

Telimenella gangraena and Septogloeum oxysporum on grasses in Finland

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Abstract. — Material of this study consists of c. 4650 grass samples gathered on leys, field borders, yard swards, and forest meadows and seashore throughout the country during 1966-1974. Collections of Department of Plant Pathology, and Botanical Museum, University of Helsinki, and Mr. Pentti Alanko's herbarium were also examined.

Telimenella gangraena (Fr.) Petr. was found on 28 samples of six grass species: *Deschampsia caespitosa* (L.) PB., *D. flexuosa* (L.) Trin., *Festuca rubra* L., *Melica nutans* L., *Poa alpina* L., and *P. nemoralis* (L.), throughout the country (60° — 69°N, 19° — 29°E), being most common on *D. flexuosa* in North Finland.

Ripe perithecia of the fungus were found by the authors on two specimens of *D. flexuosa* (collected in Aug. 1973), just after keeping them in refrigerator for six months. Besides, mature perithecia were refound on *F. rubra* and *D. caespitosa*, collected by Karsten in 1866 and 1867 (in Herb. H). Mature perithecia were found only in the specimens collected in early spring and late autumn.

Septogloeum oxysporum Bomm., Rouss. & Sacc. was found on 58 samples of 12 grass species: *Agrostis tenuis* Sibth., *A. canina* L., *A. stolonifera* L., *Alopecurus pratensis* L., *Calamagrostis arundinacea* (L.) Roth, *C. epigeios* (L.) Roth, *C. lapponica* (WG). Hartm., *Deschampsia flexuosa* (L.) Trin., *Festuca pratensis* Huds., *Melica nutans* L., *Poa nemoralis* L., and *P. pratensis* L. throughout the country (60° — 69°N, 22-31°E), being most common on *A. tenuis* and *C. arundinacea*, occurring only accidentally on the other grasses. Conidia of the fungus were found to be most abundant in June and August.

The both fungi are of negligible importance.

Material and Methods

This study is based on c. 4650 grass samples gathered throughout the country on leys, field borders, yard swards, and forest meadows and seashore. In Finland many wild grasses are common throughout the country (HULTÉN 1971). The major portion of samples was collected from July to August. Besides, several grass specimens were examined in collections of Department of Plant Pathology, HPP, Botanical Museum University of Helsinki, H, and Mr. Pentti Alanko's herbarium.

Abbreviations of the Finnish biological provinces are in accordance with Heikinheimo and Raatikainen (1971).

Collectors were Pentti Alanko = P.A., Hilikka Koponen = H.K., and Kaiho Mäkelä = K.M.

Microscopic slides were prepared from all the samples bearing symptoms of the fungi.

The slides were preserved in lactic-acid and lactophenol solution, where the fungi were also measured and photographed. The microphotographs were taken by Kaiho Mäkelä.

Results and Discussion

Telimenella gangraena (Fr.) Petr., Sydowia 1: 79, 1947. Syn. *Sphaeria gangraena* (Fr.) Fr., Summa Veg. Scand. p. 387, 1849, *Phyllachora gangrena* (Fr.) Fuck., Symb. Myc. p. 217, 1869, *Sphaerella gangraena* (Fr.) Karst., Myc. Fenn. 2: 185, 1873; *Homostegia gangraena* (Fr.) Wint., Rabenh. Krypt.-Flora, I, 2: 917, 1887. Syn. cf. JØRSTAD 1962a: 18.

Telimenella is a genus of *Dothideales* (AINSWORTH 1967).

T. gangraena lives on various grasses. It is a conspicuous fungus and therefore often

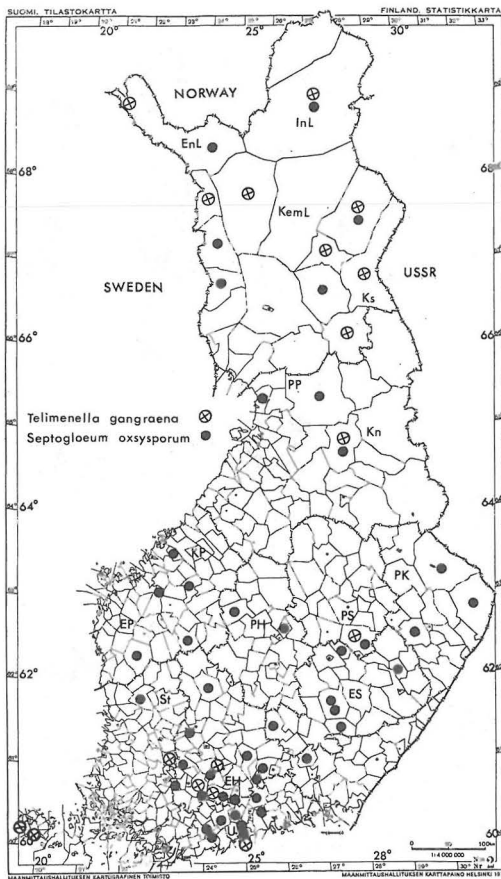


Fig. 1. The origin of *Telimenella gangraena* and *Septogloeum oxysporum* on grasses in Finland.

