butler & Jones, Pl. Path. 389–396. 1949, Moore & Moore *in* Bull. Minist. Agric. Fish., Lond. **129**: 22–23. 1950, and Colhoun & Park *in* Trans. Br. mycol. Soc. **47**: 559–572. 1964. The occurrence on maize is treated by Rintelen *in* Phytopath. Z. **60**: 141–165. 1967.

GIBBERELLA ZEAE (Schw.) Petch

Gibberella zeae (Schw.) Petch *in* Annls mycol. **34**: 260. 1936.

≡ *Sphaeria zeae* Schweinitz *in* Schr. naturf. Ges. Leipzig **1** [= Syn. Fung. Car. sup.]: 48. 1822.

: Fries, Syst. mycol. **2** [Sect. 2]: 527. 1823.

stat. con. *FUSARIUM GRAMINEARUM* Schwabe

Fusarium graminearum Schwabe, Fl. Anhaltina **2**: 285. 1838.

[≡ *Fusarium roseum* 'Graminearum' or (if pathogenic to cereals): *Fusarium roseum* f. sp. *cerealis* 'Graminearum' according to the "cultivar concept" proposed by Snyder, Hansen & Oswald *in* J. Madras Univ. **27**: 185–192. 1957 for "morphologically different strains" of the collective species *Fusarium roseum* Link emend. Snyder & Hansen *in* Am. J. Bot. **32**: 663–664. 1945.]

Note: On cereals this fungus is one of the causal organisms of Seedling Blight, Brown Foot Rot and Ear Blight. Under wet conditions, besides the conidial state, perithecia of the perfect state are also produced on stems and ears: Scab. The fungus is furthermore one of the causes of Stalk Rot and Ear Rot of maize. For descriptions, physiologic specialization and notes on the pathology see Booth, Genus Fusarium 179–182. 1971 and Booth *in* C.M.I. Descr. pathog. Fungi Bact. 384. 1973. See also Booth, Fusarium Lab. Guide Ident. 40–41. 1977, and Malone & Muskett *in* Proc. int. Seed Test. Ass. **29** (2) [= Handb. Seed Health Test. Ser. 4, Fasc. 1]: 276–278. 1964. Descriptions of the disease symptoms on cereals can be found in e.g. Butler & Jones, Pl. Path. 396–403. 1949, Moore & Moore *in* Bull. Minist. Agric. Fish., Lond. **129**: 23–24. 1950 and Colhoun & Park *in* Trans. Br. mycol. Soc. **47**: 559–572. 1964. For the symptoms on maize see e.g. Koehler *in* Bull. Ill. agric. Exp. Stn **658**: 10–13. 1960 (stalk rot) and Koehler *in* Bull. Ill. agric. Exp. Stn **639**. 1959 (ear rot). Methods of obtaining perithecia in vitro are discussed by Tschanz, Horst & Nelson *in* Mycologia **67**: 1101–1108. 1975.

GLOEOTINIA TEMULENTA (Prill. & Delacr.) M. Wils. & al.

Gloeotinia temulenta (Prill. & Delacr.) M. Wilson, Noble & Gray *in* Trans. Br. mycol. Soc. **37**: 31. 1954.

≡ *Phialea temulenta* Prillieux & Delacroix *in* Bull. Soc. mycol. Fr. **8**: 22–23. 1892.

= *Phialea mucosa* Gray *in* Trans. Br. mycol. Soc. **25**: 332. 1942.

stat. con. *ENDOCONIDIUM TEMULENTUM* Prill. & Delacr.

Endoconidium temulentum Prillieux & Delacroix *in* Bull. Soc. mycol. Fr. **7**: 116–117. 1891.

Note: Causal organism of the Blind Seed Disease of grasses. The disease is particularly severe on perennial rye grass and (less frequently) on Italian rye grass. For the nomenclature and synonymy of the perfect state of *G. temulenta* see Wilson, Noble & Gray l.c. For disease symptoms, descriptions of both states of the fungus and lists of hosts (which also includes rye) see e.g. Sprague, Dis. Cer. Grasses N. Am. 96–100. 1950, Sampson & Western, Dis. Br. Grasses herb. Leg. ed. 2, 39–42. 1954 and Malone & Muskett *in* Proc. Int. Seed Test. Ass. **29** (2) [= Handb. Seed Health Test. Ser. 4, Fasc. 1] 283–287. 1964. See also Smith, Fung. Dis. Turf Grasses ed. 2 [revised by Jackson & Smith], 67–69. 1965.

LEPTOSPHAERIA NODORUM E. Müll.

Leptosphaeria nodorum E. Müller *in* Phytopath. Z. **19**: 409. 1952.

≡ *Phaeosphaeria nodorum* (E. Müll.) Hedjaroude *in* Sydowia **22** [1968]: 79–81. 1969.

stat. con. *SEPTORIA NODORUM* (Berk.) Berk.

Septoria nodorum (Berk.) Berkeley apud Berkeley & Broome *in* Ann. Mag. nat. Hist. II, **5**: 379. 1850.

≡ *Depazea nodorum* Berkeley *in* Gdnrs' Chron. **1845**: 601. 1845.

≡ *Hendersonia nodorum* (Berk.) Petrak *in* Sydowia **1**: 76. 1947.

= *Stagonospora hennebergii* (Kühn) Petrak & Sydow *in* Annls mycol. **23**: 272. 1925.

≡ *Phoma hennebergii* Kühn *in* Fungi europ. exs. / Klotzschii Herb. mycol. Cont. [Ed. Rabenh.]. Cent. 23, No. 2261. 1876.

≡ *Macrophoma hennebergii* (Kühn) Berlese & Voglino *in* Atti Soc. veneto-trent. Sci. nat. **10**: 202. 1886.

= *Septoria glumarum* Passerini *in* Atti Soc. crittogam. ital. **2**: 46. 1879.

Note: This species is well-known as the cause of Glume Blotch of wheat, but has also been recorded on rye, barley and many grasses, apparently without strict host specialization; see the hosts listed by Sprague, Dis. Cereals Grasses N. Am. 244–246. 1950 and the discussion of the host range by Shipton, Boyd, Rosielle & Shearer *in* Bot. Rev. **37**: 231–262 [247–248]. 1971. For description of both states of the fungus see Sutton & Waterston *in* C.M.I. Descr. pathog. Fungi Bact. 86. 1966. The pycnidial state is maintained here under the common name *Septoria nodorum*, although it does not agree with typical *Septoria* species as for instance *S. tritici* Rob. ex Desm.; compare Jörstad [Jørstad] *in* Skr. norske Vidensk-Akad. [Mat.-naturv. Kl.] II [= Ny Serie] **24**: 43–45. 1967. The generic name *Leptosphaeria* Ces. & de Not. to which the perfect state is assigned by Müller (l.c.), is invalid but has been proposed for conservation (Holm *in* Taxon **24**: 480–481. 1975). Müller's concept of *Leptosphaeria* is rather broad, see his study *in* Sydowia **4**: 185–319. 1950. The arrangement of the perfect state of the glume blotch fungus under *Phaeosphaeria* Miyake by Hedjaroude l.c. follows the classification of Holm *in* Symb. bot. upsal. **14** (3). 1957 [188 pp.]. Recent studies by Rapilly, Foucault & Lacazedieux *in* Annls Phytopath. **5**: 131–141. 1973 have shown that the perfect state plays a much more important role in the life cycle of the fungus than formerly assumed. Furthermore, the fungus has the capacity to produce microconidia which also may be of importance in the dispersion of the pathogen. These microconidia are found together with macroconidia in normal pycnidia and alone in smaller pycnidia, see Harrower *in* Trans. Br. mycol. Soc. **67**: 335–336. 1976. For general information on the glume blotch disease of wheat and the pathology and biology of the fungus see Sutton & Waterston l.c. and the reviews given by Shipton & al. l.c. and van der Wal & Luuring *in* Tech. Ber. Sticht. Ned. Graan-Cent. **22**. 1976 [Dutch; 78 pp.]. The diagnosis on seeds is treated in Handb. Seed Health Testing [Ed. Int. Seed Test. Ass.] III, Working Sheet 19. 1964.

MARASMIUS OREADES (Bolt. ex Fr.) Fr.

Marasmius oreades (Bolt. ex Fr.) Fries, Epicr. 375. 1838.

rn ≡ *Agaricus oreades* Bolt. ex Fries, Syst. mycol. **1**: 127. 1821.

dn ≡ *Agaricus oreades* Bolton, Hist. Fung. **3**: tab. 151. 1791.

Note: This Fairy Ring Mushroom is the most common Basidiomycete associated with rings of lush and dead turf. For description and symptoms of the fairy rings due to *M. oreades* see Smith, Fung. Dis. Turf Grasses ed. 2 [revised by Jackson & Smith], 71–82. 1965, and Smith *in* J. Sports Turf Res. Inst. **51**: 41–45. 1975. A colour-plate of *M. oreades* and notes on cultivation substrates can be found in Singer, Mushrooms Truffles pl. 1, 168–169. 1961. See also Poelt & Jahn, Mitteleuropäische Pilze, Taf. 107. 1963 and Singer *in* Sydowia **18** [1964]: 227. 1965.

MASTIGOSPORIUM ALBUM Riess

Mastigosporium album Riess in Fresenius, Beitr. Mykol. **2**: 56. 1852.

Note: Causal organism of Leaf Fleck of meadow foxtail and some wild foxtail grasses. Records on other grasses are probably due to misidentifications, see Gunnerbeck *in* Svensk bot. Tidskr. **65**: 42–44. 1971. For descriptions see Bollard *in* Trans. Br. mycol. Soc. **33**: 250–264. 1950 [morphological and cultural characteristics] and Gunnerbeck l.c. [morphology]. See also Schlösser *in* Phytopath. Z. **67**: 248–258. 1970. For disease symptoms and pathology see Bollard l.c. and Bollard *in* Trans. Br. mycol. Soc. **33**: 265–275. 1950. See also Mäkelä *in* Suom. maatal. Seur. Julk. **124**(1): 36, 43. 1972. The erroneous statement that *M. album* is related to the twist-fungus *Dilophospora alopecuri* (Fr.) Fr. is often found in older literature, see Gunnerbeck l.c.

MASTIGOSPORIUM KITZEBERGENSE Schlösser

Mastigosporium kitzebergense Schlösser *in* Phytopath. Z. **67**: 256–257 (248–258). 1970.

Note: This common Leaf Fleck fungus of timothy is often confused with other species of *Mastigosporium*, particularly with *M. rubricosum* (Dearn. & Barth.) Nannf. (see below) and with *M. cylindricum* Sprague [*in* Mycologia **32**: 44. 1940] described from brome grass in the U.S.A. For differentiating (morphological and cultural) characteristics and the disease symptoms on timothy see Schlösser l.c. See also Gunnerbeck *in* Svensk bot. Tidskr. **65**: 47–48. 1971 [as '*M. cylindricum*'] and Mäkelä *in* Suom. maatal. Seur. Julk. **124**(1): 36, 43. 1972 [as '*M. rubricosum*'].

MASTIGOSPORIUM MUTICUM (Sacc.) Gunnerb.

Mastigosporium muticum (Sacc.) Gunnerbeck *in* Svensk bot. Tidskr. **65**: 46. 1971.
≡ *Mastigosporium album* var. *muticum* Saccardo *in* Annls mycol. **9**: 254. 1911.

Note: The cause of Leaf Fleck of cocksfoot and related grasses. Formerly the leaf fleck disease of cocksfoot was attributed to *Mastigosporium rubricosum* (Dearn. & Barth.) Nannf., which is now known to occur only on bent grasses and wild small-reed grasses (see below). Both fungi can be distinguished by small differences in conidial shape and different growth characters in vitro. See Gunnerbeck *in* Svensk bot. Tidskr. **65**: 45–47. 1971, in comparison with the cultural study of both fungi by Bollard *in* Trans. Br. mycol. Soc. **33**: 250–264. 1950 [*M. rubricosum* var. *agrostidis* Bollard = *M. rubricosum* proper; his '*M. rubricosum*' = *M. muticum*]. For disease symptoms, and descriptions see also Schlösser *in* Phytopath. Z. **67**: 248–258. 1970 and Schmidt *in* Revue suisse Agric. **4**: 64–65. 1972 [in both cases as '*M. rubricosum*']. For pathology see Bollard *in* Trans. Br. mycol. Soc. **33**: 265–275. 1950.

MASTIGOSPORIUM RUBRICOSUM (Dearn. & Barth.) Nannf.

Mastigosporium rubricosum (Dearn. & Barth.) Nannfeldt *in* Fungi exs. suec. [Ed. Lundell & Nannf.] Fasc. 17/18 No. 876. 1939 [p. 32. 1939].

V ≡ *Fusoma rubricosum* Dearness & Bartholomew apud Dearness *in* Mycologia **9**: 361. 1917 [as '*F. rubricosa*'].

H ≡ *Mastigosporium rubricosum* (Dearn. & Barth.) Sprague *in* Mycologia **32**: 43. 1940.

= *Mastigosporium rubricosum* var. *agrostidis* Bollard *in* Trans. Br. mycol. Soc. **33**: 262. 1950.

