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MONITORING OF THE MAIN PATHOGENS FOUND IN APPLE PLANTATIONS AT SCDP IASI

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Abstract
The observations took place at RSFG Iasi, Development Center Falticeni in 2022, in apple plantations where a number of 9 phytosanitary treatments were applied to the warning, with the spray machine of the type Agroma. A total of 3 varieties (Jonathan, Golden delicious, Stakrimson) were studied compared to the untreated variant.
The phytosanitary treatment program covered a wide range of phytopharmaceuticals, using 8 contact and systemic fungicides to prevent and combat pathogens that produce Venturia inaequalis, Erwinia amylovora,, Podosphaera leucotricha (Ell. et Ev) Salm and Monilinia laxa.
Thus, in the untreated variant, the degree of attack for rapeseed on the fruit was 82.8%, and for Podosphaera leucotricha on the shoots the attack was 35% in the Jonathan variety.
In the treated plot, the degree of Venturia inaequalis attack on fruit was reduced to 11.3% and 3.0% in the Starkrimson and Golden delicious varieties, and in the Jonathan variety up to 0.5%.

Keywords: degree of attack, phytosanitary treatment, Venturia inaequalis.

1. INTRODUCTION

The use when planting varieties that have a certain level of resistance to several common diseases of the apple tree (*Venturia inaequalis, Erwinia amylovora,, Podosphaera leucotricha (Ell. et Ev) Salm and Monilinia laxa.)* can reduce the number of treatments with fungicides and the total cost of the spraying program in a given growing season. (Baudoin et al., 2010).

Table 1. **Susceptibility of apple varieties at *Podosphaera leucotricha***

Apple variety	Sensitivity
Golden Delicious	S
Idared	HS
Jonathan	HS

HS= very susceptible (control is always necessary when the disease is present)
S = susceptible (control is usually necessary when the disease is present)
R = resistant (control is necessary only in conditions of high pressure of the disease)

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Podosphaera leucotricha (Ell. et Everh.) Salm., is one of the most harmful diseases of the apple tree, Romania (Sestraş, 2010).

The studies of the FAO database (2022) show the fruiting of apple production in Romania according to table 1, where from 2011 to 2021 the highest production was recorded in 2018 with 634770 tons and the lowest in 2017 with a production of 348656 tons.

Table 2. Apple production in Romania in the period 2011-2021

Item	Year	Unit	Value
Apples	2011	tonnes	620362,00
Apples	2012	tonnes	462935,00
Apples	2013	tonnes	513580,00
Apples	2014	tonnes	513195,00
Apples	2015	tonnes	476059,00
Apples	2016	tonnes	467259,00
Apples	2017	tonnes	348656,00
Apples	2018	tonnes	634770,00
Apples	2019	tonnes	492700,00
Apples	2020	tonnes	537470,00
Apples	2021	tonnes	593700,00

2. MATERIALS AND METHODS

Observations and determinations were made in the field in August (for secondary infections) regarding the attack of fungi that produce *Venturia inaequalis* on leaves and fruits, *Podosphaera leucotricha* on shoots, respectively the frequency, intensity and degree of attack on fruits or shoots, presented in the table below.

In the conditions of 2022, in the apple plantations, a number of 9 phytosanitary treatments were applied to the warning, with the Agroma spraying machine, according to the table below. When warning treatments to combat pathogens and pests, several factors were taken into account: the biology of parasites; the evolution of climatic conditions; the evolution of the phenology of the apple tree; the plant protection products used and their period of action.

The phytosanitary treatment program included a wide range of plant protection products, using 8 contact and systemic fungicides to prevent and control pathogens that produce *Venturia inaequalis*, *Erwinia amylovora*, *Podosphaera leucotricha* and *Monilinia laxa*. These fungicides have been applied in an alternating and complexed way in order not to create resistance, in close correlation with the pressure of infection of pathogens and their period of action.

Each treatment applied with fungicides was also complexed in the conditions of this year with insecticides that have a wider spectrum of control. Insecticides numbered 7, to combat *Quadraspidiotus perniciosus, Aphis spp., Sciaphobus squalidus, Eriosoma lanigerum, Adoxophyes orana, Adoxophyes reticulana*, *Cydia pomonella.* The climatic conditions of 2022 were very favorable to the development of the fungus that produces the apple tree's *Venturia inaequalis* starting from April, May and June when mornings with dew were recorded, high daily temperatures

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for this period, frequent precipitation, fallen in averse, in the number of 11 days (August) and 14 days (September).

During the vegetation period (May – August) the average monthly temperatures recorded were by about 1.0-5.4º C higher than the monthly normal of the area, and the absolute maximum was 37.0º C.

The high amplitude of day-to-night temperatures caused most of the mornings of the growing season to be dew, which persisted on the trees during the day (4-5 hours) which caused a high infection pressure for the apple tree's *Venturia inaequalis*. Both persistent dew and short-term precipitation, recorded repeatedly, made it difficult to apply phytosanitary treatments.

