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BASIC PRINCIPLES OF PLANT PROTECTION FOR HEALTHY OLIVE FRUIT "ARISTOIL PLUS"

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INTRODUCTION

The quality of olive oil is directly linked to the health of the fruit. Polyphenols in particular are drastically reduced in the affected fruit. It is the producer's duty to be aware of the main risks that are likely to occur and what precautionary measures to take. The topics presented below, by the scientific collaborator of the programme, Dimitris Kostellenos, Agronomist, are the minimum that the olive grower should know well. The ARISTOIL series of programs aims to inform producers on the production of higher quality olive oil, rich in polyphenols. The stages to which particular attention should be paid are:

- Plant protection
- Harvesting (time, method, transport and storage of the fruit)
- The mill (time and conditions of fruit storage, two-phase technology, time and temperature of malaxing, minimising contact of the oil with water).
- Storage of olive oil - standardisation (direct filtration, INOX tanks, absence of oxygen, constant temperature of around 15^{o}C - 18^{o}C)
- Sampling for each tank and checking at least the chemical, phenolic and organoleptic characteristics.
- Handling - marketing (standardized products must not be exposed to temperatures > 25^{o}C).

The ARISTOIL PLUS project presents in this manual the basic principles of plant protection with texts by Dimitris Kostellenos and photographs by Georgios Kostelenos. All project staff as well as the Coordinating Partner EYXINI POLI, the partners SVIMED, Chamber of Commerce of Seville (CCSEV), VALDANOS, ANCO and the collaborating institutions (for Greece: AGRIDIATROPHIKI SYMPRAXI DYTIKIS ELLADAS, UNION OF NEW FARMERS, ELAIONES LIVA SA, VIOILIS) is at the disposal of any producer who requests information assistance for the above mentioned stages, in order to produce a healthy, fruity, polyphenolic olive oil.

Dr. Nikolaos Krimnianiotis
Coordinator of AristOil Plus project

PROTECTION OF OLIVE PLANTS FROM THE COLD

The resistance of olive trees to low temparatures depends on many factors, the most important of which are:

α) The variety,
b) The soil and climate conditions,
c) The cultivation cares - practices.

As far as the variety factor is concerned, there is NO olive variety that can withstand -18°C, not even -16°C. Therefore, since it is not possible to change the soil and climatic conditions of a region, particular attention should be given to the choice of varieties and the cultivation treatments to which the plants are subjected.

A cultural technique that is often used to harden off smaller and larger olive trees in low temperatures is the technique of two (2) treatments of Bordeaux mixture. In this case, two (2) treatments are made within 1 week (7 days) with Bordeaux mixture at the manufacturer's maximum indicated dose.

This technique is applied during the winter period, especially in those cases where the winter is mild with relatively high temperatures. Under such conditions the olive trees, because they do not go into complete dormancy, are particularly vulnerable to even moderate frosts.

By applying the technique of two (2) sprays of Bordeaux mixture, the olive trees are 'shocked' and a greater resistance to frost is achieved.

EFFECT OF LOW TEMPERATURES ON YOUNG OLIVE STEMS

EFFECT OF LOW TEMPERATURES ON OLIVE FRUITS

II. PLANT PROTECTION OF OLIVE TREES

The plant protection of olive trees could be divided into three broad areas for convenience:

1. The plant protection of young trees.
2. The plant protection of olive trees in production.
3. Plant protection of olive fruit.

IIa. PLANT PROTECTION OF YOUNG OLIVE TREES

Young olive trees require particular attention and care in terms of plant protection, the more so the smaller they are. This does not in any way means that older plants are in better situation. The opposite is true. However, older plants are more resistant to "neglect" which mainly concerns pests such as: olive leaf moth, olive weevil beetle, olive bark beetle, etc. and less so to minor importance diseases.

Most important of all is that young plants should not be attacked by pests and above all by diseases which in the future may undermine the viability of the olive grove itself, such as verticillium, armillaria, etc.

STEM ROTS

They are very common in the young of olive trees during the hot summer months. The fungi are pre-existing in the soil, are not carried over with the propagating material (Young trees) and attack the young olive trees at neck height, especially when the young plants are planted deep in the ground. A necrotic ring is formed at the neck level, the crown is dried out without the root rotting.

Treatment: During days of very high temperatures, avoid irrigation. If infestations are observed, remove the topsoil and apply one or two root applications with copper-based formulations or broad-spectrum fungicides.

