

# Hybrid walnut

*(Juglans x intermedia)*

# and common walnut

*(J. regia)*

# for high quality timber

# 1 Hybrid walnut

*(Juglans x intermedia)*



Photography: Jacques Becquey.IDF.

There are different walnut species utilized for valuable timber production. The most popular is Common walnut (*Juglans regia*), original from Central Asia and utilized in Europe for nut production for millennia. Other species with remarkable commercial interest are the black American walnuts (*Juglans nigra*, *J. major*, *J. hindsii*).

In the last decades, hybrid walnuts have appeared in the market, achieved by crossing common walnut with high performance clones of black American walnut. These materials have been selected based on their attitude to produce vigorous hybrids in natural conditions, with timber showing remarkable properties. The progenies of hybrid walnut most commonly utilized in plantations for valuable timber production are Mj-209xRa and Ng-23xRa.

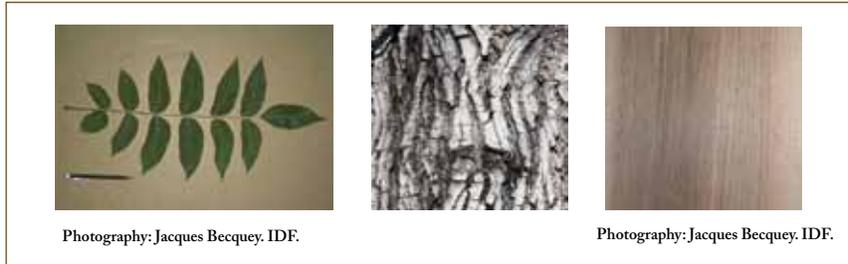


*Hybrid walnut plantations.*

## Why planting walnut to produce timber ?

Walnut has been widely utilized for valuable timber production for decades, both in Europe and in North America. The reasons include the superb technical and aesthetic features of its timber. The pieces with highest quality are destined to veneer industry (top class furniture), where they reach their highest price. Hybrid walnut timber has similar properties to the one from its parents. In comparison with common and black American walnut, the hybrids tend to be more vigorous since the first years of plantation, showing a marked apical dominance as well. Therefore, this vegetative material show excellent attitude for valuable timber production. Moreover, hybrids are more resistant to diseases and less sensitive to phototropism than common walnut, while being more tolerant to drought and less sensitive to spring frosts than black American walnut.

Hybrid walnut is an excellent compromise between growth rate, resistance to damaging agents and climatic uncertainties, while easing the management for valuable timber production.



## What are the main walnut requirements ?

Hybrid walnut is exigent regarding soil and climate conditions, likewise common and black American walnuts: it needs a rather humid climate, preferably with a moderate or absent dry period, not too cold, as well as a deep soil, with balanced texture and well drained. The figure below summarizes the main ecological requirements of hybrid walnuts Mj-209xRa and Ng-23xRa for valuable timber production. Mj-209xRa progenies shows a higher tolerance to warm climates (Mediterranean areas), while Ng-23xRa is more suitable at cold sites. The last page shows specific ecological requirements of common and black American walnuts.

	Comments
<p><b>Soil depth (cm)</b></p>	Hybrid walnut has a well developed root system, with a strong tap root that allows it reaching deep soil water.
<p><b>Texture</b></p>	It is very sensitive to water stagnation, which may limit its utilization in heavy textures (clayish). Soils that are excessively light (sandy) should also be avoided, because of their low water and nutrient holding capacity.
<p><b>pH</b></p>	The optimal pH is neutral or slightly basic, although it can grow in a wide variety of soil types. Hybrid walnut tolerates active limestone.
<p><b>Altitude (m)</b></p>	Hybrid walnut is favoured by warm mean annual temperatures, always that water provision is sufficient. It can also tolerate low winter temperatures relatively well.
<p><b>Mean annual temperature (°C)</b></p>	
<p><b>Mean annual precipitation (mm)</b></p>	Despite tolerating moderate summer droughts, high rainfall regimes considerably enhance growth, especially in areas without access to water table.

	Water need	Sensitivity to temporary stagnation	Need for Ca, Mg, K	N and P need	Active limestone sensitivity	Wind sensitivity	Drought sensitivity	Competition for light sensitivity
Hybrid walnut	High	Medium	Medium	Medium	Low	Medium	Low - media	Medium
Black American walnut	High	Low - medium	Medium	Medium	Medium	High	Medium - high	Low - medium
Common walnut	High	High	Medium - high	Medium	Low - media	Medium	low - medium	High

Hybrid walnut shows a capacity for adapting to different site features higher than its parent species. This material joins the drought and wind tolerance of common walnut with the “forest character” (limited phototropism) and tolerance to temporary stagnation of black American walnut.



Hybrid walnut plantation.

