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Frost hardiness and over-wintering of forest trees

Metsäpuiden pakkaskestävyys ja talvehtiminen

HEIKKI HÄNNINEN & PAAVO PELKONEN (EDS.)

SUOMEN METSÄTIETEELLINEN SEURA

THE SOCIETY OF FORESTRY IN FINLAND

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The issue consists of eight articles, which are based on a co-nordic conference "Frost hardiness and over-wintering in forest tree seedlings", held in Joensuu, Finland, during December 1–3, 1986. The whole annual cycle of the trees is considered. Emphasis is given on methods for the study of frost hardiness, genetic variation in frost hardiness, nitrogen metabolism, bud dormancy release, and joint effect of natural and anthropogenic stress factors in the winter damage of forest trees. Practical implications for tree breeding and nursery management are discussed.

Kooste käsittää kahdeksan erillistä artikkelia, jotka perustuvat Joensuussa 1.–3. 12. 1986 pidetyssä yhteispohjoismaisessa seminaarissa "Metsäpuiden taimien pakkaskestävyys ja talvehtiminen" pidettyihin esitelmiin. Artikkeleissa käsitellään puiden koko vuotuista kehityssykliä. Erityisesti tarkastellaan pakkaskestävyyden mittaamenetelmiä, pakkaskestävyyden geneettistä vaihtelua, puiden typpiaineenvaihduntaa, silmujen lepotilan purkautumista sekä luontaisten ja antropogeenisten stressitekijöiden yhteisvaikutusta puiden vaurioitumisessa. Myös tulosten merkitystä metsänjalostuksen ja taimituotannon kannalta arvioidaan.

Keywords: annual cycle of development, breeding, dormancy, frost damage, genetic variation, nursery management
ODC 181.221+161.4+422.1

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Preface

A co-nordic conference titled "Frost hardiness and over-wintering in forest tree seedlings" was held at the University of Joensuu during 1–3 December, 1986. The conference was organized jointly by the Committee for tree seeds and seedlings in Nordic countries and the Academy of Finland. About fifty researchers and practical foresters, representing all Nordic countries excluding Iceland, participated in the conference. A total of eighteen presentations were given. This issue consists of eight studies, which are based on presentations given at the conference.

In the first article, the accuracy of the impedance method in assessing frost hardiness is discussed mainly on the basis of a literature review. In this article, the importance of further development of the measurement methods for frost hardiness is clearly pointed out.

Frost hardiness is the main theme also in the next three studies. In the second article, effects of summer frost and frost desiccation is studied for a large number of coniferous species. In the third and fourth articles, families or progenies of one conifer species are screened for frost hardiness. Genetic differences in frost hardiness, both at the species and the family level, are demonstrated, and the possible implications for tree breeding are discussed. On the basis of these three articles, the prospects for future breeding seem promising. In the fifth article, the effect of previous environmental conditions, on the hardiness development of the trees, is studied. The study points again out that the annual cycle of the trees should ultimately be considered

as a whole, when the climatic adaptation is studied.

The annual development of seedling frost hardiness is closely related to other physiological changes, which take place during the annual cycle. In the sixth article, the seasonal variation in the nitrogen metabolism of the trees is examined during the whole annual cycle. The seventh article deals with the classical problem of bud dormancy release in forest trees, using a modelling approach.

In the last article, the joint effect of natural cold stress and anthropogenic stress factors on the winter damage of the trees is studied. On the basis of this article it is evident that natural stress factors must be strictly taken into account when the hazards caused by anthropogenic environmental changes are evaluated. Thus, also from this point of view, sound basic information on the annual cycle and climatic adaptation of trees is urgently needed.

We hope that this issue will give an oversight to nordic research carried out in the fields of frost hardiness and over-wintering of forest trees. We express our sincere thanks to Mr. Jan Heino and Dr. Pentti K. Räsänen for their initiative in arranging the congress, to the authors of the articles for their valuable contributions, to Barbara Thompson for linguistic revision of most of the articles, and to Academy of Finland for financial support.

Joensuu, April 13, 1988

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