Wild cherry

Prunus avium

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These Technical Guidelines are intended to assist those who cherish the valuable wild cherry genepool and its inheritance, through conserving valuable seed sources or use in practical forestry. The focus is on conserving the genetic diversity of the species at the European scale. The recommendations provided in this module should be regarded as a commonly agreed basis to be complemented and further developed in local, national or regional conditions. The Guidelines are based on the available knowledge of the species and on widely accepted methods for the conservation of forest genetic resources.

Biology and ecology

Wild cherry (*Prunus avium* L.) belongs to the family Rosaceae and it is a diploid with a chromosome number of 2n=2x=16. The domesticated form cultivated for fruit is known as sweet cherry. Wild cherry can hybridize with the various other cherry species, especially where their natural ranges overlap.

It is a fast growing tree, with strong apical growth and most of its lateral branches are arranged in annual whorls. The crown is broadly conical and the trunk usually straight. The bark is shiny with large lenticels and peels horizontally. It is one of the first trees to flower in the spring and produces masses of white blossom. It matures at around 60-80 years, when trees are typically 20-25 m in height with trunks of 50-70 cm in diameter. Exceptional trees can reach up to 35 m in height with trunks over 120 cm in diameter. Wild

cherry usually lives between 70-100 years.

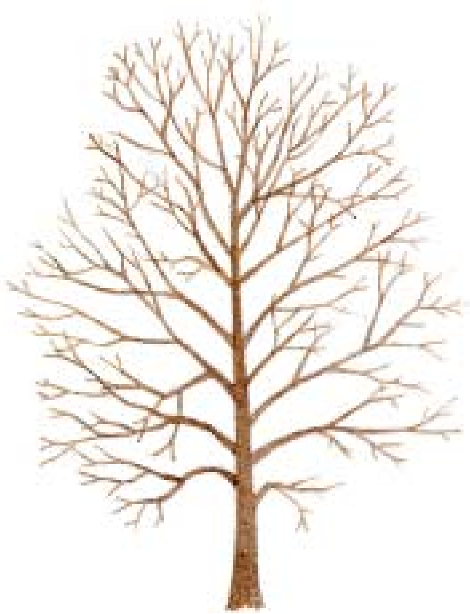
Wild cherry is insect pollinated. It is also self-incompatible, controlled by a multi-allelic locus *S*, with gametophytic expression. Flowering and seed production starts from about four years of age under optimal conditions. Its edible fruits are small and red or black. The seeds are disseminated by birds, especially pigeons, thrushes, starlings and jays, and by small mammals. Seed dormancy is usually for one winter but can last two. The germination rate of stored seed is improved when a combination of warm and cold stratification is applied. Cherry also frequently regenerates by root suckers forming dense clonal clumps of trees.

Wild cherry favours deep, light, silty soils that are fertile with a good water supply. It can tolerate a wide range of soil pH (5.5-8.5) but prefers slightly acidic conditions. It does not grow well on exposed sites or on sites prone to waterlogging. It is very winter hardy, but flowers can be damaged by spring frosts.

Wild cherry is a light demanding, relatively short-lived species and is frequently found on woodland edges and glades. It is essentially a pioneer species, and quickly colonises clearings by seeds and suckering, forming secondary woodland, but is often out-competed later by other hardwood species. Vegetative regeneration from both stumps and roots after coppicing is strong. It is frequently found growing as a minor component of oak, ash and beech woodlands.

Distribution

The natural range of wild cherry includes western Eurasia and the northern extremity of Africa. The latitude of its distribution ranges from about 30°- 61° N and it is thought to have originated in the Caucasus and the surrounding area. Its distribution is typically very scattered and extended natural populations are rare. It is essentially a lowland species with a maximum altitude of about 1900 m reported in France. Archaeological and subfossil evidence indicates it is native to North West and Central Europe.



Importance and use

Wild cherry is the most important European timber species in the family Rosaceae. Its straight, fine grained, easy working timber with pinkish brown heartwood and paler sapwood is highly sought after for cabinet making, furniture, panelling, decorative joinery and turnery. The colour of the timber and freedom from defects such as heart rot and green stain, greatly influence the value. As there are insufficient supplies of wild cherry to meet demand in Europe, black cherry (*P. serotina*) is imported from North America.

Wild cherry is used extensively in Europe for the afforestation of agricultural land and it is also valued for wildlife and amenity plantings. Many European countries have gene conservation and/or breeding programmes for wild cherry.

