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OLIVE PRODUCTION INTEGRATED PEST MANAGEMENT GUIDELINES

Agriculture Directorate



Agriculture Research
& Innovation Hub



AgriConnect

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PLANT PROTECTION PRODUCT AUTHORISATION

Plant protection products (PPPs) need to be authorised by the MCCA to be placed on the Maltese market in accordance with the provisions of Regulation (EC) No 1107/2009 implemented in Malta through Subsidiary Legislation S.L. 430.07, Plant Protection Products (Implementation) Regulations, issued under the Pesticides Control Act (Cap. 430).

A list of authorised PPPs can be found on the MCCA website:
<https://mcca.org.mt/Section/Content?contentId=1158>

It is the legal obligation of all farmers and professionals making use of PPPs to consult the list prior to the purchase or application of any products to ensure their authorisation, even if they are listed in this publication. One can contact AgriConnect for further assistance.

For PPPs listed in this publication but currently not yet authorised, the Agriculture Directorate encourages farmers, farmer representatives and commercial entities to contact AgriConnect, which will provide information and assistance in the authorisation process of products containing such substances.

Colour code for substances listed in this guideline.

- Authorised for use in the Maltese Islands.
- Can be authorised for use.
- 🌿 Organic.
- 🌱 Beneficial insect.



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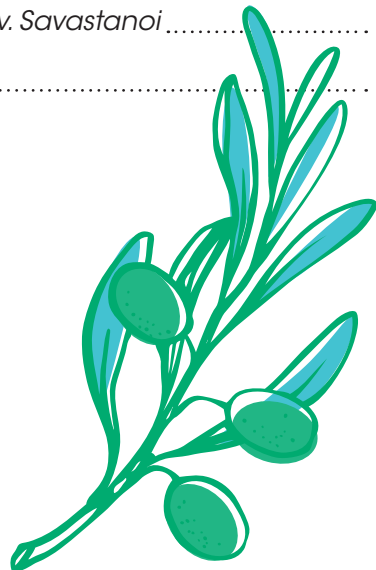
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Olive Fruit Fly

Bactrocera oleae

The olive fruit fly is a widespread and major pest for olive trees in Malta, causing damage that has a significant economic impact and requiring annual management. Untreated infestations can result in 80 to 100% of olives being affected.

The adult olive fruit fly is 4–5 mm in length. The head, thorax and abdomen are predominant orange-brown to black, and the thorax has yellow patches on each side. Wings are transparent with dark veins. The female olive fruit flies oviposit the eggs below the skin of the olive fruit with one egg laid at a time. Females can lay over 200 eggs. The eggs hatch within 2 to 4 days and the larvae feed for an additional 10 to 14 days. The larvae are monophagous, feeding on olive fruit pulp, causing premature fruit drop and resulting in yield reduction. Pupation can take place in the soil or in the olive fruit. Puncture marks caused by the oviposition hole and exit holes may be observed on the fruit. Adults live for 1 to 2 months.

Over the period of a year there could be between 3 to 7 overlapping generations depending on temperatures. Optimal temperatures for larval development are between 20 to 30°C and peak periods are April to May and September to October.

○ Management and Control

It is compulsory to place yellow pheromone traps or colour-attractive traps from 1st June to 30th October. It is advisable to deploy traps at a rate of 1 trap per hectare. Upon capture of the first flies, start the weekly sampling of the drupes to ascertain the presence of insect lesions.

○ Preventive chemical interventions

Apply poisoned protein-based lures containing deltamethrin, spinosad or acetamiprid. Alternatively, install attractive devices, possibly with pheromone or 'Attract and Kill' type solutions. At the first signs of fly injuries to the olive drupes, treat the sun-exposed parts of the trees with a solution of 1L of spinosad in 4L of water, using 5 L of mixture per hectare. Spray solution must be applied every 3 olive rows.

O Chemical curative interventions

Take action when the following thresholds are exceeded:

- For oil olives, depending on the variety, take action when 5–10% of have been infested fruits. The percentage of an active infestation is determined by collecting a sample of olives from various trees in the field (generally 50 fruits) and checking the presence of eggs and larvae by examining if the drupes exhibit entrance holes and/or tunnels on the drupes. If 3 out of 50 fruits are affected, this indicates a 6% infestation.
- For table olives, only in suitable areas and under intensive olive cultivation, take action using chemical means in the presence of the first fruit lesions.

PEST PROTECTION SUBSTANCES AND DEVICES

🌿 *Opius concolor* (beneficial insect) 🌿

● *Beauveria bassiana* 🌿

● Attractive devices, protein-based lures of the attract and kill type

● Spinosad (1) 🌿

● Acetamiprid (2) (3)

● Flupyradifurone (2) (4)

LIMITATIONS OF USE & SPECIAL CONDITIONS

(1) Should be used as ready-to-use bait and with a maximum of eight applications per year.

