

Cultivate TUBER MELANOSPORUM

Driving an 'orchard' truffle is quite apart from what can be known in the world of fruit growing.

Indeed, in the case of the nose, we have to take into account both the plant support (air system) and the mushroom, truffle, (subway system) with which it lives in symbiosis and who will bear the fruit of harvest.

Any crop intervention should be rational based on these two elements, their vegetative stage, the environment in which they find themselves, and basically the ground.

Several techniques are possible routes: a method of intensive farming (tillage, fertilizing, watering, ...) to a more extensive method where nature takes precedence and why not, in some cases, an intermediate alternative mix 2.

In all cases, the goal remains the same, namely:

- For the host plant: make a good recovery after planting with steady growth, without excess, to allow the root system to properly colonize the soil.
- For truffles: allow it to remain on the root system and colonize the well to reach fruition.

We distinguish truffle's life 3 steps:

- I. **Installation of the plant**
- II. **Mushroom Development**
- III. **Phase fruiting**

At each stage, interventions should be carefully reasoned.

Intensive truffle farming is made when the plant is close to the place of residence, on arable land, watering, and when the farmer, with material, is present and can intervene when necessary.

The truffle can produce more rapidly, with quicker installed trees, but beware of excess development that can lead to unpleasant surprises.

Conversely, extensive truffle farming maybe more suitable for the patient who are more dependent on nature but, over time, can win the jackpot!

I. Installation phase of the plant

It lasts from 1 to 3 years, depending on the seedling growth rate. The key is to ensure good recovery of the plants throughout the year after planting; this is a guarantee of successful development of the trees in the following years.

In fact, what is expected of a plant during this phase is that it produces the maximum possible

fine roots because it is on the roots that one finds the mycorrhizae, the starting point of mycelial activity.

To obtain them, the immediate environment of the plant must be ventilated (weeding), free of herbaceous competitors (hand weeding), moistened (manual or using drip irrigation), the trees trimmed, and healthy for plant protection.

1) The maintenance of soil

* **Between rows:**

Preferably use a toothed tool (cultivator) for a very superficial work.

* **On the lines:**

Weeding at the foot of plant: hoeing or weeding when not using mulch to suppress weeds and aerate the soil (2 to 3 times per year 1 square meter around the plant during the first three years).

In spaced, hand weeding or mechanical advised to air the surface layer and avoid too much competition for the tree. Too clean and too worked soil is not to search. In grassy field, a few mowings a year.

2) Watering

In the conduct of watering, it is imperative to consider the following:

- ✓ **The plant essence:** oak that has a taproot system (deep), is less sensitive to drought than hazel which lateral root systems (superficial).
- ✓ **The needs of the fungus:** Truffle is xerothermophile: that is to say that she appreciates and drought and heat: excess water is more harmful than lack of water. The objective is to maintain the freshness around the root ball without excessive intake.
- ✓ **The outside temperature** must abstain watering in times of high gel to prevent, around the plant and root ball, a detrimental ice engaged to the survival of the young plant.
- ✓ **The growth stage of the plant:**

* During the winter dormant, the water requirement of the plant is zero.

The purpose of irrigation is, firstly, to ensure the recovery of the young plant and its development and that of mycorrhizae. Subsequently, this will provide fruiting bodies, the water being needed for their development *.

Installing drip or micro spraying system, sprinklers, watering manually or with a water tank are the ways the most used.

Water requirements can also vary:

* **The type of field:**

On sandy soil clean the inflows every 10 days during the summer. On clay soil clean the inflows every 20 days.

* **Rainfall:** a rain gauge gives the accurate measurement of rainfall; disregard isolated rainfall under 5 mm rain; consider the decadal or fortnightly global rainfall from 10 mm, whether one or more isolated precipitation of 10 mm represent a contribution of 10 litres per plant).

* **Cultivation:** hoeing is worth 2 watering's. In contrast, natural or artificial excessive weed at the foot of the plant quickly dries the ground.

Note: mulching (of 1 m²) realized by flat stones or degraded straw or black plastic provides excellent economics of water.

3) Trimming

It comes from the 2nd year in February / March (after the last frost, before bud break).

It allows the tree to have an airy foliage and the more spread out port possible: given the

correlation between air system and the underground system; we are looking for truffles, spreading root system.

As for the truffle, it needs a clear and sunny environment: we speak of a middle "open"; we will remove excessive vegetation under trees, including suckers. This is called the screen "inverted cone." While in the south of France, where sunlight is more important or less size low branches in more northern areas, we will ensure clear 20 to 25% of the base of the trunk.