collected, but only seldom in the mature stage (SPRAGUE 1950, JØRSTAD 1962a, ERIKSSON 1967). Ripe perithecia have been found only on certain species of *Poa*, *Deschampsia* and *Festuca* (KARSTEN 1873, JØRSTAD 1945, 1962a, b, c, PETRAK 1947, ERIKSSON 1967). Besides the fungus is found commonly in the immature stage on many grasses all over Scandinavia (ERIKSSON 1967).

In Finland, the fungus has been known since 1866 on *Festuca rubra* L. and since 1867 on *Deschampsia caespitosa* (L.) PB. collected by Karsten in EH: Mustiala (in H., cf. p. 59). According to KARSTEN (1873) the fungus was found to some extent in the southern and central parts of country as far as Vaasa.

In the present study, *T. gangraena* was found rather uncommon and infrequent

throughout the country (Fig. 1). The fungus was most common on *Deschampsia flexuosa* (L.) Trin., in northern Finland. About 9 per cent of the specimens studied (157 specimens) were infected by the fungus. *T. gangraena* was also found on *D. caespitosa* (L.) PB. (one of 158 specimens studied), *Melica nutans* L. (three of 46 specimens), and *Poa alpina* L. (one of 19 specimens). The fungus has been found on the same grass species all over Fennoscandia (ERIKSSON 1967). Most of the specimens were collected in July and August.

T. gangraena causes on the leaves of grasses conspicuous, black stromata, which vary in shape and size on different hosts (Fig. 2) (cf. KARSTEN 1873, WINTER 1887, ERIKSSON 1967). On *Deschampsia flexuosa* stromata are 2–15 mm long surrounding the leaves as barrel-shaped. On *D. caespitosa* and species of *Poa* stromata are oval, more or less irregular blotches on both surfaces of leaves. Smaller stromata may unite and cover the surface of leaves with the long black stroma of a few centimeters.

The authors found only immature perithecia in stromata in nature (cf. JØRSTAD 1962a, ERIKSSON 1967). On the other hand mature perithecia with ascus and ascospores were found in two specimens of *Deschampsia flexuosa* collected in PS: Leppävirta 11. VIII. 1973 and in EnL: Kaaresuvanto 27. VII. 1973 (cf. p. 59) after keeping them under humid conditions at 2° – 5° C in the refrigerator for six months (Fig. 2). The authors have also re-examined several Karsten's specimens in Herb. H (see above), and have found ripe perithecia in two specimens on *Festuca rubra* (18. IV. 1866) and on *Deschampsia caespitosa* (10. X. 1867) both collected in EH: Mustiala. The reason why the authors found only not yet ripe perithecia in nature, was obviously too early gathering time (July – Aug.). The size of perithecia, asci and ascospores were of the following kind. *Deschampsia flexuosa* (in Leppävirta 1973) ascospores (17.5) 19.8 (22.5) x (3.8) 4.8 (5.0) μm, 1–2-septa, asci (40) 50 (55) x (8.8) 10.1 (11.0) μm, perithecia (150) 188 (225) μm in diam. *Festuca rubra* (in Mustiala 1866) ascospores (17.5) 18.0 (18.8) x 5.0 μm, 2-septa, asci (60) 65 (68) x (12.5) 14.5 (15.0) μm, perithecia (150) 163 (175) μm in diam. *Deschampsia caespitosa* (in Mustiala 1867) ascospores 17.5 x 3.8 μm, asci (45) 51 (58) x 12.5 μm, perithecia (150) 164 (175) μm in diam. In the present study the size of the fungus is similar or greater than KARSTEN'S