## Pests and diseases of walnuts

The diseases affecting hybrid walnut are the same described for common walnut, despite they are considerably less frequent. Most of these pests and diseases have been described on plantations for fruit production, and are favoured by excessive soil moisture and air humidity, high soil clay content and for high rates of irrigation and nitrogen application. The main diseases are fungi penetrating through the root system: *Armillaria* and *Phytophthora*: they are favoured by wounds and high plantation densities. *Armillaria* causes the withering of leaves and branches, while *Phytophthora* produce trunk rots, starting at the root collar, where it leads to a black suppuration. The bacterium *Brenneria* (*Erwinia nigrifluens*) causes dark spots, 5 cm wide, on the bark, which can devaluate timber if reaching the inner trunk. Antracnosis (fungus *Gnomonia*), causes brown spots on leaves, leading to a loss of tree vigour. Regarding pests, the most remarkable one is *Zeuzera* (photo), a moth excavating galleries in branches and young stems during larval stadium. These galleries increases the wind-related breaking risk of these branches, as well as the risk of occurrence of other pathogens.



## First steps of plantation

The first steps of a hybrid walnut plantation are similar to those of other valuable broadleaved species.

### *Choosing the plant*

Hybrid walnut is an artificial species, and thus it is not possible to find native populations. The general recommendation is therefore to guarantee that the plantation area meets all the ecological requirements mentioned previously. It is also recommended to inquire about the performance of hybrid walnut in neighbouring areas, in order to find out the most suitable progenies. The plants are generally sold bare rooted, and must show a robust aspect, with a unique, lignified stem and a well developed root system, with abundant secondary roots. The most adequate size is 60 cm height for 1 year-old plants (1+0), with at least 30 cm of tap root. In high quality areas it is also possible to utilize 2 year-old plants (1+1), reaching 100 cm.

### *Soil preparation*

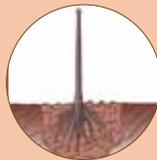
The first step in every plantation is clearing the vegetation that could hamper plantation operations. Secondly, and especially at agricultural land, it is necessary to apply a sub-soiling, preferably crossed (in 2 perpendicular directions) at the maximum depth possible (40-60 cm) in order to allow the development of the vigorous walnut root system and promote soil water retention. Plantation is done manually in pits opened either manually or with backhoe excavator, with dimensions adequate to plant size.

### *Planting*

Planting is performed during dormancy period, between November and April, on days without risk of frost, rain or strong winds. It is fundamental to prevent that roots remain bended or compressed at the plantation pit, so that it is important to hold the plant in upright position and progressively fill up the pit. The tip of the taproot can be cut if damaged during its uprooting in the nursery, but at least 30 cm should be respected. The root collar (a thickening at the stem base) must remain at floor level, not buried. The plantation can be completed with a watering amounting 30-40 l/tree in order to ease plant establishment and early growth.

### *Protect*

Hybrid walnut is very sensitive to weed competition for water and light, which can reduce considerably both growth and survival during the first 5-10 years. It is recommended to cover the ground around the tree with a 1 m<sup>2</sup> mulch. This technique allows reducing considerably weed competition, while mitigating soil water loss by evaporation. Browsing damages (rabbit, hare, roe deer, red deer) must be avoided with individual or collective (fencing) protection.



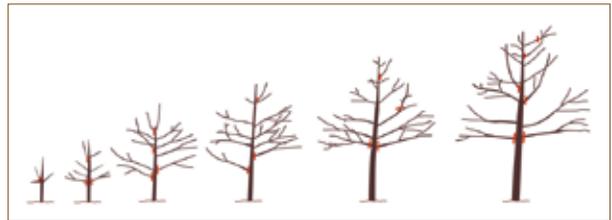
Photography: Jacques Becquey. IDF.

## Management of a walnut plantation

Because of its vigorous growth, hybrid walnut plantations must be managed following a dynamic silviculture. The plantation can be either pure (composed only by hybrid walnut) or mixed (hybrid walnut and some other species). The density chosen defines the initial investment and the cost of tending operations (weeding, pruning, thinning).

### Pruning

Pruning of hybrid walnut for valuable timber production established at open areas is normally applied annually. In highly productive sites it might be necessary to apply two pruning interventions yearly, while in areas with limiting conditions pruning could be applied every two years. Pruning is performed around July, in order to avoid the sprout of epicormic shoots. Pruning is done in two simultaneous interventions: **formative pruning**, consisting on promoting the main stem axis or apical shoot, clearing or blunting those high branches that could compete with it; and **quality pruning**, during which the thickest branches (2.5–3 cm diameter at their base), are cut, in order to avoid creating large knots in the timber. Pruning is applied progressively, respecting at least 50% of leaves at each intervention, although in very productive sites it is possible to apply higher intensities during the first 4 years, for preventing thick branches. The target clean bole length is 3–6 m, depending on tree potential and site quality. Pruning is simpler at high density plantations, as well as on mixed plantations with fast-growing species, because of lateral shading, which reduces branch development.