(2) Do not exceed two curative-type interventions (treatments against larvae) regardless of the the active substance used.

(3) Do not exceed two interventions per year regardless of adversity or crop.

(4) Do not exceed one intervention per growing period



Bactrocera oleae adult ¹



Exit holes of olive fruit fly larvae ²

Olive Kernel Borer

Prays oleae

The olive kernel borer, also known as olive moth, is considered one of the major phytophagous pests harmful to olive trees. The insect has three generations, each generation capable of feeding on different parts of the olive plant (fruit and kernel, foliage, and flowers), hence affecting the plant during the flowering stage, the fruiting stage and the vegetative growing stage. The highest damage the *Prays oleae*³ causes is when the adult appears in the months when the olive fruit starts to form. The adult lays its eggs on the olive. In the larval stage, the larva pierces through the olive, boring into the centre and through the olive kernel before it hardens.

○ Management and Control

It is advisable to use pheromone traps in May to identify the second generation larvae (fruit generation) that give rise to the carpophagous generation.

○ Agronomic interventions

Yearly pruning can be used as a preventive measure to open up the canopy since dry conditions hinder insect development.




A larva eating a leaf of an olive tree, leaving a leaf mine²

O Chemical curative interventions

Take action before the fruit pit hardens when the following thresholds are exceeded:

- 5–7% of infested drupes for table olives;
- 10–15% of infested drupes for oil olives.

PEST PROTECTION SUBSTANCES AND DEVICES

- Acetamiprid (1)
- Spinetoram (2)
- *Bacillus thuringiensis* 

LIMITATIONS OF USE & SPECIAL CONDITIONS

With the exception of *Bacillus thuringiensis*, do not exceed more than one treatment and apply only during the carpophagous developmental phase.

(1) Not more than one intervention per year.

(2) Not more than two interventions per year regardless of disease or crop.

Prays oleae adult.³



Olive Leaf Moth

Palpita unionalis

Palpita unionalis is another major secondary pest that is common in Malta. Adults have an average size of 13mm and a wingspan of around 18mm for both males and females. The adult can be characterised by semi-transparent or white wings that have a sheen, with a brown edge of the forewing. Young larvae consume entire leaves and buds in the first generation. If they reach a high population level in the second generation they feed on fruits and seeds. Due to the consumption of leaves and shoots, the olive leaf moth causes the most significant damage to young trees, especially in nurseries, and may prevent their healthy development.

○ Management and Control

○ Agronomic interventions

For adult olive trees, it is advisable not to prune the sucker branches during the vegetative period. Suckers act to attract the insects at the expense of the main plant.

○ Chemical interventions

Intervene in the presence of the first larval stages.

PEST PROTECTION SUBSTANCES AND DEVICES

- Pyrethrin 
- Mineral/Paraffin oil 

LIMITATIONS OF USE & SPECIAL CONDITIONS

- (2) Do not exceed one application per year.
- (3) Do not exceed one application limit per year of Tebuconazole and Difenconazole regardless of disease or crop.
- (4) Do not exceed one application per year regardless if disease or crop.



Palpita unionalis moth ⁴

Olive Scale

Saissetia oleae

Saissetia oleae is a scale insect that in its mature stage appears on stems or the underside of leaves as dark grey or brownish-black sessile lumps that look like scales. Insects in their mature phase are easy to spot on the plant. The olive scale is generally a parthenogenetic species. Each female lays approximately 1,000 eggs. After they hatch, generally April to May, the crawlers find a suitable place to settle, which is commonly not far from the parent female, forming a high density aggregation of olive scale. Similar to other scale insects, olive scale colonies feed on sap and extract large quantities that weaken the host plant. Olive scale also lead to honeydew deposits that may cause sooty moulds on the leaves.



*Olive scale insect feeding on a twig*⁵

Chilocorus bipustulatus adult⁶

○ Management and Control

○ Agronomic interventions

Promote the aeration of foliage by pruning and remove branches that show high rates of infestation.

○ Chemical curative interventions

Start monitoring the pest population from April. Only intervene using chemical treatments when the insect has no signs of parasitization or is attacked naturally by the ladybird *Chilocorus bipustulatus*. When this is not the case, treat chemically when the spring thresholds of 10 nymphs per 10cm of twig of the same year or 5 nymphs per leaf are exceeded. If the threshold is exceeded, intervene in the summer in an advanced migration phase of the insect.

