OVERWINTERING OF *GRAMINEAE*-PLANTS AND PARASITIC FUNGI

II. On the *Typhula* sp.-fungi in Finland

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The author's previous article on the fungi of *Gramineae*-plants (4) dealt with the occurrence in Finland of the *Sclerotinia borealis* Bubák & Vleugel. The present article presents observations on the *Typhula*-fungi on overwintering graminaceous plants in Finland.

The fungi of the *Typhula*-genus are most easily to be seen in spring after the melting of the snow when there is an abundance of sclerotia of the fungi on the plants. The leaves damaged by the fungi are grey, open and flat to begin with, later becoming shrivelled and stringy and often enclosing the sclerotia. In particular the sclerotia of *T. itoana* are often lodged at the base of the stalk between the leaf and the sheath, where they cannot always be discovered on closer inspection. In damp weather, before the sun has dried the soil surface, pale mycelium of the fungi may appear, the mycelium of *T. borealis* is white, that of *T. itoana* very pale pink. The mycelium presents a similar growth on a nutrient medium in the laboratory. When dry the sclerotia remain alive in order to continue their development in autumn with the arrival of the cold and damp weather in September and October. At this time the fruit bodies develop in the sclerotia.

Typhula itoana Imai

The species was defined in 1929 by IMAI as *Typhula itoana* (3). In Finland KARSTEN described, in 1869 (8), a species called *T. gramineum*, which is similar to *T. itoana*. In some later works these fungi have not, however, been considered identical (3, 9, 12).

The sclerotia of *T. itoana* are reddish brown, smooth, and rough when dry or old, 0.5 — 2 × 1.5 — 4 mm. in diameter. The rind of the sclerotia is about 7.8 μ thick, golden to reddish brown. The medulla is pale, paraplechtenchymatous with the hyphae loosely interwoven. The sclerotium usually produces one sporophore, which is erect, straight or slightly curved, 8—25 mm. in length. The stipe

of the sporophore is straight, 5—10 mm. tall, 0.5—1.0 mm. in diam., and white in colour. The stipe ends in a fusiform clavula containing the hymenium of the fungus; it is hydrangea pink to pale vinaceous pink in colour, cylindrical, 10—15 mm. long, about 1—2 mm. wide. The basidia of the hymenium are 27.2—34.6 × 5.1—7.8 μ in size; the basidiospores 4.3—7.8 × 11.3—14.8 μ in size.

The colour and shape of the sclerotia of the *T. itoana* material which has been examined at the Department of Plant Pathology, correspond with the above description, which is based on literary sources (9, 11, 12). Only the size of the sclerotia was smaller, on an average 0.6—1.2 mm. in diameter. In some random experiments on the growing of the fungus it was found that the fruit bodies and their spores were similar to those described above both in shape and size.

In the accompanying list (p. 77—79) the material on the *T. itoana* fungus, which has been accumulated at the Department of Plant Pathology, has been classified according to the size, shape and colour of the sclerotia. It should be pointed out that in the taxonomy of the species of the *Typhula*-genus, some scientists, e.g. REMSBERG (9), consider the sclerotia the most important distinctive feature of this genus.

Typhula idahoensis Remsb.

According to literary sources (9, 11) the distinctive features of the *T. idahoensis* are as follows. When young, the sclerotia are chestnut brown, when mature, dark brown appearing nearly black. The sclerotia are generally in the leaves and other parts above ground, they are globose in shape, sometimes somewhat flattened, 0.5—0.9 × 1—2 mm. in size; the cortex is reddish brown, 5—20 μ thick. The sporophore is erect, straight or slightly curved, simple to rarely ramose, fawn colour to wood brown in colour; the clavula is fusiform, 5—10 mm. long, 0.5—1.5 mm. thick, vinaceous brown to leathery brown. The basidia have enlarged tips, 27—31.5 × 5.8—7.8 μ in size, the basidiospores are oval or elliptical, 8—14 × 3.8—8 μ, on an average 10.5 × 4.5 μ in size. — The sclerotia of the *T. idahoensis* material, which has been examined at the Department of Plant Pathology, correspond with the above description except in size. The size of the examined sclerotia was to some extent smaller, on an average 0.5—0.9 mm. The fruit bodies and their spores in the studied material were similar to those described above.

