

Calonectria nivalis Causes Scab in the Pacific Northwest

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ABSTRACT

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Calonectria nivalis caused scab in wheat fields throughout Skagit County in northwestern Washington in 1980. The disease has not been reported previously in the Pacific Northwest, although the fungus has been known for a long time in the region. The unusually high number of rainy and cloudy days in northwestern Washington during May and June probably favored the disease.

Additional key words: *Fusarium nivale*, *Micronectriella nivalis*, *Triticum aestivum*

Calonectria nivalis Schaffn. (= *Fusarium nivale* (Fr.) Ces.) causes both pink snow mold and scab of wheat (*Triticum aestivum* L.). The two diseases and the conditions under which they develop are very different. Pink snow mold occurs when snow covers unfrozen soil and temperatures remain near -0.5°C at the soil-snow interface (2). Scab occurs when conditions are continuously cool and moist (foggy) during heading and flowering (4). Pink snow mold is initiated by soilborne inoculum, probably mycelium in infested crop debris. Scab is initiated by airborne ascospore inoculum, and it occurs on any or all parts of the head. Seed from heads with scab may become infected and eventually shrivel.

Scab caused by *C. nivalis* occurs infrequently on a worldwide basis, although scab caused by *Gibberella zeae* (Schw.) Petch (= *F. graminearum* Schawbe), *G. avenacea* Cook (= *F. avenaceum* (Fr.) Sacc.), or *F. culmorum* (W.G. Sm.) Sacc. occurs in several areas throughout the world. Geographic areas previously reporting scab caused by *C. nivalis* include Scotland, northern

England, the Toluca Valley near Mexico City, and the lower reaches of the Yangtze River in the People's Republic of China (4).

Scab has not been recognized previously in the Pacific Northwest, although perithecia of *C. nivalis* have been observed in nature east and west of the Cascade Mountains (5). Pink snow mold can occur in most wheat areas of eastern Washington (2), but ascospores are unimportant in the etiology of pink snow mold (6). Until now, no significance has been attributed to the presence of perithecia of *C. nivalis* in the Pacific Northwest.

Skagit County is located in the northwest corner of Washington, bordering on the northern end of Puget Sound. Fruits and vegetables are the traditional crops in this county, but wheat has become increasingly popular; more than 5,000 ha were grown in 1980.

Scab was evident on winter wheat throughout the county in 1980. It was first noticed on wheat growing in experimental plots at the Northwestern Washington Research Extension Unit, Mt. Vernon, in July and August 1980. All diseased heads showed signs typical of scab caused by *Fusarium*, including salmon-pink sporodochia on the rachis, glumes, and awns, and perithecia on spikelets. Many kernels were shrunken, wrinkled, rough, and discolored, but only a few spikelets were sterile. Basal leaf sheaths of most plants from this location were permeated with empty perithecia of *C. nivalis*.

METHODS AND RESULTS

F. nivale was recovered from diseased tissue of winter wheat heads placed on Difco cornmeal agar amended with streptomycin at 100 ppm. Small blocks of agar with mycelium were transferred to plates of carnation leaf agar (7) and incubated at 20°C with a 12-hr alternating light cycle. After sporulation (2-3 wk), single spore isolations were grown on slants of

homemade potato-dextrose agar (12.5% sliced potatoes, 1% dextrose, 2% agar). Cultures on either carnation leaf or potato-dextrose agar produced sporodochia and perithecia of the pathogen.

Ten diseased heads were individually hand-threshed and the seeds surface-sterilized for 30 sec in 50% ethanol and 1% sodium hypochlorite after a 2-hr rinse in running tap water. Seeds were placed on plates of cornmeal agar and assayed for the presence of *F. nivale* after 3-4 days. About 83% of the kernels in each head yielded *F. nivale*.

Samples of wheat seed were obtained from five areas of Skagit County, and 200 seeds from each location were surface-sterilized and assayed for *F. nivale*. Seed infection from each area sampled was 6.5, 7.5, 10.4, 13, and 21%. By comparison, similar random samples of wheat seed from the Willamette Valley (western Oregon) yielded no colonies of *F. nivale*.

DISCUSSION

Scab probably occurred in 1980 because unusually humid conditions, including many overcast and foggy days, prevailed in Skagit County during heading and flowering. According to 1980 data from the National Oceanic and Atmospheric Administration (Federal Building, Asheville, NC 28801), precipitation in Mt. Vernon in May was 0.25 mm higher and in June was about 25 mm higher than the 30-yr average. More important, there were 13 days of rain and only 7 clear days in May, 14 days of rain and 8 clear days in June, and 6 days of rain and 4 clear days in July.

Ascospores and high humidity during anthesis are known to favor scab development (4). Large numbers of perithecia on basal leaf sheaths probably constituted the source of primary inoculum for the disease. Infection probably occurred throughout heading and flowering in May and June, although additional infection may have also occurred in July.

Growers in Skagit County reported unusually low test weights after the 1980 harvest. Scab is a likely reason for this problem, because *F. nivale* was readily obtained from samples collected at random in the county.

Production of winter wheat continues to increase in northwestern Washington. Growers should be advised against using locally produced seed for planting in the

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future, especially if the seed was produced during seasons favorable to scab. Extensive use of seeds infected by *C. nivalis* can result in poor emergence and seedling blight (1,3).

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