Oriental sweet gum

Liquidambar orientalis

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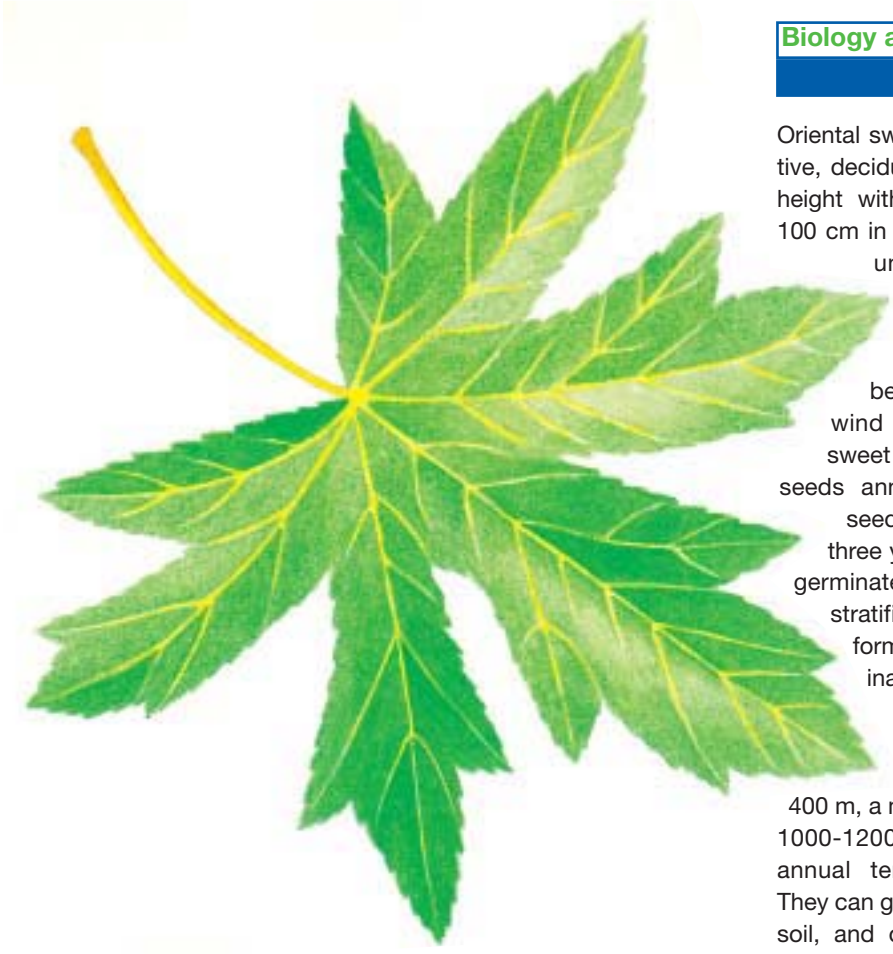
These Technical Guidelines are intended to assist those who cherish the valuable oriental sweet gum genepool and its inheritance, through conserving valuable seed sources or use in practical forestry. The focus is on conserving the genetic diversity of the species at the European scale. The recommendations 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

Oriental sweet gum is an attractive, deciduous tree, 30-35 m in height with a straight trunk of 100 cm in diameter. Flowers are unisexual and bloom from March - April. The fruits ripen in November - December and the seeds are wind dispersed. Oriental sweet gum trees produce seeds annually, but abundant seed crops occur every three years. Although seeds germinate readily, cold-moist stratification provides uniform conditions for germination.

Oriental sweet gum trees favour an elevation of between 0-400 m, a mean annual rainfall of 1000-1200 mm and a mean annual temperature of 18°C. They can grow on slopes and dry soil, and optimal growth is on rich, deep and moist soils such as bogs, river banks and coastal areas.

Oriental sweet gum opportunely produces coppice by sprouting/ suckers, and in reasonable conditions, natural regeneration is also possible.

