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ORIGINAL ARTICLE

Growth parameters of coniferous planting stock influenced by principal growing technologies in Estonia

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Abstract

The present research is a comparative analysis of how the main quality indices of containerized and barerooted planting stock (plant height, root collar diameter (RCD), and their ratio, above-ground biomass (AGB), below-ground biomass (BGB), and their ratio) conform to the existing planting stock standards in Estonia. Data were collected from nurseries in various state forest regions in 2001–2007. Containerized Scots pine (*Pinus sylvestris* L.) and Norway spruce (*Picea abies* (L.) Karst.) seedlings were grown in Ecopot containers with 450 and 360 plants m⁻², and barerooted pine seedlings and spruce transplants were grown using the traditional field-grown technology, with 400 and 65 plants m⁻². The height of Scots pine containerized seedlings exceeded that of barerooted seedlings by 20% ($p < 0.05$). The height of barerooted Norway spruce transplants exceeded that of containerized seedlings by 19% ($p < 0.05$). The RCD of containerized pine stock formed 70% and the corresponding index of containerized spruce stock formed 48% of the RCD of the barerooted plants of the same species. The AGB of containerized spruce stock was on average 5.1 times smaller than that of barerooted transplants. The AGB of containerized pine stock was 1.9 times smaller than that of barerooted seedlings. The proportional development of various plant parts is also essential. It emerged that the BGB of 2-year-old barerooted pine seedlings was relatively small compared with their AGB (ratio 4.61), which may decrease plant establishment in cultivation. The ratio between the height and the RCD of containerized spruce stock was too high (7.9), making plants less resistant to external damage in cultivation.

Keywords: barerooted plants, containerized plants, Norway spruce, quality of plants, Scots pine.

Introduction

The main use of forests in Estonia lies in timber production. In intensive forest management regions, the most advantageous timber stocking takes place through clear-cutting. This enables reforestation, which is the safest and the fastest method of forest generation. Natural regeneration takes years and results in broadleaved forests of varying age (Harmer, 1994). Considering Estonia's climatic and soil conditions, coniferous stands should be preferred. This requires the establishment of more high-quality Scots pine (*Pinus sylvestris* L.) and Norway spruce (*Picea abies* (L.) Karst.) plantations (Dunsworth, 1996).

Until now, barerooted planting stock has mainly been used for afforestation in Estonia. Pine plantations are traditionally established with 2-year-old seedlings (sowing is also used) and spruce plantations

with 4-year-old spruce transplants. Estonia has more than 100 years of experience in growing barerooted seedlings and transplants. This long-running afforestation experience confirms the successful use of such planting stock. In Nordic countries, however, 90–95% of forest planting stock has been taken over by containerized planting stock during recent decades (Helenius, 2005). It has also influenced silviculture in Estonia.

The first experiment with container-grown stock in Estonia was conducted in the 1980s. Although nursery pine and birch paperpot plants were grown and several vast forest plantations were formed in the Estonian Forestry Institute, the production of paperpots was stopped owing to negative feedback from foresters. This emanated from the low productivity of paperpot plants and their low resistance to external damage (Paal, 1991). Although hundreds