Autecology of the

COMMON ASH

Fraxinus excelsior L.

Fr. : Frêne commun
Sp. : Fresno Común; Cat.: Freixe de fulla gran
Ger. : Esche
It. : Frassino maggiore

GEOGRAPHICAL DISTRIBUTION

- European species extending into Sub-Atlantic areas [28, 27].
- Occurs throughout France, less common in the Mediterranean region [27]; occurs in Spain, mainly in the North of the country.
- Area of stands in France = 583 000 ha (NFI data, 2005-2009, main species Fraxinus, all species together, but mostly Common ash).

CLIMATE AND TEMPERAMENT

Bioclimatic conditions

- Not sensitive to winter cold [31, 14, 1].
- In mountain areas, mild temperatures at the start of the growing season positively affect growth [15].
- Sensitive to spring frosts [31, 28, 22, 14, 1] causing forks [24, 2].
- Poor growth when average annual temperatures < 5.6 ° C [17].
- Demands abundant water [28, 19, 22, 2], particularly in May and June [31]; sensitive to atmospheric drought [28, 14].
- Sensitive to the drying action of wind [31, 14].
- In Spain, demands annual average rainfall > 700 mm [21, 2, 1].

Summary of bioclimatic requirements and sensitivity of the Common ash

<table>
<thead>
<tr>
<th>Warmth requirements</th>
<th>Sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>cold</td>
<td>sticky snow</td>
</tr>
<tr>
<td>late frost</td>
<td>Very high</td>
</tr>
<tr>
<td>early frost</td>
<td>Very high</td>
</tr>
<tr>
<td>Moderate</td>
<td>Very low</td>
</tr>
</tbody>
</table>

Occurrence of the species (rate as a percentage of inventory items):
Black: rate ≥ 5%; Blue: rate < 5%; White: rate = 0%
Vegetation stages
- Occurs from the sub-montane to the upper montane stage (400 to 1800 m) [28, 27, 14, 2, 13, 1].

Distribution of the Common ash according to vegetation stages

Temperament
- Heliophilic [30, 31, 28, 27, 22, 14, 2, 13, 1].
- Shade-tolerant in the first years [30, 31, 28, 22, 14, 25, 2, 1].
- Vulnerable to competition when adult [14, 4].
- Reported sensitivity to strong lateral light that appears to cause bark necrosis [14].

SOILS

Water and drainage
Water supply:
- Essential growth factor [12, 19, 7, 5, 3, 9, 14, 2, 32].
- Needs soil with a good water supply for sustained growth (thick soil with a high maximum useful reserve) [28, 7, 9, 14, 8, 1]. Occurs on dry soil but smaller in size and less productive [31, 27, 10, 32].
- Topographic position ensuring a lateral water supply [12, 19, 14, 4, 10] or presence of a permanent water table [9, 8, 10] significantly increase growth.
- Very vulnerable to interruptions in the water supply [3, 14] which cause forking [24]; delays in regulating transpiration [3, 5].

Waterlogging:
- Prefers well-drained soils [31, 7, 22, 14, 2, 13, 1].
- Occurs on temporarily flooded ground or permanently flooded areas around springs [10], but waterlogging very close to the surface reduces growth [28, 12] and may even prevent growth [9, 10] in marshy conditions.
- Waterlogging promotes black heartwood [7, 9].

Drainage and excess water

<table>
<thead>
<tr>
<th>Natural drainage</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>h</th>
<th>i</th>
<th>g</th>
<th>e</th>
<th>f</th>
<th>virtually non-existent</th>
<th>non-existent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water table</td>
<td>temporary redox horizon with rust patches</td>
<td>no water table</td>
<td>absent or &gt; 90cm</td>
<td>80-125cm</td>
<td>40-80cm</td>
<td>20-50cm</td>
<td>0-30cm</td>
<td>0-20cm</td>
<td>&lt; 0-20cm</td>
<td>favourable</td>
<td>tolerated</td>
</tr>
<tr>
<td></td>
<td>permanent reductive waterlogged horizon</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>&gt; 80cm</td>
<td>40-80cm</td>
<td>-</td>
<td>40-80cm</td>
</tr>
</tbody>
</table>

(from the Species Ecology file, Ministry of the Walloon Region, 1991, amended [20])

Favorable topographic situations for the Common ash with regard to water supply
(included in the morpho-pedological compensations, to be modulated according to the other site characteristics)

<table>
<thead>
<tr>
<th>favourable</th>
<th>tolerated</th>
<th>unfavourable</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>lateral inflow gains in relation to drainage losses</td>
<td>-</td>
<td>0</td>
</tr>
</tbody>
</table>

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Texture and materials
- Materials favouring good water retention [28, 7, 2722, 14, 13, 1] and poor in coarse components.