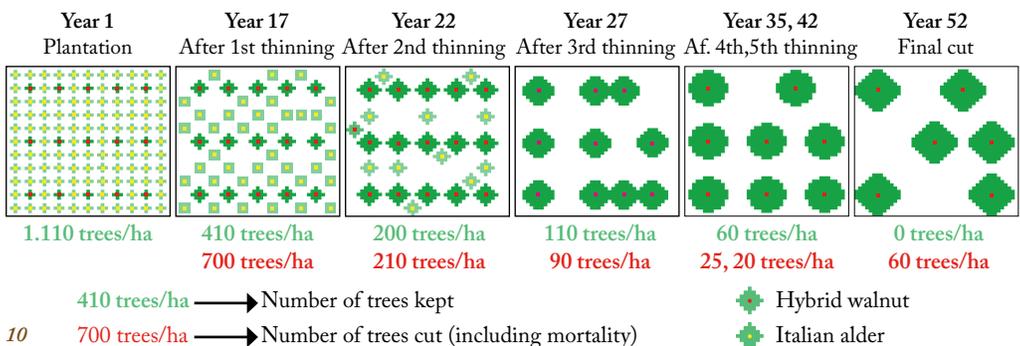


Scheme of application of pruning in walnut, during the first 6 years. Red lines indicate where to apply pruning.

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### Thinnings

Thinnings consist on promoting the best trees (future trees), which are those with potential to produce timber valid for veneer industry: vigorous trees, with a straight bole, free of defects. With this aim, all trees that compete with future trees are progressively cut. This intervention allows keeping a high and regular diameter growth rate. The intensity and frequency of thinnings depend on the initial density and site productivity. Below it is shown a thinning scheme for a hybrid walnut plantation (12x6 cm, 140 trees/ha) accompanied by Italian alder (*Alnus cordata*, 3x3 m, 970 trees/ha), in a good quality site. Target diameter of hybrid walnut: 60 cm at breast height (60 trees/ha).



## A more classic silvicultural scheme

Example of 1 ha pure hybrid walnut plantation, 9x6 m (185 trees/ha) at a site well adapted to species requirements.

Summary of the plantation stages and economic assessment.

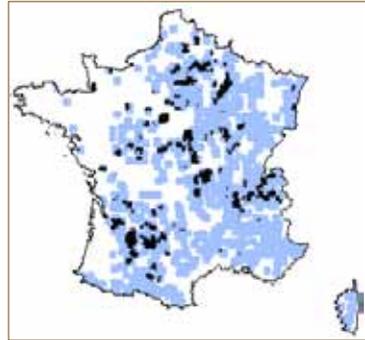
Age (years)	Mean diameter (cm)	Operations	Quality timber obtained (m <sup>3</sup> )	Expense/revenue (€2013)
-1		Soil analysis. Pre-existent vegetation clearing. Soil preparation		-850
0-1		Plantation marking and pit opening. Vegetative material (185 hybrid walnuts) purchase and plantation. Mulching (1 m <sup>2</sup> ) purchase and install individual shelters purchase, install. Initial watering.		-2,220
1-6		Annual pruning. 1 annual weeding between tree rows. 1 emergency watering.		-1,200
7-12		Annual pruning, up to 4-6 m on 100 best trees. 1 weeding between tree rows every 2 years. 1 emergency watering.		-500
18	20	Thinning of 45 walnuts, promoting the best 100.	15 steres	+90
25	28	Thinning of 35 walnuts.	20 steres + 2 m <sup>3</sup> quality wood	+220
35	41	Thinning of 25 walnuts.	30 steres + 8 m <sup>3</sup> quality wood	+980
43	50	Thinning of 20 walnuts.	35 steres + 12 m <sup>3</sup> quality wood	+3,210
50	60	Final cut: 55 walnuts.	100 steres + 60 m <sup>3</sup> quality wood	+36,600
<b>IRR (Internal Rate of Return)</b>				<b>4.7%</b>

*Note: it is considered that 5 walnuts are not harvested because of low vigour. The income resulting from possible crops between rows during the first years are not considered.*

*The 100 walnuts pruned up to 4-6 m and promoted at the first thinning are cut during the last thinnings and the final cut.*

## **Common walnut (*Juglans regia*)**

Common walnut is an emblematic species in Europe, with a remarkable interest regarding fruit and timber production. Despite its use for the latter has been set aside in favour of hybrid walnut, this species still suppose a considerable share of the walnut timber utilized at veneer industry.



*Distribution of common walnut (*Juglans regia*) in Spain (Source: Genford Inia-CIFOR, 2009) and France (Source: IFN; Black: occurrence  $\geq$  5% of sampling points; Blue: occurrence < 5%; White: occurrence = 0%).*

The ecological requirements of common walnut are relatively similar to those from hybrid walnut. The main differences are its higher sensitivity to water stagnation, even when temporary, and to bacterial and fungal diseases in wet areas. The varieties of common walnut with early flushing are especially sensitive to damages by spring frosts.



*Common walnut plantations.*  
Photographs: Jacques Becquey. IDF.



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At forest conditions common walnut tends to show leaning shapes, because of its strong phototropism. In general, its needs for light and warmth are higher than those of hybrid walnut, as well as its tolerance to drought. This species is very well adapted to low density plantations in open areas, such as agricultural fields, as well as on agroforestry systems.

Because of the strategic interest of this species, and of the presence of individuals with superb features for valuable timber production and disease resistance, common walnut has been devoted improvement programmes for developing local materials to be utilized in plantations. It is possible to find in the market some different clones and other high performance materials selected for their timber production potential and their tolerance to the limiting conditions that hamper the use of this species.