EKSTRAND who has studied the fungi of the *Typhula*-genus in Sweden has used the name *T.* cfr. *borealis* for the fungus of the type described above. He defined the fungus with this name also in the material he had collected in Finland in 1946 (1). The author has also, in his previous articles (5, 6), called this fungus *T.* cfr. *borealis*. In his publication of the year 1955 EKSTRAND (2) defines two new fungus species belonging to the *T.* cfr. *borealis* group, *T. borealis* and *T. hyperborea*. These species can be identified only by growing fruit bodies from the sclerotia. The fungi differ from each other to some extent in the shape of the spores and the differences in colour in the nutrient medium. The two species cannot be differentiated on the basis of the fruit bodies and other characteristics of the spores or the sclerotia.

REMSBERG had described the species *T. idahoensis* in 1940 (9). EKSTRAND mentions in his publication of the year 1955 (2, p. 41) that the name *T. borealis* ought to be valid if *T. idahoensis* were the same species as *T. borealis*. As REMSBERG's description of the species *T. idahoensis* corresponds with the material investigated at the Department of Plant Pathology, the author will have to use the name *T. idahoensis* for the species in question (cf. also SPRAGUE 11, p. 142; RØED, 10, p. 431). To what extent the material on *T. idahoensis*, collected for the Department of Plant Pathology and presented in the accompanying list, in which the material has been defined according to the shape, size and colour of the sclerotia, would include two or perhaps more variations based on the shape of the spores or other structural differences in the fruit body, remains open as regards the material presented in this work.

In Finland, as well as in other countries (cf. 1, 11), *T. itoana* and *T. idahoensis* have been proved injurious to winter cereals and forage grasses. The author has dealt with this in greater detail in another publication (7).

Conclusion

Judging by the material on the *Gramineae*-plants collected in spring for the Department of Plant Pathology from various parts of the country, mainly from the experimental stations and departments of the Agricultural Research Centre, the *Typhula itoana* Imai and *T. idahoensis* Remsb. are common in Finland and are found throughout the country in winter cereals and different forage grasses.

LIST OF *Typhula* SAMPLES

collected for Plant Pathology Department

Abbreviations:

The plant geographical countries of Finland: Al = Alandia, Ab = Regio aboensis, N = Nylandia, Ka = Karelia australis, St = Satakunta, Ta = Tavastia australis, Sa = Savonia australis, Kl = Karelia ladogensis, Oa = Ostrobottnia australis, Tb = Tavastia borealis, Sb = Savonia borealis, Kb = Karelia borealis, Om = Ostrobottnia media, Ok = Ostrobottnia kajaniensis, Ob = Ostrobottnia borealis, Ks = Kuusamo, Lk = Lapponia kemensis, Le = Lapponia enontekiensis, Li = Lapponia inariensis.
Res. C. = Agricultural Research Centre; Exp. Sta: = Experimental Station.
The time of collection of samples: date, month, year.
M. H. = Matti Haavisto, E. A. J. = E. A. Jamalainen, A. Y. = Aarre Ylimäki.

Typhula itoana Imai

Agrostis sp.
St Mouhijärvi, Exp. Sta., 7. 5. 52: H. M.
Alopecurus pratensis L.
N Tikkurila, Res. C., 22. 4. 51: M. H.

Sb Maaninka, Exp. Sta., 28. 4. 50: M. H.

Arrhenatherum elatius (L.) M. & K. (*Avena elatior* L.)

Ob Rovaniemi, Exp. Sta., 18. 6. 53: Anna-Liisa Tuomola.

Bromus inermis Leyss.

St Mouhijärvi, Exp. Sta., 7. 5. 52: M. H.

Ta Jokioinen, Res. C., 28. 4. 53: A. Y.; 25. 5. 55: E. A. J.

