# Pink Snow Mold on Winter Cereals and Lawn Grasses in Alaska

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**ABSTRACT**

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Pink snow mold (*Fusarium nivale*) (= *Gerlachia nivalis*) was discovered in Fairbanks and its vicinity for the first time in 1983 and again in 1984. Pink snow mold was most prevalent on winter wheat, winter rye, and lawn grasses after a mild winter with relatively heavy snowfall. No clear indication of antagonism was noticed between *F. nivale* and *Sclerotinia borealis* and the sclerotial low-temperature basidiomycete (*Coprinus* sp.) under field conditions..

Additional key words: low-temperature pathogenic fungi

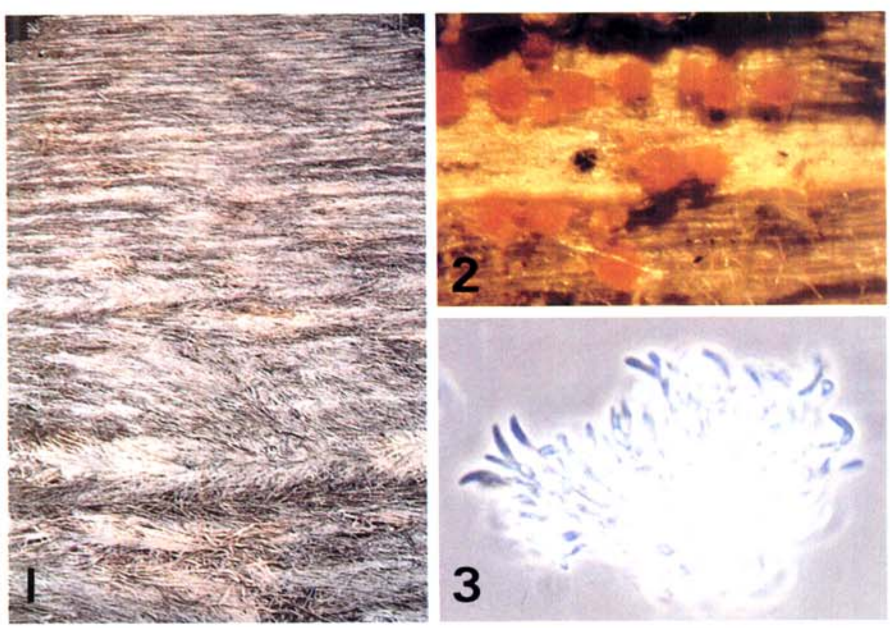
In Alaska, snow mold diseases seriously affect the winter survival of many graminaceous plants (3,7). Several low-temperature fungi cause snow mold diseases in Alaska. Among them, the most common are *Sclerotinia borealis* Bubak & Vleugel and a sclerotial low-temperature basidiomycete (sLTB) (identified as *Coprinus* sp. by Traquair in 1980 [10]) (5,7).

In spring 1983, a new snow mold disease with symptoms closely resembling those described as pink snow mold was found in Fairbanks and its vicinity. The discovery occurred after a relatively mild winter when the ground was unfrozen as it became snow-covered. The winter precipitation in 1982–1983 was fairly heavy, and 53 cm of maximum snow depth was measured. After snow melt, abundant round, pinkish patches of diseased plants were observed on lawns and winter wheat and winter rye fields. The distinctive color and shape of the patches readily differentiated them from those caused by *S. borealis* or sLTB in the field. The size and shape of the spores and other characteristics of this new snow mold fungus closely resembled those of *Fusarium nivale* (Fr.) Fckl. (1,8). *F. nivale* was reclassified as *Gerlachia nivalis* (Ces. ex Sacc.) W. Gams & E. Müller in 1980 (2). Pink snow mold was found again in Fairbanks during a survey conducted in spring 1984. The weather conditions in 1983–1984 were fairly severe. The ground was frozen when it became snow-covered, and there was a light snowfall (33 cm of maximum snow depth measured). The incidence of pink snow mold found on grasses and winter crops in 1983–1984 was very slight.

This report describes the detection, isolation, and identification of *F. nivale* in interior Alaska. This is the first record of an occurrence of pink snow mold in the subarctic region of northern America. Part of this study has been reported elsewhere (6).

## MATERIALS AND METHODS

**Field observation and survey.** Disease surveys for snow mold disease were conducted in both 1983 and 1984 shortly after the spring snow melt. In 1983, snow mold was observed in late April on winter wheat and winter rye plots on the experimental farm at the University of Alaska-Fairbanks (UAF) and on lawn grasses in residential areas of Fairbanks and its vicinity. The prevalence of pink snow mold and its severity in relation to other snow mold fungi were evaluated by examining 1,367 dead winter wheat plants in the experimental plots. To determine the source of inoculum of this disease, information was also collected on the origin of production of plants on which pink snow mold was found. In 1984, snow mold was evaluated in mid-May at the UAF experimental farm. About 300 dead winter wheat plants were collected at random from the winter wheat plots, and incidence by *S. borealis*, sLTB, and *F. nivale* was assessed. The foci of disease by *F. nivale* and the extent of this disease on the plants were also



**Figs. 1–3.** Pink snow mold caused by *Fusarium nivale*. **(1)** A plot of winter rye severely diseased with snow mold. The salmon-pink patches of dead plants are caused by pink snow mold. Gray patches in the background are plants killed by *Sclerotinia borealis*. **(2)** Tufts of salmon-colored sporodochia of *F. nivale* (×55). **(3)** Sporodochia of *F. nivale* seen with phase-contrast microscopy. Curved microconidia with tapered tips are formed at the tip of the conidiophores. Note the absence of microconidia (×350).