Note: This Leaf Fleck fungus occurs on a wide range of wild small-reed grasses, but the fungus also attacks the important bent grasses. In the past it has been confused with *M. muticum* (Sacc.) Gunnerb. parasitizing on cocksfoot (see above). Bollard (l.c.) erroneously misapplied the binomial *M. rubricosum* to the fungus on cocksfoot and introduced the superfluous varietal name *M. rubricosum* var. *agrostidis* for the leaf fleck fungus on bent and small-reed grasses. Records on timothy refer to *M. kitzebergense* Schlösser (treated above). The full synonymy of *M. rubricosum* can be found in Gunnerbeck *in* Svensk bot. Tidskr. **65**: 45–47. 1971. For descriptions see Bollard l.c. [morphological and cultural characteristics] and Gunnerbeck l.c. [morphology]. For disease symptoms and pathology see Bollard l.c. and Bollard *in* Trans. Br. mycol. Soc. **33**: 265–275. 1950.

MONOGRAPHELLA NIVALIS (Schaffn.) E. Müll.

Monographella nivalis (Schaffn.) E. Müller *in* Revue Mycol. **41**: 132 (129–134). 1977 [erroneously as '(Rehm) Müller comb. nov.'].

≡ *Calonectria nivalis* Schaffnit *in* Mycol. Centbl. [Mykol. Zentbl.] **2** (5): 257. 1913 [April].

≡ *Griphosphaeria nivalis* (Schaffn.) E. Müller & von Arx *in* Phytopath. Z. **24**: 356. 1955.

≡ *Micronectriella nivalis* (Schaffn.) Booth, Genus Fusarium 42. 1971.

= *Monographella divergens* (Rehm) Petrak *in* Annls mycol. **22**: 143. 1924.

≡ *Sphaerulina divergens* Rehm *in* Annls mycol. **11**: 397. 1913 [November].

stat. con. *FUSARIUM NIVALE* Ces. ex Sacc.

Fusarium nivale Cesati ex Saccardo *in* Syll. Fung. **10**. 726. 1892. [with reference to Cesati's collection of '*Fusarium oxysporum* Schlecht.?' *in* Klotzschii Herb. mycol. [Ed. Rabenh.] Cent. 15, No. 1439. 1850; see note].

≡ *Fusarium hibernans* Lindau *in* Rabenh. Krypt.-Fl. [ed. 2], Pilze **9** [Lief. 113]: 542. 1909 [vol. dated "1910"].

H = *Fusarium nivale* (Fr.) Sorauer *in* Z. PflKrankh. **11**: 220. 1901 [see note].

≡ *Lanosa nivalis* Fries, Syst. Orb. Veg. 317. 1825, emend. Fries, Summ. Veg. Scand. [2] 495. 1849 [with ref. to the description by Unger *in* Bot. Ztg **2**: 569–575. 1844; see note].

[= *Fusarium nivale* f. sp. *graminicola* according to Snyder & Hansen's concept of *Fusarium nivale in* Am. J. Bot. **32**: 661–662. 1945.]

Note: One of the fungi causing Seedling Blight, Brown Foot Rot and Ear Blight of cereals. Furthermore it is responsible for the *Fusarium* Patch Disease of turf, also called Snow Mould. The latter name refers to the serious damage which the fungus may cause on winter cereals and ley grasses in areas with prolonged snow cover: Under the snow the leaves and sometimes entire plants are killed and abundant aerial mycelium usually develops on the dead tissue (Pink Snow Mould). Aerial mycelium appears in a similar but less obvious manner on turf affected by the patch disease under conditions of local high humidity. The perfect state usually develops in rows on the leaf sheaths of infected cereals. Its nomenclature has been recently discussed in detail by Müller (l.c.). It was first described as *Calonectria nivalis*, but differs from *Calonectria* de Not. by its thin-walled asci with amyloid apical apparatus. Müller has found it to be conspecific with *Sphaerulina divergens*, the type species of the genus *Monographella* Petr. Studies of the type species of *Griphosphaeria* Höhn. [Shoemaker & Müller *in* Can. J. Bot. **42**: 403–410. 1964] and *Micronectriella* Höhn. [von Arx & Müller *in* Stud. Mycol. **9**: 92. 1975] have shown that these genera are synonymous with *Discostroma* Clements and *Sphaerulina* Sacc., respectively, having characteristics different from those of the perfect state of the snow mould. The author citation of the conidial state, *Fusarium nivale*, varies widely in the literature [e.g. 'Auct.', 'Ces.', '(Fr.) Ces.', 'Sor.', '(Fr.) Sor.', '(Fr.) Snyd. & Hans.'], due to the confusing nomenclatural history of the snow mould. Unger's (1844, l.c.) interpretation of *Lanosa nivalis* Fries (1825, l.c.) without doubt refers to the snow mould stage of *Monographella nivalis* [compare Schaffnit *in* Landw. Jbr **43**: 523. 1912]. As Fries (1849, l.c.) has adopted Unger's emended description of his *Lanosa nivalis*, the latter can be accepted as the oldest known name of the snow mould. Sorauer (1901, l.c.) concluded that Unger's (= Fries's) fungus belonged to the genus *Fusarium* and changed the name: '... der vorliegende, als *Fusarium nivale* Sor. nunmehr angesprochene Pilz'. This binomial, however, was already introduced by Saccardo (l.c.) in 1892 for the snow mould based on a collection from Cesati. Saccardo listed Cesati as author; therefore the correct author citation is Ces. ex Sacc. Sorauer's (l.c.) study of the snow mould obviously includes different *Fusarium* species (among others one with chlamydospores, never observed in *F. nivale*). This brought Lindau (l.c.) to the conclusion that two species were involved, and he renamed Cesati's species *Fusarium hibernans*. For descriptions of both states of the fungus see Booth, Genus Fusarium 42–43. 1971 and Booth *in* C.M.I. Descr. pathog. Fungi Bact. 309. 1971. See also Booth, Fusarium Lab. Guide Ident. 51. 1977, and Malone & Muskett *in* Proc. int. Seed Test. Ass. **29** (2) [= Handb. Seed Health Test. Ser. 4, Fasc. 1]: 291–294. 1964. For the symptoms of seedling blight, brown foot rot and ear blight of cereals caused by *M. nivalis* see e.g. the description of the disease on wheat by Millar & Colhoun *in* Trans. Br. mycol. Soc. **52**: 57–66. 1969. The patch disease of grasses is treated in Smith, Fung. Dis. Turf Grasses ed. 2 [revised by Jackson & Smith], 32–40. 1965.

PHANEROCHAETE FUCIFORMIS (Berk.) Jülich

Phanerochaete fuciformis (Berk.) Jülich *in* Persoonia **8** (4): 434 [433–436]. 1976.

≡ *Isaria fuciformis* Berkeley *in* J. Linn. Soc. (Bot.) **13** ["1873"]: 175. 1872.

≡ *Corticium fuciforme* (Berk.) Wakefield *in* Trans. Br. mycol. Soc. **5**

["1914–16"]: 481. 1917.

Note: The cause of the Red Thread disease of turf and relatively long grasses (Am.: Pink Patch). The "red threads" refer to the pink-red, branched or simple, gelatinous tufts of mycelium produced on the shoots and leaves of the infected grasses. The perfect state – in Europe not found until late in autumn – is commonly known as *Corticium fuciforme*. The genus *Corticium* Auct. was an accumulation of often unrelated species, which in the past decades have been assigned to different small and more natural genera. Recently Jülich (l.c.) concluded that the proper taxonomic position of the red thread fungus is under *Phanerochaete* P. Karst. The fungus has been reported from several species of grass; but fescues (in particular varieties of red fescue) are the most susceptible species. For other hosts, descriptions and other synonyms see Sprague, Dis. Cereals Grasses N. Am. 126–127. 1950, Richter & Schneider *in* NachrBl. dt. PflSchutzDienst., Stuttgart **13**: 54–59. 1961, Cunningham *in* Bull. N. Z. Dep. scient. ind. Res. **145**: 87–88. 1963 and Jülich l.c. For disease symptoms [colour plate] and epidemiology see Smith, Fung. Dis. Turf Grasses ed. 2 [revised by Jackson & Smith], 49–53. 1965.

PHYLLACHORA DACTYLIDIS Delacr.

Phyllachora dactylidis Delacroix *in* Bull. Soc. mycol. Fr. **8**: 191. 1892.

stat. sperm. *LINOCHORA* sp.

Note: The causal organism of Black Leaf Spot of cocksfoot. The distribution of this harmless parasite is apparently restricted to Europe, where it is found occasionally on fescues and wild brome grasses. Although the fungus is quite different from the other species of *Phyllachora* present in Europe, it has often been misidentified as *P. graminis* (Pers. ex Mérat) Nitschke or *P. sylvatica* Sacc. & Speg. (both listed below), neither of which occur on cocksfoot. For synonymy, description and illustrations of *P. dactylidis* see Parbery *in* Aust. J. Bot. **15**: 303–304, 365. 1967.

PHYLLACHORA GRAMINIS (Pers. ex Mérat) Nitschke

Phyllachora graminis (Pers. ex Mérat) Nitschke apud Fuckel *in* Jb. nassau. Ver. Naturk. **23–24** [= Symb. mycol.]: 216. 1870 ["1869"].

rn ≡ *Sphaeria graminis* Pers. ex Mérat, Nouv. Fl. Env. Paris, ed. 2, **1**: 141. 1821.

: Fries, Syst. mycol. **2** [Sect. 2] 434. 1823.

dn ≡ *Sphaeria graminis* Persoon, Obs. mycol. **1**: 18. 1796; Syn. meth. Fung. 30. 1801.

stat. sperm. *LINOCHORA GRAMINIS* (Grove) Parbery

Linochora graminis (Grove) Parbery *in* Aust. J. Bot. **15**: 288. 1967.

≡ *Leptostromella graminis* Grove, Br. Coelomycetes **2**: 194. 1937.

Note: This Black Leaf Spot fungus occurs on a wide range of grasses (Am.: Common Tar Spot). In Europe it is especially common on bent grasses. For the other hosts of this practically harmless parasite see Sprague, Dis. Cereals Grasses N. Am. 107–108. 1950, and Parbery *in* Aust. J. Bot. **15**: 286–289. 1967. It should be realized that European records of *Phyllachora graminis* on cocksfoot refer to another species, *P. dactylidis* Delacr. (listed above). With regard to the author citation of the fungus, Petersen *in* Mycotaxon **1**: 156–157, 163. 1975 and **3**: 259. 1976 pointed out that the first valid publication [after the starting point date 1 Jan. 1821] of the basionym

Sphaeria graminis was given by Mérat. It should be noted that in older literature the combination *Phyllachora graminis* has often been erroneously ascribed to Fuckel (see Parbery l.c.: 274). For synonymy, descriptions and illustrations of the fungus see von Arx & Müller *in* Beitr. KryptogFlora Schweiz **11** (1): 215–217. 1954 and Parbery l.c.

PHYLLACHORA SYLVATICA Sacc. & Speg.

Phyllachora sylvatica Saccardo & Spegazzini *in* Michelia **1** (4): 410. 1878 [according to Art. 73 the mediaeval spelling *sylvatica* deliberately adopted by Saccardo & Spegazzini must not be altered to the correct classical spelling *silvatica*].

Note: In Europe the common cause of Black Leaf Spot of fescues. For other hosts of this very widely distributed harmless parasite (Am.: Tar Spot) see Parbery *in* Aust. J. Bot. **15**: 346–347. 1967. In the past it has often been confused with *Phyllachora dactylidis* Delacr. (see above). Synonymy, description and illustrations of *P. sylvatica* can be found in Parbery's paper of 1967 (l.c.), but it must be noted that the spermatial state attributed to *P. sylvatica* in that paper is now known to be part of another, separate species, see Parbery *in* Aust. J. Bot. **19**: 227. 1971. For description see also Sprague, Dis. Cereals Grasses N. Am. 114–115. 1950 [as *P. 'silvatica'*].

PSEUDOCERCOSPORELLA HERPOTRICHOIDES (Fron) Deighton

Pseudocercosporella herpotrichoides (Fron) Deighton *in* Mycol. Pap. **133**: 46–47. 1973.

≡ *Cercosporella herpotrichoides* Fron *in* Annls Sci. agron. fr. IV, **1**: 11. 1912.

Note: This fungus, commonly known as *Cercosporella herpotrichoides*, attacks all commercially grown varieties of wheat and barley: Eyespot (and Lodging; Am.: Strawbreaker). Oats and rye are much less susceptible. Further it occurs on various grasses, see e.g. Sprague, Dis. Cereals Grasses N. Am. 317–321. 1950 and Deighton (l.c.). The recent transfer of the species to the new genus *Pseudocercosporella* Deighton is based on the fact that its method of conidial liberation is different from that of typical *Cercosporella* spp. The eyespot lesions caused by *P. herpotrichoides* usually possess only sterile mycelium and may not form conidia until the following winter and spring. A method for obtaining sporulation on attacked material can be found in Glynne *in* Trans. Br. mycol. Soc. **36**: 46–51. 1953. For growth and sporulation of the fungus on artificial media see Pang Chang & Tyler *in* Phytopathology **54**: 729–735. 1964, but near-UV irradiation is the most efficient means of inducing sporulation [Leach *in* Can. J. Bot. **45**: 1999–2016. 1967; Schlösser *in* Phytopath. Z. **68**: 171–180. 1970]. For cultural characters see also Lange-de la Camp *in* Phytopath. Z. **55**: 34–66. 1966, Booth & Waller *in* C.M.I. Descr. pathog. Fungi Bact. 386. 1973 and Deighton l.c. The eyespot lesions caused by *P. herpotrichoides* may be confused with those of the Sharp Eyespot disease caused by *Rhizoctonia cerealis* [p. 191]. For differentiating characters of the symptoms of both diseases, see the descriptions *in* Advis. Leafl. Minist. Agric. Fish. Fd 321. 1972 [revised ed.]. The phytopathological literature on *P. herpotrichoides* is very extensive; a general review can be found in Booth & Waller l.c. The epidemiology on wheat has recently been discussed by Rowe & Powelson *in* Phytopathology **63**: 981–988. 1973.