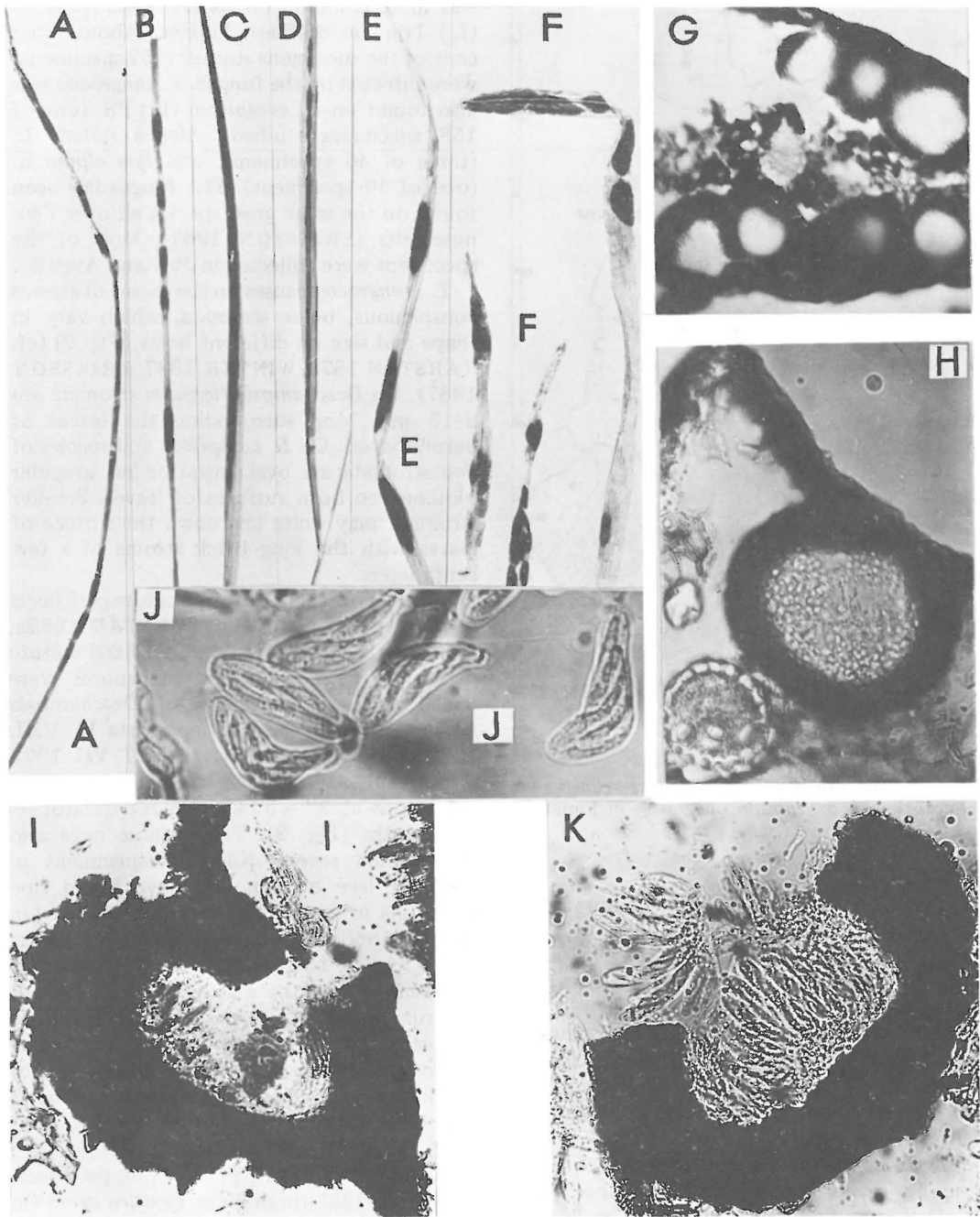


Fig. 2. *Telimenella gangraena*. A, B, H, I: on *Deschampsia flexuosa*, A: Savukoski 2. VIII. 1973, B, I: Kaaresuvanto 27. VII. 1973, H: Puolanka 8. VIII. 1973, C, D: on *Melica nutans* Helsinki 31.VII. 1915, E: on *Poa nemoralis* Seutula 13. VI. 1934, F, G: on *Poa alpina* Kilpisjärvi 28. VII. 1973, J, K: on *Festuca rubra* Mustiala 18. IV. 1866. G, H, I, K: section of leaves. G, H: immature pseudothecia, I, K: mature pseudothecia, J: asci with ascospores in K. A-F: x 1, G: x 80 H: x 170, J: x 500, I, K: x 250.

(1873) and JØRSTAD's (1945, 1962a, 1962b) material but greater than reported by PET-RAK 1940, 1942, cf. JØRSTAD 1962a: 19).

Examined Material

On *Deschampsia caespitosa*:

EH: Mustiala 10. X. 1867 (P. A. Karsten, H); EnL: Hetta 30. VII. 1973 (H.K.).

