Length of cuttings in juvenile development of a hybrid poplar clone

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Received 9 October 1990; accepted 19 July 1991

Key words: Populus, P. “Rasumowskiana”, poplar cuttings, length of cuttings, short rotation

Application. When short rotation plantations are established by directly planting unrooted poplar cuttings, long cuttings can ensure success: the longer the cuttings, the better are the expected survival and productivity. In the conditions of this trial the best result was obtained with a length of 40—50 cm.

Abstract. The influence of length of cuttings on establishment of a short rotation plantation was investigated over a period of two years using direct field planting of unrooted Populus “Rasumowskiana” cuttings. The longer the cuttings, the higher were the survival and dry mass production. Survival at the end of the second growing season varied from 75% to 97%. In two years, the two longest cutting lengths (40 cm and 50 cm) produced about 100 g dry mass per living cutting; but owing to the higher survival rate of the longest cuttings, there was a difference per area unit: 360 g/m² for 40 cm and 400 g/m² for 50 cm-long cuttings. The shortest (10 cm) cuttings produced only 115 g/m².

Introduction

Growing of balsam poplars, section Tacamahaca (Regel) Dipp., and black poplars, section Aigeiros Duby, for forestry and use in parks etc. is based mainly on clonal propagation. Plants are produced in the nursery by rooting 20 cm-long cuttings taken from dormant 1-year-old stems (FAO 1980). Because of their rapid juvenile growth and reproduction by sprouting after harvesting, poplars are suitable for intensively cultivated plantations (Lavoie and Vallee 1981). Stem cuttings (15—25 cm long) are reported to be the cheapest and most flexible planting stock for willows and also for many hybrid poplars (Anderson et al. 1983; Hansen et al. 1983).

The most common hybrid poplar grown in parks in Finland, Populus “Rasumowskiana”, belongs to the easy-to-root balsam poplars. Because of
its exceptionally good winter hardiness, *P. "Rasumowskiana"* can be grown as far north as the Arctic Circle (Karhu 1986). It is therefore considered promising for intensively cultivated short-rotation plantations, even in Finland (Ferm et al. 1989). The objective of this trial was to investigate the suitability of different cutting lengths of *P. "Rasumowskiana"* for establishing short-rotation plantations with unrooted cuttings. Survival and development were recorded over a period of two years.

**Materials and methods**

Cuttings were collected in early April from dormant field-grown stools of *P. "Rasumowskiana"*, which had 1-year-old sprouts on 3-year-old roots. A total of 80 branchless sprouts, 10 mm in diameter at a height of 150 cm, were selected and made up into 5 bundles, each consisting of 16 sprouts. Tops with a basal diameter smaller than 10 mm were discarded. The bundles were segmented into cuttings of five lengths (10 cm, 20 cm, 30 cm, 40 cm and 50 cm) with a band saw in such a way that each length represented cuttings from each position extending from the base of the sprout to the apex. To eliminate the influence of cutting position and diameter, cuttings of each length were then mixed and made up into 5 bundles of 16 cuttings (cf. Frison and Facciotto 1985). The cuttings were packed in polythene bags and stored at $-5\,^\circ C$.

The field trial was established on agricultural land that had lain fallow for several years but had been ploughed the previous autumn. The soil was fine sand with a pH of 5.7 and a calcium (Ca) content of 225 mg/l. The organic matter content in the top soil was 6.7% and at a depth of 20–50 cm it was 1.8%. After presoaking for 24 hours in water, the cuttings were planted out on June 1. They were inserted vertically into the soil leaving about 2 cm and one bud above the soil surface. Cuttings up to 30 cm long could easily be inserted into the soil; but for 40 cm and 50 cm-long cuttings, holes had to be made using an iron rod.

The experimental design was randomized block with 4 replications. Each $2 \times 2\,\text{m}$ plot consisted of 16 cuttings, planted at a distance of 0.5 m apart with 0.5 m between the rows. During the first summer, the weeds on each plot were cut twice with a sickle. Ammonium nitrate with lime fertilization was started 4 weeks after planting, and a total of 110 kg/ha N was given in 3 doses at 2-week intervals. During the second summer, weeds were not cut, and a total of 90 kg/ha N was given as ammonium nitrate with lime in 2 doses: at the beginning of June and in the middle of July. The plots were not irrigated during either summer.

Survival of the cuttings, number of sprouts on them and the height of