PUCCINIA BRACHYPODII var. *POAE-NEMORALIS* (Otth) Cummins & H. C. Greene [sensu lato]

Puccinia brachypodii var. *poae-nemoralis* (Otth) Cummins & H. C. Greene *in* Mycologia **58**: 705. 1966 [with emended circumscription, see note].

≡ *Puccinia poae-nemoralis* Otth *in* Mitt. naturf. Ges. Bern **1870**: 113. 1871 [with reference to Tulasne *in* Annls Sci. nat. (Bot.) IV, **2**: 184. 1854, who notes that he has seen uredinial paraphyses in a *Puccinia* on *Poa nemoralis*].

Note: Includes a common Rust on meadow grasses (uredinia and telia, the latter usually scanty or not produced at all), which was formerly often confused with *Puccinia poarum* Niels. Cummins & Greene's concept of the listed variety embraces a group of the world-wide complex of grass rust fungi characterized by abundant clavate-capitate uredinial paraphyses whose walls are thick throughout. Most of the different host-forms were originally described as separate species. The oldest valid name within the complex is *Puccinia brachypodii* Otth *in* Mitt. naturf. Ges. Bern **1861**: 82. 1861, the next oldest name is *P. poae-nemoralis* cited above. Hylander, Jørstad & Nannfeldt *in* Op. bot. Soc. bot. Lund **1**: 40, 62–63. 1953 treat *P. brachypodii* and *P. poae-nemoralis* as distinct species; this has also been adopted by Wilson & Henderson, Br. Rust Fungi 250–251, 271–274. 1966. We follow Cummins & Greene (l.c.), who recognize only one species, *P. brachypodii*, devided into four varieties. Their variety *poae-nemoralis* represents only a part of *P. poae-nemoralis* sensu Hylander & al. (l.c.). For synonymy, hosts and detailed descriptions of *P. brachypodii* var. *poae-nemoralis* see Cummins & Greene l.c. and Cummins, Rust Fungi 166–167. 1971. See also Frauenstein *in* NachrBl. dt. PflSchutzdienst, Berl. **24**: 7–8. 1970. On various grasses telia are scarce or not found at all. In India aecidia have been recorded on a *Berberis* sp., but generally the life cycle is completed without host alternation. The forms adapted to different Gramineae may be interpreted as formae speciales. The fungus can be distinguished from *P. poarum* by the presence of the characteristic capitate uredinial paraphyses.

PUCCINIA CORONATA Corda var. *CORONATA*

Puccinia coronata Corda, Icon. Fung. **1**: 6. 1837, var. *coronata* [type on *Calamagrostis* sp.; varietal epithet to be cited without an author's name, Art. 26; see note].

= *Puccinia coronifera* Klebahn *in* Z. PflKrankh. **4**: 135. 1894.

Note: This Crown Rust of grasses (uredinia and telia) alternates with *Rhamnus* spp. and some other shrubs (spermogonia and aecidia) and therefore has also been treated in Series 1a of the Check-list [*in* Neth. J. Pl. Path. **78**, Suppl. 1: 39–40. 1972]. There occurs a considerable host specialization within the crown rusts of Gramineae, see e.g. the discussion by Wilson & Henderson, Br. Rust Fungi 251–255. 1966. The specialization is partly correlated with minor morphological differences, which explains why the various crown rusts, which have adapted to different hosts, have been classified as varieties as well as formae speciales. There is still no agreement on this point, but it is generally accepted that the crown rust occurring on oats represents a separate variety: *P. coronata* var. *avenae* Fraser & Led. (see below). The crown rust of grasses is therefore indicated above as *P. coronata* var. *coronata*, a varietal name which was already automatically established (autonym) in 1853 by the publication

of *P. coronata* var. *lolii* Bellynck [in Mathieu, Fl. gén. Belg. **2**: 434. 1853; at present generally considered to refer to a forma specialis of var. *coronata*, see below]. Descriptions of the uredo- and teleutospores of *P. c.* var. *coronata* in comparison with those of *P. c.* var. *avenae* can be found in e.g. Urban *in* Česká Mykol. **21**: 13–14. 1967 and Cummins, Rust Fungi 141–143. 1971. For the characteristics of the spermogonia and aecidia see e.g. Wilson & Henderson l.c. and Cummins l.c. The various host-related taxa within *P. c.* var. *coronata* are, in accordance with the opinion of Urban l.c. and Cummins l.c., regarded here as formae speciales. Four of them are listed below.

f. sp. *AGROSTIDIS* [Erikss.]

V Puccinia coronata f. sp. *agrostidis* Eriksson *in* Centbl. Bakt. ParasitKde II. Abt., **3**: 302. 1897 [as '*agrostis*'].

Note: For gramineous hosts see Gäumann *in* Beitr. KryptogFlora Schweiz **12**: 577. 1959. Common alternate host *Rhamnus frangula* L.

f. sp. *ALOPECURI* [Erikss.]

Puccinia coronata f. sp. *alopecuri* Eriksson *in* Ber. dt. bot. Ges. **12**: 321. 1894.

Note: For gramineous hosts see Gäumann *in* Beitr. KryptogFlora Schweiz **12**: 578. 1959. Common alternate host *Rhamnus cathartica* L.

f. sp. *FESTUCAE* [Erikss.]

Puccinia coronata f. sp. *festucae* Eriksson *in* Ber. dt. bot. Ges. **12**: 321. 1894.

Note: For gramineous hosts see Gäumann *in* Beitr. KryptogFlora Schweiz **12**: 578. 1959. Common alternate host *Rhamnus cathartica* L.

f. sp. *LOLII* [Erikss.]

Puccinia coronata f. sp. *lolii* Eriksson *in* Ber. dt. bot. Ges. **12**: 321. 1894.

= *Puccinia coronata* var. *lolii* Bellynck in Mathieu, Fl. gén. Belg. **2**: 434. 1853.

= *Puccinia lolii* Nielsen *in* Ugeskr. Landm. IV, **9** (1): 549. 1875.

Note: For gramineous hosts see Gäumann *in* Beitr. KryptogFlora Schweiz **12**: 579. 1959. Common alternate host *Rhamnus cathartica* L.

PUCCINIA CORONATA var. *AVENAE* Fraser & Led. [sensu lato]

Puccinia coronata var. *avenae* Fraser & Ledingham *in* Scient. Agric. **13**: 314, 322. 1933.

Note: This Crown Rust originally described from oats alternates with *Rhamnus* spp. and therefore has also been treated in Series 1a of the Check-list [*in* Neth. J. Pl. Path. **78**, Suppl. 1: 40–41. 1972]. For description of the uredo- and teleutospores of *Puccinia coronata* var. *avenae* in comparison with those of *P. c.* var. *coronata* see Urban *in* Česká Mykol. **21**: 13–14. 1967 and Cummins, Rust Fungi 141–143. 1971. Urban l.c. recognizes within *P. c.* var. *avenae* two special pathogenic forms:

f. sp. *AVENAE* [Refers to the type of var. *avenae* Fraser & Led.; in Check-list 1a erroneously cited with the author indication '(Erikss.) Urban'.]

= *Puccinia coronata* f. sp. *avenae* Eriksson *in* Ber. dt. bot. Ges. **12**: 321. 1894.

Note: For detailed description and a review of the extensive literature

see Urban *in* Rozpr. čsl. Akad. Věd, Řada MPV **79** (6): 18–31. 1969. In Europe the natural occurrence is apparently restricted to oats and wild oats.

f. sp. *GRAMINICOLA* [Urban]

Puccinia coronata var. *avenae* f. sp. *graminicola* Urban *in* Česká Mykol. **21**: 14. 1967.

Note: Especially common on tall oat grass.

PUCCINIA GRAMINIS Pers. ex Pers. subsp. *GRAMINIS*

rn *Puccinia graminis* Pers. ex Persoon, Syn. meth. Fung. 228. 1801, subsp. *graminis* [lectotype on cultivated *Triticum* sp.; subspecific epithet to be cited without an author's name, Art. 26; name automatically established (autonym) by the publication in 1967 of *P. graminis* subsp. *graminicola* Urban].

dn ≡ *Puccinia graminis* Persoon *in* Neues Mag. Bot. **1**: 119. 1794 [= Tent. Disp. meth. Fung. 39. 1797].

Note: This Black Rust of cereals and grasses (uredinia and telia) alternates with *Berberis* or *Mahonia* spp. (spermogonia and aecidia), and has therefore already been discussed in Series 1a of the Check-list [*in* Neth. J. Pl. Path. **78**, Suppl. 1: 41. 1972]. A description of the uredo- and teleutospores of *Puccinia graminis* subsp. *graminis* as compared with those of the specific grass-black rust *P. g.* subsp. *graminicola*, can be found in Urban *in* Česká Mykol. **21**: 14–15. 1967 and Cummins, Rust Fungi 208–211. 1971. For the spermogonia and aecidia see e.g. Wilson & Henderson, Br. Rust Fungi 256. 1966 and Cummins l.c. In accordance with Guyot, Massenot & Saccas *in* Annls Éc. natn. Agric. Grignon III, **5**: 145. 1946, Urban (l.c.) recognizes within *P. g.* subsp. *graminis* two varieties; but in many cases these varieties cannot be identified morphologically, compare Urban *in* Rozpr. čsl. Akad. Věd, Řada MPV **79** (6): 37(32–45). 1969. *P. g.* subsp. *graminis* shows marked host specialization which has led to the differentiation of various formae speciales. The host specialization is partly correlated with minor differences in spore dimensions (especially of the uredospores), which explains why the specialized pathogenic forms are sometimes indicated as varieties (Θ). The variability (range) of spore sizes, however, often makes diagnostic morphological differentiation impossible. Only the three formae speciales recorded on cereals are listed below. For discussion on the host specialization and hybridization of these pathogenic forms and a review of the extensive literature on the black rust of cereals and grasses in general see Urban 1969 l.c.

f. sp. *AVENAE* [Eriksson. & E. Henn.]

Puccinia graminis f. sp. *avenae* Eriksson & E. Henning *in* Z. Pfl-Krankh. **4**: 71. 1894 [as 'Form', but to be read as 'forma specialis', see Eriksson *in* Ber. dt. bot. Ges. **12**: 293, 297. 1894].

Note: Recorded as naturally occurring on oats, wild oats and certain grasses, compare Batts *in* Trans. Br. mycol. Soc. **34**: 533–538. 1951.

f. sp. *SECALIS* [Eriksson. & E. Henn.]

Puccinia graminis f. sp. *secalis* Eriksson & E. Henning *in* Z. Pfl-Krankh. **4**: 71. 1894 [as 'Form', see reference above under f. sp. *avenae*].

Note: Recorded as naturally occurring on barley, rye and certain grasses, see Batts l.c.

f. sp. *TRITICI* [Erikss. & E. Henn.]

Puccinia graminis f. sp. *tritici* Eriksson & E. Henning *in* Z. PflKrankh. **4**: 71. 1894 [as 'Form', see above under f. sp. *avenae*].

Note: Natural occurrence is apparently usually restricted to wheat. Artificially barley and rye may be weakly infected, cf. Batts l.c. The lectotype of *P. g.* subsp. *graminis* probably refers to this special form; the nomenclature of formae speciales, however, is not governed by the provisions of the botanical rules [Art. 4], therefore change of f. sp. *tritici* into 'f. sp. *graminis*' is not necessary (and not desirable).

PUCCINIA GRAMINIS subsp. *GRAMINICOLA* Urban

Puccinia graminis subsp. *graminicola* Urban *in* Česká Mykol. **21**: 14–15. 1967.

= *Puccinia phlei-pratensis* Eriksson & E. Henning *in* Z. PflKrankh. **4**: 140. 1894.

≡ *Puccinia graminis* f. sp. *phlei-pratensis* (Erikss. & E. Henn.) Stakman & Piemeisel *in* J. agric. Res. **10**: 433. 1917 [as 'biologic form *P. graminis phleipratensis*'].

= *Puccinia dactylidis* Gäumann *in* Ber. schweiz. Bot. Ges. **55**: 79. 1945.

Note: Urban *in* Rozpr. čsl. Akad. Věd, Řada MPV **79** (6): 44. 1969 proved that this specific Black Rust of grasses (uredinia and telia) alternates with *Berberis vulgaris* (spermogonia and aecidia), therefore it was also listed in Check-list 1a [*in* Neth. J. Pl. Path. **78**, suppl. 1: 42. 1972]. For description of the teleuto- and uredospores of *Puccinia graminis* subsp. *graminicola* in comparison with those of *P. g.* subsp. *graminis* refer to Urban 1967 l.c. and Cummins, Rust Fungi 210. 1971. For other synonyms see also Urban 1967 l.c. and Cummins l.c. The gramineous host specialization of *P. g.* subsp. *graminicola* has recently been discussed by Cagaš *in* Phytopath. Z. **87**: 57–65. 1975. He confirmed that subsp. *graminicola* cannot infect cereals but has a wide host range of grasses, especially species among the tribes Festuceae, Agrostideae and Aveneae.

