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Early growth and development of silver birch (*Betula pendula* Roth.) plantations on abandoned agricultural land

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Abstract Eight-year-old plantations (11) of silver birch were studied on abandoned agricultural land in Estonia. Trees were planted on uncovered soil and on polyethylene. After eight growing seasons, the height and diameter at breast height of the trees grown on polyethylene were significantly ($P < 0.001$) larger than corresponding parameters of the trees grown on uncovered soil. The annual height increment of the birches grown on the polyethylene was significantly ($P < 0.05$) larger during six growing seasons after planting compared to that of the trees grown on uncovered soil. However, annual height increments were not significantly different in the 7th and the 8th growing seasons. The use of polyethylene mulching had a statistically significant effect ($P < 0.001$) on the height of the beginning of the live crown in 8-year-old plantations. The differences between the values of live crown ratio of the trees grown on polyethylene and the values of live crown ratio of the trees grown on uncovered soil decreased during six growing seasons. However, by the 7th and 8th growing seasons, there was no significant difference ($P > 0.05$) between the values

of the live crown ratio. The height growth of silver birch grown without mulching as well as with mulching was found to be more intensive on *Glossic Podzoluvisol*, *Calcaric Cambisol*, *Calcaric Luvisol* and *Dystric Gleysol*; however, the height growth was more intensive on mulched soil. The height growth of the birches was modelled on the single-tree and stand levels for five soil types.

Keywords Silver birch · Field soils · Polyethylene mulching · Height growth model · Crown characteristics

Introduction

For socio-economic reasons, the use of agricultural land in Estonia has decreased significantly; as a result, about 400,000 ha of abandoned agricultural land has come into existence (Jõgiste et al. 2005). A similar tendency is also characteristic of other post-socialist countries in the Eastern Europe (Chrempińska 2003; Daugaviete et al. 2003; Tučeková 2003; Urbaitis 2003). One alternative land utilization possibility is to afforest abandoned agricultural land partly using deciduous tree species for this purpose. Deciduous trees have a number of important advantages over conifers on abandoned agricultural land. In young age, they usually grow faster than conifers, improve soil properties, have better wood quality and are less susceptible to *Heterobasidion annosum* and insect damage. In Estonia, deciduous trees normally form the first forest generation on abandoned agricultural land. Therefore, different natural processes are considered when establishing deciduous plantations. The growing of deciduous species is also important socio-economically, since the demand for pulp and renewable energy is growing all the time.

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