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determined.

**Light microscopy.** Plant tissues with symptoms of pink snow mold were collected from patches of diseased plants. The tissues were examined with a stereomicroscope to determine the type of spore-bearing structures present. Spore morphology was ascertained by phase-contrast microscopy.

**Fungal isolation and cultivation.** Conidia of *F. nivale*, from sporodochia on diseased tissue, were gently smeared on potato-dextrose agar (PDA) with a transfer needle. After incubation at 5 C for 5 days in the dark, the small single colonies were isolated and transferred to other PDA plates. These isolates of *F. nivale* were incubated at 5 C for an additional 8 wk. The growth and development of this fungus in culture were observed periodically.

## RESULTS AND DISCUSSION

*F. nivale* has been found capable of surviving the harsh Alaska environment and causing serious damage to winter wheat (*Triticum aestivum* L.), to winter rye (*Secale cereale* L.), and to turfgrasses—Kentucky bluegrass (*Poa pratensis* L.) and fescues (*Festuca* spp.). The distribution of this fungus in Alaska appeared to be varied: In some areas, pink snow mold appeared to be the predominant disease; in other areas, patches of pink snow mold were found among patches of plants with diseases caused by *S. borealis* (Fig. 1) or by sLTB.

Winter temperatures, especially the soil temperatures, greatly affect the development and growth of low-temperature pathogenic fungi. Lebeau (4) demonstrated that the microflora changed dramatically as the minimum soil temperature was raised from −3 to 3 C or higher, and *F. nivale*, instead of a low-temperature basidiomycete, became the dominant snow mold fungus causing serious damage on grasses. The severity of pink snow mold in Alaska seemed to fluctuate with the weather conditions (which affect soil temperatures). In spring 1983, after a relatively mild winter and heavy snowfall (good insulation layer), severe disease caused by *F. nivale* occurred. In a snow mold survey conducted in spring 1983, the death of 440 (42.2%) of the 1,367 winter wheat plants was caused by *F. nivale*. *S. borealis* and sLTB contributed to the loss of most plants, in the amounts of 693 (50.7%) and 234 (17.1%), respectively. In spring 1984, after a fairly severe winter with relatively little snowfall (poor insulation layer), *F. nivale* was isolated from only 31 of 300 plants surveyed. *S. borealis* was the predominant snow mold species isolated (250 plants, 83.3%).

Antagonism between snow mold fungi *S. graminearum* Elen. and *Typhyla incarnata* Lasch ex Fr. has been reported by Tomiyama (9) in observing the behavior of these two fungi on one PDA plate. In the field surveys conducted in 1983 and 1984, no clear indication of antagonism between different species of snow mold fungi was found. This apparent lack of antagonism made it difficult to assess the cause of death of winter wheat sampled in 1984. Unlike those collected in 1983, which were usually infected by a single snow mold fungus, about one-third of the winter wheat specimens collected in 1984 were infected by two or even three snow mold fungi. For instance, *S. borealis* and/or sLTB were also observed on the 31 plants on which *F. nivale* was found.

Conidial morphology and the lack of chlamydospores of the fungus causing pink snow mold in Alaska closely conform to the species concept of *F. nivale* described by Booth in 1971 (1) and by Nelson et al in 1983 (8). On the pink snow mold diseased tissues, profuse numbers of tufts of salmon-colored sporodochia were observed (Fig. 2) from which numerous macroconidia were produced (Fig. 3). The macroconidia were quite small, ranging from 13 to 20 μm long, and most of them were curved with tapered tips (Fig. 3). Most of the macroconidia had only one septa, but macroconidia with two or three septa also were observed. Neither microconidia nor chlamydospores were found. No perithecia were detected on the diseased tissue.

*F. nivale* grew well at 5 C in the dark. In the initial stage of development, the white, aerial mycelium gave the colony a felted, white appearance; no pigment was produced. As the culture aged, numerous tiny, salmon-colored sporodochia were produced at the periphery of the colony, which seemed to contribute to the slight pinkish orange color at the undersurface of the colony. No morphological differences were found between spores produced in culture and those obtained from diseased tissues.

Seeds contaminated by *F. nivale* may not be the sole source of inoculum, because pink snow mold has been observed on newly established lawns with out-of-state seed sources as well as on old farmlands where mostly Alaska-grown seeds were sown.

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