

PLANT TUBER MELANOSPORUM

Establishing a truffle orchard requires good planting practices and favourable conditions for both plant and truffle.

To increase your odds of success and achieve good truffle production, it is essential that you follow four critical steps:

- A. Choose fertile ground for truffle cultivation
- B. Select the species and determine the most suitable planting density
- C. Prepare the soil
- D. Plant

A / THE GROUND'S CHOICE

- a. **Its climatic limit:** the black truffle (*Tuber Melanosporum*) is harvested in winter, and is susceptible to freezing in moist soils. It also needs a soil that warms up in the spring, when the mycelial activity starts.
- b. **Its geological limit:** *Tuber Melanosporum* grows only on calcareous soils (rich in calcium) with an optimal pH level between 7.5 and 8.3.
Regardless of what the soil types are, their composition should be lumpy and granular to ensure good drainage of the ground, good anchorage of the plants, good exploration by the mycelium of the fungus, and play a protective role against surface evaporation.
- c. **Its natural environment:** you increase your chances of success when planting in an environment that is similar to indigenous truffle habitat. The flora present on the plot is a good indicator: brambles, wild rose, dogwood, juniper, lavender, sheep fescue, sedum, erected bromine, sedge, these are good indicators.
- d. **Its cultural history:** truffle plants must be grown on cultivated land without recent deforestation. Indeed, forests maintain mycorrhizal fungi that could compete later with truffles and infect seedlings. The vineyards, grain fields, orchards and meadows are historically favourable lands.
- e. **Its physicochemical state:** to be certain of the soil chemistry, a physicochemical analysis of the land is to be performed by a specialized laboratory.

Truffle is an underground mushroom, it will require a ventilated, stoney high draining soil (tilth) without excess clay (less than 40%).

Chemically, the analysis will determine:

- its CaO content (exchangeable calcium of from 4 to 16%),
- organic matter content (1.5 to 8%) and the manner in which it is advanced into the ground (C / N close to 10),
- its mineral content: medium fertility without deficiency or excess.

The laboratory technician provides interpretation of the analysis and advice on possible corrections, or makes the conclusion to discourage planting.

After visiting your field and knowing more about your parcel, we will provide comments and may need to adjust some recommendations.

All the collected data should help to conclude if the land is favourable for truffle production or not.

Finally, soil biology and microorganism content is very important in establishing a successful truffle plantation. It is reassuring to detect the presence of galleries, insect larvae and ants in your soil ...

B / CHOICE OF TRUFFLE PLANT

The right choice of plant species is important. The rule is to plant what naturally thrives best in your particular habitat (biotope).

Species available to Agri-Truffe:

| SPECIES | DESCRIPTION | ADVANTAGES | DISADVANTAGES |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Green oak | <ul style="list-style-type: none"> - leathery foliage and persistent - no dormant in winter - Mediterranean origin | <ul style="list-style-type: none"> - well adapted to drought - Easy maintenance (no phytosanitary problems) - slow and steady growth - early production, - aesthetic as it remains green all year - the game does not like its prickly leaves | <ul style="list-style-type: none"> - sensitive to frost (less than -15°C) - avoid planting in frost sensitive period |
| Pubescent oak | <ul style="list-style-type: none"> - commonly known as "white oak" - it is the quintessential truffle tree - its brow, foliage remains present in winter, - hair system under the leaves | <ul style="list-style-type: none"> - Southwest shaft and altitude - long-term production - hardy tree and dormant in winter. | <ul style="list-style-type: none"> - production slower than the holm oak (about 8 to 10 years) - susceptible to powdery mildew and pests |
| Cerris oak | <ul style="list-style-type: none"> - very close to the pubescent oak - serrated foliage, hair system on and under the leaves, renewing itself faster than the downy oak | <ul style="list-style-type: none"> - rapid growth - early production (about 4 to 6 years) - dormant in winter - good resistance to powdery mildew and anthracnose | <ul style="list-style-type: none"> - less hardy than the downy, it prefers cooler land - strong growth which closes mid faster - dislike limestone excess (chlorosis) |

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| Hazel | <ul style="list-style-type: none"> - common - origin of the seeds: Négret berry variety | <ul style="list-style-type: none"> - rapid growth - early production (around 4 years) - dormant in winter; it does not frost - control of mycorrhizal easy with abundant and superficial root hairs | <ul style="list-style-type: none"> - its hairy root system easily traps unwanted fungus - slightly rustic, it prefers fresh and deep land - rapid growth which (closes mid faster) - low production sustainability - expensive work (trimming, suckers, parasitism) - the presence of hazelnuts attracts rodents! - fears limestone excess (chlorosis) |
| Hornbeam | <ul style="list-style-type: none"> - Common (betulus) - deciduous - intermediate behaviour between oak and hazel | <p>Benefits such as oak:</p> <ul style="list-style-type: none"> - Rustic (taproot) - dormant in winter - no suckers - sustainably produced <p>As hazel:</p> <ul style="list-style-type: none"> - hairy tracing (early production) - used as a hedge (hornbeam) | <p>Disadvantages hazel:</p> <ul style="list-style-type: none"> - chlorosis (excess limestone) - Rapid growth in ground pushing (middle closure) |
| Kermes oak | <ul style="list-style-type: none"> - Same as green oak with bushy habit, smaller leaves and aggressive. | <ul style="list-style-type: none"> - Same as oak, hardier used in dry and arid area - used as hedges | <ul style="list-style-type: none"> - Same as oak with the size problem (bushy) and for the dog as very pungent foliage! |
| Faginea oak | <ul style="list-style-type: none"> - Origin Spain and Portugal - intermediate between green oak and downy oak - tough and marcescens foliage. | <ul style="list-style-type: none"> - Benefits of downy oak and holm oak | <ul style="list-style-type: none"> - Disadvantages : between green oak and downy oak (hardiness, phytosanitary problems ...) |
| Lime | <ul style="list-style-type: none"> - common | <ul style="list-style-type: none"> - Same as hazel but lower growth - used sparingly, arboretum | <ul style="list-style-type: none"> - Same as hazel without suckers! - Production slower than hazel |
| Cistus | <ul style="list-style-type: none"> - cistus incanus to purple flowers - bushy aromatic shrub bushy | <ul style="list-style-type: none"> - mid-seeding - mulching (ditto lavender) - Facility size - resistant to drought | <ul style="list-style-type: none"> - Not resistant to frost the 1st year (to plant in the spring) - short lifespan (10 years max) |