Distribution

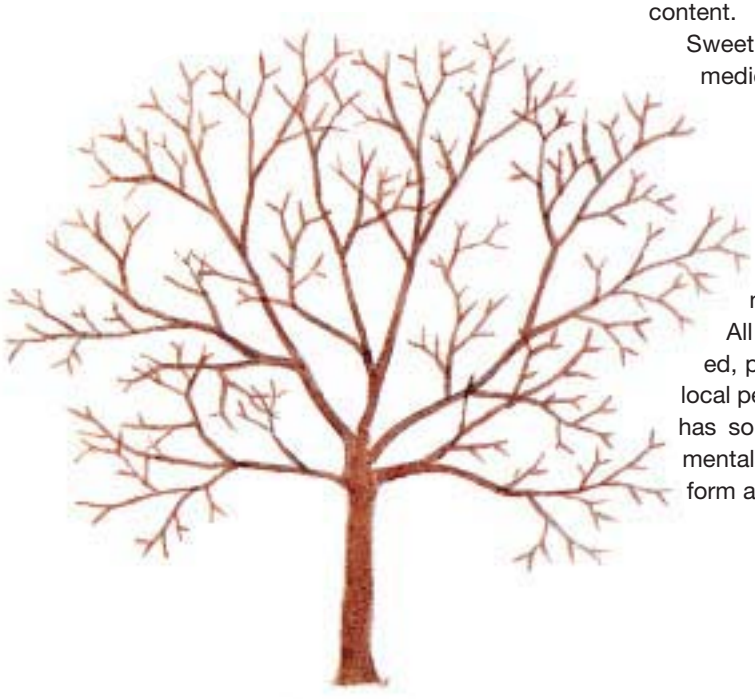
The natural range of oriental sweet gum is a limited area in southwest Turkey and Rhodos Island in Greece between 36°-38° N, and it is found at altitudes of 0-1000 m.

Importance and use

Oriental sweet gum is important both as a relic and endemic species. It is also economically important, due to its natural balsam producing ability, which is rare among forest trees.

Since research and breeding focus on the oil (balsam) production properties, data on wood characteristics are limited. Although the wood is not suit for sawmill processing, it is a preferred fuel wood due to the oil content.

Sweet gum oil is used in medicine, and the chemical and cosmetic industries. It is used as a fixative in producing soap and cosmetics, and is a raw "ingredient" for cinnamyl alcohol and acid. All oil produced is exported, providing an income for local people. The species also has some value as an ornamental, due to its attractive form and colour.



Genetic knowledge

There is very little genetic knowledge or ongoing research on this species. According to fossil evidence, although the species spread into the northern part of Anatolia in the past, its distribution is now restricted to the Mediterranean. Two different morphological types are observed - those that produce oil and those that do not. Oil producing (balsam) trees are smaller with large branches and the bark has large scales. The type that does not produce oil has a straight trunk with smaller branches and smaller bark scales.

Although there is very little information available on the genetics of this species, its ecological and biological characteristics give some indication about the patterns of genetic diversity. Trees growing from sea level to 400 m, are known as “plain sweet gum”, while trees at higher altitudes are “mountain sweet gum”. Trees growing at the higher altitudes form small groups and tolerate frost better.

Studies on vegetative propagation indicate that grafting methods from cleft, bud and splice are most successful in open forest areas and greenhouse conditions.

Threats to genetic diversity

In 1947 the natural distribution area of oriental sweet gum was 7000 ha. Today it is limited to about 3200 ha. Most of the trees have been damaged due to poor oil production methods, which involve wounding to stimulate and increase the oil production. If performed properly, the trees can be kept healthy. Badly wounded trees are about 20 m in height, crooked and weak, while unwounded trees can reach about 35 m in height with straight stems. Grazing and habitat destruction are also posing a threat, especially in Turkey.

The rich, fertile soils found in the natural distribution area of the species means that many forest stands are being destroyed so the land can be farmed. Areas close to the cultivated land are also drained of the moisture that sweet gums require for optimum growth.

Guidelines for genetic conservation and use

The genetic structure of populations urgently needs to be investigated for conservation purposes.