On *Deschampsia flexuosa*:

U: Helsinki commune 12. VII. 1929 (V. Heikinheimo & J. I. Liro, H), Helsinki 19. IX. 1968 (P.A.); St: Punkalaidun 21. VII. 1973 (K.M.); EH: Loppi 26. VIII. 1967 (P.A.); PS: Leppävirta 11. VIII. 1973 (H.K.); Kn: Puolanka 8. VIII. 1973 (H.K.); Ks: Posio 8. VIII. 1973 (H.K.); Salla 3. VIII. 1973 (H.K.); KemL: Kittilä 31. VII. 1973 (H.K.), Muonio 27. VII. 1973 (H.K.), Pelkosenniemi 7. VIII. 1973 (H.K.), Savukoski 2. VIII. 1973 (H.K.), 6. VIII. 1973 (H.K.); EnL: Hetta 30. VII. 1973 (H.K.), Kaarenavanto 27. VII. 1973 (H.K.), Kilpisjärvi 28. VII. 1973 (H.K.); InL: Inari 31. VII. 1973 (H.K.).

On *Festuca rubra*:

EH: Mustiala 18. IV. 1866 (P.A. Karsten, H).

On *Festuca* sp.

EH: Mustiala 10. VIII. 1888 (P.A. Karsten, H).

On *Melica nutans*:

A: Eckerö 24. VII. 1967 (P.A.), Maarianhamina 11. VIII. 1967. (P.A.); U: Helsinki 24. VII. 1929, 31. VII. 1915 (J. I. Liro, H), (V. Heikinheimo & J. I. Liro, H); EH: Hattula 17. VII. 1965 (P.A.).

On *Poa alpina*:

EnL: Kilpisjärvi, Saana 28. VII. 1973 (H.K.).

On *Poa nemoralis*:

U: Seutula 13. VI. 1934 (M. Puolanne).

— Except where indicated all specimens are preserved in HPP, Alanko's specimens are in his private herbarium.

Septogloeum oxysporum Bomm., Rouss. & Sacc., Bull. Soc. R. Bot. Belg, 29, 1: 294, 1890. Syn. *Fusoma triseptatum* Sacc., Syll. Fung. 10: 566, 1892; *Cheilaria agrostidis* Lib., Pl. Crypt. Ard., no 63, 1830; *Septogloeum agrostidis* (Rostr.) Gunnerbeck, Svensk Bot. Tidskr. 65: 48, 1971. Syn. cf. JØRSTAD 1962a: 19, GUNNERBECK 1971: 48.

Septogloeum is a genus of *Melanconiales* (AINSWORTH 1967).

It causes blotch and char spot on various grasses, particularly on species of *Agrostis* and

Calamagrostis (SPRAGUE 1950, JØRSTAD 1945, 1962a, GUNNERBECK 1971). The fungus is widespread (SPRAGUE 1950). It has been found commonly in Scandinavia since the end of the last century (JØRSTAD 1945, 1962a, GUNNERBECK 1971).

In Finland, the fungus has been known since 1866 on *Agrostis* sp. as *Dothidea gangraena* (Fr.) Kirckx, since 1867 on *Deschampsia caespitosa* (L.) PB. as *Sphaerella gangraena* (Fr.) Karst., and since 1872 on *Calamagrostis arundinacea* (L.) Roth as *Phyllachora graminis* (Pers.) Fuck., gathered by Karsten in South Häme, Mustiala. The authors have re-examined the above mentioned specimens in H, but have found only conidia of *Septogloeum oxysporum*. This species has often been mistaken for a *Phyllachora graminis* (cf. JØRSTAD 1945, 1962a) or a *Mastigosporium* spp. (cf. GUNNERBECK 1971). Besides, the fungus has been supposed to be the conidial stage of *Telimenella gangraena* (JØRSTAD 1945, 1962a) or of *Phyllachora agrostidis* Fckl. (GROVE 1935).

In the present study the fungus was found moderately common and abundant throughout the country (Fig. 1), being most common on *Agrostis tenuis* and *Calamagrostis arundinacea*. The fungus is commonly known on the same grass genera (GROVE 1935, JØRSTAD 1945, 1962a, LATCH 1966, ERIKSSON 1967). The fungus was found on *A. tenuis* in about 7 per cent of the specimens studied (363 specimens) throughout the country and on *C. arundinacea* in about 20 per cent of the 74 specimens studied in southern and central Finland. Besides, *S. oxysporum* was found occasionally on the following grasses: on *Agrostis stolonifera* L. (two of 30 specimens studied), *Alopecurus pratensis* L. (one of 195 specimens), *Calamagrostis epigeios* (L.) Roth (one of 176 specimens), *C. lapponica* (WG) Hartm. (one of 15 specimens), *Deschampsia flexuosa* (one of 157 specimens), *Festuca pratensis* (one of 534 specimens), *Melica nutans* (one of 46 specimens), *Poa nemoralis* (one of 15 specimens) and *P. pratensis* (one of 151 specimens studied).