PEST PROTECTION SUBSTANCES AND DEVICES

- Mineral oil 



Olive Psyllid

Euphyllura olivina

Euphyllura olivina is a common secondary pest in Malta which causes damage of little economic importance. The olive psyllid is part of the *Psyllidae* family of insects which are commonly referred to as jumping plant lice. Adults are dull green to grey in colour and their forewings are spotted with small black dots. The adults are approximately 2mm long. The nymphs are smaller and have a flattened body with a light green or yellowish colour. The nymphs and adults damage the plant by extracting sap, taking nutrients from the plant. The nymphs secrete a white sticky wax, that when accumulating on the foliage, may stimulate premature flower drop. The insect also produces honeydew that may result in sooty mould.



Secretions made by Euphyllura olivina on leaves of an olive tree ⁷

Adult Olive Psyllid (Euphyllura olivina) ⁸

○ Management and Control

○ Agronomic interventions

Promote the aeration of the foliage with regular pruning.

Olive Tree Borer

Phloeotribus scarabaeoides, *Hylesinus oleiperda*

These bark beetles feed on the wood of the olive trees in both their adult and larval stage. The adults are around 2.5mm in length, have a dark brown colour and are covered in dense yellow hair. The adult bores galleries in twigs and broken branches, laying eggs underneath the bark. The larvae continue feeding on wood underneath the bark. Already weakened trees are more susceptible to this pest.



Phloeotribus scarabaeoides adult ⁹



Hylesinus oleiperda adult ⁹



Bored galleries on living olive tree ¹⁰

○ Management and Control

○ Agronomic interventions

Maintain the olive grove in good condition by applying standard agriculture management practices. Take care to eliminate decaying and infested branches and twigs.

○ Physical interventions

Leave bundles of pruned branches in the olive grove as bait for insect oviposition. Burn the deposited branches before the adult insects fly off (circa April), after noticing the typical insect mastication signs.

Olive/Apple Tree Beetle

Otiorhynchus cribricollis

This weevil is a pest of olive trees as well as apple trees and vines. The pest is considered as a secondary one in olive orchards due to ease of management with mechanical interventions. The adult female weevil is of a brown colour, is around 7 to 8 mm in length and has no wings. The weevil is most active at night. If unmanaged the adult weevils damage the foliage of the olive tree by feeding on tender leaves.

○ Management and Control

○ Mechanical interventions

Apply a band of glass wool around the stem to prevent adults from climbing during the period of maximum insect activity (May to June and September to October).

PEST PROTECTION SUBSTANCES AND DEVICES

- Glasswool bands are to be applied to the trunk to prevent the insect from climbing up the plant. 🌿



Otiorhynchus cribricollis adult.¹¹ Damage on margins of leaves caused by feeding.¹²



Verticillium Wilt

Vertici

Verticillium wilt is caused by a soil-borne fungal pathogen that may lead to reduced yields and tree mortality. The fungus can survive in the form of microsclerotia in the soil for over 10 years. Infection of olive trees starts through the root system. Once in the xylem vessels, the pathogen spreads through a mycelial network and eventually becomes a systemic pathogen. This results in leaf necrosis and defoliation, induces branch dieback.

○ Management and Control

○ Agronomic interventions

- Avoid cropping with susceptible plants (tomato, eggplant, etc.);
- Avoid injury to the root system;
- Remove and burn the dead branches below 20-30cm from the point of infection;
- Disinfect pruning tools with sodium hypochlorite or concentrated Bordeaux mixture.

Wood Leopard Moth

Zeuzera pyrina

The leopard moth feeds on various fruit trees, including olives. The adult is identifiable through its pattern – white wings with black or dark blue spots.

Wingspan varies between females and males, ranging between 40 to 60mm. The larvae are around 50mm long and bright yellow, with numerous black spots on each segment with a shiny black head. Larvae can attach to leaves, buds and young shoots and bore into tips of branches when they are young. Feeding of the larvae continues for 2 years with larvae attacking larger branches and trunks by boring galleries, leaving frass and wood dust at entry holes.

Damage may be severe if untreated, making the tree more susceptible to other pests and pathogens.

○ Management and Control

If the presence of the phytophagous (leaf-eating phase) has been detected, place pheromone traps to monitor moth presence in the highest part of the canopy. Traps have to be in place by the end of April and organised at least one per homogeneous plot.



Zeuzera pyrina
female adult moth ¹³



Zeuzera pyrina larva ¹⁴

○ Pheromone interventions

Mass capture of adult males can be useful and can be achieved, by placing the appropriate pheromone traps at the end of April, on the highest part of the canopy, at a rate of at least five per hectare. Traps must be ideally replaced every four weeks until the end of September.

○ Physical interventions

During the early stages of pest detection, destroy those twigs which show initial signs of infestation. During later stages of infestation, when holes in the branches have been noted, a filament iron wire can be introduced gently in the hole to destroy the large larvae.

