OVERWINTERING OF *GRAMINEAE* PLANTS AND PARASITIC FUNGI

III. Isolations of *Fusarium nivale* from gramineous plants in Finland

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The most important low-temperature parasitic fungi on graminaceous plants in Finland are the cause of *Fusarium* snow mold, the cause of *Typhula* snow mold (*T. itoana* Imai and *T. idahoensis* Remsb.), and *Sclerotinia borealis* (Bubák) Vleugel. Of these fungi *S. borealis* and *Typhula* spp. have been described in author's earlier articles (2, 4).

As far as is known the first report in Finland of the fungus causing *Fusarium* snow mold was that of KARSTEN (5) who determined it as *Lanosa nivalis* Fr.(syn. *Fusarium nivale* [Fr.] Ces.). After that time many reports are to be found in the agricultural literature concerning the occurrence and damages of *Fusarium* snow mold in this country (cf. 3).

The author, in an earlier work on *Fusarium* species in Finland (1), has described isolations of *F. nivale* made from some graminaceous plants. In two of these isolations in addition to the conidial stage also the perithecial stage, *Calonectria graminicole* (Berk. and Broome) Wr. developed on pure culture. At the Department of Plant Pathology determinations have since been made of the *Fusarium* fungi found on snow mold-diseased *Gramineae* plants. Samples of such plants were collected from various parts of Finland in the spring and determinations of the fungi were made from pure cultures, using a medium of oatmeal agar.

The mycelium of *F. nivale* forms a loose network of hyphae, colored pale salmon to pale rose or white. The conidia are crescent-shaped, narrowing at both ends and without the footshaped basal cell typical of most *Fusarium* fungi. The conidia are either scattered throughout the mycelium or they are in salmoncolored masses forming sporodochia or pionnates. The fungus does not produce sclerotia nor chlamydospores. The conidia are one- to three-septate: one-septate 15—19 × 2.7—3.5 μ (average 17 × 3.0 μ) and three-septate 17—26 × 3.0—3.8 μ (average 23 × 3.5 μ) (cf. 1,6).

List of *Fusarium* samples collected by the Department of Plant Pathology

The abundance of determinations on *Secale cereale* in the following list is due to the fact that more samples of winter rye were collected than other gramineous plants.

Abbreviations:

Plant geographical countries (provinces) from south to north: *Ab* = Regio aboensis, *N.* = Nylandia, *St* = Satakunta, *Ta* = Tavastia australis, *Sa* = Savonia australis, *Oa* = Ostrobottnia australis, *Tb* = Tavastia borealis, *Sb* = Savonia borealis, *Ka* = Karelia australis, *Kb* = Karelia borealis, *Om* = Ostrobottnia media, *Ok* = Ostrobottnia kajaniensis, *Ob* = Ostrobottnia borealis, *Lk* = Lapponia kemenses.

Res. C. = Agricultural Research Centre. Exp. Sta. = Local Experimental Station. The date of collection of the sample is indicated thus: Day. Month. Year. In parentheses is the number of samples if more than one. E. A. J. = E. A. Jamalainen.

Fusarium nivale (Fr.) Ces.

Avena sativa L. *Sb.* Maaninka, Exp. Sta., 13. 5. 52: M. Haavisto.

Dactylis glomerata L. *N.* Tikkurila. Res. C., 26. 4. 44: E. A. J. — *Sb* Maaninka, Exp. Sta., 27. 4. 50: M. Haavisto. — *Ob.* Apukka, Exp. Sta. 24. 5. 50: M. Haavisto.

Festuca pratensis Huds. *Sa.* Maaninka, Exp. Sta. 24. 5. 50: M. Haavisto.

Hordeum vulgare L. (winter barley). *N.* Tikkurila, Res. C. 2. 5. 48 E. A. J.

Lolium multiflorum Lam. *Sb.* Maaninka, Exp. Sta., 21. 5. 53: M. Haavisto.

Lolium perenne L. *Sb.* Maaninka, Exp. Sta., 27. 4. 50, 12. 5. 52: M. Haavisto; 15. 5. 55: E. A. J.

Phleum pratense L. *Om.* Ruukki, Exp. Sta., 4. 48: O. Anttinen.

Poa annua L. *N.* Tikkurila, Res. C. 4. 39: H. Roivainen; 4. 48: E. A. J.

