

PRESERVATION AND MANAGEMENT OF BIODIVERSITY IN FOREST SEED PRODUCTION CHAIN*

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Summary

Genetic variability is of utmost importance for forest tree species, being linked with adaptability. However, ordinary procedures adopted in seed production chain often give rise to consistent loss of biodiversity from the seed source to the material used for reforestation. The reduction in genetic variability was studied in a Scots pine seed production chain and suggestion for a more efficient germplasm management are given.

Keywords

Genetic variability, Forest seed production, Molecular markers, *Pinus sylvestris*, Reforestation

Contribution

It is well-known the importance of genetic variability for forest species and the correlation between the latter and adaptability [1, 2]. As a consequence, the higher the genetic variability of a stand, the better the expected results of reforestation and afforestation using seed collected in that stand, mainly if the aim of the operation is environmental restoring [3]. In recent years, the need of forest seeds has dramatically increased, also due to rules issued by European Community aimed at increasing and improving the forest coverage. In Italy, however, the available seeds are often of poor quality and sometimes their origin is unknown [4]: this is one of the main reason explaining the failure of many reforestation operations [5]. The need of an optimization of the forest seed production chain is therefore clear

The aim of the research was the evaluation of the effect of ordinary nursery activity on genetic variability of the processed material. The study involved 5 steps of seed production chain in Scots pine (*Pinus sylvestris* L.), namely:

- Seed stand (Olgasca provenance, Como province)
- Seed orchard (Campogrande di Pinè, Verona province)
- Commercial seed lot collected in the seed orchard and processed by the National Forest Service factory in Dogana di Peri (Verona province)
- Nursery plantlets (two years old) located in Dogana di Peri
- Two artificial stands established using plants produced in the Dogana di Peri nursery (S. Damiano Macra and Cortemilia, both Cuneo province).

Genetic variability was estimated by means of polymorphism showed at 68 RAPD loci, amplified through PCR and electrophoretically separated on 1.5% agarose gel. DNA was extracted from young needles and embryos and, where possible, also from endosperms.

Data on genetic variability estimated for any of seed production chain steps are reported in Tab. 1. It is possible to observe a significant loss of genetic variability along the seed chain, from the seed stand to the artificial stands. It is likely that the biodiversity decrease is due to the ordinary nursery procedures, which give rise to random selection from one step of the chain to the following. For instance, the loss of genetic variability from the seed stand to the orchard as well as from the latter to the seed lot and the nursery is probably due to the harvest of many seeds from a limited number of plants, that is those with a more abundant fructification. To the contrary, the preservation of biodiversity could be achieved harvesting seeds from a higher number of individuals. A further loss of genetic variability occurred during the establishment of the artificial stands: in this case the effect of unsuitable germplasm management procedures has to be added to natural selection. This is confirmed by the scarce success of the reforestation: many plants died in both the stands and those that survived show clear symptoms of weakening.

Since a biodiversity loss occurs already in the seed orchard (established about 25 years ago), it is suggested to increase the number of the plants with different genotypes. This should be achieved using plants grown by seeds collected in Olgelasca stand

	Mean number of alleles per locus	Effective number of alleles per locus	Percentage of polymorphic loci	Expected heterozygosity
Seed stand	1.86	1.78	86	0.366
Seed orchard	1.80	1.74	85	0.362
Seed lot	1.68	1.67	78	0.331
Nursery	1.54	1.62	67	0.292
Art. stand No. 1	1.43	1.58	59	0.287
Art. stand No. 2	1.39	1.52	54	0.282

Tab. 1 – Measure of genetic variability in the studied levels of Scots pine seed production chain.

On the basis of the results obtained in the present study, the Forest Seed Service of the Italian *Corpo Forestale dello Stato* decided to modify the seed harvesting procedures. Nowadays, seeds are collected from at least 30 non adjacent plants, although a higher number should be preferred.

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