Genetic knowledge

The genetics of sweet cherry has been studied more extensively than wild cherry and since this is the domesticated form of the same species, this information can also be applied to wild cherry. In sweet cherry, over a dozen monogenic and dygenic characters have been reported, and several of these and some quantitative traits have been genetically mapped. Protein and DNA techniques have been developed to identify the incompatibility *S* alleles in cherry, and to determine *S* alleles of new accessions, design seed orchards and to study genetic variation in sweet and wild cherry. The *S* locus is highly polymorphic with 12 alleles reported in sweet cherry. Additional *S* alleles are being identified in wild cherry accessions and in total, some 25-30 alleles may be found.

There is very little known about the population structure and gene flow of wild cherry. Several isoenzyme, microsatellite and chloroplast DNA studies have been or are being used to study genetic variation in clonal collections, seed stands, seed lots and natural populations of wild cherry. The analyses of collections reveal high levels of genetic variation. In natural populations, clonal clustering resulting from vegetative suckering has been found to contribute significantly to lowering the genetic variability within populations. Chloroplast DNA studies have shown differences between Central European and South East European provenances, suggesting different colonisation routes following the glacial period.

Several European countries have established full and half-sibling progeny trials, and clonal trials to determine the heritability of important silvicultural traits, and to select trees for use in improvement programmes and clonal production. High heritability values (0.56-0.83) have been found for height increment, diameter, branch angle and sensitivity to Cherry Leaf Spot (*Blumeriella jaapii*). European-wide provenance studies have not been established. The existence of different ecotypes has been reported for sweet cherry but not proven for wild cherry. Clones have been commercialised from improvement programmes in France and Great Britain.

Threats to genetic diversity

On a European scale, wild cherry is not an endangered species. However, due to its generally scattered and rare occurrence, the genetic diversity of populations can be considered to be under threat from a number of factors, including:

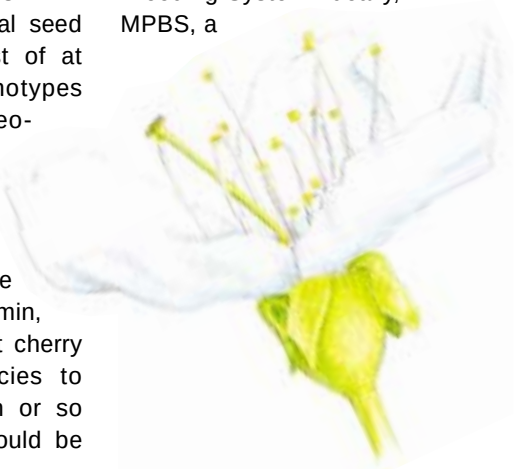
1) the felling and destruction of habitat;
2) transfer of seed from areas with different ecological conditions/ from dubious origins (jam factories);
3) collection of seed from a small number of seed stands;
4) phenotypic selection for homogenous stands;
5) hybridization with sweet cherry;
6) pests and diseases; and
7) low natural regeneration and competition with other species.

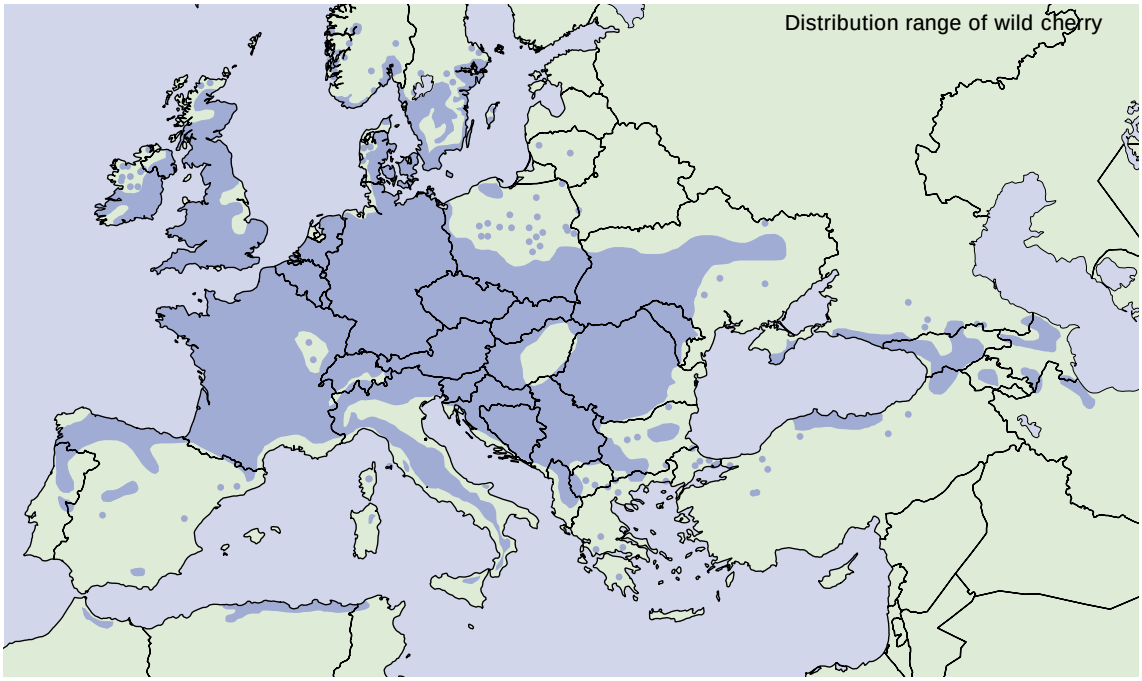
More general threats include deforestation, pollution and climate change.