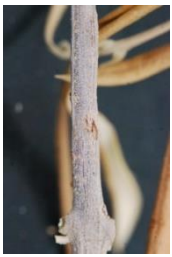
STEM ROT IN 1-YEAR OLIVE TREE (EXTERNAL SYMPTOMS)

STEM ROT IN 1-YEAR OLIVE TREE (SECTION OF THE YOUNG STEM)

OLIVE BARK WIDGE (*Resseliella oleisuga* Targ.)

It is an insect that attacks the young shoots of olive trees. The insect lays eggs in cracks or under the bark of young shoots. The larvae feed on the drying shoots.

Treatment: Careful pruning of the trees, removal of dead shoots and, in more serious infestations, spraying with appropriate insecticides.



OLIVE BARK WIDGE (EXTERNAL SYMPTOMS)

OLIVE BARK WIDGE (SECTION OF THE STEM)

OLIVE LEAF MOTH *(Palpita unionalis* Hubner)

It's one of the most common problems of young olive trees. Infestations begin in spring and end in mid-autumn. The perfect insects (butterflies) lay eggs on young leaves and young shoots. The larvae feed on the young leaves and young shoots, the flowers and even the young fruits. A characteristic symptom of olive leaf moth infestations is the tying of the tops with webs.

Treatment: Sprays are made with ecological insecticides such as "Bacillus Thuringiensis" or other insecticides.

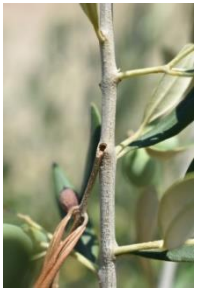
OLIVE LEAF MOTH

OLIVE LEAF MOTH

HYLESINUS – OLIVE TREE BORER (*Hylesinus oleiperda* F.)

It is a tiny insect of about 2.5 mm that attacks healthy branches and young shoots by opening tunnels at the knee level. The infestations dry out branches and young shoots.

Treatment: Keep the trees in good condition, remove and burn the dead branches and shoots and in the case of heavy infestations spray with insecticides.



HYLESINUS – TUNNEL AT THE STEM

HYLESINOUS – THE INSECT

OLIVE SCALE (*Saissetia oleae* Olivier.)

It is the most common and most harmful scale insect of the olive tree. It is favored by the abandonment of olive trees, lack of pruning, high atmospheric humidity, etc. It can cause great damage to young olive trees and older olive trees by drying shoots and reduced fruitfulness. Favors the growth of fungi such as *Capnodiun*, *Cladosporium* etc. that blacken trees.
Treatment: Good tree aeration, pruning, cupper treatments and treatments with youth hormone mimetic formulations that are not toxic to other insect pests of the olive scale.

OLIVE SCALE

OLIVE SCALE

OLIVE WEEVIL BEETLE (*Otiorrhynchus cribricollis* Gyll.)

It is a 7-8 mm long insect that attacks young vegetation and young leaves of trees. The infestation is characterised by serrated peripheral teeth on the leaves.
Treatment: In the case of severe infestations, spraying with insecticides.

OLIVE WEEVIL BEETLE

OLIVE WEEVIL BEETLE

OLIVE PSYLLID (*Euphyllura olivina* Costa.)

It is an insect characterized by its white waxy secretions. It usually does not cause damage. In severe infestations it may cause flower drop and consequently a reduction in production.

Treatment: Usually no treatment is necessary. In heavy infestations, treatments are made with insecticides to which wetting agents must be added to enable them to penetrate the waxy secretions.

OLIVE PSYLLIDE

OLIVE PSYLLIDE

ERIOPHYID MITES (*Eriophyies oleae, Oxycenus maxwelli, Tegolophus hassani* etc.)

Eriophyid mites attack young leaves in the spring and summer months and on mature trees the fruits causing deformities. Unlike other mites, they are not visible to the naked eye.

Treatment: Spraying with Abamectin, summer oil, sulphur (S), or sulfur (S) with CaO.

ERIOPHYID MITE INFECTION (UPPER SIDE OF THE LEAVE)

ERIOPHYID MITE INFECTION (BOTTOM SIDE OF THE LEAVE)

OLIVE BARK BEETLE (*Phloeotribus scarabaeoides* Bern.)

It is one of the serious pests of the olive tree that attacks mainly weak trees. A characteristic symptom is the opening in the bark of vertical tunnels up to the cambium and then 2 tunnels in the opposite direction perpendicular to the axis of the branch and towards the entrance tunnel. Perpendicular to these 2 main galleries are several secondary galleries up to 30 cm long. The insect causes drying of branches and trees.

