

Variation in Seed Quality, Seedling Growth and Biomass Allocation of One-year-old Siberian Larch (*Larix sibirica* Ledeb.) Seedlings Grown in Different Conditions from Diverse Seed Sources of Mongolia

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Abstract

The rehabilitation of degraded forests in Mongolia showed very low success and the total area reforested successfully represents only 5% of the total forest lost. One of the reasons for such poor results may be low quality of planting stock due to the poor quality of seeds. The objectives of this study were to determine seed source variation in seed quality, to examine their growth and biomass allocation in one-year-old seedlings of Siberian larch from diverse seed sources, and to select the most promising seed sources for reforestation of degraded forest lands in Mongolia. Siberian larch seedlings from eight geographically different seed sources were grown at an open nursery and in greenhouse nursery conditions, and seedlings were subjected to growth and biomass allocation measurements at the end of the first growing season. It was found that there were significant differences in seed quality, growth and biomass allocation among the seed sources in both growth conditions. Overall, Sources No.3 (Tuul river) and No.4 (Mungun) showed the best growth performances and biomass accumulation at open nursery and greenhouse nursery conditions, respectively. Source No.1 (Ovorkhangai) had the lowest performances in both growth conditions for all measured variables. On the other hand, seedlings grown in the greenhouse nursery conditions had more intensive growth and accumulated more biomass compared to seedlings grown in open nursery conditions. However, the proportion of biomass of the roots at open nursery grown seedlings was higher than that of greenhouse grown seedlings, which may indicate a more promising survival rate after field transplanting.

Key words: Seed quality, seed source, growth, biomass allocation, *Larix sibirica* Mongolia

Introduction

Mongolia is a land-locked country located in the heart of Central Asia between N41°35' and N52°06', E87°47' to E119°57', in it and borders with Russia and China. The total land area of Mongolia is 1,566,000 km² consisting of 76.2% steppe and pasture land, 11.4% forest land area and less than 0.5% is currently cultivated.

The forests in Mongolia occur mainly in the northern part of the country, forming a transitional zone between the Siberian taiga forest and Central Asian steppe (World Bank, 2002). The species composition of Mongolian forests (Table 1) is simple, as in other temperate forests, composed mostly of Siberian larch (*Larix sibirica* Ledeb.) which covers almost 60% of the total closed forest area. The growth rate of Mongolian forests is slow because of the relatively harsh Central Asian

climate with its dry and windy characteristics and short growing season. As a result, they are easily influenced by fire, pests, disease and human activities. Forest resources in Mongolia have been continuously degraded over the past few years due to improper exploitation and inadequate management, which are negatively affected by environmental conditions causing severe deforestation, desertification and ecological stress in some regions.

During the last decades, Mongolia lost approximately 4 million ha of forests, averaging 40,000 ha annually. Between 1990 and 2000, the rate of deforestation increased up to 60,000 ha per year. As a result of ongoing loss and degradation, only 13 million ha of forests are relatively remote and closed canopy forests. Much of the other 5.3 million ha of forests are fragmented and degraded (World Bank, 2002). According to another report