Dactylis glomerata L.

N Tikkurila, Res. C., 22. 4. 51: M. H.

Sb Maaninka, Exp. Sta., 27. 4. 50: M. H.

Om Revonlahti, Exp. Sta., 26. 4. 50: M. H.

Ob Rovaniemi, Exp. Sta., 26. 5. 50: M. H.

Festuca gigantea (L.) Vill.

St Mouhijärvi, Exp. Sta., 7. 5. 52: M. H.

Festuca pratensis Huds.

N Tikkurila, Res. C., 22. 4. 51: M. H.

Sb Maaninka, Exp. Sta., 3. 5. 45: E. A. J.; 15. 5. 48: E. A. J.; 28. 4. 50: M. H.

Oa Ylistaro, Exp. Sta., 5. 6. 46: E. A. J.

Om Revonlahti, Exp. Sta., 27. 5. 51: E. A. J.

Festuca rubra L.

N Tikkurila, Res. C., 22. 4. 51: M. H.

Sb Maaninka, Exp. Sta., 28. 4. 50: M. H.

Holcus lanatus L.

St Mouhijärvi, Exp. Sta. 7. 5. 52: M. H.

Lolium multiflorum Lam.

N Tikkurila, Res. C., 22. 4. 51: M. H.; 7. 1. 52: M. H.

Sb Maaninka, Exp. Sta., 10. 5. 54: M. H.

Lolium perenne L.

Ab Sauvo, 17. 5. 56: M. H.

N Tikkurila, Res. C., 22. 4. 51: M. H.

Sb Maaninka, Exp. Sta., 15. 5. 48: E. A. J.

Ob Rovaniemi, Exp. Sta., 25. 5. 50: M. H.

Phleum pratense L.

Ab Pohja, Borgby, 25. 3. 53: M. H.

N Anjala, Exp. Sta., 18. 5. 53: M. H.

St Mouhijärvi, Exp. Sta., 7. 5. 52: M. H.

Ta Jokioinen, Res. C., 24. 4. 53: M. H.

Sa Savonlinna, Nojamaa, 3 samples, 4. 5. 48: A. Y.

Oa Ylistaro, Exp. Sta., 5. 6. 46: E. A. J.

Tb Jyväskylä, Palokka, 5. 5. 48: A. Y.

Sb Maaninka, Exp. Sta., 4. 6. 47: E. A. J.; 3. 5. 49: E. A. J.; 3 samples, 22. 5. 53: M. H.

Kb Tohmajärvi, Exp. Sta., 13. 5. 48; E. A. J.; 10. 5. 51: L. Saloheimo; 16. 5. 51: M. H.

Ok Ristijärvi, Hiisijärvi, 25. 4. 48: F. Härkönen.

Ob Kemijärvi, Puikkola, 1. 6. 48: E. A. J.

Poa pratensis L.

N Tikkurila, Res. C., 22. 4. 51: M. H.

Ob Rovaniemi, Exp. Sta., 25. 5. 50: M. H.

Poa trivialis L.

N Tikkurila, Res. C., 22. 4. 51: M. H.

Secale cereale L.

Ab Mietoinen, Haijala, 15. 5. 56: M. H.

Ta Pälkäne, Exp. Sta., 26. 4. 51: P. J. Jalkanen. — Ypäjä, 25. 4. 53: M. H.

Sa Mikkeli, Exp. Sta., 4 samples, 29. 4. 48: Y. K. Koskinen. — Mikkeli, country commune, 2 samp'es, 3. 5. 48: A. Y.

Sb Kiuruvesi, Mäenpää, 9. 5. 48: P. Huttunen.

Kb Tohmajärvi, Exp. Sta., 7. 6. 46: E. A. J.; 3. 6. 47: E. A. J.; Tohmajärvi, Exp. Sta., 4. 5. 49: E. A. J.; 10. 5. 51: L. Saloheimo.
Om Revonlahti, Exp. Sta., 22. 5. 51: E. A. J.
Ob Rovaniemi, Exp. Sta., 26. 5. 50: M. H.

