
Evaluation of genetic variability and local adaptation of silver fir (*Abies alba*) from reciprocal transplant experiments over 3 altitudinal gradients

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Abstract

As long lived organisms, forest tree species may be severely affected by climate change. Sustainability of forest stands will depend on the ability of species and communities to adapt combining plasticity and genetic evolution. The amount and respective contributions of these two components will fully determine the potential of adaptation and consequently the type of forest ecosystem management to promote.

Although well documented at the scale of species distributions, the variability and adaptation of forest tree genetic resources is mostly unknown at local scale. To evaluate these components for silver fir (*Abies alba*), a species susceptible to drought and low relative humidity, a multi-sites reciprocal transplant experiment was conducted on three mountains of the French south-eastern Alps : Mont Ventoux, Issole and Vésubie. Variability was assessed on half-sib families originating from 57 seed-trees representative of the mature populations, along the 3 altitudinal gradients (1000m to 1550m). Seedlings were raised in nursery and transplanted at 3 elevations in each of the 3 forests. All families were tested in each of the 9 common garden experiments. Phenotypic measurements were conducted on fitness related traits related to survival, growth and phenology.

Most of the explained variability was due to environmental factors and especially to the elevation of the transplantation sites. Genetic variability was mostly due to family effect and to altitude of origin : seedlings from low altitude origins perform better than the others. No *sensu stricto* local adaptation was highlighted.

Keywords: local adaptation, forest tree, altitudinal gradient, progeny, common garden, half, sibs, reciprocal transplant experiment, growth, survival, phenology

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