Secale cereale (winter rye) L. *Ab.* Karkkila, 20. 5. 44; Piikkiö, Res. C., 10. 5. 44 (2): V. Kallio. — *N.* Tikkurila, Res. C. 23. 9. 39, 3. 39 (3), 24. 4. 44, 4. 48, 7. 5. 58: E. A. J. — *St.* Peipohja, Exp. Sta., 5. 44: T. Virri. — *Ta.* Jokioinen, Res. C. 4. 48 (2): K. Multamäki. — *Sa.* Karila, Exp. Sta., 7. 5. 44 (4), 29. 4. 48: Y. Koskinen; Ristiina 5. 39. — *Oa.* Kälviä, Koskenkylä 26. 5. 48: A. Alasinni; Pihtipudas 13. 5. 48: E. Kananen; Ylistaro, Exp. Sta., 17. 4. 44 (7): T. Honkavaara. — *Oa.* Jalasjärvi, Kurikka, Lapua (from the seeds), 3. 38. — *Tb.* Karstula, Vastinki, 1. 5. 48: T. Marttinen. — *Sb.* Maaninka, Exp. Sta., 9. 5. 44 (2): M. Salminen. — *Kb.* Ilomantsi, 24. 5. 48: K. Syrjänen; 19. 5. 48: M. Volotinen; Tohmajärvi, Exp. Sta., 8. 5. 48 (4): L. Saloheimo; 13. 5. 48: E. A. J. — *Om.* Alavieska, 26. 4. 48: N. Verronen; Kalajoki, 18. 4. 48: M. Tilvis; 20. 4. 48: J. Rukkala; Paavola 5. 38; Ruukki, Exp. Sta., 16. 5. 44, 4. 44: O. Anttinen; Ylivieska, 3. 5. 48: H. Mattila. — *Ok.* Ristijärvi, 25. 4. 48: F. Härkönen. — *Ob.* Muhos, 9. 5. 48 (2): Y. Sevón; Rovaniemi, Agr. Sta., 23. 5. 44: A. Rankamaa; 31. 5. 48 (2): E. A. J.; Simo 2. 5. 48: O. Salmela. — *Lk.* Kolari, 7. 6. 46: J. Juppala; 24. 4. 48: V. Kortelainen.

Triticum aestivum (winter wheat) L. *N.* Tikkurila, Res. C. 25. 4. 48, 7. 5. 58: E. A. J. — *Ta.* Jokioinen, Res. C., 4. 48: K. Multamäki. — *Sa.* Mikkeli, Exp. Sta. 6. 38: E. A. J. — *Ob.* Rovaniemi, Exp. Sta., 31. 5. 48: E. A. J.

Triticum spelta L. *N.* Tuusula, Anttila Exp. Farm, 16. 5. 55: E. A. J.

Fusarium avenaceum (Fr.) Sacc.

Secale cereale (winter rye) L. *N.* Tikkurila, Res. C., 3. 38: E. A. J. — *Sa.* Ristiina, 9. 38. — *Sb.* Maaninka, Exp. Sta. 9. 5. 44: E. A. J.

Triticum aestivum (winter wheat) L. *Ab.* Piikkiö, Res. C., 10. 5. 44: V. Kallio. — *Sa.* Mikkeli, Exp. Sta. 5. 38.

The foregoing determinations of fungi found on plants with *Fusarium* snow mold show that the actual cause of this disease in Finland is *F. nivale* as it is also in other countries (cf. 6). In some isolations *F. avenaceum* was found, indicating

that other *Fusarium* species might also be the cause of snow mold. *F. nivale* is found in most geographical countries of Finland and in many different *Gramineae* plants.

Summary

Determinations carried out for many years on *Fusarium* snow mold occurring on graminaceous plants in different parts of Finland show that the cause of this disease is *Fusarium nivale* (Fr.) Ces. In pure cultures made of the fungi isolated from samples of diseased plants, *F. nivale* was found in 72 samples and *F. avenaceum* (Fr.) Sacc. in 5 samples.

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SELOSTUS:

GRAMINEAE-KASVIEN TALVEHTIMINEN JA TUHOSIENET

III. *Fusarium nivale*-eristyksiä *Gramineae*-kasveista Suomessa

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Useiden vuosien kuluessa eri tahoilla maata keväisin *Gramineae*-kasvien näytteistä suoritetut sienimääritykset osoittavat, että lumihomeen aiheuttajana Suomessa on *Fusarium nivale* (Fr.) Ces. Eräissä tapauksissa oli syysviljojen oraista eristetty myös *F. avenaceum* (Fr.) Sacc., joka viittaa siihen että lumihomeen aiheuttajana saattaa olla muitakin *Fusarium*-lajeja. *F. nivalea* tavattiin useimmissa maamme kasvimaantieteellisissä maakunnissa, useissa eri *Gramineae*-kasveissa.