

## INTEGRATED PEST AND DISEASE MANAGEMENT IN SWEET CHERRY AND PLUM ORCHARDS

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### Abstract

High quality fruit yields is impossible without effective control of pests and diseases. The methods chosen must be those that present the least danger to humans, animals and environment, while providing effective control of pests and diseases.

Sweet cherries are one of the most attractive fruits in terms of both taste and nutrition. The most damaging pests and diseases, present in the sweet cherry orchards in Dâmbovița County, are: *Rhagoletis cerasi* – the european cherry fruit fly, *Myzus cerasi* – the black cherry aphid, anthracnose caused by the fungus *Blumeriella jaapi* and the brown rot disease produced by *Monilinia laxa* and *Monilinia fructigena*. A good protection of the sweet cherry culture requires 9 treatments, both during the vegetative rest period and during the vegetation period - 5 chemical and 4 biological treatments.

The plum culture occupies one of the largest areas of fruit cultivation in our country, due to its ability to adapt to different environmental conditions, the organoleptic properties, the nutrient content, multiple processing possibilities. In Dâmbovița County the most important pests and diseases are: the plum fruit moth – *Cydia funebrana* and the San-José scale - *Quadraspidiotus perniciosus*, the red leaf spot of plum produced by *Polystigma rubrum*, the shot hole disease produced by the *Stigmina carpophila* fungus and the brown rot disease produced by the *Monilinia laxa* fungus. A good protection of the plum crop requires 9 treatments, which involve the use of 5 chemicals and 4 biologicals.

Keywords: sweet cherry, plum, resistance, diseases, pests

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### 1. INTRODUCTION

Sweet cherries are one of the most attractive fruits in terms of both taste and nutrition.

High and good quality yields requires crop protection against pests and diseases, which must be done rationally so that the level of harmful populations does not exceed the economic damage threshold, pollute the environment as little as possible, and toxic waste of fruit does not exceed the maximum permitted limit.

The most damaging pests and diseases, present in the sweet cherry orchards of Dâmbovița County, are: *Rhagoletis cerasi* - the european cherry fruit fly, *Myzus cerasi* - the black cherry aphid, anthracnose caused by the fungus *Blumeriella jaapi* and the brown rot diseases produced by *Monilinia laxa* and *Monilinia fructigena*.

The plum culture occupies one the largest areas of fruit cultivation in our country, due to its

ability to adapt to different environmental conditions, organoleptic properties, nutrient content, multiple processing possibilities. In Dâmbovița County the most important pests and diseases are: the plum fruit moth - *Cydia funebrana* and the San-José scale - *Quadraspidiotus perniciosus*, the red leaf spot of plum caused by *Polystigma rubrum*, the shot hole disease caused by *Stigmina carpophila* fungus and the brown rot blossom blight caused by *Monilinia laxa*.

### 2. MATERIALS AND METHODS

Data from the literature were used and pesticides were taken from the catalogs of approved plant protection products.

The insecticides and fungicides of synthesis used in the control scheme have low toxicity, and the biological treatments consisted in the use of products based on bacteria and fungi, as

well as in the placement of traps with sex pheromones.

### 3. RESULTS AND DISCUSSION

The production of high quality sweet cherries is impossible without an efficient control of pests and diseases. Consumers of sweet cherries and other stone fruits are justifiably concerned about the contamination of the fruit with pesticides. Environmental protection regulations and the disadvantages of using chemicals have prompted the development of environmentally friendly pest control methods. Production of high quality cherries is impossible without effective pest and disease control. (Kutinkova and Andreev, 2004)

The selected method should be the one which poses the least hazard to humans, livestock and the environment, while providing effective pest, disease or weed control (Pelov et al., 1996; Tonev et al., 1999).

A good protection of the sweet cherry orchards requires 9 treatments, both during the dormant period and during the vegetation stage. Copper-based products, mineral oils, as well as biological fungicides (Defense 3), insectofungicide biopreparations (Morpheus SR) and biological insecticides (Naturis-L based on *Beauveria bassiana*) can be used.

Of particular importance is the use of the Naturalis -L product during the fruit set period, as it does not require a break time and does not create toxic residues in the fruit. In conclusion, the scheme includes 5 chemical and 4 biological treatments (Table 1).

