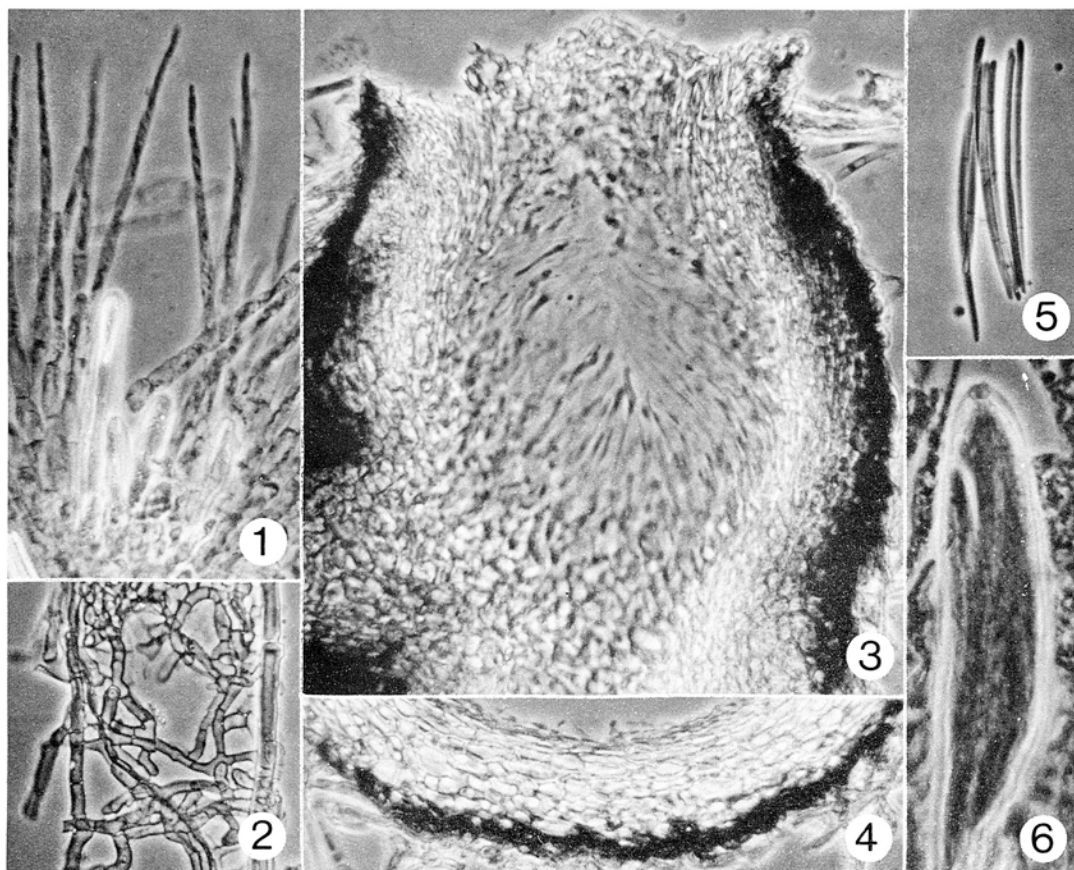


GAEUMANNOMYCES GRAMINIS VAR. TRITICI



1, Paraphyses arising among young asci; 2, hyphopodia; 3, ostiole lined with periphyses; 4, perithecium wall detail; 5, ascospores; 6, young ascus showing annulus stained with ink. 1,2,6, DAOM 19596; 3,4,5, DAOM 144597. 1-5, $\times 400$; 6, $\times 1000$.

Gaemannomyces graminis (Sacc.) von Arx & Olivier var. *tritici* Walker, Trans. Brit. Mycol. Soc. 58: 439. 1972.

PERITHECIA embedded in leaf sheath near culm base, oval, $260-390 \times 200-240 \mu$, wall $30-40 \mu$ thick, of 3-5 layers of polygonal brown cells $6-9 \mu$ diam. and an inner layer of tangentially flattened cells $8-13 \times 2-5 \mu$, beak erumpent, terete, often lateral and bent, $190-320 \times 120-145 \mu$, smooth, shining black, lined with hyaline, septate periphyses, $20-30 \times (1.5-2)2-5 \mu$. **ASCI** unitunicate with ink-positive, IKI-negative annulus, long-elliptical $(60-80-100(-125) \times 10-14(-20) \mu$, eventually free-floating, bearing a fascicle of 8 spores. **ASCOSPORES** thread-like, rounded at ends, slightly narrower towards the base, slightly curved, many-guttulate, pale yellow, without sheath or appendages, with 3 or even 5 thin indistinct septa, mostly $63-97 \times 3-4 \mu$. **PARAPHYSES** hyaline, $6-10 \mu$ wide at base among ascogenous hyphae, narrowed to $2-3 \mu$ near apex, septate at $14-22 \mu$ intervals, exceeding asci. **HYPHAE** forming a conspicuous dark grey mass between culm and leaf sheath for several cm above

roots. RUNNER HYPHAE in several parallel strands, each 4-8 μ wide, dark brown, septate at 20-35 μ intervals. HYPHOPODIA unlobed, terminal, 9-15 \times 5-8 μ , with one central circular infection peg, often united into a mycelial plate.

