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Effects of seed water content and storage temperature on the germination parameters of white spruce, black spruce and lodgepole pine seed

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Abstract The effect of seed water content (WC) (2–3, 5–6 and 22–25%, on a fresh weight basis), storage temperature (+4, –20, –80 and –196°C) and storage duration (6, 12, 24, 48 and 60 months) on the germination of white spruce (*Picea glauca* (Moench) Voss), black spruce (*Picea mariana* (Mill.) B.S.P.) and lodgepole pine (*Pinus contorta* Dougl. ex Loud. var. *latifolia* Engelm.) seed was investigated. Germination of white spruce control (untreated) seeds and seeds adjusted to 2–3% and 5–6% WC declined after 48 months of storage at –80 and –196°C, with a further decline at 60 months at –20, –80, –196°C. Germination remained high when control white spruce seeds and seeds with 2–3, 5–6% WC were stored at +4°C, over all storage durations. Generally, black spruce and lodgepole pine exhibited high germination at all storage temperatures at 2–3% and 5–6% WC as well as the control (untreated) seed, for up to 60 months in storage. Germination declined for all three species when seed was conditioned to 22–25% WC. This loss in germination was partially recovered in white spruce seed stored at +4, –20 and –80°C after storage durations of 24, 12 and 48 months, respectively, and in black spruce seeds stored at –20 and –196°C after storage durations of 24 months. Mean germination time (MGT) was relatively constant for all species, under all conditions, except for seed conditioned to 22–25% WC, where MGT increased for white spruce seed stored 48 months at –80 and –196°C, and for black spruce seed stored 24 months at +4 and –80°C and 60 months at –196°C. These results show that the optimal storage temperatures are 4°C for white spruce, and 4, –20, –80, and –196°C for black spruce and lodgepole pine, and 2–6% water content is optimal for all 3 species at these temperatures.

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