Textures favourable for growth of the Common ash
(involving the morpho-pedological compensations, to be modulated according to the climate and soil)

<table>
<thead>
<tr>
<th>Texture</th>
<th>Very sandy S</th>
<th>Coarse SA, LS, SL</th>
<th>Loamy LmS, Lm, Li, LIS</th>
<th>Intermediate LAS, LSA, LA AL</th>
<th>Clayey A, AS</th>
<th>Very clayey ALo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tolerability</td>
<td><img src="red" alt="Favourable" /></td>
<td><img src="green" alt="Tolerated" /></td>
<td><img src="red" alt="Unfavourable" /></td>
<td><img src="green" alt="Favourable" /></td>
<td><img src="green" alt="Tolerated" /></td>
<td><img src="red" alt="Unfavourable" /></td>
</tr>
</tbody>
</table>

Nutrients
Nutritive elements:
- This growth factor is less crucial than the water supply [12, 19, 2, 1].
- Occurs over a wide pH range from 3.8 to 7.8 [16, 9]. However, growth is very poor on very acid soils [31, 28, 19, 8, 1] due to the sensitivity of the species to aluminium toxicity, which causes root necrosis [33].
- Adult tree growth limited by availability of K [15].
- Juvenile growth depends on availability of Ca and Mg [33].

Nitrogen and phosphorus:
- Humus in mull form. Ash tree litter has a low C/N ratio [16, 22, 14].
- Growth depends mainly on the availability of nitrogen [16, 28, 17] associated with phosphorus [18, 20].

Lime in fine soils:
- Appears unaffected unless the concentration is very high [9].

Summary of water and nutrient requirements and sensitivity of the Common ash

<table>
<thead>
<tr>
<th>Water requirements</th>
<th>Very high</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity to temporary waterlogging</td>
<td>Moderate</td>
</tr>
<tr>
<td>Nutrient requirements (Ca, Mg, K)</td>
<td>Moderate</td>
</tr>
<tr>
<td>Nitrogen (and phosphorus) requirements</td>
<td>High</td>
</tr>
<tr>
<td>Sensitivity to lime in fine soil</td>
<td>Low to zero</td>
</tr>
</tbody>
</table>

Minimum values for the growth of demanding species

- Least demanding species
- Minimum values for the growth of demanding species
- Level of requirement of the species in question

Mineral nutrition of the Common ash

Dynamic behaviour and characteristics
- Nomadic species with a pioneer temperament [30, 31, 25].
- Good growth of basal shoots
- Life span about 150 to 200 years [27]. Timber harvesting recommended at less than 60 years to minimise black heartwood [9]. In areas favourable to production, ash trees can reach 180 cm in circumference in 60 years [99].
- Common ash is easily established because the seedlings can develop a dense and robust root system [17] even in poor light.
- In 2008, ash dieback appeared for the first time in north-east France, linked to the fungus *Chalara fraxinea*. This is an ash tree parasite in North-Eastern Europe, causing twig die-back followed by necrosis and leaf wilt on the branches, and even crown dieback [23]. Particular attention should be paid to the spread of this so far little-known disease.

Main factors limiting the production of good quality timber
- Inconsistent water supply during the growing season
- Permanent waterlogging in surface horizons
- Slowly mineralizing humus
- Presence of exchangeable aluminium
- Nutrient-poor soils
- Heavy snow
- Late frost
- Atmospheric drought
- A Supra-Mediterranean species [27, 1].
- Occurs in France at heights of up to 300 m in the Mediterranean region and in south-west France at sub-montane, supra-Mediterranean and meso-Mediterranean stages, less common in the north of France [27].
- Occurs throughout the Iberian Peninsula, except in the mountains and along the upper reaches of rivers in the northern third of the country, where it is replaced by the Common ash.

- Thermophilic [27], occurs where average rainfall is >450 mm/year [21]; not susceptible to summer drought provided that there is a good water supply in the soil [21, 1]; not susceptible to winter cold [21].

- Susceptible to waterlogging [11; prefers soils with sandy textures [21, 1]; rarely occurs on highly acidic soils [27].
- Like Common ash, this species can be affected by ash dieback disease [23].

Ecogram of the Narrow-leaved ash
(According to Rameau et al., 1989, amended)

- Black: rate ≥ 5%; Blue: rate < 5%; White: rate = 0%
- Favourable for timber production
- Total range of the species

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1. ASFOLE - Selvicultura de las especies principales. ASFOLE, Asociación Forestal de León, 28 p.