SUBSTRATE: Lower culm and roots of *Triticum aestivum* L., causing take-all or whitehead disease, *Agrostis tenuis* Sibth. (DAOM 133679), and undetermined monocotyledon (134956).

DISTRIBUTION: Quebec, Ontario, Saskatchewan, British Columbia.

COLLECTIONS: Que., Ste Anne de la Pocatière, 20.VIII.1945, DAOM 15370 (A. Payette). Ont., Edgeley, 8.VII.1947, 19596 (W.C. Broadfoot, I.L. Conners); Kemptville, 20.VII.1973, 144539, 144540b (R.V. Clark), 25.IX.1973, 144597 (P.M. LeClair, R.A. Shoemaker); Ottawa, 30.VI.1947, 19782 (R.J. Baylis); Toronto, artificial inoculation in greenhouse, 5.I.1931, 86088 (Herb. R.F. Cain 237, TRTC 2875. R.C. Russell), culture on oat hulls, 12.III.1931, 145598 (R.C.R.); Bolton, Peel County, 13.IV.1968, 134956 (D. Malloch). Sask., Annaheim, 3.VII.1925, 62656 (R.C.R., G.A. Scott), 21.VI.1934, 3643 (H.W. Mead, R.C.R.); Saskatoon, artificial inoculations in greenhouse, 4.I.1939, 5345, 3.I.1927, 62655 and 19.VII.1925, 145593 (all R.C.R.); Indian Head, 6.VIII.1927, 62327 (P.M. Simmonds, B.J. Sallans); Naican, 23.VIII.1938, 5344, Henribourg, 1.X.1930, 145595, Briarlea, VIII.1930, 145594, Englefield, 4.VIII.1926, 145596, St. Benedict, 30.VIII.1925, 145597 (all R.C.R.). B.C., Sidney, VII.1934, 118289, Duncan and U.B.C., 18.VII.1940, 118290 (W. Jones); Delta, VIII.1970, 133679 (D.J. Ormrod).

NOTES: Conners (Annotated index of plant diseases in Canada. Res. Branch Publ. 1251. Can. Dept. Agric. Ottawa. 1967, p. 399) records the occurrence of the fungus additionally in N.S. and Man., and on *Agropyron* spp. and *Bromus inermis* Leyss. No substantiating specimens for these records are in DAOM. Russell (Studies of Take-all and its causal organism *Ophiobolus graminis* Sacc. Can. Dept. Agric. Bulletin 170 N.S., 1934) gives a good account of the natural and artificially tested host range as well as some fine observations on the morphology of the fungus. The account of perithecium development by Jones (Ann. Bot. 40: 607-629. 1926) may have been of the related, larger-spored *G. graminis* var. *avenae*.

Walker (Trans. Brit. Mycol. Soc. 58: 427-457. 1972) has clarified many of the ambiguities concerning *G. graminis* var. *tritici* and its related varieties. He and many others consider it not to be pleosporaceous (*Ophiobolus*) but a member of Diaporthales. He accepts *Gaeumannomyces* because *G. graminis* is not congeneric with the type of *Linocarpon*. Petrak (Sydowia, 6: 383-388. 1952) had proposed the name *Linocarpon cariceti* and Fitzpatrick, Thomas & Kirby (Mycologia 14: 30-37. 1922) employed the binomial *Ophiobolus cariceti*. Walker (l.c.) studied the type of *Sphaeria cariceti* Berk. & Br. and found a fungus resembling *G. graminis* var. *graminis* and var. *tritici* in ascospore size (i.e. smaller-spored than var. *avenae*); but the diagnostic hyphopodia were not found to be unambiguously associated with *S. cariceti* and he could not assign it as a synonym of either var. *graminis* or var. *tritici*. As Walker noted, the epithet '*cariceti*' does not have priority at varietal rank over '*graminis*' or '*tritici*'.

Weste (Trans. Brit. Mycol. Soc. 59: 133-147. 1972) gives a good account of infection, with notes on ascospore germination: 88% polar with 12% also lateral. Microconidia were produced directly from some ascospores, and procedures for perithecial formation in culture were given: glucose asparagin agar, 20°C with daylight for 2 weeks. It was not made clear whether or not genetic incompatibility is a factor in development.

The name *Phialophora radicola* Cain (Can. J. Bot. 30: 340. 1952) was applied to the conidial (spermatial) state of what is now considered *G. graminis* var. *tritici* (LeMaire, J.M. & Ponchet, J., Compte rendu hebdomadaire Acad. Agric. France 49: 1067-1069. 1963). However, Walker (l.c.) implied that this aspect needs more study and clarification. Only one dried culture of Canadian origin (DAOM 145598) was examined and no conidia were found among the mature perithecia. On one specimen (DAOM 145593) of artificially inoculated wheat some curved spores resembling the conidial state were found but the association may be fortuitous.

R.A. Shoemaker