The european cherry fruit fly is found everywhere in our country, especially in areas where late ripening cherries are grown (Manolache et al., 1953). To control the *Rhagoletis cerasi* pest it is recommended to perform deep plowing in autumn and digging the soil under the crowns of trees to destroy the hibernating pupae. Also, in early spring, it is recommended to treat the soil around the trees with granular products, in order to destroy the adults. Chemical treatments will be applied at warning (Paşol et al., 2007).

*Bacillus thuringiensis* treatments should be applied when average temperatures are above 16°C to ensure proper bacterial activity (Kutinkov and Andreev, 2004).

Also, that Rebell trap + ammonium acetate combination against the *Rhagoletis cerasi* pest was the most effective (Katsoyannos, 2000; Özdem and Kilişer, 2009). It was concluded that for a successful mass trapping, hanging four of these trap combination per tree was sufficient (Özdem and Kilişer, 2009).

In 2009, first evidence was provided that adult *Rhagoletis cerasi* are susceptible to hyphomycetous fungi (Daniel and Wyss, 2009).

Field experiments with foliar applications of *Beauveria bassiana* ATCC 74040 (product Naturalis-L) were conducted to control the European cherry fruit fly *Rhagoletis cerasi*, it has been proven that the application of Naturalis-L is a suitable and economically feasible strategy for controlling R. wax in organic cherry production. Naturalis-L was applied at concentrations of 250 ml per 100 l in 7-day intervals. Fruit infestation was assessed at harvest. The number of infested fruits was significantly reduced by 65% with foliar applications of Naturalis-L (Daniel and Wyss, 2010).

Covering the ground with nets under the canopy to prevent hatching flies from reaching fruit is another effective management strategy. The net can reduce fruit infestation by 91%. This method could be an option for *Rhagoletis cerasi* control in extensively managed standard tree orchards.

To control the black cherry aphid - *Myzus cerasi*, winter treatments with products against pest eggs must be applied as well as treatments, in the spring, when the first colonies appear.

The rapeseed oil applied in the late latency stage significantly reduced the damage caused by the black cherry aphid. The effectiveness of the oil mixed with pesticides was higher, but significant only in three out of seven tests. Results showed that rapeseed oil applied at the late dormant stage significantly reduced damage by black cherry aphid. Efficiency of oil mixed with pesticides was higher, but only

significant in three of seven trials (Jaastad, 2007).

In the fight against black cherry aphid - *Myzus cerasi* F., good results were obtained with the product Prev-Am, based on a mixture of cold-pressed orange oil. Because Prev-Am has only a contact action and low persistence, repeated treatments are required every 7-10 days, depending on the infestation level (Sumedrea et al., 2020).

Anthraxnose caused by the pathogen *Blumeriella jaapi* is widespread in all areas where cherries are grown. It causes great damage in nurseries. Hygiene practices are very important measures of protection. Starting with the fall of petals, 5 treatments with copper products will be applied in the orchards. In the nurseries, treatments will be applied every 2 weeks.

Hygiene practices will also be considered against the brown rot diseases. For *Monilinia fructigena*, diseased shoots will be cut and destroyed, plant injuries being avoided. For *Monilinia laxa*, during the latency period, treatments are applied using Bordeaux mixture 3% or barium polysulfide 6% and for *Monilinia fructigena* sprays with calcium polysulfide (lime-sulfur solution) 20% or barium polysulfide 20%. To protect flowers and shoots, we recommend treatments for bud burst, white bud and when 10-15% of the petals are fallen. For the protection of the fruits, a treatment will be applied when they are set.

As can be seen in Table 2, a good protection of the plum crop requires 9 treatments, of which 5 chemical treatments and 4 biological treatments.

Preventive measures are important in the control of San-José scale: the use of uninfested seedlings when setting up orchards, grafts will be used from uninfested orchards, the avoidance of woody species susceptible to scale attack. As a curative method, 2 winter treatments with calcium polysulfide - 20% or mineral oils will be applied. Summer treatments will also be applied according to the 2 + 2 scheme, and 1 + 1 scheme in areas with reduced infestation (Săvescu and Rafăilă,

1978). Summer treatments will be applied at warning, in relation to the appearance of the larvae and their degree of resistance to insecticides (Paşol et al., 2007).