4) The parasitism of young truffle plants

Do not use fungicides in systemic action because they affect mycorrhizal plants. The doses to be used are based on the commercial characteristics of each product. Refer to the instructions on the package. There is no product approved for truffles (user liability)

PARASITES	DESCRIPTION OF SYMPTOMS AND RISKS	WAYS TO COMBAT
1) CRYPTOGAMIC DISEASES (caused by a fungus)		
OIDIUM	* Foliage covered with white mycelial felting * general weakening of the plant young (recovery, growth) and thus indirectly of mycorrhizal	* Preventive chemical control by providing micronized colloidal sulfur and spray on plants late May to mid-June. * Not curative systemic fungicide, dinocap (Karathane) or Armicarb (□)
RUST	* Brown spots appear at the end of the summer and cause a drying of leaves * if the attack is important, photosynthesis is reduced and the young plant weakens	* Spray Bordeaux mixture to 2% at the onset of symptoms
ANTHRACNOS E	* Brown lesions at the end of lignified young growth and leaves falling * on herbaceous side shoots: cankers buds dying causing the stems of the stems	* Preventive spraying Bordeaux mixture in 2% pre-bud stage and autumn *deleting branches bearing cankers of vigorous size * possible treatments using the prochloraz (octave) to 46 g of active material per 100 litres of water (10 g Octave commercial product to 10 litres of water) every month from late May to August. The addition of mancozeb (Dithane M45) makes the most effective control.
2) INSECTS		
Caterpillars	* Caterpillars devour the leaves * decreased vigour of the tree * in the month of April, the larva bends young leaves to build a lodge within which it installs its cocoons * if the attack is important, photosynthesis is reduced and the young plant weakens	* At the onset of caterpillars, often from the bud of the trees treated with either "Karate K" or with Diflubenzuron (Dimilin Flo 0.3 l / ha) or equivalent active material (i.e. Deltametrine) * environmental control using a plant biological insecticide based Bactospein (predatory bacteria) as "Naturen".

Leopard moth (Lepidoptera)	* The leopard moth bores a gallery * Desiccation and death of branches	* Introduce a wire into the gallery to kill the caterpillar * cutting the portion of the branch containing the larva, export and burn.
RINGWORM (Lepidoptera) and leaf miners' weevils	* Caterpillars dig mines in the leaves * the epidermis (cuticle for oaks) rises on all or part of the leaf, dry and falls * if the attack is important, photosynthesis is reduced and the seedlings weaken	* Products used for the caterpillars are very suitable
Beetles (COLEOPTERA)	* Grubs attack the roots youth causing the death of the plant drying plant *	* Biological control with predators (nematodes) Bioverde-GREEN distributed by BHS
PHYLLOXERA (aphid pest of grapevine)	* Small yellow lemon and brown tasks on the leaves eventually fall * on the underside of leaves, there are small "aphids" oranges and small winged insects	* Preferably use a biological insecticide based on bacteria (bacillus thuringiensis) under various trade names (i.e. Dipel) * as for aphids, chemical control is possible with the Karate K (trade name)
3) BACTERIES		
BACTERIOSES OF HAZEL	Colonization by bacteria after injury (leaf fall, storm, hail and frost). Presence of brown lesions on the end of the rods and on the nodes. The bark can be cracked surface. Drying of the rod and tree decline.	Preferably use biological insecticide based on bacteria (bacillus thuringiensis) under various trade names as for aphids, chemical control is possible with the Karate K (trade name). Curative control: removal and burning of branches carrying cankers, during a severe pruning. Chemical control with a cupric product: using the Bordeaux Mixture.

II. Mushroom development

They arrive after the 4th year, when the trees are themselves installed and buds begin to appear:

it is proof of the good evolution of the mycelial activity: truffles are not far!

A. Ground work

All work must now be focused on the ecological cycle of the truffle.

It will no longer issue tillage or pass with heavy machinery in the late May truffle (training truffettes (truffles which start to born) to August (truffle magnification) and until the end of the harvest in mid-March.

2 possibilities to truffle:

- either continue the intensive tillage,
- or no longer work the soil.

Everything will depend in fact of the land: the soil of the truffle should be ventilated. This is an indispensable condition for the success of the culture. If the soil is compact (case of too clayey soils), there is little chance of observing a truffle production.

As in the first phase, the ground work is done using a cultivator, superficially, between 5 and 10 cm deep. Always using the cultivator in the same direction to avoid breaking the roots.

It is also good to move away gradually from the tree so as not to disrupt mycorrhiza in early activity. It is the working depth of the soil that determines the level of root systems and thus of future truffles (neither too deep nor too little!).

If you decide not to work the ground, it will maintain the natural vegetation or artificial to limit competition with herbaceous weeds and future truffles.

Without work, root systems will rise to the surface and thus, truffles; attention, they will be more sensitive to climatic hazards.

And no question of changing the way you work from one year to another. All would be lost!

B. Watering

We speak here of micro-sprinklers.

This is to maintain some freshness into the ground to help the growth of the mycelium and keep alive the mycorrhizal roots, and prevent soil becoming too dry during the spring and summer.

The mycelium of *Tuber Melanosporum* is very resistant to drought. Fortunately for the sustainability of natural sites or plots without irrigation, excess water is more harmful than a lack

Note that excess irrigation may also lead to the development of mycorrhizal competitors or other species such as truffles *Tuber brumale*.

