Fusariurn nivale (Gerlachia nivalis) from cereals and grasses: Is it the same fungus?[1]

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Perithecia of the teleomorph of ***Fusarium nivale (Gerlachia nivalis)*** developed in culture on sterilized cereal straws from isolates obtained from cereals. No perithecia developed in isolates from perennial grasses. Nearly all isolates from grasses and cereals were pathogenic on rye seedlings. Is the fungus from cereals and grasses a different species or variety, or is it the same, but the grass isolates have lost the ability to produce perithecia?

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Des isolats de ***Fusarium nivale (Gerlachia nivalis)*** obtenus à partir de graminbes vivaces ne produisent pas de pbrithbces lorsqu'ils sont inoculbs sur de la paille de céréale stérilisée contrairement aux isolats obtenus à partir de céréales. Toutefois, presque tous les isolats quelle que soit leur origine sont pathogbnes envers les plantules de seigle. Le champignon isolé chez les céréales appartient-il à une espèce ou une variété diffbrente, ou est-il semblable à celui isolb chez les graminbes vivaces à la différence prbs que ce dernier ne serait plus capable de produire des pbrithbces?

Dobrozrakova (6) and Wollenweber and Reinking (14) reported that the perithecia of the teleomorph of ***Fusarium nivale*** (Fr.) Ces., ***Calonectria graminicola*** Wollenw., now named ***Monographella nivalis*** (Schaffnit) E. Muller (9) with an anamorph ***Gerlachia nivalis*** (Ces. ex Sacc.) W. Gams and E. Muller (7), were produced freely on cereals in Europe. Bennett (2) failed to find them on cereals in Northern England, but later obtained perithecia and ascospores on sterilized wheat grains in culture (12). The teleomorph is unknown in Canada except in culture (8), but Cook and Bruehl (4) found it on leaves and leaf sheaths of mature wheat plants in Washington and Oregon. Perithecia were found on a grass in the Isle of Rhum, Scotland by Dennis (5), but that is the only record of the teleomorph on grasses that I have found. However, it is common on oats in Scotland and Noble and Montgomerie (10) confirmed the connection between the two states by single ascospore cultures. They also found perithecia in isolates growing in culture on potato dextrose agar.

No perithecia were found during examination and culturing in many cases of fusarium patch disease from turfgrasses in the British Isles and Western Europe from 1951 to 1964 at the Sports Turf Research Institute in England (12). No special techniques were used to induce perithecial production, but a large number of isolates were grown on wheatmeal, oat, potato dextrose, glucose boric, glucose yeast extract agars and on sterile grass clippings and on none of these were perithecial structures seen.

None of the isolates from grasses in Norway examined by Årsvoll (1) produced perithecia in culture (Dr. K. Årsvoll, personal communication).

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Between 1972 and 1974, 53 isolations of ***Fusarium nivale*** were made, mainly from turfgrasses in Saskatchewan, but also from British Columbia and Washington. Isolates were obtained from a ***Bromus*** sp. and from an unidentified turfgrass in New Zealand (from Dr. G.C. Latch, N.Z.D.S.I.R., Palmerston North). Isolations were also made from fall rye and winter wheat plants at several places in Saskatchewan after snow melt in 1974. Two isolates from seeds of winter wheat from Norway were obtained (from Mr. L.R. Hansen, Plant Protection Institute, As-NLH). Several of the cereal isolates produced mature perithecia in culture on potato dextrose agar on a temperature gradient plate under 12 h near ultraviolet light at 13-17°C. No perithecia formed on any of the grass isolates grown under the same conditions which are those routinely used in this laboratory for the inducement of conidial production. This apparent difference between the isolates from cereals and those from grasses indicated the need for more critical examination of the ability of the isolates to produce perithecia.

Materials and methods

Fifty isolates of the fungus from grasses and 24 from cereals were selected; all produced conidia of the description given by Booth (3) for F. ***nivale.*** Ten pieces of wheat straw were sterilized for 1 h at 1 atm by autoclaving in 250 ml erlenmyer flasks containing 40 ml distilled water. The straws were inoculated with pieces of ***F. nivale*** culture cut from the edges of actively growing colonies of the appropriate isolate. The flasks were plugged, capped with foil and incubated at 18°C. The occurrence and abundance of perithecia was recorded after 6 to 8 weeks of incubation (3).

Spore suspensions prepared from 15 grass and 7 cereal isolates were used to inoculate cold-acclimated fall rye seedlings which were then incubated at 0 to 1°C in high humidity chambers for two months (13).

Results and discussion

None of the 50 grass isolates produced perithecia or perithecial initials. Fourteen of the cereal isolates formed these structures, some more frequently than others. Mature asci with ascospores were found in some of these; most did not mature.

Six of the rye isolates and 14 of the grass isolates were pathogenic on the inoculated rye. Pathogenicity towards grasses was not examined since cereal isolates are known to be pathogenic on grasses (11).

There was great variation in cultural characters of isolates of ***F. nivale*** from both grasses and cereals as has been previously noted (11) and considerable difference in conidial size. Most turfgrass isolates from Saskatchewan have 0- or 1-septate conidia (Smith, unpublished). We have not examined a sufficient number of cereal isolates to determine septation frequency. Wollenweber and Reinking (14) recognized ***F. nivale*** and a larger spored var. ***majus***. Some of the cereal isolates may have been classified as the latter, and this variety may produce perithecia more freely than the type. An alternative explanation may be that in perennial grasses ***F. nivale*** has lost the ability to produce perithecia or is unable to do so under the cultural conditions provided. Whether grass isolates may be induced to do so or whether they would regain the ability to form perithecia on cereals is of considerable taxonomic and epidemiological interest.

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