Although there are currently no comprehensive conservation measures, some practices, such as seed stands, nature conservation areas and clonal seed orchards, have contributed to the dynamic conservation process of oriental sweet gum. To meet the specific conservation requirements, these programmes must be revised to increase the population sizes and ensure representation of diverse habitats within the natural range of the species.

For species with limited genetic information, it is often assumed that genetic variation follows geographic and ecological variation. To capture the adaptive variation in oriental sweet gum, ecogeographic zones should be defined according to climatic variation. The minimum effective size of a gene conservation population is 50 trees, and it is recommended that each population is composed of at least 150-200, to ensure enough flowering and fruiting trees.

Natural regeneration should be stimulated and used wherever ecological conditions allow. Seed production is normally sufficient and seed orchards can produce seed in about seven years. To conserve and enhance the diver-

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sity in small populations it is also recommended that effective population sizes are increased by planting local material.

Local material should also be used for afforestation purposes wherever possible. For the further improvement of oriental sweet gum plantations, "selected" and "tested" material (seed or clonal) should be used in future.

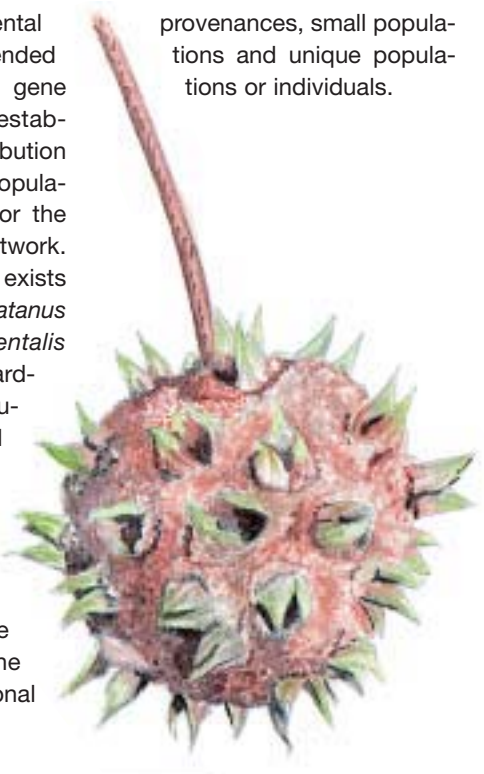
In situ stands should be tended, including thinning, understory clearing, and weeding. These and other silvicultural measures in gene conservation stands are more effective than if the stands are left unmanaged.

Multiple uses of the gene conservation stands are encouraged, including oil production. Recommended oil production methods o
should be followed to ensure sustainable oil production. The designated gene conservation stands should serve as a source of reproductive material for breeding, afforestation, oil production and landscape planting. Utilizing well adapted seed sources is the most effective tool in genetic conservation. Trees can also be planted in forest riverbeds to act as a firebreak for *Pinus brutia*, and this should be promoted to increase the use of this species.

In order to conserve sufficient genetic variation to maintain the adaptive potential of oriental sweet gum, it is recommended that a network of *in situ* gene conservation stands is established throughout the distribution area. Several fairly small populations could be selected for the establishment of such a network. Since oriental sweet gum exists in mixed stands with *Platanus orientalis* and *Alnus orientalis* which are also Noble Hardwoods, a few natural populations could be extended to conserve the associated species.

This *in situ* network should be complemented with *ex situ* collections, which will also enable provenance research. The establishment of new clonal seed orchards should be especially considered for oil production to reduce the pressure on natural stands.

In regions where seed sources are limited, local e*x situ* collections (stands) should be established to serve both conservation and seed production. These collections should typically be established within the local region of provenance. Measures should be taken to protect them against undesired pollination from outside. These stands can be bulk collections, seedling seed orchards and clonal seed orchards. From a conservation perspective, priority should be given to resources that are threatened by extinction or contamination from undesired provenances, small populations and unique populations or individuals.