PUCCINIA HORDEI Otth

Puccinia hordei Otth *in* Mitt. naturf. Ges. Bern **1870**: 114. 1871.

= *Puccinia anomala* Rostrup *in* Herb. mycol. oecon. [Ed. von Thümen] Fasc. 10, No. 451. 1877.

H = *Puccinia simplex* (Körn.) Eriksson & E. Henning *in* K. Landtbr-Akad. Handl. Tidskr. **33**: 175. 1894; *in* Z. PflKrankh. **4**: 260. 1894 [not *P. simplex* Peck *in* Rep. N. Y. St. Mus. nat. Hist. **34**: 41. 1881].

≡ *Puccinia straminis* var. *simplex* Körnicke *in* Herb. mycol. oecon. [Ed. von Thümen], Fasc. 3, No. 101. 1873.

Note: The Brown Rust or Dwarf Rust of barley (uredinia and telia) resembles the brown rust of other cereals and grasses, *Puccinia recondita* Rob. ex Desm., but it is easily distinguished by the high proportion of unicellular teleutospores (mesospores). Furthermore it has broader teleutospores and paler uredospores. As alternative hosts of *P. hordei* various species of *Ornithogalum* (spermogonia and aecidia) are known, but the rust appears to be independent of host alternation; see the documentation by Urban *in* Rozpr. čsl. Akad. Věd, Řada MPV **79** (6): 46–52. 1969. The nomenclature of the barley rust has been discussed by Buchwald *in* Annls mycol. **41**: 306–316.

1943, who concluded that the brown rust of wild barley (*Hordeum murinum* L.) is caused by a different species: *P. hordei-murini* Buchwald. The latter does not attack common barley varieties and, conversely, wild barley is strongly resistant to the barley rust, see Urban l.c. McNabb *in* Trans. R. Soc. N. Z., Bot. **1** (19): 242–243. 1962 classifies the rust of wild barley only as a clearly defined race of *P. hordei*. The citation of *Hordeum murinum* as host of *P. hordei* by Wilson & Henderson, Br. Rust Fungi 264–265. 1966 is based on records previous to the study by Buchwald (l.c.). For description of the brown/dwarf rust of barley see Urban l.c. and Wilson & Henderson l.c. For data on susceptible species of *Hordeum* see Urban l.c.

Cummins, Rust Fungi 317–319. 1971 treats *P. hordei* in a different, very broad concept, which included the rusts on barley and wild barley as well as similar rusts on species of 20 genera of the Gramineae. As alternative hosts he listed besides species of *Ornithogalum* also *Allium* and *Sedum* spp. Phytopathologically the use of *P. hordei* emend. Cummins is only practicable when differentiated into numerous formae speciales.

PUCCINIA POARUM Niels.

Puccinia poarum Nielsen *in* Bot. Tidsskr. III, **2**: 34. 1877.

Note: *P. poarum* as described by Nielsen (l.c.) refers to a common Rust on meadow grasses (scanty uredinia and abundant telia), alternating with *Tussilago farfara* L. (spermogonia and aecidia); see the documentation by Buchwald *in* Annls Agric. fenn. **11**: 283–291. 1972. For description see Wilson & Henderson, Br. Rust Fungi 274–275. 1966. The uredinia and telia of *P. poarum* are difficult to distinguish from those of the brown rust *P. recondita* Rob. ex Desm., but *P. poarum* has paler uredinia and uredospores and usually fewer telial paraphyses. It can be distinguished from *P. brachypodii* var. *poae-nemoralis* (Otth) Cummins & H. C. Greene by the absence of capitate uredinial paraphyses.

Greene & Cummins *in* Mycologia **59**: 47–57. 1967 treat *P. poarum* as a 'complex species'. According to their concept it includes similar rusts on various other genera of the Gramineae alternating with different Compositae. For synonymy, hosts and descriptions of the species in this very broad concept see Greene & Cummins l.c. and Cummins, Rust Fungi 315–316. 1971. The use of *P. poarum* emend. Greene & Cummins only becomes practicable for phytopathologists when differentiated into several formae speciales.

PUCCINIA RECONDITA Rob. ex Desm. [sensu lato]

Puccinia recondita Roberge ex Desmazières *in* Pl. cryptog. France II [ed. 3] Fasc. 6, No. 252. 1855; *in* Bull. Soc. bot. Fr. **4**: 798. 1857 ['Rob. in Herb.'; type on *Secale cereale*].

Note: The Brown Rusts of cereals and grasses (uredinia and telia), previously recognized as distinct species, are at present generally regarded as host-related pathogenic forms of a polymorphous 'complex species', with as oldest valid name *Puccinia recondita* which was originally described from rye, see e.g. Wilson & Henderson, Br. Rust Fungi 278–290. 1966, and Cummins, Rust Fungi 320–322. 1971. "On a world basis, the variability in morphological features is continuous from extreme to extreme" (quotation from Cummins l.c.). It should be noted, however, that Urban *in* Česká Mykol. **21**: 16. 1967 (and other papers) and Chochrjakov, Proc. Europ.

Mediterr. Cereal Rust Conf. Praha **1**: 155–156. 1972 (and other papers) treat the brown rust of rye again as a separate species (*P. recondita* sensu stricto), although they have conflicting opinions about the taxonomic concept and nomenclature of the brown rusts of wheat and grasses [see the discussion by Urban *in* Česká Mykol. **28**: 80–83. 1974]. The heterogeneous character of *P. recondita* sensu lato is also manifested in the wide range of alternate hosts: spermogonia and aecidia are recorded on Balsaminaceae, Boraginaceae, Crassulaceae, Hydrophyllaceae and Ranunculaceae. General characters of the sori and spore stages can be found in Wilson & Henderson l.c. and Cummins l.c. For the synonymy of *P. recondita* sensu lato see Cummins l.c. According to the broad, morphologically based concept of *P. recondita*, the various host-related brown rusts are classified as formae speciales, see Wilson & Henderson l.c. Only the forms commonly occurring on rye and wheat are listed below.

f. sp. *RECONDITA* [An automatically established special form, including the type of the species; see Henderson *in* Notes R. bot. Gdn Edinb. **23**: 505. 1961.]

= *Puccinia dispersa* Eriksson & E. Henning *in* Z. PflKrankh. **4**: 257–258. 1894 [type on rye].

≡ *Puccinia dispersa* f. sp. *secalis* Eriksson & E. Henning *in* Z. PflKrankh. **4**: 259. 1894; *in* Ber. dt. bot. Ges. **12**: 316. 1894.

H ≡ *Puccinia dispersa* Eriksson *in* Annls Sci. nat. (Bot.) VIII, **9**: 268. 1899.

= *Puccinia secalina* Grove, Br. Rust Fungi 261. 1913.

= *Puccinia rubigo-vera* f. sp. *secalis* Carleton *in* Bull. Div. Veg. Physiol. Path. U.S. Dep. Agric. **16**: 10, 42. 1899 [as trinomial: '*P. rubigo-vera secalis*'; often erroneously cited with the author indication '(Erikss.) Carl.'].

Note: For detailed description and review of the extensive literature of this brown rust of rye see Urban *in* Rozpr. čsl. Akad. Věd, Řada MPV **79** (6): 61–67. 1969. It is also recorded from oats. Common alternate hosts are *Anchusa officinalis* L. and *Lycopsis arvensis* L.

f. sp. *TRITICI* [(Erikss.) C. O. Johnston]

Puccinia recondita f. sp. *tritici* (Erikss.) C. O. Johnston *in* Robigo **15**: 1. 1963.

≡ *Puccinia dispersa* f. sp. *tritici* Eriksson *in* Ber. dt. bot. Ges. **12**: 316. 1894 [often referred to Eriksson & E. Henning *in* Z. PflKrankh. **4**: 259. 1894; but there is only suggested that a special 'f. *Tritici*' may occur].

≡ *Puccinia triticina* Eriksson *in* Annls Sci. nat. (Bot.) VIII, **9**: 270. 1899 [apparently based on the same material as *P. dispersa* f. sp. *tritici*].

≡ *Puccinia recondita* f. sp. *triticina* (Erikss.) D. M. Henderson *in* Notes R. bot. Gdn Edinb. **23**: 504. 1961.

≡ *Puccinia perplexans* var. *triticina* (Erikss.) Urban *in* Česká Mykol. **21**: 16. 1967, f. sp. *triticina* [name of special form automatically established by Urban's (l.c.) differentiation of f. sp. *persistens* (Plowr.) Urban occurring on grasses].

Note: For detailed description and review of the extensive literature

of this brown rust of wheat see Urban *in* Rozpr. čsl. Akad. Věd. Řada MPV **79** (6): 53–60. 1969. It is also recorded from barley *(H. distichon)*. Alternates possibly sometimes with certain Ranunculaceae.

PUCCINIA SORGHI Schw.

Puccinia sorghi Schweinitz *in* Trans. Am. phil. Soc. II, **4** [= Syn. Fung. Am. bor.]: 295. 1832 ["1834"] [lectotype on *Zea mays*, see Cummins, Rust Fungi 260. 1971].

= *Puccinia maydis* Bérenger *in* Atti Riun. Sci. ital. **6**: 475. 1845 ["1844"].

Note: This Rust of maize (uredinia and telia) was endemic in N. America but is now found wherever maize is cultivated [in tropical regions *Euchlaena* spp., closely related to maize, are recorded as additional hosts]. This rust alternates with *Oxalis* species of N. American origin, e.g. *O. corniculata* L. and *O. stricta* L. (spermogonia and aecidia). Some African species of *Oxalis* are also susceptible, but the common European *O. acetosella* is resistant. A complete list of susceptible *Oxalis* spp. is given by Gäumann *in* Beitr. KryptogFlora Schweiz **12**: 727–729. 1959. For discussion of the role of the alternative hosts in the life cycle of the rust see Urban *in* Rozpr. čsl. Akad. Věd, Řada MPV **79** (6): 68–73. 1969. The confusing epithet *sorghi* is due to Schweinitz's (l.c.) opinion that the rust of maize agrees with a common rust on *Sorghum* spp., which also alternates with *Oxalis* spp. The latter is now known as *Puccinia purpurea* Cooke and differs by the occurrence of thick-walled uredinial and telial paraphyses. Through inbreeding experiments on *Oxalis* it now appears that both species are related, as uredinial clones of *P. sorghi* have been obtained that incite rust on *Sorghum* spp. and uredinial clones of *P. purpurea* that incite rust on maize; see Le Roux & Dickson *in* Phytopathology **47**: 101–107. 1957. For the synonymy of *P. sorghi* see Urban l.c. Detailed descriptions can be found in Gäumann l.c., Wilson & Henderson, Br. Rust Fungi 293. 1966, Urban l.c., and Cummins l.c. For differentiating characteristics against other rust fungi occurring on maize in tropical regions see Cummins *in* Phytopathology **31**: 856–857. 1941. See further the summarizing information and literature references on *P. sorghi* by Laundon & Waterston *in* C.M.I. Descr. pathog. Fungi Bact. 3. 1964.

PUCCINIA STRIIFORMIS Westend. var. *STRIIFORMIS*

V Puccinia striiformis Westendorp *in* Bull. Acad. r. Sci. Lett. Beaux-Arts Belg. [Bull. Acad. r. Belg. Cl. Sci.] **21**: 235. 1854 [as '*P. striaeformis*']; *in* Herb. crypt. [Ed. van Doosselaere] Fasc. 22, No. 1077, var. *striiformis* [varietal epithet to be cited without an author's name, Art. 26; see note].

= *Puccinia glumarum* Eriksson & E. Henning *in* K. LandtbrAkad. Handl. Tidskr. **33**: 169. 1894; *in* Z. PflKrankh. **4**: 197. 1894 [as comb. nov. of the uredial name *Uredo glumarum* J. C. Schmidt, Allg. ökon-techn. Fl. **1**: pl. 27. 1827].

= *Puccinia tritici* Ørsted, Sygd. hos Planterne 95. 1863.

Note: The 'hemi-form' Yellow Rust of cereals and grasses (only uredinia and telia known) is in the uredial stage difficult to separate from other rusts on Gramineae. Confusion with brown rust (*Puccinia recondita* Rob. ex Desm.) especially is possible. The macroscopic characters used are the bright lemon-yellow colour of the uredo-

spores in mass and their occurrence in lines (Am.: Stripe Rust). Microscopically the uredospores are differentiated from those of brown rust by the larger number of pores, which are readily observed in chloralhydrate solution. For detailed descriptions see Wilson & Henderson, Br. Rust Fungi 294(–297). 1966, Urban *in* Rozpr. čsl. Akad. Věd, Řada MPV **79** (6): 74–76, 81–83 (74–84). 1969, Cummins, Rust Fungi 151–152. 1971 and Mulder & Booth *in* C.M.I. Descr. pathog. Fungi Bact. 291. 1971. *Puccinia striiformis* is the most harmful rust on wheat, it is not uncommon on barley and has occasionally been recorded from rye and oats. Further it is known from a large number of grasses, see Cummins l.c. The host relation and specialization within the species is apparently flexible and not fixed, therefore at present only races are usually recognized, see Urban l.c. Only the yellow rust of cocksfoot is generally considered as a separate taxon: *P. striiformis* var. *dactylidis* Manners (see below), which is morphologically distinct by smaller uredo- and teleutospores. The publication of this variety has automatically created the varietal name *striiformis* (autonym) for the yellow rust including the type of *P. striiformis* (on wheat). For a review of the extensive literature on *P. s.* var. *striiformis* see Urban l.c. The epidemiology of the rust is discussed by Zadoks in number of papers, e.g. *in* Tijdschr. PlZiekt. **67**: 69–256. 1961, *in* Pl. Prot. Bull. F.A.O. **13** (5): 97–108. 1965 and *in* Neth. J. Pl. Path. **72**: 12–19. 1966.