Triticum sativum L.

N Tikkurila, Res. C., from several places, 23. 4. 48: E. A. J.
— Tuusula, Anttila, Exp. Farm., from several places, 16. 5. 55: E. A. J.
Ta Jokioinen, Res. C., 6. 5. 49: O. Pohjanheimo; 24. 4. 53: M. H. — Loppi, Juhola, 28. 4. 53: M. H. — Pälkäne, Exp. Sta., 26. 4. 51: P. Jalkanen.
Sa Mikkeli, Exp. Sta., 3. 5. 48: A. Y.; 4. 6. 56: M. H.
Kb Tohmajärvi, Exp. Sta., 2 samples, 27. 4. 50: L. Saloheimo.

Typhula idahoensis Remsb.

Agrostis sp.

St Mouhijärvi, Exp. Sta., 7. 5. 52: M. H.

Alopecurus pratensis L.

N Tikkurila, Res. C., 22. 4. 51: M. H.
Sb Maaninka, Exp. Sta., 28. 4. 40: M.H.; 22. 5. 53: M. H.
Ob Rovaniemi, Exp. Sta., 10. 6. 53: Anna-Liisa Tuomola.

Arrhenatherum elatius (L.) M. & K.

N Tikkurila, Res. C., 22. 4. 50: M. H.
Ob Rovaniemi, Exp. Sta., 18. 6. 53: Anna-Liisa Tuomola.

Bromus inermis Leyss.

St Mouhijärvi, Exp. Sta., 7. 5. 52: M. H.; 13. 6. 53: E. A. J. — Jokioinen, Res. C., 25. 4. 53: M. H.; 25. 5. 55: E. A. J.

Dactylis glomerata L.

N Tikkurila, Res. C., 22. 4. 51: M. H.
Sb Maaninka, Exp. Sta., 28. 4. 50: M. H.; 20. 5. 51: M. H.; 22. 5. 53: M. H.
Om Revonlahti, Exp. Sta., 26. 4. 50: M. H.
Ob Rovaniemi, Exp. Sta., 25. 4. 50: M. H.; 29. 5. 51: E. A. J.; 6. 6. 52: E. A. J.

Deschampsia sp.

Kb Tohmajärvi, Exp. Sta., 13. 5. 48: E. A. J.

Festuca pratensis Huds.

N Tikkurila, Res. C., 5. 4. 50, 18. 4. 50: M. H.; 22. 4. 51: M. H.
Sb Maaninka, Exp. Sta., 15. 5. 48: E. A. J.; 22. 5. 53: M. H.
Om Revonlahti, Exp. Sta., 3. 6. 48: E. A. J.
Ob Rovaniemi, Exp. Sta., 29. 5. 51: E. A. J.

Festuca rubra L.

N Tikkurila, Res. C., 13. 4. 50, 26. 5. 50: M. H.; 22. 4. 51: M. H.

Holcus lanatus L.

St Mouhijärvi, Exp. Sta., 7. 5. 52: M. H.

Lolium multiflorum Lam.

N Tikkurila, Res. C., 5. 4. 50, 12. 4. 50: M. H.; 23. 4. 51: M. H.
Sb Maaninka, Exp. Sta., 21. 5. 53: M. H.
Ob Rovaniemi, Exp. Sta., 27. 5. 48: E. A. J.; 25. 5. 50: M. H.

Lolium perenne L.

N Tikkurila, Res. C., 12. 4. 50, 17. 4. 50: M. H.; 23. 4. 51: M. H.
Sb Maaninka, Exp. Sta., 15. 5. 48: E. A. J.; 22. 5. 53: M. H.
Om Revonlahti, Exp. Sta., 24. 5. 50: M. H.
Ob Rovaniemi, Exp. Sta., 26. 5. 50: M. H.; 29. 5. 50: M. H.

Phalaris arundinacea L.

Ob Rovaniemi, Exp. Sta., 29. 5. 51: E. A. J.