A system that combines mechanical, biological and chemical methods can be applied against plum worms. As mechanical methods we remind the scraping of thicker branches and the trunk, in early spring or in winter, gathering of the fruit with worms on small areas (especially at the first generation), the use of trap belts in catching caterpillars during the winter retreat. Chemical and biological treatments will be done at the warning, according to the male flight dynamics established with the pheromone traps with the AtraFUN pheromone. 10-15 g of pheromone / ha - 200-300 50 mg evaporators will be used to disorient the males. In warmer areas, a second application is required, 5-7.5 g / ha, after July 10 (Ghizdavu and Oprean, 1987). 20-40 traps are needed to combat mass capture, evenly spread over the entire surface. By this method, the frequency of fruit attack is below 0.1% (Ghizdavu, 1984; Ghizdavu and Oprean, 1987). Biological treatments can also be applied using biopreparation based on bacteria (Dipel DF) or viruses (Carpovirusine Super SC and Madex Top).

According to Baicu, 1991, 4-5 releases of egg-eating wasps for each generation (e.g. *Trichogramma embryophagum*), at each release - 200,000 wasps/ha, starting with the appearance of the egg stage and after that every 5 days, has good results in pest control (Baicu, 1991).

Given the chemical methods, depending on the biological reserve, 1-2 treatments are needed for the first generation and 2-3 treatments for the second generation.

In order to prevent and control the red leaf spot disease produced by *Polystigma rubrum* the cultural hygiene, the application of copper-based treatments at the leaf loss and in June have a special importance.

The shot hole disease produced by the *Stigmia carpophila* fungus requires for protection the cultural hygiene with the removal of the infected branches, the disinfection of the

wounds. At the beginning of vegetation, in spring and when the leaves fall in autumn, treatments with cupric products can be applied (Severin et al., 2001).

The brown rot of plum caused by the *Monilinia laxa* fungus will be treated as in the case of the brown rot of cherry.

#### 4. CONCLUSIONS

The most damaging pests and diseases, present in the cherry orchards from Dâmbovița county, are: *Rhagoletis cerasi* - the european cherry fruit fly, *Myzus cerasi* - the black cherry aphid, anthracnose caused by the *Blumeriella jaapi* fungus and the brown rot disease produced by *Monilinia laxa* and *Monilinia fructigena*.

In Dâmbovița County the most important pests and diseases in the plum orchards are: the plum fruit moth - *Cydia funebrana* and the San-José scale - *Quadraspidiotus perniciosus*, the red leaf spot of plum produced by *Polystigma rubrum*, the shot hole disease produced by the *Stigmia carpophila* fungus and the brown rot produced by the *Monilinia laxa* fungus.

A good protection of the cherry culture requires 9 treatments, both during the vegetative rest period and during the vegetation period - 5 chemical and 4 biological treatments.

A good protection of the plum culture requires 9 treatments, which involve the use of 5 chemicals and 4 biologicals.

The integrated control schemes can be adapted according to the concrete conditions in the orchard, the biological reserve of pests and diseases, choosing the most suitable method.

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Table 2: Integrated control scheme for plum pest and disease control

Treatment	Product	Dosage(l/ha), Concentration (%)	Pathogen	PHENOPHASES															
				March	April	May	June	July	August	September	October								
T1	Mospilan 20 SG	0.03%	The San-José scale ( <i>Quadraspidiotus perniciosus</i> ), aphids	buds swelling															
T2	Cuproxat Flowable	0.35 %	Bacteriosis and mycosis (brown rot diseases, shot hole disease, leaf spot disease)		green button														
T3	Morpheus SR	5.0 l/ha	Wasps ( <i>Hoplocampa spp.</i> ), shot hole disease ( <i>Stigmia carpophylla</i> )			10-15% shocked petals													
T4	Karate Zeon	0.015% (0.15 l/ha in 1,000 l water)	The plum fruit moth ( <i>Cydia funebrana</i> ), the plum seed wasp ( <i>Eurytoma schreineri</i> )				every 6-8 days												
T5	Defense 3	1.0 l/ha	The red leaf spot ( <i>Polystigma rubrum</i> ), brown rot diseases ( <i>Monilinia spp.</i> )					every 6-8 days											
T6	atraFUN Movento 100 SC	30 traps/ha 1.875 l/ha	The plum fruit moth- <i>Cydia funebrana</i> , the San-José scale ( <i>Quadraspidiotus perniciosus</i> )							fruitgrowing									
T7	Chorus 50	0.45-0.75 kg/ha	Brown rot diseases								fruit ripening								
T8	Cuprantol Duo	3.9 kg/ha	Diseases - fungi overwintered forms																leaves fall