PUCCINIA STRIIFORMIS var. *DACTYLIDIS* Manners

Puccinia striiformis var. *dactylidis* Manners *in* Trans. Br. mycol. Soc. **43**: 65. 1960.

Note: This specific Yellow Rust of cocksfoot and related species ('hemi-form': only uredinia and telia) differs from the yellow rust of other Gramineae (*P. striiformis* Westend. var. *striiformis*) by its smaller spores and a higher optimum temperature for uredospore germination ('autumn rust'). For descriptions see Manners l.c., and Wilson & Henderson, Br. Rust Fungi 297. 1966.

PYRENOPHORA AVENAE Ito & Kuribay.

Pyrenophora avenae Ito & Kuribayashi apud Ito *in* Proc. imp. Acad. Japan **6**: 354. 1930.

H = *Pyrenophora avenae* E. Müller *in* Sydowia **5**: 255. 1951 [as new combination of *Pleospora avenae* Died.; see note under *Pyrenophora teres* Drechsl.].

O = *Pleospora avenae* Diedicke *in* Centbl. Bakt. ParasitKde Abt. II, **11**: 56. 1903 [proposed in anticipation of the perfect state being found].

stat. con. *DRECHSLERA AVENAE* (Eidam) Scharif

Drechslera avenae (Eidam) Scharif, Stud. graminic. Helminthosporium, Teheran 72. 1963.

≡ *Helminthosporium avenae* Eidam *in* Landwirt, Breslau **27**: 509. 1891.

Note: This is the causal organism of Leaf Spot (Am.: Leaf Blight) and Seedling Blight of oats. It has also been recorded on other Gramineae. The conidial state of this organism has been confused with *Drechslera avenacea* (Curt. ex Cooke) Shoemaker = *Helminthosporium avenaceum* Curt. ex Cooke (perf.?: *Pyrenophora chaetomioides* Speg.?); see Ellis, Dematiac. Hyphom. 429–431. 1971. Other names considered as synonyms can be found in Shoemaker *in* Can. J. Bot. **40**: 815–817. 1962. The perfect

state, *Pyrenophora avenae*, is uncommon in the field [cf. Dennis *in* Trans. Br. mycol. Soc. **19**: 288–290. 1934], but can be produced in culture, see Shipton & McDonald *in* Trans. Br. mycol. Soc. **55**: 329–332. 1970. Pycnidia with small hyalin spores (unnamed state) also occur in the life cycle of the fungus, and are interpreted as spermogonia, see Malone & Muskett *in* Proc. int. Seed Test. Ass. **29** (2) [= Handb. Seed Health Test. Ser. 4, Fasc. 1]: 331–335. 1964 and Shipton & McDonald l.c. For differentiating characters of the conidial state see e.g. Drechsler *in* J. agric. Res. **24**: 663–667. 1923, Ellis l.c. and Ellis & Waller *in* C.M.I. Descr. pathog. Fungi Bact. 389. 1973. See also Shoemaker l.c. and Ammon *in* Phytopath. Z. **47**: 255–256. 1963 [in both cases under the misapplied names mentioned above]. Descriptions and illustrations of the disease symptoms are to be found in Butler & Jones, Pl. Path. 415–420. 1949, Mäkelä *in* J. scient. agric. Soc. Finland **47**: 185–189. 1975, and Olofsson *in* Meddn St. VäxtskAnst. **16** (172): 377–400, 421. 1976. For diagnosis on seed see Malone & Muskett l.c., Handb. Seed Health Testing [Ed. Int. Seed Test. Ass.] III, Working Sheet 3. 1964, and Chidambaram, Mathur & Neergaard *in* Friesia 10(3) [Handb. Seed Health Testing II B(3)]: 167, 168, 197, 198. 1973.

PYRENOPHORA DICTYOIDES Paul & Parbery

Pyrenophora dictyoides Paul & Parbery *in* Trans. Br. mycol. Soc. **51**: 708 (707–710). 1968.

stat. con. *DRECHSLERA DICTYOIDES* (Drechsl.) Shoem.

Drechslera dictyoides (Drechsl.) Shoemaker *in* Can. J. Bot. **37**: 881. 1959 [f. sp. *dictyoides* cf. Shoemaker *in* Can. J. Bot. **40**: 821(–822). 1962; see note].

≡ *Helminthosporium dictyoides* Drechsler *in* J. agric. Res. **24**: 679. 1923 [f. sp. *dictyoides*, cf. Braverman & Graham *in* Phytopathology **50**: (691–)695. 1960; see note].

V = *Helminthosporium dictyoides* f. sp. *perennis* Braverman & Graham *in* Phytopathology **50**: (691–)695. 1960 [as '*perenne*'] [see note].

V ≡ *Drechslera dictyoides* f. sp. *perennis* (Braverman & Graham) Shoemaker *in* Can. J. Bot. **40**: 821(–822). 1962 [as '*perenne*'] [see note].

Note: Well known as the cause of Net Blotch of fescues, especially meadow fescue. In some countries it is also commonly found on rye grasses, especially perennial rye grass, see e.g. Latch *in* N. Z. Jl agric. Res. **9**: 398–400. 1966. It has further been sporadically recorded from various other grasses. Braverman & Graham (l.c.) found that isolates from meadow fescue ('f. sp. *dictyoides*') do not infect rye grasses and could be distinguished from the isolates obtained from perennial rye grass ('f. sp. *perennis*', pathogenic to rye grasses and fescues) by production of protothecia (sclerotia) in culture. However, as Mäkelä *in* Karstenia **12**: 8–17. 1971, obtained infections on rye grasses with isolates from meadow fescue and observed protothecia in cultures from perennial rye grass, we doubt whether the separation into two formae speciales can be maintained. In this connection it should also be noted that the perfect state, *Pyrenophora dictyoides*, described by Paul & Parbery has been obtained by pairing protothecia-producing isolates from perennial rye grass and rat's-tail fescue, *Vulpia myuros* (L.)C.C.Gmel. For the host records on other grasses see Mäkelä l.c. and Mäkelä *in* Suom. maatal. Seur. Julk. **124** (1): 1–56 [esp. 33, 41–42] and

124 (2): 1–44 [esp. 16–17, 26]. 1972. For disease symptoms see the above-mentioned papers of Mäkelä [especially 1972, **124** (1): 41–42; good illustrations]. The characteristics of the conidial state can be found in Drechsler l.c., Ammon *in* Phytopath. Z. **47**: 262–263. 1963, Mäkelä 1971 and 1972 l.c., and Ellis, Dematiac. Hyphom. 433. 1971. The diagnosis on seeds is treated by Chidambaram, Mathur & Neergaard *in* Friesia **10** (3) [Handb. Seed Health Testing II B(3)]: 170–171, 200, 201, 202. 1973.

PYRENOPHORA GRAMINEA Ito & Kuribay.

Pyrenophora graminea Ito & Kuribayashi apud Ito *in* Proc. imp. Acad. Japan **6**: 353. 1930.

H = *Pyrenophora graminea* (Died.) E. Müller *in* Sydowia **5**: 255. 1951.

≡ *Pleospora graminea* Diedicke *in* Centbl. Bakt. ParasitKde Abt. II, **11**: 56. 1903.

stat. con. *DRECHSLERA GRAMINEA* (Rabenh.) Shoem.

Drechslera graminea (Rabenh.) Shoemaker *in* Can. J. Bot. **37**: 881. 1959 [as '*D. g.* (Rab. ex Schlecht.) comb. nov.'].

≡ *Helminthosporium gramineum* Rabenhorst *in* Klotzschii Herb. mycol., ed. 2, Cent. 4, No. 332. 1857; *in* Bot. Ztg **15**: 94. 1857 [quotation by Schlechtendal].

Note: Causal organism of Leaf Stripe of barley (Am.: Stripe Disease). Also on wild species of *Hordeum* and occasionally on oats, wheat and rye. The perfect state is sometimes cited as *P. g.* '(Died.) Ito & Kuribay.', but in Ito's paper (l.c.) no reference is made to Diedicke's *Pleospora graminea*. Mature perithecia are uncommon, but pycnidia with small hyaline spores (unnamed state) may be produced in vivo and in vitro, see Rapilly & Ponchet *in* Annls Epiphyt. **13**: 298–299. 1962, and Mäkelä *in* Suom. maatal. Seur. Julk. **124** (3): 6–8, 11. 1972. The well-known basionym of the *Drechslera*-state is often cited as *Helminthosporium gramineum* 'Rabenh. ex Schlecht.', but the printed label accompanying the exsiccata distributed by Rabenhorst already constitutes an effective publication [compare Art. 29, 30]. For synonymy and description of this state see Drechsler *in* J. agric. Res. **24**: 650–656. 1923, and Shoemaker *in* Can. J. Bot. **40**: 825–826. 1962. See also Ammon *in* Phytopath. Z. **47**: 249–250. 1963, Ellis, Dematiac. Hyphom. 428–429. 1971, and Ellis & Waller *in* C.M.I. Descr. pathog. Fungi Bact. 388. 1973. For disease symptoms see Drechsler l.c., Ellis & Waller l.c., Mäkelä l.c. [good illustrations], Mäkelä *in* J. scient. agric. Soc. Finland **47**: 189–191, 195. 1975, and Olofsson *in* Meddn St. VäxtskAnst. **16** (172): 331–352, 419–420. 1976. For diagnosis on seeds see Handb. Seed Health Testing [Ed. Int. Seed Test. Ass.] III, Working Sheet 6. 1964, and Chidambaram, Mathur & Neergaard *in* Friesia **10** (3) [Handb. Seed Health Testing II B(3)]: 171, 172, 197, 199, 201. 1973. See further the literature references on the leaf stripe disease of barley given by Ellis & Waller l.c.

PYRENOPHORA LOLII Dovaston

Pyrenophora lolii Dovaston *in* Trans. Br. mycol. Soc. **31**: 251–252. 1948.

stat. con. *DRECHSLERA SICCANS* (Drechsl.) Shoem.

Drechslera siccans (Drechsl.) Shoemaker *in* Can. J. Bot. **37**: 881. 1959.

≡ *Helminthosporium siccans* Drechsler *in* J. agric. Res. **24**: 682. 1923.

Note: This species is known as the causal organism of leafspots and footrot (Am.: Leaf Blight) of cultivated rye grasses. The principal host is perennial rye grass; but Italian rye grass and other grasses as meadow fescue are also attacked, see Ammon *in* Phytopath. Z. **47**: 259–260. 1963, and Mäkelä *in* Karstenia **12**: 19–20, 22. 1971. The perfect state is only known from Dovaston's (l.c.) observations of a single spore culture of *Drechslera siccans* on oatmeal agar. Protothecia (sclerotia) are also rarely observed in cultures, see Shoemaker *in* Can. J. Bot. **40**: 828–829. 1962. For disease symptoms and descriptions of the conidial state see Drechsler l.c., Mäkelä l.c. [good illustrations], and Smith, Fung. Dis. Turf Grasses ed. 2 [revised by Jackson & Smith], 59–60. 1965. For description of *D. siccans* see also Shoemaker l.c., Ammon l.c., and Ellis, Dematiac. Hyphom. 431–432. 1971. The identification on seeds is treated in Handb. Seed Health Testing [Ed. Int. Seed Test. Ass.] III, Working Sheet 43. 1968, and by Chidambaram, Mathur & Neergaard *in* Friesia **10** (3) [Handb. Seed Health Testing II B(3)]: 179, 197, 198, 201. 1973.

PYRENOPHORA TERES Drechsl.

Pyrenophora teres Drechsler *in* J. agric. Res. **24**: 656. 1923 [as new combination of *Pleospora teres* Died.; see note].

O = *Pleospora teres* Diedicke *in* Centbl. Bakt. ParasitKde Abt. II, **11**: 56. 1903 [see note].

stat. con. *DRECHSLERA TERES* (Sacc.) Shoem.

Drechslera teres (Sacc.) Shoemaker *in* Can. J. Bot. **37**: 881. 1959.

≡ *Helminthosporium teres* Saccardo *in* Michelia **2** (3): 558. 1882.

= *Helminthosporium hordei* Eidam *in* Landwirt, Breslau **27**: 509. 1891.