PEST PROTECTION SUBSTANCES AND DEVICES

- Mass capture with pheromone traps
- Sexual confusion



Damage caused by larvae. Entry/emergence hole with frass and wood dust ¹⁵

Olive Peacock Spot

Spilocaea oleaginea



Olive peacock spot is caused by a fungal pathogen that can result in leaf abscission, reduced yield and stunted growth of olive trees. The pathogen creates a spotted effect on the leaves and causes blemishes on the fruit.

○ Management and Control

○ Chemical interventions

Intervene in the period November to March, when leaves start showing signs of infection and when this coincides with the climatic conditions that promote such disease.

PEST PROTECTION SUBSTANCES AND DEVICES

- Copper-based products (1) 
- Azoxystrobin + Difenoconazole (3)
- Dodine (2)
- Pyraclostrobin (4)
- *Bacillus subtilis* strain QST 713 



Peacock spot effect on olive leaves ¹⁶

LIMITATIONS OF USE & SPECIAL CONDITIONS

- (1) Do not exceed the cumulative application of 28kg of copper per hectare over 7 years and do not exceed the average quantity of 4kg of copper per hectare per year.
- (2) Do not exceed one application per year.
- (3) Do not exceed one application limit per year of Tebuconazole and Difenconazole regardless of disease or crop.
- (4) Do not exceed one application per year regardless of disease or crop.



Anthracnose

Colletotrichum gloeosporioides

Anthracnose is caused by the fungal pathogen *Colletotrichum gloeosporioides* that affects olives before and after harvesting. Symptoms are mainly observed on immature and mature olive fruit, resulting in brown spots, sunken lesions, orange spore formation and fruit mummification. The fungal disease can also impact other parts of the tree, affecting leaves and branches.

○ Management and Control

○ Agronomic interventions

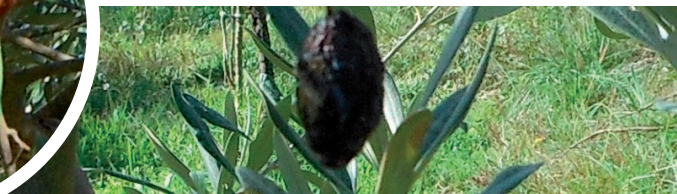
- Ensure adequate tree spacing;
- Carry out yearly pruning and aeration of the canopy;
- Anticipate the harvesting of olives;
- Remove mummified olives still attached to the tree.

○ Chemical interventions

The interventions must be carried out in the veraison phase if the climatic conditions favour the occurrence of high humidity.





Anthracnose damage on tip of a drupe ¹⁷



Fruit drying and mummification ¹⁷

PEST PROTECTION SUBSTANCES AND DEVICES

- Copper-based products (1) 
- *Bacillus subtilis* strain QST 713 
- (Tebuconazole (4) + Tyfloxystrobin) (2)
- Pyraclostrobin (3)

LIMITATIONS OF USE & SPECIAL CONDITIONS

(1) Do not exceed the cumulative application of 28kg of copper per hectare over 7 years and do not exceed the average quantity of 4kg of copper per hectare per year.

(2) Apply not more than one intervention per year and between vegetative regeneration to pre-flowering phase.

(3) Do not exceed one intervention per year regardless of disease or crop. Do not intervene after July and allow a minimum of 120 days prior to harvest before final application.

(4) Do not exceed one application limit per year from Tebuconazole and Difenconazole regardless of disease or crop. Treatments carried out against *Spilocaea oleaginea* are also applicable against *Colletotrichum gloeosporioides*.

Olive Knot

Pseudomonas savastanoi pv. *Savastanoi*

Oleander knot or olive knot is caused by a pathogenic bacterium. The disease manifests in the form of hyperplasia on the branches and stems forming tumours/knots and less frequently on leaves and fruit. The pathogen can spread by infecting tissue through wounds/fissures, and dispersed through rain, aerosols or agricultural practices. The disease is mostly severe during years of very heavy rainfall.



Twigs of olive tree with a tumour/knot caused by *Pseudomonas savastanoi* ^{2,18}

○ Management and Control



○ Agronomic interventions

- Eliminate and burn affected branches;
- Prune during dry weather conditions;
- Disinfect the surface having open incisions with copper-based healing pastes.

○ Chemical interventions

Only intervene in the case of meteorologic events that may cause injuries such as hail storm or very strong winds that can damage the twigs and branches.

PEST PROTECTION SUBSTANCES AND DEVICES

- Copper-based products 
- *Bacillus subtilis* strain QST 713 

LIMITATIONS OF USE & SPECIAL CONDITIONS

Do not exceed the cumulative application of 28kg of copper per hectare over 7 years and do not exceed the average quantity of 4kg of copper per hectare per year.



PHOTO REFERENCES

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