The specimens with conidia were collected between May 3 and October 19, the bulk in July and August. This differs from observations of JØRSTAD (1962a), who has found the conidial stage only between June 30 and Aug. 7 on specimens collected in Norway.

S. oxysporum causes different kind of

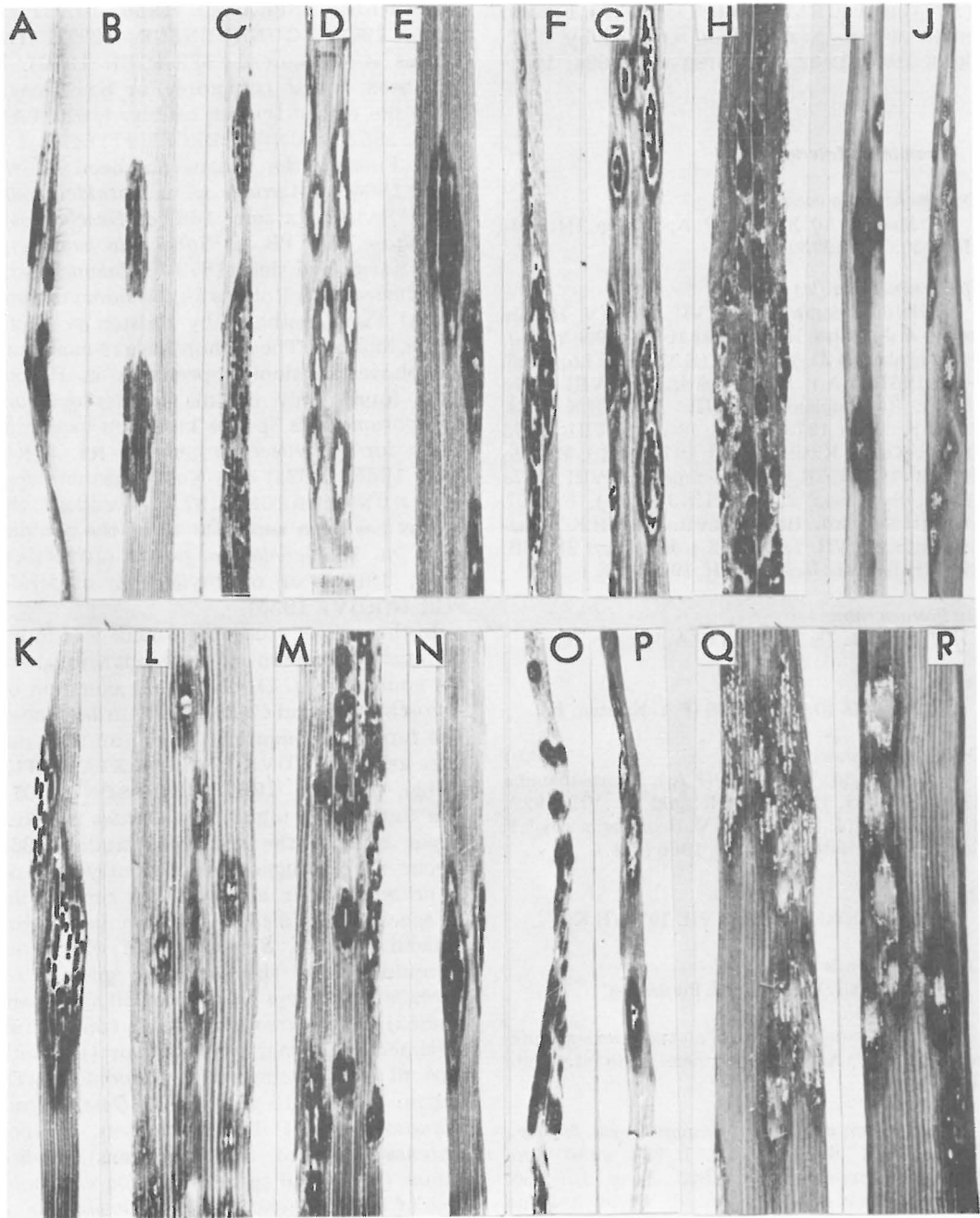


Fig. 3. *Septogloeum oxysporum*. A: on *Agrostis canina*, Helsinki commune 3. V. 1936, B, C: *A. tenuis*, Leppävirta 11. VIII. 1973, D-J, Q, R: on *Calamagrostis arundinacea*, D: Jäppilä 3. VII. 1973, E, F: Lammi 24. VIII. 1971, G, H: Ilomantsi 29. VII. 1972, I: Jaala 5. VII. 1970, J, Q, R: Nummela 21. VI. 1954, K: on *C. lapponica* Savukoski 6. VIII. 1973, L, M: on *Festuca pratensis* Ypäjä 17. VIII. 1972, N: on *Melica nutans* Hattula 17. VII. 1965, O, P: on *Poa nemoralis* Siuntio 14. VI. 1970. A, D-K, N-P: x 1, B, C, L, M, Q, R: x 2.

symptoms of char spot on the leaves on various grasses (Fig. 3) (cf. SACCARDO 1892, SPRAGUE 1950, JØRSTAD 1962a). Lesions are epiphyllous, oval to elongate, at first yellowish white – pale – tawny in center. The margin is greyish brown – greyish orange – greyish red – golden yellow – brown in colour. Later lesions become covered with black brown – black stromatic tissue, charcoal like streaks (e.g. *Melica nutans*) (cf. PETRAK 1959). Black stromata of *Puccinia coronata* type were found e.g. *Agrostis tenuis*, *Calamagrostis lapponica* and *Festuca pratensis*. The shape and size of lesions vary according to hosts 0.2 – 11 cm, the shortest on *Agrostis* species and the longest on *Melica nutans* and *Calamagrostis arundinacea*. Conidia bear usually in epiphyllous acervuli, mostly on young lesions, but moderately also on old black stromata (cf. SPRAGUE 1950), whilst according to PETRAK (1959) and JØRSTAD (1962a), the bulk of stromata remains sterile. The pycnidia were found on two of the specimens (on *Calamagrostis arundinacea*, EH: Hollola, 10. VIII. 1968, P.A., and *Poa nemoralis*, U: Siuntio, 14. VI. 1970, P.A.). They were subglobose, brown, 100–150 µm in diam.; the pycnosporos resembled the conidia arising from the acervulus, but were usually 2-septa (Fig. 4). Also SPRAGUE (1941, 1950) has found pycnidia of this fungus.