Note: This species causes Net Blotch of barley, but also occurs sporadically on wheat, oats and other Gramineae. Diedicke (l.c.) introduced the binomial *Pleospora teres* before the perithecial state was known, therefore Drechsler's *Pyrenophora teres* must be considered as a new name of a new species [Art. 59]. The characteristics of the perithecia, which develop on the straw and stubble during the spring are shown in Drechsler l.c., and Shoemaker *in* Can. J. Bot. **40**: 830. 1962. For descriptions of the *Drechslera* state see Drechsler l.c. [under *Helminthosporium teres*], Ellis, Dematiac. Hyphom. 429. 1971, and Ellis & Waller *in* C.M.I. Descr. pathog. Fungi Bact. 390. 1973. See also Ammon *in* Phytopath. Z. **47**: 251–252. 1963. In vivo and in vitro the fungus also produces pycnidia with small hyaline conidia (unnamed state), see Rapilly & Ponchet *in* Annls Épiphyt. **13**: 298–299. 1962, and Mäkelä *in* Suom. maatal. Seur. Julk. **124** (3): 8–18. 1972. Descriptions of the disease symptoms on barley can be found in Drechsler l.c., Mäkelä l.c. [good illustrations], Mäkelä *in* J. scient. agric. Soc. Finland **47**: 191–196. 1975, and Olofsson *in* Meddn St. VäxtskAnst. **16** (172): 352–377, 420–421. 1976. For diagnosis on seeds see Handb. Seed Health Testing [Ed. Int. Seed Test. Ass.] III, Working Sheet 7. 1964 and Chidambaram, Mathur & Neergaard *in* Friesia **10** (3) [Handb. Seed Health Testing II B(3)]: 181, 182, 197, 199, 201. 1973. References on physiologic specialization, transmission etc. are given by Ellis & Waller l.c. See also Smedegård-Petersen *in* Phytopath. Z. **89**: 193–202. 1977.

PYTHIUM ULTIMUM Trow var. *ULTIMUM*

Pythium ultimum Trow *in* Ann. Bot. **15**: 300–301. 1901, var. *ultimum* [varietal

name to be cited without an author's name, cf. Art. 26; name automatically established by the publication in 1960 of var. *sporangiiferum* Drechsl.].

Note: The most common *Pythium* species associated with Root Rot of grass seedlings; a disease which may be differentiated in Pre-emergence Blight and Post-emergence Damping-off [Smith, Fung. Dis. Turf Grasses, ed. 2 (revised by Jackson & Smith) 29–31. 1965]. For other *Pythium* species which can cause damage to grass seedlings, see e.g. van Luyk *in* Meded. phytopath. Lab. Willie Commelin Scholten **13**: 1–28. 1934. *P. ultimum* is a widely distributed species with an extensive host range. As the cause of Watery Wound Rot of the potato it is also listed in Series 2a of the check-list [*in* Neth. J. Pl. Path. **82**: 209. 1976]. The original diagnosis of *P. ultimum* is quoted by Waterhouse *in* Mycol. Pap. **110**: 68. 1968. For differentiating characters see the Key to *Pythium* published by Waterhouse *in* Mycol. Pap. **109**: 1–15. 1967. The literature data on this soil fungus are summarized by Domsch & Gams, Pilze Agrarböden 127–128. 1970. Under certain conditions (warm, wet weather) *P. ultimum* may also cause considerable loss in established turf grass stands (Am.: Pythium Blight), see Moore & Couch *in* Pl. Dis. Reptr **45**: 616–619. 1961 and Couch, Dis. Turfgrasses 84–88. 1962.

RHIZOCTONIA CEREALIS van der Hoeven spec. nov.

Coloniae in agaro solani tuberosi glucosato (PDA dicto) fere lente crescentes, hyalinae vel sordide albae, mycelio aerio albo mediocriter evoluto. Hyphae vegetativae primariae 3.8–6.2 µm latae, laterales 5.1–8.7 µm, aeriae 2.8–5.3 µm; generaliter angulis rectis ramosae, basi ramorum constrictae, septo primo paucis micris ab origine disposito; rami hypharum interdum anastomosantes. Omnes hypharum cellulae binucleatae. Hyphae moniliformes longitudine irregulares, e cellulis doliiformibus 17–30 × 7–15 µm constant. Sclerotia post 10 vel plures dies in PDA formata, primo alba vel flava, postea brunnea, globosa vel irregularia, 0.3–1.2 mm diametro, e cellulis doliiformibus laxis composita, superficie non multum differente; sero in vitro sclerotia atrobrunnea in moles majores confluentia. Occurrit in *Secali cereali*, *Tritico aestivo*, *Avena sativa*, *Hordeo vulgari* velut causa morbi macularum oculiformium acrium.

Typus CBS 236.77, isolatus ex morbosis plantis *Secalis cerealis*, Vada (Wageningen-Hoog) in Neerlandia, 1974.

Note: This causal organism of Sharp Eyespot of cereals is in the literature commonly indicated as *Rhizoctonia solani* Kühn, the well-known mycelial state of *Thanatephorus cucumeris* (Frank) Donk [Check-list 2a *in* Neth. J. Pl. Path. **82**: 210–211. 1976]. Comparative cultural studies, however, have convinced us that it represents a separate fungus, to be differentiated from *R. solani* by *i.* its relatively slow radial growth (on PDA in the dark at 23°C: 4.8–7 mm/day), *ii.* the sclerotia which are at first white-yellow and *iii.* the presence of only two nuclei in the hyphal cells [compare Parmeter, Whitney & Platt *in* Phytopathology **57**: 218–223. 1967].

The diagnosis originally compiled by Ir. E. P. van der Hoeven, Stat. féd. Rech. agron. Nyon, Switzerland, runs as follows: – On PDA (2% Difco), the colonies grow comparatively slowly and are colourless to dirty white with little white aerial mycelium. The main hyphae are 3.8–6.2 µm wide, side branch hyphae 5.1–8.7 µm and aerial hyphae 2.8–5.3 µm. The hyphae generally branch at right angles, with a constriction at the point of origin and the first septum placed a few microns beyond this. The

hyphal branches sometimes anastomose. All hyphal cells are binucleate. Monilioid hyphae of irregular length, consisting of doliiform cells, 17–30 × 7–15 µm. Sclerotia produced after 10 days on PDA are at first white to yellow, later brown, globose to irregular, 0.3–1.2 mm in diameter. They consist of loosely arranged doliiform cells with a little differentiated superficial layer. In older cultures aggregations of dark brown sclerotia occur –. All commonly grown varieties of rye, wheat, oats and barley are attacked, and according to Pitt *in* Ann. appl. Biol. **54**: 231–240. 1964, some grasses can also become infected. The common *Rhizoctonia solani* without doubt also occurs on cereals and grasses [see Richter & Schneider *in* Phytopath. Z. **20**: 167–226. 1953, 'Gruppe C', and Parmeter, Sherwood & Platt *in* Phytopathology **59**: 1270–1278. 1969, 'Group AG 4'], but in western Europe *R. solani* is not known as an important pathogen of Gramineae; compare Smith, Fung. Dis. Turf Grasses ed. 2 [revised by Jackson & Smith], 85. 1965. For the symptoms of sharp eyespot of cereals in comparison with the more serious Eyespot disease caused by *Pseudocercosporella herpotrichoides* (Fron) Deighton see the descriptions *in* Advis. Leafl. Minist. Agric. Fish. Fd **321**. 1972 [revised ed.]. See further the studies on sharp eyespot disease of cereals by Pitt *in* Ann. appl. Biol. **54**: 77–89. 1964; **58**: 299–308. 1966.

RHYNCHOSPORIUM SECALIS (Oud.) J. J. Davis

Rhynchosporium secalis (Oud.) J. J. Davis *in* Trans. Wis. Acad. Sci. Arts Lett. **19**: 705. 1919.

≡ *Marsonia secalis* Oudemans *in* Versl. gewone Vergad. Afd. Natuurk. K. ned. Akad. Wet. **6**: 86. 1897.

Note: This is the causal organism of Leaf Blotch (Am.: Scald) of barley, rye and certain wild and cultivated grasses. It is common on barley on which it also causes lesions on the grains. For the host range see Sprague, Dis. Cereals Grasses N. Am. 422–424. 1950, and Kay & Owen *in* Trans. Br. mycol. Soc. **60**: 413–422. 1973. Cross-inoculations have shown that some isolates attack only their original hosts, but others also attack one or more alternative hosts, see Kay & Owen l.c., and Owen *in* C.M.I. Descr. pathog. Fungi Bact. 387. 1973. The host-relation and specialization within the species is apparently flexible and not fixed, therefore at present only races are recognized [on barley], see Williams & Owen *in* Trans. Br. mycol. Soc. **60**: 223–234. 1973, and Jackson & Webster *in* Phytopathology **66**: 719–728. 1976. For disease symptoms see Moore & Moore *in* Bull. Minist. Agric. Fish., Lond. **129**: 17–18. 1950, Sprague l.c., Owen l.c., Mäkelä *in* Suom. maatal. Seur. Julk. **124** (3): 16, 19. 1972 [good illustrations], and Kay & Owen *in* Trans. Br. mycol. Soc. **60**: 405–411. 1973 [lesions on barley grains]. For a detailed description of the fungus and notes on the biology see Owen l.c.

SELENOPHOMA DONACIS (Pass.) Sprague & A. G. Johnson [sensu lato]

Selenophoma donacis (Pass.) Sprague & A. G. Johnson *in* Mycologia **32**: 415. 1940.

≡ *Septoria donacis* Passerini *in* Fungi europ. exs. / Klotzschii Herb. mycol. Cont. [Ed. Rabenh.] Cent. 25, No. 2452. 1876.

= *Selenophoma donacis* var. *stomaticola* (Bäuml.) Sprague & A. G. Johnson *in* Mycologia **37**: 639. 1945.

≡ *Phyllosticta stomaticola* Bäumler *in* Öst. bot. Z. **39**: 289. 1889.

Note: *S. donacis* is the causal organism of Halo Spot of grasses, barley and other cereals (Am.: Eye Spot). Among cultivated grasses, cocksfoot and timothy suffer the most damage from the fungus. Sprague & Johnson *in* Ore. St. Monogr. Stud. Bot. **10**: 3–25. 1950, distinguished between *S. donacis* var. *donacis* and *S. donacis* var. *stomaticola* (Bäuml.) Sprague & A. G. Johnson according to host range and conidial size. The pathogens on cocksfoot, timothy and barley are arranged under var. *stomaticola*, which should have relatively short and narrow conidia. In view of the variability in conidial dimensions, however, the small-spored var. *stomaticola* is not well delimited from the typical form (var. *donacis*), see Jörstad [Jørstad] *in* Skr. norske Vidensk-Akad. [Mat. naturv. Kl.] II [= Ny Serie] **24**: 28–31. 1967 and Brokenshire & Cooke *in* Trans. Br. mycol. Soc. **64**: 201–207. 1975. *Selenophoma donacis* sensu lato must be considered as a complex species including numerous distinct strains or specialized forms which also often differ in cultural appearance, see Sprague, Dis. Cereals Grasses N. Am. 203–209. 1950. This also applies to the pathogens on cocksfoot, timothy and barley, see Sprague l.c., Sampson & Western, Dis. Br. Grasses herb. Leg., ed. 2, 19–21. 1954, and Brokenshire & Cooke l.c. In culture the fungus usually produces conidia without pycnidia, see e.g. Brokenshire & Cooke l.c. A method for obtaining pycnidia in culture is given by Cooke & Brokenshire *in* Trans. Br. mycol. Soc. **64**: 153–156. 1975. For synonymy of *S. donacis* sensu lato see Jörstad l.c. For description and disease symptoms see Sprague l.c., Jörstad l.c. and Punithalingam & Waller *in* C.M.I. Descr. pathog. Fungi Bact. 400. 1973.

SEPTORIA TRITICI Rob. ex Desm.

Septoria tritici Roberge ex Desmazières *in* Pl. cryptog. France [ed. 1] Fasc. 24, No. 1169. 1842; *in* Pl. cryptog. France [ed. 2] Fasc. 14, No. 669. 1842; *in* Annls Sci. nat. (Bot.) II, **17**: 107. 1842.

f. sp. *TRITICI* [Automatically established by the differentiation of specific forms on *Avena* and *Holcus* spp.; see note.]

Note: This is the causal organism of Leaf Spot of wheat (Am.: Speckled Leaf Blotch). *S. tritici* has also been recorded from many other Gramineae. In view of inoculation experiments by different workers, it may be concluded that the form on wheat is very host-specific, although some races apparently are able to attack rye and certain grasses; see the summarizing discussion of the host range and pathogenic specialization of the fungus by Shipton, Boyd, Rosielle & Shearer *in* Bot. Rev. **37**: 231–262 [248–249]. 1971. On account of small differences in conidial morphology, Sprague *in* Ore. St. Monogr. Stud. Bot. **6**: 26, 37. 1944 differentiated a form *avenae* on oats [originally described by Desmazières *in* Annls Sci. nat. (Bot.) III, **8**: 18. 1847 as *S. graminum* var. *avenae*] and a form *holci* on *Holcus* spp. At present these two forms and the form on wheat are generally interpreted as merely specialized physiologic forms, see Sutton & Waterston *in* C.M.I. Descr. pathog. Fungi Bact. 90. 1966, Jörstad [Jørstad] *in* Skr. norske Vidensk-Akad. [Mat.-naturv. Kl.] II [= Ny Serie] **24**: 49–51. 1967 and Shipton & al. l.c. The correct author citation of *S. tritici* is 'Rob. ex Desm.' and not 'Rob. & Desm.' or 'Rob. in Desm.' as often listed, see Shipton & al. l.c.: 238. For descriptions of *S. tritici* see e.g. Sprague, Dis. Cereals Grasses N. Am. 261–265. 1950, Sutton & Waterston l.c., and Jörstad l.c. In culture the fungus usually produces conidia in whorls directly from the mycelium, see e.g. Arsenijević *in* Zašt. Bilja **16** (83): 5–70. 1965. The fungus may also produce microconidia, which were

usually found together with macroconidia in normal pycnidia, see Sprague 1950 l.c. and the data given by Harrower *in* Trans. Br. mycol. Soc. **67**: 335. 1976. For disease symptoms and general information on the leaf spot disease of wheat and the pathology and biology of the fungus see Sutton & Waterston l.c. and the review given by Shipton & al. l.c. For the epidemiology see also Holmes & Colhoun *in* Trans. Br. mycol. Soc. **62**: 329–338. 1974 and Shaner & Finney *in* Phytopathology **66**: 781–785. 1976. In New Zealand an unnamed perfect state of this fungus, belonging to the genus *Mycosphaerella* Johanson, has been recorded, see Sanderson *in* N. Z. Jl Bot. **10**: 707–709. 1972.