Use 1-year old plants whose recovery is better on shallow ground than older and more established plants.

Planting density varies from 250 to 550 plants per hectare.

- **High density (ex 6 x 3 m, 555 plants / ha):** it is possible to achieve a faster production but orchard life is in turn shorter. Avoid this on fertile grounds and with cross planting of trees species such as hazel and oak tree.

- **Low density (ex, 6 x 6 m, 277 plants / hectare):** conversely, it is slower to start truffle

production, but has a longer orchard life.

C / THE SOIL PREPARATION

Soil preparation varies depending on the field and the previous crops grown.

It must be done carefully, timely and on dry ground.

Basically, it is the same planting technique used for grain production: tillage of 30 cm and avoiding any routing depth that could put back large pebbles, rocks or other poor surface soil compounds.

However, on land that has not been tilled for several years, using a ripper on planting line (40-50 cm) is recommended. It will aim to promote the installation of the oak taproot system and assuring a good supply of water later on.

Two possible scenarios are :

➤ **Plantation after soil preparation:**

It can be done on:

- old crops (vines, cereals): plowing cross shallow with disc plow and / or passage of a cultivator;
- associated crops (vines, lavandin): single planting with intercalated lines or on the row.

➤ **Plantation after intercropping 2/3 years (cereals, sainfoin, alfalfa)**

- Grazing and fallow: disassemble grazing (with a heavy harrow);
- Afforestation, scrub: grubbing evacuation of stumps and roots, and then shallow cross plowing with disc plow and / or farmer;

Remarks:

- Do not bury organic matter if the soil test revealed a $C / N > 10$;
- Restore drainage ditches that exist on the edge of the land;
- Connect orchard to a water source intended for irrigation.

Corrections:

- *If necessary, correct the soil pH by:*
 - a crushed limestone filler, or dolomite if the soil is deficient in magnesium,
 - liming if the soil is rich in organic matters that destroy lime
- *Acting on the organic matter and mineralization:*
 - if $C / N < 9$: put organic material rich in carbon (i.e. corn cobs)
 - if $C / N > 12$: put urea ammonium nitrate without burying the organic matter.

D / PLANTING

Decisive operation: bad planting procedures will delay the start of production and may result in losses of plants in the first year; Proper planting practices will ensure the tree has the best chance for healthy growth and the best possibility of healthy mycorrhizal development. In turn this will lead to truffle production.

- a. **The time:** The plants are delivered in pots; so, therefore we can plant until May before the most vigorous plant growth occurs.
For pubescent oaks, hazels and stalked plants, we recommend planting in November and December.
For oaks, we recommend planting, in November, so that seedlings can grow before the

cold winter, or in March / April, when the potential risk of frost is minimal.

b. Picketing: String lines and stakes can be used to hold netting to prevent rodent or other animal damage to young plants.

c. Planting itself:

○ ***Reception plants:***

- Upon receipt, out of their transport packaging by leaving them in their buckets;
- Store them in a dry, ventilated area away from frost and light in the case of oak trees.

○ ***Preparation of seedlings:***

To facilitate the removal of the growing pots, it is important to moisten the root ball or water the plants or completely immerse the buckets for several minutes.

○ ***Planting:***

- prepare cubic holes of 25 to 30 cm
- squeeze the whole pot and mound by hand so that the substrate does not dissociate from the root system
- open the jar unhooking the top downwards to release the sod
- take the sod carefully and position it in the hole
- fill the hole with fine soil around the sod till the top. Press well with both hands and finish filling the hole.

Warning! Do not add compost or peat because they are acidic materials

- Water (3-5 litres / plant according to your soil type) except during frost when watering will differ until spring. This eliminates air pockets and therefore promotes recovery
- Gently, put some more soil on the plants' feet, and create a bowl a few centimetres deep to hold rainwater about 15cm from the plant.
- Mulching, with black plastic, or with natural fibres (jute, for example) (avoid grass and hay that attract mice and has often been treated with undesirable fungicides) can then be installed to maintain a clean soil around the plant during the first years
- Place a stake 1 metre tall at least 10 cm from the plant, 6 to 10 cm in diameter if it is of wood; or a reinforced steel bar of 6 mm in diameter
- Place a safety net or a mini-greenhouse (Tubex).