Phleum pratense L.

Ab Fiskars Estate, Pohja, 17. 5. 56: M. H. — Kemiö, Kastkärr, 17. 5. 56: M. H.

N Lapinjärvi, Hindersby, 9. 6. 56: M. H. — Tikkurila, Res. C., 23. 4. 51: M. H.

Ta Hattula, 25. 5. 56: M. H.

Sa Leivonmäki, 29. 5. 56: M. H.— Mikkeli, Exp. Sta., 3 samples, 3. 5. 48: A. Y. — Mikkeli, country commune 3. 5. 49: A. Y. — Savonlinna, Nojamaa, 3 samples, 4. 5. 48: A. Y.

Kl Parikkala, Savikumpu, 7 .6 . 56: A. Y.

Tb Karstula, Pääjärvi, 3. 5. 48: J. Poikonen.

Sb Kiuruvesi, Mäenpää, 9. 5. 48: P. Huttunen. — Maaninka, Exp. Sta., 4. 6. 46: E. A. J.; 2 samples 15. 5. 48: E. A. J.; 18. 5. 51: M. H.; 4 samples 12. 5. 52: M. H.; 2 samples 22. 5. 53: M. H.; 10. 5. 54: M. H.; 15. 5. 55: E. A. J. — Suonenjoki, 5 .5 . 56: M. H.

Kb Kontiolahti, Lehmo, 2. 6. 48: E. A. J. — Nurmes, Farmers' School (maamieskoulu) 23. 5. 53: M. H. — Tohmajärvi, Exp. Sta., 4 samples, 6. 6. 46: E. A. J.; 2. 6. 47: E. A. J.; 2 samples, 13. 5. 48: E. A. J. — Valtimo, Haapakylä. 25. 5. 48: V. Parviainen.

Ok Kajaani, country commune, Seppälä, 8. 5. 53: E. A. J. — Pelso, Exp. Sta., 4. 6. 52: E. A. J. — Ristijärvi, Hirsijärvi, 24. 4. 48: F. Härkönen.

Ob Karunki, Ojanperä, 24. 4. 48: Aug. Alakarhu. — Kemijärvi, Puikkola, 2 samples, 1. 6. 48: E. A. J. — Laurila, 30. 5. 48: E. A. J. — Rovaniemi, Exp. Sta., 2. 6 . 46: E. A. J.; 2 samples, 31. 5. 48: E. A. J.; 29. 5. 51: E. A. J.; 2 samples 6. 6. 52: E. A. J.

Lk Kolari, 2. 6. 46: E. A. J.; Kolari, Vaattajärvi, 2 samples, 25. 4. 48: J. Kortelainen; Vanejärvi, 7. 6. 48: J. Juppala.

Poa pratensis L.

N Tikkurila, Res. C., 23. 4. 51: M. H.

Ob Rovaniemi, Exp. Sta., 26. 5. 50: M. H.

Poa trivialis L.

N Tikkurila, Res. C., 23. 4. 51: M. H.

Sb Maaninka, Exp. Sta., 26. 5. 50: M. H.

Ob Rovaniemi, Exp. Sta., 25. 5. 50: M. H.

Secale cereale L.

Ab Fiskars Estate, Pohja, 17. 5. 56: M. H.

N Elimäki, Kimonkylä, 9. 6. 56: A. Y.; Elimäki, Koria, 9. 6. 56: A. Y. — Liljendal, 1. 6. 55: A. Y. — Tikkurila, Exp. Sta., 23. 4. 48: E. A. J.

Ta Hartola, 29. 5. 56: A. Y. — Jokioinen, Res. C., 3. 4. 48: K. Multamäki; — Loppi, Juhola, 28. 4. 53: M. H. — Pälkäne, Exp. Sta., 26. 5. 56: M. H.