TILLETIA CARIES (DC.) Tul.

Tilletia caries (DC.) Tulasne *in* Annls Sci. nat. (Bot.) III, **7**: 113. 1847.

≡ *Uredo caries* de Candolle *in* de Candolle & de Lamarck, Fl. fr. [ed. 3] **5** [6]: 78. 1815 ["1805"].

rn = *Tilletia tritici* (Bjerk.) ex Wolf, Brand des Getreides 13. 1874; Winter *in* Rabenh. Krypt.-Fl. [ed. 2], Pilze **1** [Lief. 2]: 110. 1881.

dn ≡ *Lycoperdon tritici* Bjerkander *in* K. [svenska] VetenskAkad. Handl. **36**: 326. 1775.

Note: The nomenclature of this rough-spored Bunt or Stinking Smut of wheat follows the study by Stevenson & Johnson *in* Pl. Dis. Reptr **28**: 665–666. 1944. In older literature this smut has been referred to as *Tilletia tritici*, which binomial was based on the pre-starting point name *Lycoperdon tritici* Bjerk. (l.c.). Persoon, Syn. meth. Fung. 224. 1801, cited Bjerkander's name as a synonym of his '*Uredo Segetum* β *Uredo Tritici*', which subspecies however was characterized as 'subeffusa' and refers to the loose smut of wheat, see under *Ustilago nuda* (Jens.) Rostr. f.sp. *tritici*. Stevenson & Johnson (l.c.) consider *Lycoperdon tritici* Bjerk. as a "nomen confusum", but in recent literature it is generally accepted as a devalidated synonym of *T. caries*. The spores of *T. caries* are finely reticulate, in contrast with the smooth-walled spores of *T. foetida* (Wallr.) Liro, which can also cause Bunt of wheat. The latter commonly occurs in the warmer regions of South-East Europe and North America. In South-East Europe (mountain-regions) and North America Dwarf Bunt of wheat also occurs, a disease in which the symptoms include excessive tillering and dwarfing of the plants. The causal fungus *T. controversa* Kühn has more prominent reticulations than *T. caries*. For the differentiating characters of these three smuts and some other *Tilletia* species recorded from wheat in Europe see Blumer, Rost- u. Brandpilze Kulturpfl. 281–290. 1963, and Săvulescu, Ber. PflSchutz-Kongr. Berlin [11–16 Juli 1955] 169–182. 1956 [Biol. Syst. Tilletia-Arten Steinbrand Weizens]. Many physiologic races of *T. caries* have been reported, some of which are capable of infecting rye and various wild grasses, see the references given by Ainsworth & Sampson, Br. Smut Fungi 83–86. 1950. For a list of recorded hosts see Zundel, Ust. World 284. 1953. *T. secalis* (Corda) Kühn, causing Bunt of rye which occurs in South-East Europe, has somewhat larger spores than *T. caries*, but is at present considered by most workers to be only a race of the latter. For disease symptoms and biology of *T. caries* see e.g. Butler & Jones, Pl. Path. 362–367. 1949, and Blumer l.c.: 283–286. Infection of the hosts occurs at the seedling stage (seedling infection). For testing of seed contamination see Malone & Muskett *in* Proc. int. Seed Test. Ass. **29** (2) [= Handb. Seed Health Test. Ser. 4, Fasc. 1]: 360–361. 1964.

TILLETIA DECIPIENS (Pers.) Körn.

Tilletia decipiens (Pers.) Körnicke *in* Hedwigia **16**: 30. 1877.

≡ *Uredo segetum* subsp. *decipiens* Persoon, Syn. meth. Fung. 225. 1801 [as 'ε *Uredo decipiens*'].

Note: This is the causal organism of Bunt in bent grasses. For synonymy, descriptions and disease symptoms see Ainsworth & Sampson, Br. Smut Fungi 86. 1950, Fisher, N. Am. Smut Fungi 174. 1953, and Zundel, Ust. World 286. 1953. For a list of susceptible *Agrostis* spp. see Zundel l.c. See also Rădulescu *in* SchrReihe Karl-Marx-Univ. **8**: 131–136. 1962.

TYPHULA INCARNATA Lasch ex Fr.

Typhula incarnata Lasch ex Fries, Epicr. 585. 1838.

= *Typhula itoana* Imai *in* Trans. Sapporo nat. Hist. Soc. **11**: 39–44. 1929.

Note: This fungus is in the northern parts of Europe, America and Japan known as one of the *Typhula* species causing injury to cereals and grasses under deep and prolonged snow cover, which becomes evident as the snow melts: Snow Scald or Typhula Blight [for other vernacular names see Corner, Monograph Clavaria 673–675. 1950]. *T. incarnata* is also widely distributed in areas having relatively mild and wet winter climates, and then becomes active during the cool, wet months of spring and early summer. In older literature the fungus has often been misidentified as *Typhula graminis* P. Karst., a saprophyte occurring on dead leaves of grasses; see the discussion of the synonymy of *T. incarnata* by Corner l.c. For descriptions and disease symptoms see Corner l.c. and Årsvoll *in* Meld. Norg. LandbrHøgsk. **54** (9): 29–30. 1975. See also the description by Maas Geesteranus *in* Wet. Meded. K. ned. natuurh. Veren. **113**: 44–45. 1976 [with data on records in the Netherlands.]. For cultural characteristics and the factors influencing the development of sclerotia, sporophores and basidiospores see Lehmann *in* Phytopath. Z. **53**: 255–288. 1965. Characters which differentiate it from other *Typhula* spp. parasitizing on cereals and grasses in areas with frequent prolonged snow cover are described by Bruehl & Cunfer *in* Phytopathology **65**: 755–760. 1975. See also Bruehl, Machtmes & Kiyomoto *in* Phytopathology **65**: 1108–1114. 1975.

UROCYSTIS OCCULTA (Wallr.) Rabenh.

Urocystis occulta (Wallr.) Rabenhorst *in* Klotzschii Herb. mycol., ed. 2, Cent. 4, No. 393. 1856.

V ≡ *Erysiphe occulta* Wallroth, Fl. crypt. Germ. **2**: 212. 1833 [as '*Erysibe*'].

≡ *Tuburcinia occulta* (Wallr.) Liro *in* Annls Univ. fenn. Åbo. A, **1** (1): 12. 1922.

Note: Stripe Smut of rye [Am.: Flag Smut or Stalk Smut]. A number of grasses also appear to be susceptible to this smut, see Fischer & Holton *in* Phytopathology **33**: 910–921. 1943. For synonymy, descriptions and disease symptoms see Ainsworth & Sampson, Br. Smut Fungi 98–99. 1950, Fischer, N. Am. Smut Fungi 223–225. 1953, and Blumer, Rost- u. Brandpilze Kulturpfl. 305–306. 1963. Infection of rye mainly takes place during germination of the seed (seedling infection) but infections of young side-shoots of older plants also occur, cf. Blumer l.c.

UROMYCES DACTYLIDIS Otth var. *DACTYLIDIS* [sensu lato]

Uromyces dactylidis Otth *in* Mitt. naturf. Ges. Bern **1861**: 85. 1861, var. *dactylidis* [varietal name to be cited without an author's name, cf. Art. 26; name automatically established (autonym) by the publication in 1971 of the varietal name *U. dactylidis* var. *poae* (Rabenh.) Cummins].

= *Uromyces festucae* H. Sydow & P. Sydow *in* Hedwigia **39**: 117. 1900.

Note: The Rust of the genus *Uromyces* Unger which occurs on cocksfoot (uredinia and telia) is listed here according to the concept of Cummins, Rust Fungi 472–473. 1971. This means that besides the rust on *Dactylis* spp. it also includes the morphologically similar rusts of fescues and dog's-tails. *Ranunculus* spp. are known as alternative hosts (spermogonia and aecidia). For synonymy and detailed description see Cummins l.c. Within *U. dactylidis* var. *dactylidis* numerous specialized forms can be distinguished, adapted to different gramineous hosts and/or alternative hosts: see e.g. Gäumann *in* Beitr. KryptogFlora Schweiz **12**: 232–234 [*U. dactylidis* sensu stricto], and 235–238 [*U. festucae*]. 1959. The fungus can be distinguished from *Uromyces dactylidis* var. *poae* (Rabenh.) Cummins [sensu lato; see below] by larger uredospores. This difference in size of uredospores is also noted by Wilson & Henderson, Br. Rust Fungi 360–362, 363. 1966, who treat *U. dactylidis*, however, in a very broad concept [adopted from Hylander, Jørstad & Nannfeldt *in* Op. bot. Soc. bot. Lund **1**: 87–88. 1953].

UROMYCES DACTYLIDIS var. *POAE* (Rabenh.) Cummins [sensu lato]

Uromyces dactylidis var. *poae* (Rabenh.) Cummins, Rust Fungi 474. 1971.

≡ *Uromyces poae* Rabenhorst in Marcucci, Unio Itineraria Crypt. No. 38. 1866.

Note: According to Cummins (l.c.), the Rust of the genus *Uromyces* Unger which commonly occurs on meadow grasses (uredinia and telia), represents only one host-form of a plurivorous gramineous rust. As alternative hosts (spermogonia and aecidia) *Ficaria* as well as *Ranunculus* spp. have been recorded. For synonymy, hosts and detailed description of *U. dactylidis* var. *poae* sensu lato see Cummins l.c. The forms adapted to different grasses, originally described as separate species, may be interpreted as formae speciales. The specialization, however, is not restricted to the gramineous hosts but is also demonstrated by adaption to different alternative hosts; see the various formae speciales discussed by Gäumann *in* Beitr. KryptogFlora Schweiz **12**: 239–244. 1959, under *Uromyces poae* sensu stricto. *U. dactylidis* var. *poae* can be distinguished from var. *dactylidis* (see above) by smaller uredospores.

USTILAGO AVENAE (Pers.) Rostr. [sensu lato]

Ustilago avenae (Pers.) Rostrup *in* Overs. K. danske Vidensk. Selsk. Forh. **1890**: 13. 1890 [March].

≡ *Uredo segetum* subsp. *avenae* Persoon, Syn. meth. Fung. 224. 1801 [as '*γ Uredo Avenae*'].

H ≡ *Ustilago avenae* (Pers.) Jensen ex Kellerman & Swingle *in* Rep. Kans. agric. Exp. Stn **2**: 215. 1890 [June] [with reference to

Θ *Ustilago avenae* Jensen, Charb. Céréales 4. 1889].

Note: Fischer *in* Mycologia **35**: 611–613. 1943 established that the Loose Smut of

oats morphologically resembles the Smut of tall oat grass and the so called Black or False Loose Smut of barley (Am.: Shallow-borne Loose Smut). The latter, described as *U. nigra* Tapke *in* Phytopathology **22**: 869. 1932 and **33**: 206. 1943, has only been occasionally recorded in Northern Europe. The three smuts differ in their host-relation and other biological aspects and therefore should be considered as separate specialized pathogenic forms. The black loose smut of barley has already been differentiated in this way by Ainsworth & Sampson, Br. Smut Fungi 63, 136. 1950 as *U. avenae* f. sp. *nigra* [as 'form' but used in the sense of specialized pathogenic form]. For descriptions of *U. avenae* sensu lato see Fischer, N. Am. Smut Fungi 242–243. 1953, and Punithalingam & Waterston *in* C.M.I. Descr. pathog. Fungi Bact. 279. 1970. The echinulated outer surface of the spores distinguishes *U. avenae* from the covered smut pathogen of oats and barley, *U. hordei* (Pers.) Lagerh., which has smooth spores.

f. sp. *AVENAE* [An automatically established special form including the type of the species.]