Conidia are hyaline, fusoid, often flattened on one side, tapering towards to pointed apex, and as young 1- or 2-septa, as old 3-septa conidia dominating (SACCARDO 1892: 497, JØRSTAD 1962a). The size of conidia vary on different host: on *Agrostis tenuis* (15) 25.2 (30) x (3) 5.1 (6) µm, (2) 2.9 (3)-septa, *A. stolonifera* (22) 25.2 (29) x (3) 4.1 (5) µm, 3-septa, *Calamagrostis arundinacea* (15) 22.2 (34) x (2) 3.5 (5) µm, (2) 3 (5)-septa, *C. epigeios* (21) 23.2 (26) x (4) 4.1 (5) µm, 3-septa, and *Poa pratensis* (18) 21.4 (25) x (3) 3.1 (4) µm, 2–3-septa. In this study the size of conidia is quite similar as reported earlier (SAMPSON and WESTERN 1942, SPRAGUE 1950, PETRAK 1959, JØRSTAD 1962a, LATCH 1966).

Immature perithecia of *Telimenella gangraena* and conidia of *Septogloeum oxysporum* were found three times on the same specimen of *Festuca pratensis* (EH: Ypäjä 17. VIII. 1972) and *Deschampsia flexuosa* (EnL: Kilpisjärvi 28. VII. 1973, InL: Inari 31. VII. 1973). JØRSTAD (1945: 54, 1962a: 19) has also found these two fungi together in two speci-

mens of *Poa nemoralis* in Norway. Besides the symptoms of these two fungi are quite similar on many grass species (cf. Figs. 2 and 3). On the other hand *Telimenella gangraena* and *Septogloeum oxysporum* have been found usually on the different hosts. *T. gangraena* is the most common on *Deschampsia* species, whilst *S. oxysporum* is the most common on *Agrostis*, and *Calamagrostis* species (cf. JØRSTAD 1962a).

On the basis of this material, the authors cannot draw any certain conclusions about mutual relationships between these two fungi (cf. JØRSTAD 1945, 1962a).

