

# A new generation of clonal seed orchards of wild cherry. Selection of clones and spatial design

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Forest policy in Belgium strongly promotes the use of indigenous hardwoods for re- and afforestation and for stand conversion. For wild cherry (*Prunus avium* L.) this option is even more motivated by the acknowledgement of its high silvicultural, ecological and economical importance. Furthermore, the species is often mentioned as a potential alternative to poplar for the afforestation of abandoned and set-aside farmland. This line of policy generates a strong demand for high quality forest reproductive material, which cannot be met by the currently available basic material. Seed orchards have been created in the past, yet are relatively unproductive, mainly due to their restricted area.

The selection and breeding programme attempts to remedy the discrepancy between supply and demand by creation of a new generation of clonal seed orchards characterised by (i) a high yield and (ii) a high genetic quality and diversity of the offspring.

The constituents of the seed orchards have been chosen from a basic collection of 168 phenotypically superior plus trees selected within 27 different populations throughout Belgium. In the late seventies, vegetative copies of these plus trees were planted in seven experimental comparative plots. The half-sib offspring of these multiclonal plantations allowed the evaluation of the genetic background of the superior traits of the original mother trees.

The adopted research strategy led to four major achievements:

- i. Assessment of the genetic diversity of the basic collection and detection of identical or closely related accessions using microsatellite and AFLP markers.
- ii. Identification of the very best clones within the basic collection, based on the value of their selection index  $I_s$ . This index was constructed using the general combining ability (GCA) and the narrow sense heritability  $h^2_A$  for a number of adaptive traits such as vigour, morphology, phenology and disease resistance:  $I_s = \sum_i (h^2_A \cdot GCA)_i$  with  $i = 1$  to  $n$  and  $n =$  number of traits.
- iii. Design of the layout of the seed orchard, i.e. assessment of the optimal spatial arrangement of the clones within the orchard. As paternity analysis revealed a small-scaled patch-like pollination pattern, neighbouring trees should be:
  - Phenologically compatible, i.e. display an overlapping flowering period
  - Gametophytically compatible, i.e. have a different *S*-genotype
- iv. Establishment of minimum isolation standards with regard to surrounding natural populations of wild cherry and cultivated sweet cherries in order to avoid pollen contamination.

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