Treatment: Infested branches should be removed and burnt, no piles of cut branches should be left without being sprayed with insecticides and finally care should be taken to ensure that the trees are not weak.

OLIVE BARK BEETLE (EXTERNAL SIMPTOMS)

OLIVE BARK BEETLE. (SYMPTOMS BELOW THE PHLOEM)

OLIVE KNOT (*Pseudomonas savastanoi subsp. savastanoi*)

Olive knot is a bacterium that mainly affects young shoots, branches, but also the fruit and leaves of the olive tree. It is favored by high atmospheric humidity and any cause that causes wounds to the trees (frost, harvesting by beating with sticks, strong winds, etc.). It usually does not cause economic problems to trees and rarely can dry trees. A characteristic symptom of the disease is the black bumps.

Treatment: Trees should not be damaged, propagating material should be healthy, severely affected shoots and branches should be removed by pruning and finally, regular cupric-treatments should be carried out.

OLIVE KNOT

OLIVE KNOT

OLIVE LEAF SPOT (*Spilocaea oleagina* Hugh.)

It is the most important disease of the olive leafs. It also attacks young shoots, fruit peduncles and fruits. It is favored by high atmospheric humidity and dense foliage of trees, causing mainly defoliation. The characteristic symptom is round brownish-black spots with a chlorotic rim (aloes).

Treatment: Planting of olive leaf spot resistant varieties in very humid areas, appropriate pruning of olive trees canopy for better aeration, spraying with copper or other formulations which in sensitive olive varieties should not be less than 3 (the 1st at the beginning of autumn, the 2nd after harvesting or else at the end of November and the 3rd at the beginning of spring), and finally burying in the ground of fallen leaves from the trees in spring.

OLIVE LEAF SPOT

OLIVE LEAF SPOT

VERTICILLIUM WILT or DIEBACK OF OLIVE (*Verticillium dahlia* Kleb.)

It is consistently the most important disease of the olive tree. It attacks olive trees mainly from the root system and leads to drying in two forms: a) apoplexy and b) hemiplegia, i.e. progressive drying of the branches first and then of all the trees. A typical symptom is dry branches on the trees. Similar symptoms are caused by other diseases such as *Phoma incompta*, *Xylella fastidiosa* etc. and it is therefore necessary to identify the pathogen.

Treatment: Purchase of healthy propagating material, avoid transport of the infection by other means (tools, machinery, etc.), avoid drench irrigation, reduce nitrogen fertilizers and irrigation and in areas where the infection is endemic, use of resistant rootstocks and planting of verticillium wilt resistant varieties.

VERTICILLIUM WILT

VERTICILLIUM WILT

OLIVE FLY (Bactrocera oleae Gmelin)

It is the most serious pest of olive fruits. The insect overwinters mainly in the soil. In summer the females begin to lay eggs on the olive fruit with the first infestations occurring in June and July. Fungi often grow on the infected fruits and destroy the fruit on the trees. The best temperatures for the development of the blight are between 20ºC and 28ºC. Very high temperatures during the summer they do not favor the spread of olive fly.

Treatment: The control of olive fly populations is done with traps and based on the number of insects in them; the decision to control the olive fly is made. To combat the insect, spraying is done from the ground or from the air or bait spraying, or biological control. The fight against the olive fly is one of the most serious issues in olive growing worldwide.

OLIVE KERNEL BORER (*Prays oleae* Bern.)

It is the second most serious pest of the olive tree. The insect attacks the flowers in April, the fruit from the beginning of June and the leaves from the end of autumn. It causes damage to the flowers and major damage to the fruit, which suffers fruit loss immediately after fruiting and also in autumn. Infestations on the leaves are of no economic importance. High summer temperatures are not favor the spread of the olive kernel borer.

Treatment: Control of the olive kernel borer populations is done with "Δ" type traps. Spraying is used to control it during flowering. The most important insecticide for its control is “bacillus thuringiensis”. Insect growth regulators can also be used to control the insect on fruit. For best results it is preferable to treat against olive kernel borer at the flowering stage.

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George Kostelenos - Agronomist

Dimitrios Kostellenos - Agronomist

Dimitris Kostelenos is an Agronomist, continues research on olive tree varieties and olive tree culture, where his father **George Kostelenos,** Agronomist, has been active for decades. Parents and children, all of them scientists in Agriculture, specialized in Plant Production, maintains in Trizinia province the most niche nursery on olive trees in Greece, OLEA G. KOSTELENOS NURSERIES and probably the only one not state - independent olive research center in Greece, where they study and propagate all the indigenous olive varieties of the Greece and beyond.

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