Examined Material

On *Agrostis tenuis*:

U: Nurmijärvi 19. VIII. 1973; EH: Kärkölä 15. VIII. 1974, Loppi 6. VII. 1969 (P.A.), Ruovesi 23. VII. 1973, Urjala 10. VIII. 1972, 2. VII. 1973 (P.A.); ES: Mikkeli commune 29. VII. 1972; EP: Alavus 24. VI. 1967; 12. VIII. 1970 (P.A.), Kauhajoki 19. VIII. 1972; PH: Karstula 1. VII. 1973, 2. VII. 1973, Sumiainen 2. VII. 1973; PS: Leppävirta 11. VIII. 1973; PK: Koli 5. VI. 1972; KP: Lappajärvi 15. VIII. 1972, Ähtävä 17. VIII. 1972; Kn: Puolanka 9. VIII. 1973; PP: Ii 26. VII. 1973, 28. VII. 1973, Kemijärvi 7. VIII. 1973, Pello 26. VII. 1973, Pudasjärvi 8. VIII. 1973; KemL: Kolari 26. VIII. 1973; EnL: Enontekiö 30. VII. 1973.

On *Agrostis canina*:

U: Helsinki commune 3. V. 1936 (J. I. Liro & al.).

On *Agrostis stolonifera*:

U: Helsinki 5. VI. 1972 (K.M.); St: Kankaanpää 13. VIII. 1972 (H.K.).

On *Agrostis* sp.:

V: Lohja 17. IX. 1930 (J. I. Liro); U: Pornainen 12. VII. 1916 (T. Putkonen); EH: Mustiala 19. X. 1866, 14. X. 1867 (2 specimens, P.A. Karsten, H); EP: Alavus 25. VI. 1967 (P.A.), Ylihärmä 14. VIII. 1972 (H.K.); PK: Ilomantsi 30. VI. 1972 (H.K.), Liperi 5. VII. 1972 (H.K.).

On *Alopecurus pratensis*:

U: Helsinki 18. VI. 1954 (K.M.); EH: Tyrväntö 17. VII. 1965 (P.A.).

On *Calamagrostis arundinacea*:

V: Nummela 21. VI. 1954 (K.M.); U: Hyvinkää 6. VIII. 1972 (H.K.), Hyvinkää commune 16. VII. 1967 (P.A.), Mäntsälä 1. V. 1973 (H.K.); EH: Hattula 17. VII. 1965. (P.A., H), Hollola 10. VIII. 1968 (P.A.), Hämeenlinna 30. IX. 1973 (K.M.), Jaala 5. VII. 1970, 29. VII. 1972 (P. Ilonoja), Lammi 24. VIII. 1971 (H.K.), Mustiala 13. VIII. 1872 (P.A. Karsten, H), Pirkkala 25. IX. 1924 (V. Heikinheimo, H), Sysmä