Sa Lappee, Lempiälä, 7. 6. 56: A. Y. — Mikkeli, Exp. Sta., 3 samples, 3. 5. 48: Y. K. Koskinen. — Kangasniemi, 3 samples, 3. 5. 48: A. Y. — Rautjärvi, Kuntola, 7. 6. 56: A. Y.; Rautjärvi, Laukko, 7. 6. 56: A. Y. — Savonlinna, Nojanmaa, 2 samples, 4. 5. 48: A. Y.

Kl Saari, Akonpohja, 7. 6. 54: A. Y.

Tb Karstula, Vastinki, 1. 5. 48: T. Marttinen.

Sb Maaninka, Exp. Sta., 25. 5. 55: E. A. J.; 5. 6. 56: M. H. — Taipalsaari, Saikkola, 8. 6. 56: A. Y.

Kb Ilomantsi, Maukkula, 24. 5. 48: K. Syrjänen. — Kesälahti, 2 samples, 7. 6. 56: A. Y. — Kitee, village, 7. 6. 56: A. Y.; Kitee, Niinikumpu, 7. 6. 56: A. Y. — Kontiolahti, Lehmo, 2 samples, 2. 6. 47: E. A. J. — Kuusjärvi, village, 2 samples, 7. 6. 56: A. Y. — Liperi, Kuorinka, 6. 6. 56: A. Y.; Liperi, Taipale, 6. 6. 56: A. Y. — Pielisensuu, Mustala, 2. 6. 48: E. A. J. — Pyhäselkä, Niittylahti, 6. 6. 56: A. Y. — Tohmajärvi, Exp. Sta., 7. 6. 46: E. A. J.; 4 samples, 3. 6. 47: E. A. J.; 3 samples, 8. 5. 48: L. Saloheimo; 13. 5. 48; E. A. J.; 4. 5. 49: E. A. J.; 10. 5. 51: L. Saloheimo; 7. 6. 56: A. Y.

Om Kalajoki, Tynkä, 2 samples, 20. 4. 48: J. Rukkala. — Paavola, 4. 5. 53: E. A. J. — Ruukki, Exp. Sta., 2 samples, 31. 6. 46: E. A. J.; 3. 6. 48: E. A. J.; 9. 5. 53: E. A. J.

Ok Kajaani, country commune, Seppälä, 8. 5. 53: E. A. J.

Ob Kemi, 31. 5. 46: E. A. J. — Kemijärvi, Joutsijärvi, Puikkola, 1. 6. 48: E. A. J. — Rovaniemi, Exp. Sta., 2. 6. 46: E. A. J.; 3 samples, 31. 5. 48: E. A. J.; 13. 6. 53: Anna-Liisa Tuomola; 2. 6. 55: E. A. J.

Lk Kolari, Sieppijärvi, 7. 6. 46: J. Juppala.
Triticum sativum L.
N Anjala, Exp. Sta., 1. 6. 55: A. Y. — Tikkurila, Res. C., from several places, 23. 4. 48: E. A. J.; 15. 4. 53: M. H. — Tuusula, Anttila, Exp., Farm, from several places, 16. 5. 55: E. A. J.
Ta Jokioinen, Res. C., 2 samples, 25. 4. 49, 2 samples, 6. 5. 49: O. Pohjanheimo; 25. 4. 53: M. H.
Sa Mikkeli, country commune, 3. 5. 48: A. Y.; Exp. Sta., 4. 5. 56: M. H.
Kb Tohmajärvi, Exp. Sta., 10. 5. 51: L. Saloheimo.
Ob Rovaniemi, Esp. Sta., 2. 6. 55: E. A. J.

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SELOSTUS:

Gramineae-KASVIEN TALVEHTIMINEN JA TUHOSIENET

II. *Typhula* sp.-sienistä Suomessa

E. A. Jamalainen

Maatalouden tutkimuskeskus, kasvitautiosasto, Tikkurila

Gramineae-kasveista keväisin eri puolilta maata kasvitautiosastolle kerääntyneen aineiston perusteella ovat *Typhula itoana* Imai ja *T. idahoensis* Remsb. Suomessa yleisiä, esiintyen kautta koko maan syysviljoissa ja eri nurmiheinälajeissa.