Declining and injured needles in young spruce outplantings and their causes

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Introduction

Unfavorable conditions of large-area clearings in the localities of the Orlické hory Mts, which are heavy laden by emissions, mark also the number of the contemporary problems with the forest reproduction. Large amount of the stand, mostly spruce, established here in the 1980s now runs to (or approaches) Age Class II. Nonetheless, the forest economy is still confronted with their unsatisfactory growth, development and health condition. The aim of my contribution is to describe briefly some of the general ecophysiologival presumptions of prosperity, preservation and dispersion of the botanical types.

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About dormancy

In our geographical location the active and passive vegetation periods of some wood species are regulated by the environmental factors, in particular by the day photoperiod and thermoperiod. The process of the plant hardening against the frost effects proceeds in gradual mutually connected phases. The autumn cool weather activates the process of hardening and any following exposition to the cold and frost deepens it. When the tissue is exposed to early cold, it underlies to this stressor. In particular, young needles and sprouts can loss this resistance to frost also in the middle of the winter after several days with temperatures above 0°C. The temperatures above zero at the end of winter cause the renewal of the meristematic activity of the cells and the possibility of the late frost stress appears; budding sprouts get frozen, the cambial zone and the conductive function of the trunk are disturbed.

Damages of the tissues caused by frost

Direct damage of vegetative tissues by frost is connected with the creation of the ice crystals in tissues which destruct them mechanically by their enlargement. The destruction concerns both needles and trunks in the areas with higher concentration of parenchym where the frost cracks happen, later to be cured by the frost ruptures. The extracellular ice-cover formation in apoplast happens more often. The examples of the frost damage of needles and sprouts are shown in the pictures. The 2002 examinations pointed out the combined frost effects with high illumination during sunny bright winter days and the further aspects of the spruce damage in the Orlické hory Mts. One of these aspects is also the anaerobic stress (hypoxia) in the tissues under the snow cover. The compaction of the snow layers (the extrusion of air from the snow) and the creation of the frost incrustation, which prevents the access of the oxygen (air) to young spruce shoots.

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