Note: The synonymy of this loose smut of oats is documented by Stevenson & Johnson *in* Pl. Dis. Reptr **28**: 667. 1944. Hybridization between this loose smut and the covered smut of oats, *U. hordei* (Pers.) Lagerh. f. sp. *avenae*, can occur and in these crosses the factor echinulate spore wall from loose smut is dominant. On the other hand symptom expression in the host may vary from typically loose to typically covered smut. See the discussion by Ainsworth & Sampson l.c.: 32–35. A large number of physiologic races of loose smut of oats are known to occur, see e.g. Punithalingam & Waterston l.c. A list of hosts [various *Avena* spp.] is given by Zundel, Ust. World 141–142. 1953. For disease symptoms and biology see e.g. Butler & Jones, Pl. Path. 404–409. 1949, and Blumer, Rost- u. Brandpilze Kulturpfl. 260–262. 1963. Apart from seedling infection by spores carried on the seed the fungus may also produce a resting mycelium in the outer parts of the seeds. For the testing of seed contamination see Malone & Muskett *in* Proc. int. Seed Test. Ass. **29** (2) [= Handb. Seed Health Test. Ser. 4, Fasc. 1]: 374–377. 1964.

f. sp. **PERENNANS** [(Rostr.) comb. nov.]

≡ *Ustilago perennans* Rostr. *in* Overs. K. danske Vidensk. Selsk. Forh. **1890**: 15. 1890.

H = *Ustilago decipiens* (Wallr.) Liro *in* Annls Acad. Scient. fenn. A, **17**: 95, 445. 1924 [not *U. decipiens* Schubert in Ficinus & Schubert, Fl. Geg. Dresd. [II] Krypt. 236. 1823].

≡ *Uredo segetum* var. *decipiens* Wallroth, Annus Bot. 139. 1815 [p.p.].

Note: This is the common perennial Smut of tall oat grass. The mycelium hibernates in the root stock. Seedlings are infected by spores carried on the seed and by resting mycelium. For other synonyms see Zundel l.c.: 190. Descriptions and disease symptoms are to be found in Zundel l.c., and Blumer l.c.: 256–257. For disease symptoms see also Sampson & Western, Dis. Br. Grasses herb. Leg., ed. 2, 2. 1954 [with illustration].

USTILAGO HORDEI (Pers.) Lagerh. [sensu lato]

Ustilago hordei (Pers.) Lagerheim *in* Mitt. bad. bot. Ver. **1889**: 70. 1889.

≡ *Uredo segetum* subsp. *hordei* Persoon, Syn. meth. Fung. 224. 1801 [as 'α *Uredo Hordei*'].

H ≡ *Ustilago hordei* (Pers.) Kellerman & Swingle *in* Rep. Kans. agric. Exp. Stn **2**: 268. 1890.

Note: We follow the generally accepted species concept of Fisher *in* Mycologia **35**: 613–614. 1943, who concluded that the Covered Smut of barley is morphologically similar to the Covered Smut of oats. The two taxa differ, however, in their host-relation and therefore deserve to be distinguished as separate formae speciales. For descriptions of *U. hordei* sensu lato see Fischer, N. Am. Smut Fungi 270–272. 1953. The smooth spore walls of *U. hordei* distinguish this species from the loose smut pathogens *U. avenae* (Pers.) Rostr. and *U. nuda* (Jens.) Rostr., which have echinulate spore walls. The infection of the hosts occurs during germination from spores lying on the surface of the seed (seedling infection). For testing of seed contamination see Malone & Muskett *in* Proc. int. Seed Test. Ass. **29** (2) [= Handb. Seed Health Test. Ser. 4, Fasc. 1]: 374–377. 1964.

f. sp. *HORDEI* [An automatically established special form, including the type of the species.]

Note: The synonymy and nomenclature of the covered smut of barley is documented by Stevenson & Johnson *in* Pl. Dis. Reptr **28**: 667–668. 1944. For hosts [*Hordeum* spp. and some other Gramineae] see Zundel, Ust. World 166–167. 1953. Disease symptoms and biology are treated in Butler & Jones, Pl. Path. 427–429. 1949, and Blumer, Rost- u. Brandpilze Kulturpfl. 263–264. 1963. Several physiologic races have been recorded, see e.g. Ainsworth & Sampson, Br. Smut Fungi 58–59. 1950. This smut hybridized readily with the Black or False Loose Smut of barley [*U. avenae* (Pers.) Rostr. f. sp. *nigra*; rare in Northern Europe] giving rise to new forms, see Bever *in* J. agric. Res. **71**: 41–59. 1945.

f. sp. **AVENAE** [f. sp. nov.]

= *Ustilago kolleri* Wille *in* Bot. Notiser **1893**: 10. 1893.

= *Ustilago levis* (Kell. & Swing.) Magnus *in* Ber. naturw.-med. Ver. Innsbruck **21**: 33. 1894.

≡ *Ustilago avenae* var. *levis* Kellerman & Swingle *in* Rep. Kans. agric. Exp. Stn **2**: 259. 1890 [no priority in species-rank].

Note: This new special form distinguished within the species *Ustilago hordei* sensu lato, includes the covered smut of oats and is characterized by its adaptation to various *Avena* spp., see Zundel l.c.: 174 under the synonym *U. kolleri*. For disease symptoms and biology see Butler & Jones l.c.: 409–411 and Blumer l.c.: 262–263. Several races have been reported, see e.g. Butler & Jones l.c. For hybridization between covered smut and loose smut of oats see under *U. avenae* (Pers.) Rostr. f. sp. *avenae*.

USTILAGO MAYDIS (DC.) Corda

Ustilago maydis (DC.) Corda, Icon. Fung. **5**: 3. 1842.

≡ *Uredo maydis* de Candolle in de Candolle & de Lamarck, Fl. fr. [ed. 3] **5** [6]: 77. 1815 ["1805"].

rn = *Ustilago zeae* (Beckm.) ex Unger, Einfl. Bodens 211. 1836.

dn ≡ *Lycoperdon zeae* Beckmann *in* Hannov. Mag. **6**: 1330. 1768.

Note: Other synonyms of this common Smut of maize are given by Zundel, Ust. World 179. 1953. The fact that *U. maydis* is the correct name and not *U. zeae* has already been pointed out by Stevenson & Johnson *in* Pl. Dis. Reptr **28**: 668. 1944. In North and South America this smut also occurs on *Euchlena mexicana* Schrad. which is closely related to maize. For descriptions and disease symptoms see Ainsworth & Sampson, Br. Smut Fungi 45–46, 66–67. 1950, Fischer, N. Am. Smut Fungi 280–281. 1953, Blumer, Rost- u. Brandpilze Kulturpfl. 247–249. 1963, and Ainsworth *in* C.M.I. Descr. pathog. Fungi Bact. 79. 1965. Any part of the maize plant above the ground may be infected, see the study by Urech *in* Phytopath. Z. **73**: 1–26. 1972. An indefinite number of races have been distinguished, see e.g. Hirschhorn & Hirschhorn *in* Physis, B. Aires **18**: 181–222. 1939. For the extensive literature on *U. maydis* see further the bibliography given by Fischer, Smut Fungi 161–171. 1951, and by Urech l.c.

USTILAGO NUDA (Jens.) Rostr. [sensu lato]

Ustilago nuda (Jens.) Rostrup *in* Tidsskr. Landøkon. **8**: 745. 1889.

≡ *Ustilago segetum* var. *hordei* f. *nuda* Jensen, Om Kornsort. Brand 61. 1888.

≡ *Ustilago segetum* var. *nuda* Jensen *in* Jl R. agric. Soc. II, **24**: 406. 1888 [on p. 407 as *U. segetum* var. *hordei nuda*].

H ≡ *Ustilago nuda* (Jens.) Kellerman & Swingle *in* Rep. Kans. agric. Exp. Stn **2**: 277. 1890.

Note: The name *U. nuda* is at present generally used for the Loose Smut of barley (Am.: Deep-borne Loose Smut) as well as the Loose Smut of wheat. The basionym of *U. nuda* refers to the Loose Smut of barley and not to a specimen on oats as erroneously noted by Zundel, Ust. World 184–185. 1953. In the U.S.A. *U. nuda* has been recorded from rye and some grasses, see Fisher, N. Am. Smut Fungi 286–289. 1953. The morphologic similarity of the loose smuts on barley and wheat has first been established by Cunningham *in* Trans. Proc. N. Z. Inst. **55**: 397–433. 1924. Both smuts differ, however, distinctly in pathogenicity; the loose smut of barley does not attack wheat, and loose smut of wheat does not attack barley. They also show differences in spore germination, see Popp *in* Phytopathology **45**: 585–590. 1955. In our opinion they should be treated as specialized forms of one collective morphological species, as was proposed by Schaffnit in 1928 (see below). For descriptions of *U. nuda* sensu lato see Fisher l.c. and Punithalingam & Waterston *in* C.M.I. Descr. pathog. Fungi Bact. 280. 1970. The life cycle of *U. nuda* is characterized by embryo infection (flower infection). For testing of infected seeds see Malone & Muskett *in* Proc. int. Seed Test. Ass. **29** (2) [= Handb. Seed Health Test. Ser. 4, Fasc. 1]: 378–380. 1964.

f. sp. *HORDEI* [Schaffnit]

Ustilago nuda f. sp. *hordei* Schaffnit *in* Angew. Bot. **10**: 172. 1928.

= *Ustilago nuda* var. *hordei* G. W. Fischer & C. G. Shaw *in* Phytopathology **43**: 187. 1953 [as the trinomial '*Ustilago nuda hordei*'].

Note: This name refers to the loose smut on the type host of the species, but because the nomenclature of formae speciales is not governed by the botanical rules [Art. 4], it is not necessary to replace the clear indication *U. nuda* f. sp. *hordei* by *U. nuda* 'f. sp. *nuda*'. For the synonymy of this loose smut of barley see Stevenson & Johnson *in* Pl. Dis. Reptr **28**: 669. 1944. Various *Hordeum* spp. have been recorded as hosts, see e.g. Zundel l.c. It is differentiated from the seedling-infecting Black or False Loose Smut of barley [*U. avenae* (Pers.) Rostr. f. sp. *nigra*; rare in Northern Europe] by the absence of sporidia production, see e.g. Tapke *in* Phytopathology **31**: 284–286. 1941. The echinulate spore walls of *U. nuda* f. sp. *hordei* readily distinguish this loose smut from the Covered Smut of barley, *U. hordei* (Pers.) Lagerh. f. sp. *hordei*. Disease symptoms and biology are treated in Butler & Jones, Pl. Path. 426–427. 1949, and Blumer, Rost- u. Brandpilze Kulturpfl. 259–260. 1963. A number of races have been recorded, see e.g. Punithalingam & Waterston l.c.

f. sp. *TRITICI* [Schaffnit]

Ustilago nuda f. sp. *tritici* Schaffnit *in* Angew. Bot. **10**: 172. 1928.

= *Ustilago nuda* var. *tritici* G. W. Fischer & C. G. Shaw *in* Phytopathology **43**: 187. 1953 [as the trinomial '*Ustilago nuda tritici*'].

= *Ustilago tritici* (Pers.) Rostrup *in* Overs. K. danske Vidensk. Selsk. Forh. **1890**: 15. 1890 [March].

≡ *Uredo segetum* subsp. *tritici* Persoon, Syn. meth. Fung. 224. 1801 [as 'β *Uredo Tritici*'].

H ≡ *Ustilago tritici* (Pers.) Jensen apud Kellerman & Swingle *in* Rep. Kans. agric. Exp. Stn **2**: 262. 1890 [June] [Jensen himself designated this smut as:

Θ *Ustilago segetum* var. *tritici in* Jl R. agric. Soc. II, **24**: 407. 1888].

Note: The synonymy of this loose smut of wheat is discussed in Stevenson & Johnson l.c. [see also the note under *Tilletia caries* (DC.) Tul.]. The various *Triticum* spp. recorded as host [see e.g. Zundel l.c.: 212–213] differ in susceptibility. For reported races see e.g. the documentation given by Punithalingam & Waterston l.c. Disease symptoms and biology are treated in Butler & Jones l.c.: 367–372, and Blumer l.c.: 257–259.

Appendix

MUCILAGO CRUSTACEA Wigg.

Mucilago crustacea Wiggers, Prim. Fl. holsat. 112. 1780.

≡ *Mucilago crustacea alba* Micheli ex Battara, Fung. Arim. 76. 1755 [rejected, being not a binary name in accordance with the Linnaean system]

= *Mucilago spongiosa* (Leyss.) Morgan *in* Bot. Gaz. **24**: 56. 1897.

≡ *Mucor spongiosus* Leysser, Fl. Hal. 305. 1783.

Note: This Slime Mould is not a parasite and, according to the modern concept of

the classification of slime moulds (Myxomycetes), not even a fungus. It is added here because it occasionally forms a conspicuous feature on lawns and pastures, especially in autumn. The mass of white or yellowish plasmodia which move on to the leaves and stalks of grass is sometimes called 'cuckoospit'. The greyish-white spore capsules [aethalia composed of elongated lobed and branched sporangia], which are produced later, may cover the grass leaves completely. For descriptions see A. Lister, Mycetozoa ed. 3 [revised by G. Lister], 123–124. 1925 and Nanninga-Bremekamp, Ned. Myxomyceten 389–390. 1974.

Index of fungus names

The selected names are in boldface type.

Samenvatting

Verantwoording van de wetenschappelijke namen van algemeen voorkomende parasitaire schimmels.
Serie 2b: Schimmels bij akkerbouwgewassen: granen en grassen

In alfabetische volgorde wordt de nomenclatuur behandeld van de parasitaire schimmels bij gerst, haver, maïs, rogge, tarwe en de belangrijkste gekweekte grassen. Deze naamgeving zal worden gebruikt in de officiële publikaties van de Nederlandse Planteziektenkundige Vereniging en het Ministerie van Landbouw en Visserij.

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