

DISEASE CONTROL

Preventive control of the disease can be achieved using seeds of sunflower varieties resistant to the known races of the pathogen. To avoid the introduction of new physiological races of the pathogen, the use of seeds coated with systemic fungicides is highly recommended. With this respect in 1996, the NPPO established that sunflower seeds coming from Third Countries had to be treated with metalaxyl or other fungicide effective against the pathogen. In case that disease symptoms were detected in the field, it is strongly recommended to promptly eliminate the infected plants to avoid secondary infections. Besides, it is very important to apply long crop rotations to prevent the inoculum accumulation in the soil.

RECOMMENDATIONS

Since the importation of infected seeds may cause the introduction and dissemination of pathogen's new races in Italy, it is recommended to apply what specified in Legislative Decree n° 214/2005, transposing the Dir. 2000/29/EC. All the sunflower seeds coming from EU Member States must be produced in disease free areas, or adequately treated, with the exclusion of the varieties resistant to all the *P. halstedii*'s races currently present in the production areas. The same requirements are compulsory for sunflower seeds coming from Third Countries.



Fig. 6 - Infected plants should be promptly eliminated to avoid the spread of disease.

Please communicate symptoms occurrence to:
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PLASMOPARA HALSTEDII

TECHNICAL SHEET FOR RECOGNIZING QUARANTINE PESTS
(DIRECTIVE 2000/29/CE AND FURTHER MODIFICATIONS AND INTEGRATIONS)

Disease: Sunflower downy mildew

Causal agent: *Plasmopara halstedii* (Farl.) Berl. et de Toni (sin. *Plasmopara helianthi* Novot.)



Fig. 1 - Size reduction of the plant is due to an early primary infection of downy mildew

HOSTS

The disease affects either cultivated and wild Composite plants. The most economically important host is the sunflower (*Helianthus annuus*). Among wild plants, genera *Helianthus*, *Artemisia* and *Xanthium* are also reported to be affected by the disease.

GEOGRAPHIC DISTRIBUTION

Plasmopara halstedii originated from North America and is nowadays present in all the sunflower growing areas of Africa, Asia, New Zealand and Europe. In Italy, the disease was first reported in 1949 in Friuli region, likely introduced through infected seed. The disease spread quickly in the early '70s causing heavy damages. At present, the introduction of new resistant varieties and the compulsory seed coating have reduced its economic impact. Several races of the pathogen are known. At present, only race 1 (European race) and 2 (Red River) are reported in Italy.

SYMPTOMS

Disease symptoms vary depending on the kind of infection and the crop stage of the plant. Early primary infections usually begin with a growth halt and sudden death of the young plant. Late infections appear as stunted plants compared with healthy ones, with shorter internodes and erected calatids. On leaves, pale green or chlorotic areas develop localized on the main veins. In humid conditions, a whitish mycelium bearing hyaline sporangia appears on the bottom side of the leaves. Calatids are generally sterile or producing few infected seeds because the fungus mycelia are localized on achen tissue. Secondary infections affect adult plants only. On the upper side of the infected leaves, typical white fructifications may form. Secondary infections cause no damage to the plant, which apparently grows normally. However, they are important as they represent a dangerous source of inoculum. Secondary infections may also appear as latent infections, therefore not affecting the plant growth, but at the end producing infected seed.



Fig. 2 - Upstanding infected sunflower calatide containing sterile seeds.

EPIDEMIOLOGY

Infections begin from oospores in the soil, on crop residues and infected seeds. From dormant oospores, a macrosporangium germinates and develops, releasing several zoospores, that in turn, when close to the host plant, germinate and penetrate the vegetal tissues producing intercellular mycelia systemically invading the whole plant. Sporangia forming on the leaves are dispersed by the wind or rain splash, produce secondary infections and spread the disease to healthy plants. Infected seeds are the main source of inoculum for long distance infections and permanent contamination of disease-free soils. The pathogen, once established in the soil, may survive up to 8-10 years on infected crop debris. The disease is strongly influenced by humid climates. Since zoospores need humidity to germinate, prolonged rainy periods and frequent irrigations, particularly during the first two three weeks after the sowing, favour the occurrence of primary infections.



Fig. 3 - With high relative humidity, a typical whitish mycelium appears on the lower side of the leaves.



Fig. 4 - Symptoms of downy mildew on the upper side of the leaves.



Fig. 5 - Symptoms of secondary infections affecting adult plants.