It is best to set up mini-sprinklers that water the entire area occupied by the root system without provoking soil compaction.

Irrigation must be managed according to soil type: sandy soil, the risks of waterlogging are minimal, in clay soil, they are important.

Irrigation should compensate the water deficit. If the winter has been particularly dry, it may be necessary to water from the month of April to promote, from the first spring warming, the development of mycelial activity.

In summer, in the same way, with frequencies more or less close (2 to 3 times / month) depending on the soil type and input, one must offset poor rainfall.

This implies that one knows the characteristics of the soil and regularly observe the state of drought in the first 20 centimeters of soil where the future truffles will be situated.

It is also necessary to record the natural rainfall using a rain gauge that can be placed in an open area.

C. Weeding

With truffles, we prefer to recommend to be the most ecological as possible. All the more since one is not necessarily looking that the truffle area to be completely clean.

Around the plants, “burned” are making their cleaning work; and the inter-row vegetation can slow a too rapid growth of the root system. Again, do not go overboard if some herbicides, troubleshoot it when the truffle becomes overwhelmed by the weather.

D. Fertilizing

Only a soil analysis, renewed every 3 years, allows to accurately track the evolution of

various chemical and organic elements in the soil and correct if necessary. The laboratory technician will give any recommendations to fertilize or improve the soil.

Remember that the truffle becomes independent of its host plant when it is formed in late May, early June; it needs to eat to survive and grow until next winter. It seems that at that time, it needs some organic elements.

However, the rule is prudence; it is dangerous to play the sorcerer's apprentice and do too much.

Before adding anything, better give it a try on a few trees and then see the results. On the other hand, if you have concerns about the quality of the truffles you should monitor the calcium in the soil and amend as needed (provision of ground limestone).

E. Trimming

The seedlings were trained from the outset; essentially will consist then keep down well clear trees and to ensure that the lateral branches do not earn too much between the rows, always in the context of "inverted cone".

The hazel toughest carving can be done on several rods provided always on a sunny ground, guaranteeing a good spring warming.

F. Phytosanitary treatments

Gradually, as the trees reach adult age, you have less to worry about a small parasite that does not compromise the life of the plant.

On the contrary, sometimes when the trees grow too fast, parasitism may curb their excessive development (downy oak, Pedunculate, hazel).

The parasite most commonly observed on oak is powdery mildew which is characterized by the

appearance of a whitish powder on the leaves and the general weakening of the plant. It is treated with non-systemic fungicides based on sulfur or dinocap (trade name Karathane).

On hazel, the most common attack is due to bacterial disease which is manifested by necrosis on stems and drying of the branches. The only solution is to remove the affected branches and

burn them to prevent any spread. and possibly spend Bordeaux mixture. You must also thoroughly disinfect with bleach the shears that cut the branches.

III. Phase Fruiting

Eventually (Between the 6th and 8th, depending on the truffle orchard), we must think of training a dog to go to work constantly on the plantation.

Nevertheless, routine maintenance, depending on the situation, should be done:

- A light tillage especially if the ground is compacted. The truffles will be larger if the ground is soft. It is performed with the same rake, always at the same depth. This is done after the harvest of the truffles and before the birth of the next truffles. This will in addition add to the spring rains to better penetrate the soil and to limit the summer evaporation. You will monitor simultaneously the excessive vegetation (cutting grass, localization weeding) not to compete with the formation of new truffles.
- Watering: "a summer without rain gives a winter without truffles." During production, irrigation should allow both to get a good yield of truffles and keep alive mycorrhizae. Never forget that excess water is as damaging as lack of water and that it may permanently destroy a truffle. In the same way as the mushroom development, irrigation will be managed according to its ecological cycle but also the type of orchard's soil.

In May and June: at birth, according to the state of drought in the spring, a contribution of 30 mm / month in 2 or 3 times seems sufficient. This ensures the birth of a maximum of “truffettes”.

July seems less important for the truffle that grows little. Still, if this month's heatwave, some moisture will maintain these live births.

The crucial moment is still the first half of August when the truffle starts an active phase of growth and it multiplies its weight by 10 or 15 from a few milligrams to a few grams. At that time, a contribution of 60 mm water 2 or 3 times is highly recommended. As the saying goes "if it rains on St. Roch (August 16th), truffles grow on the rock! ".

The Back Season cannot be forgotten because in September / October, the truffle continues to grow. 60 mm in 2-3 times in September and around 30 in October will help ensure a good calibre of truffles in the ground.

In November and December, Truffles come into maturity phase thanks to the first autumn frosts; it will refrain from watering the risk of freeze truffles. Mulching with branches, straw or other there will also limit frost damage.

- Trimming: still practiced in winter, it will prevent the truffle to "close" too quickly and production decline. High density and provided intensive cultivation, it took severely cut throughout each stage, especially the pubescent oak.
