Emergence failure and top decay in white spruce germinants due to three fungi

R.K. Mittal[1] and B.S.P. Wang[2]

A study of seed-borne fungi and their impact on germination quality and quantity of white spruce seeds revealed that ***Alternaria alternata*** (Fr.) Keissler, ***Fusarium oxysporum*** Schlecht., and ***Penicillium variabile*** Sopp caused emergence failure and top decay in the germinants. The symptoms produced are described and discussed by species.
Key words: fungi, white spruce, germinants, disease.

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Une étude sur les champignons transmis par la semence et leur impact sur la qualité de la germination et la quantité de graines d'bpinette blanche a révélé qu'***Alternaria alternata*** (Fr.) Keissler, ***Fusarium oxysporum*** Schlecht. et ***Penicillium variabile*** Sopp causent le manque a la levee et la pourriture du sommet du germe. Les symptômes produits sont décrits et discutes par espèces.
Mots-clés: champignons, Bpinette blanche, germes, maladie.

Seed health testing is primarily concerned with evaluating the presence or absence of disease-causing organisms such as fungi, bacteria, viruses, and animal pests (ISTA 1985). In these evaluations, the main difficulty has been to find out whether seedling decay was caused by seed-borne fungi or by outside contamination. Before prescribing seed treatments for field sowings it is essential to determine the source and nature of the fungi causing pre- and post-emergence losses, and also to distinguish pathogenic from non-pathogenic fungi. A study of seed-borne fungi of white spruce ***(Picea glauca*** (Moench) Voss) was initiated in early 1985 as part of the National Tree Seed Centre's research program. In this paper we report preliminary observations on the impact of three fungi infecting white spruce seeds from Ontario sources.

Alternaria alternata (Fr.) Keissler, ***Fusarium oxysporum*** Schlecht., and ***Penicillium variabile*** Sopp have frequently been identified on white spruce seeds. They have caused radicle and cotyledon emergence failures of seed tested on moist blotter at 22°C with 12 h light. Top decay of the germinants after 15-18 days was also commonly observed. Based on 200 seeds tested, the initial percentage of infected germinants by all three species was low (4% to 8%) but increased significantly (16% to 25%) with lapse of time (after about 25 days), possibly due to spread of the pathogen. The symptoms produced are described and discussed by species below:

Alternaria alternata (Fr.) Keissler

This fungus attacked developing germinants, producing a greyish-green, loose, mycelial growth that turned blackish with age. The growth occurred at the point of the cotyledons' emergence from the seedcoat and also on the tip of cotyledons after seedcoat shedding (Fig.1.). Infected cotyledons frequently failed to shed their seedcoat and turned from green to brown, gradually darkening as the tissue decayed. The infection proceeded along the hypocotyl to include the whole germinant.

Fusarium oxysporum Schlecht.

White, cottony mycelia of this fungus developed on germinants as they emerged from seedcoats and also at cotyledon tips after seedcoat shedding (Fig.2). When located on the point of emergence, the fungus checked further growth of the germinant. When the fungus developed after hypocotyl emergence, it gradually spread on the hypocotyl, turning tissue whitish, soft, and watery, and resulted in the death of the germinant.

Penicillium variabile Sopp

This fungus produced leaf green, velvet-like, mycelial growth on cotyledons as they emerged from the seedcoat (Fig.3). No immediate disease symptoms were observed but, with advancing age, the cotyledons failed to come out of seedcoats. Eventually, the germinants died.

Frequent isolations of these fungi from seeds using moist blotter and potato-dextrose agar plate tests helped trace the seed-borne nature of the disease. Species of ***Fusarium*** and ***Penicillium,*** amongst others, have been reported to cause top blight in douglas-fir (***Pseudotsuga menziesii*** (Mirb.) Franco) and some pines, and moulding of stored seedlings of many forest species in British Columbia forest nurseries (Sutherland and Eerden 1980). This supports present observations on the pathogenicity of these fungi to white spruce germinants. Sutherland and Eerden (1980) have also reported ***Alternaria*** spp. caused needle-tip dieback in Engelmann spruce (***Picea engelmanni*** Parry) and white spruce as a disease of minor importance. However, we found that 16%-25% of white spruce germinants were infected by ***Ahernaria alternata.*** Moreover, as about 40% of seeds were found infected by this fungus, the chances of severe deterioration of seedling stands cannot be overlooked. It is interesting to note here that all three fungi initiate invasion only on cotyledons. Further studies, on the time and place of attack and location of fungi in seeds and germinants, are in progress.

[1] *NSERC Visiting Fellow, National Tree Seed Centre, Petawawa National Forestry Institute, Chalk River, Ontario, Canada, KOJ 1JO.*

[2] *Research Scientist and Project Leader, National Tree Seed Centre, Petawawa National Forestry Institute, Chalk River, Ontario, Canada, KOJ 1JO.*

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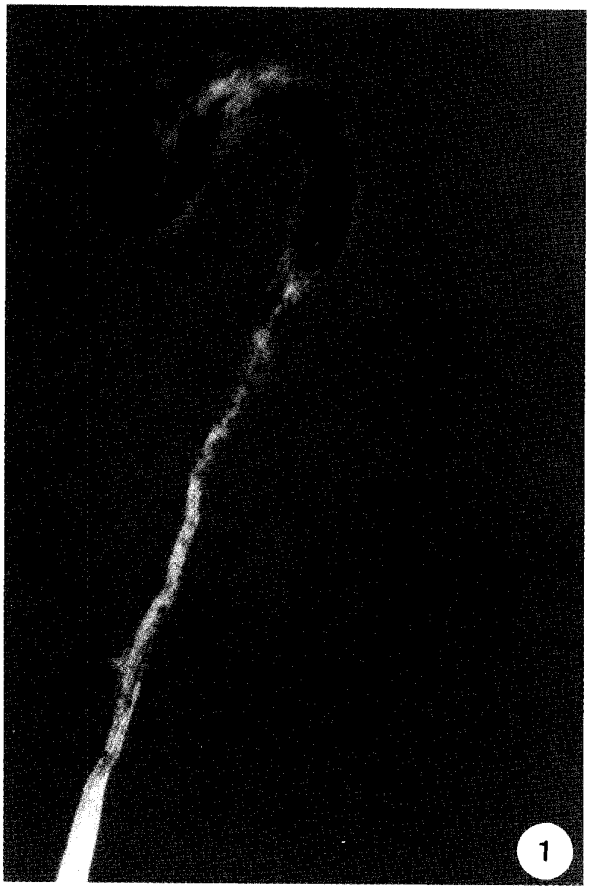

Figure 1 ***Alternaria alternata*** **(Fr.) Keissler preventing growth and causing top decay in white spruce germinants.**

Figure 2 ***Fusarium oxysporum*** **Schlecht. preventing growth and causing top decay in white spruce germinants.**

Figure 3 ***Penicillium variabile*** **Sopp at cotyledons' emergence from seed-coat in white spruce.**