Guidelines for genetic conservation and use

The objective of genetic conservation is to ensure the continued survival and adaptability of the species. Where sufficiently large populations are available, *in situ* conservation efforts should focus on identifying core populations of more than 20 distinct individuals. The natural regeneration of cherry trees should be a management priority. To avoid inbreeding depression, these core populations should ideally be linked by establishing new plantings using trees from other sources such as seed orchards or breeding populations with similar ecological conditions. Trees occurring at the extreme margins of the distribution range should also be conserved. However, as cherry grows in very scattered populations with relatively few individuals, the most effective conservation strategies are likely to be *ex situ* seed orchards and clonal banks.

Ex situ grafted clonal seed orchards should consist of at least 30 different genotypes from the same ecogeographic region. These should be established in locations favourable for growth and seed production, and should be well protected from vermin, and isolated from sweet cherry and other cherry species to avoid hybridization. Ten or so replicates per clone should be propagated onto healthy rootstocks. The use of dwarf rootstocks enables more intensive plantings of about 3 m rows with 5 m gaps, and also encourages precocious seed production. Other rootstocks will require wider spacing of 5 m x 5 m or more and may require thinning in later years. The seed orchard should be designed to ensure that a good mixture of clones is achieved. However, if the incompatibility alleles are known for each clone, they can be arranged to avoid planting incompatible genotypes next to each other. During the establishment years, full control of weeds, pests and diseases should be undertaken and pruning carried out to encourage a broad, open crown for fruiting. Seed should be collected throughout the orchard and supplied as a mixture to nurseries and growers. Regional seed orchards can form the basis of a Multiple Population Breeding System. Ideally, in MPBS, a





breeding population is subdivided into subpopulations which are then grown over a wide range of site conditions. Each subpopulation may have the same or different breeding goal.

Clonal banks should be established where the long-term future of the planting is secure. They should include a very broad range of genotypes, both geographically and genetically, e.g. superior timber trees with breeding potential as well as trees with conservation value and other species. Ideally, the accessions should be virus free, well documented and clearly labelled. A minimum of two replicates per clone should be planted. The rootstock used determines the spacing required, and the planting should ideally have a full management programme of weed, pest and disease control. Where possible, it should also be duplicated on another site. If trees die, they should be removed and replaced. The content of a clonal bank should be reviewed after several years and repropagated if necessary to ensure a healthy collection is maintained.

Provenance, progeny and clonal trials and demonstration plantings can also have potential conservation value. Encouraging the utilisation of wild cherry could also be important in promoting its planting and management.

EUFORGEN

These Technical Guidelines were produced by members of the EUFORGEN Noble Hardwoods Network. The objective of the Network is to identify minimum genetic conservation requirements in the long term in Europe, in order to reduce the overall conservation cost and to improve the quality of standards in each country.

*Citation: Russell K. 2003. EUFORGEN Technical Guidelines for genetic conservation and use for wild cherry (*Prunus avium*). International Plant Genetic Resources Institute, Rome, Italy. 6 pages.*

Drawings: Prunus avium*, Giovanna Bernetti.*

ISBN 92-9043-572-0

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The distribution map was compiled by members of the EUFORGEN Noble Hardwoods Network based on an earlier map published by Schütt in 1995 (Schütt 1995 in Förderung seltener Baumarten. 2001. Markblätter ETHZ/BUWAL).

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