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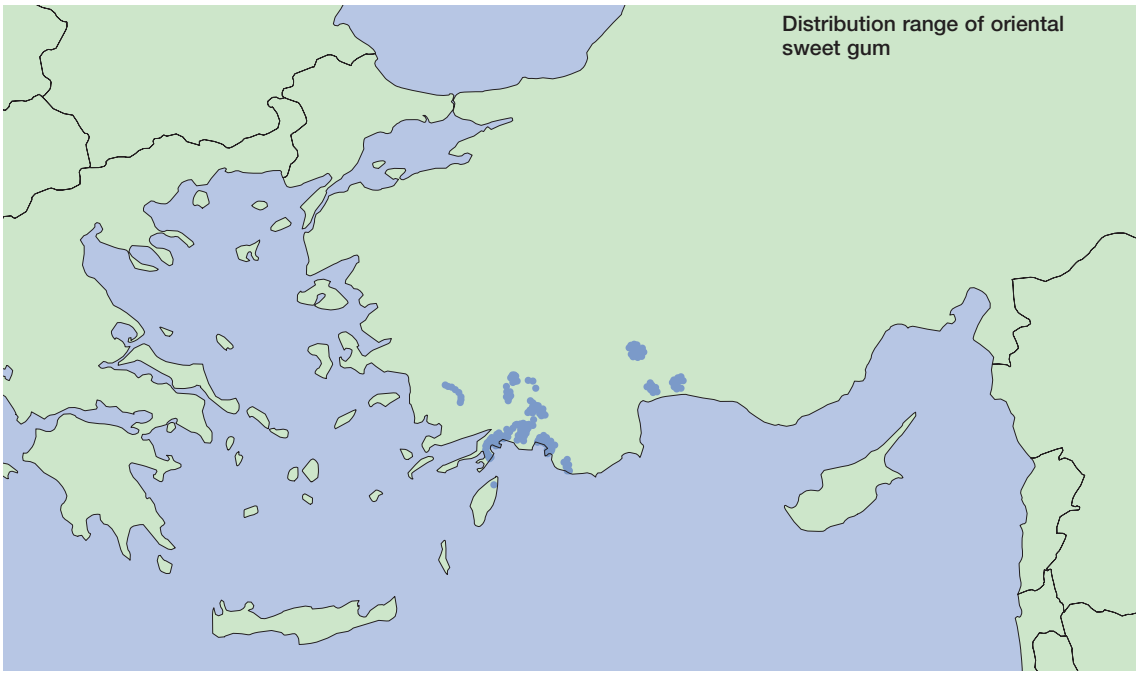

These technical guidelines were produced by members of the EUFORGEN Noble Hardwoods Network. The objective of the Network is to identify minimum genetic conservation requirements in the long term in Europe, in order to reduce the overall conservation cost and to improve the quality of standards in each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

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Selected bibliography

Acar, İ., Y. Gemici, A. Genç and N. Özel. 1993. Situation of Oriental Sweet Gum Forest in Past and Today [in Turkish]. Uluslararası Ekoloji ve Çevre Sorunları. Türk-Alman Kültür İşleri Yayın Dizisi No.3, Ankara, Turkey.

Efe, A. 1967. Studies on the Morphological and Palynological Characteristics of Liquidambar orientalis Mill. in Turkey. İ.Ü. Orm. Fak. Dergisi Seri A. Cilt 37(2):273-286, İstanbul, Turkey.

Genç, A. 1994. Utilization of Genetic Variation by Grafting in Oriental Sweet Gum [in Turkish]. Orm. Araştırma Enst. Teknik Rapor No.57:31-45, Ankara, Turkey.

Saatçioğlu, F. 1969. Silviculture I: Biological Base and Principles [in Turkish]. İ.Ü. Orm. Fak. İ.Ü. Yay :1429, Orm. Fak Yay: 138, İstanbul, Turkey.

Topçuoğlu, A. 1968. Improvement, Tending of Oriental Sweet Gum Forests and Oil Producing and Marketing [in Turkish]. OGM Teknik Haberler Bülteni Yıl 7, Sayı 28:3-23, Ankara, Turkey.

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