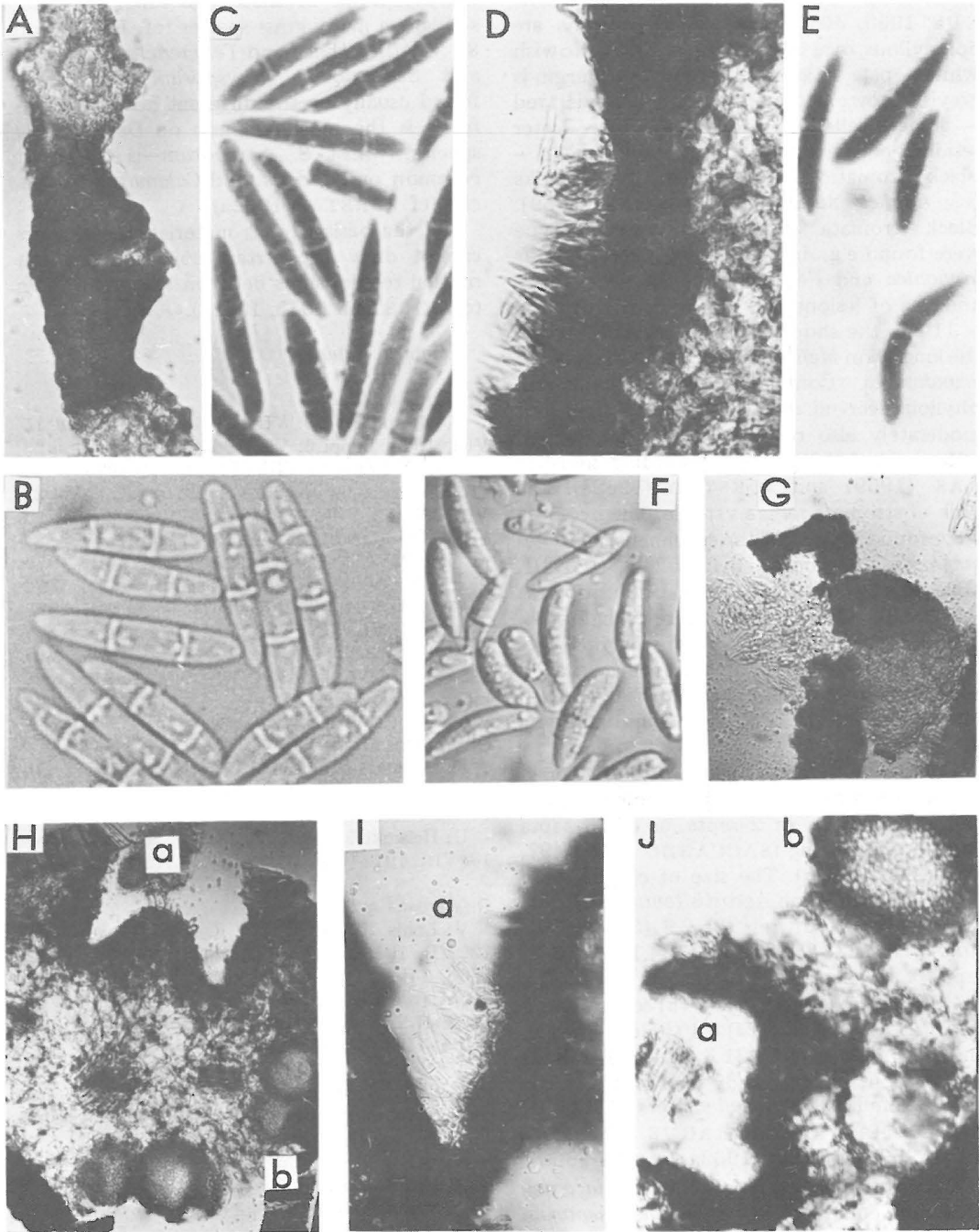


Fig. 4. *Septogloeum oxysporum*. A, B: on *Agrostis tenuis* Ii 26. VII. 1973, A: section of leaf with black stromata, B: conidia, C, D: on *Calamagrostis arundinacea* Ristiina 6. VII. 1972, C: conidia, D: stroma with conidia, E: conidia on *Festuca pratensis* Ypää 17. VIII. 1972, F, G: on *Poa nemoralis* Siuntio 14. VI. 1970, H-J: on *Deschampsia flexuosa* section of leaves, a: stromata with conidia, b: young pseudothecia of *Telimenella gangraena*, H, I: Kilpijärvi 28. VII. 1973, J: Inari 31. VII. 1973. A, H: x 80, B, C, E: x 1500, F: x 1000, G, J: x 200, D, I: x 400.

23. VI. 1972 (H.K.), 9. VII. 1972 (K.M.), Urjala 10. VIII. 1972 (P.A.), 11. VIII. 1972 (H.K.), Tammela 29. VIII. 1969 (P.A.); ES: Mikkeli commune 14. VIII. 1971 (H.K.), Ristiina 6. VII. 1972 (H.K.); PS: Jäppilä 3. VII. 1973 (H.K.); PK: Ilomantsi 29. VII. 1972 (M. Kontturi).

On *Calamagrostis epigeios*:

EH: Jaala 21. VI. 1970 (P. Ilonoja), Loppi 23. VII. 1928 (V. Heikinheimo).

On *Calamagrostis lapponica*:

KemL: Savukoski 6. VIII. 1973 (H.K.).

On *Calamagrostis* sp.:

ES: Enonkoski 3. VIII. 1953 (A. Rauhala, H), Mikkeli 28. VI. 1968 (K.M.); PK: Ilomantsi 29. VII. 1972 (M. Kontturi).

On *Deschampsia flexuosa*:

InL: Inari 31. VII. 1973 (H.K.).

On *Festuca pratensis*:

EH: Ypäjä 17. VIII. 1972 (P.A.).

On *Melica nutans*:

EH: Hattula 17. VII. 1965 (P.A., H).

On *Poa nemoralis*:

U: Siuntio 14. VI. 1970 (P.A.).

On *Poa pratensis*:

ES: Mikkeli 28. VI. 1968 (K.M.).

— Except where indicated, all specimens are collected by H.K. and preserved in HPP, Alanko's specimens are in his private herbarium.

Additions (localities not included in the maps): *Calamagrostis arundinacea*: EH. Hämeenlinna 7. IX. 1927 (J. I. Liro & V. Heikinheimo, H), Loppi 23. VII. 1928 (V. Heikinheimo, H).

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