Table 2. Phytosanitary treatments performed at the fruit apple tree, in 2022 at S.C.D.P. IAȘI - C.D. Falticeni

NO. TREATMENTS , DATE, PHENOPHASE	NAME OF PLANT PROTECTION PRODUCTS	DOSE/ HA	DISEASES, PESTS
Treatment no. 1. 08-15.04 Budding	B.bordelaise	5,0 kg	*Venturia inaequalis, Erwinia amylovora*
	Ovipron Top	11,0 l	*Quadraspidiotus perniciosus, Aphis spp., Eriosoma lanigerum, Adoxophyes orana, Adoxophyes reticulana*
	Decis 25WG	0,045 kg	
Treatment no. 2. 27-28.04 Pink button	Fontelis	0,75 l	*Venturia inaequalis, Podosphaera leucotricha.*
	Mospilan 20 SG	0,45 kg	*Aphis spp., Adoxophyes orana, Adoxophyes reticulana*
	Polyactiv B	1,0 l	Foliar fertilizer
Treatment no. 3. 11-12.05 Petal shake	Chorus 50WG	0,6 kg	*Venturia inaequalis, Podosphaera leucotricha, Monilinia laxa*
	Kumulus DF	4,0 kg	*Podosphaera leucotricha.*
	Mavrik	0,75 l	*Aphis spp., Sciaphobus squalidus .*
Treatment no.4. 02-03.06 Fruit diameter 1.5-2 cm	Score250 EC	0,2 l	*Venturia inaequalis, Podosphaera leucotricha.*
	Coragen	0,15 l	*Cydia pomonella*
Treatment no. 5 09-10.06 Fruit diameter 2.5 cm	Folicur solo	0,6 l	*Venturia inaequalis, Podosphaera leucotricha.*
	Decis 25WG	0,045 kg	*Cydia pomonella, Aphis spp..*
Treatment no. 6 17-18.06 Fruit diameter 3 cm	Chorus 50WG	0,6 kg	*Venturia inaequalis, Podosphaera leucotricha., Monilinia laxa*
	Mospilan 20 SG	0,45 kg	*Quadraspidiotus perniciosus, Aphis spp., Eriosoma lanigerum*
Treatment no. 7 24-28.06 Fruit diameter 3.5 cm	Score250 EC	0,25 l	*Venturia inaequalis, Podosphaera leucotricha, Monilinia laxa*
	Coragen	0,15 l	*Cydia pomonella, Aphis spp. , Adoxophyes orana, Adoxophyes reticulana*
Treatment no. 8 10-12.07 Fruit diameter 4 cm	Folicur solo	0,7 l	*Venturia inaequalis, Podosphaera leucotricha.*
	Karate Zeon	0,25 l	*Aphis spp,* molii, *Cydia pomonella,*
	Rezistevo	4,0 kg	*Physiological and storage diseases*
Treatment no. 9 23-26 .07 Fruit diameter 5 cm	Luna experience	0,7 l	*Venturia inaequalis, Podosphaera leucotricha., keeping diseases*
	Decis 25WG	0,040 kg	*Cydia pomonella, Aphis spp, Eriosoma lanigerum, Quadraspidiotus perniciosus*

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3. RESULTS AND DISCUSSIONS

The main pathogens of importance in monitoring the occurrence, development and attack on apple plantations are *Venturia inaequalis* and *Podosphaera leucotricha*. In order to maintain the plantations, in addition to the cultural measures and measures of prevention and control are carried out with the help of chemical protection products specific to the crop, the damaging agent and the fenofase for the development of the trees.

The first spots of *Venturia inaequalis* on the leaves were reported on 30.05 in the Golden delicious variety, and the first spots of *Venturia inaequalis* on the fruit were recorded on 6.06 in the Starkrimson and Golden delicious varieties.

Table 3. Assessment of the attack of the main pathogens in apple trees, in the conditions of 2022

No crt	Variety	*Venturia inaequalis* on fruit			*Venturia inaequalis* on leaves			*Podosphaera leucotricha* on shoots		
		F%	I%	GA%	F%	I%	GA%	F%	I%	GA%
1.	Jonathan	10	3	0,3	25	15	3,8	15	30	4,5
2.	Golden delicious	20	15	3,0	35	40	14,0	5	10	0,5
3.	Stakrimson	35	30	10,5	45	25	11,3	0	0	0,0
4.	Untreated control	90	92	82,8	85	90	76,5	50	70	35,0

Figure 1. Jonathan variety and Golden delicious variety appearance at physiological maturity

Thus, under the conditions of applying the treatments, in 2022 the Starkrimson and Golden varieties were very sensitive to *Venturia inaequalis* on fruits with a frequency of 20-35%, an intensity of 15-30% and an attack degree between 3,0 and 10,5%. *Podosphaera leucotricha* on the shoots had a

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frequency of between 5 % in the Golden variety and 15 % in the Jonathan variety, an intensity of 10 % in the Golden delicious variety and 30 % in the Jonathan variety, and the degree of attack was 0,5 % in the Golden delicious variety and 4,5 % in the Jonathan variety, very low attack values compared to the untreated control. In the untreated control there was a frequency of *Venturia inaequalis* on the fruit of 50%, an intensity of 70% and an attack degree of 35%.

4. CONCLUSIONS

In 2022, there were favorable conditions for the development of pathogens that produce *Venturia inaequalis* , *Erwinia amylovora* and *Podosphaera leucotricha*. Thus in the untreated control, the degree of attack for *Venturia inaequalis* on the fruit was 82,8%, and for flouring on the shoots the attack was 35% in the Jonathan variety. In the treated plot the degree of attack for *Venturia inaequalis* on fruit was reduced to 11,3% and 3,0% in the Starkrimson and Golden delicious varieties, and in the Jonathan variety up to 0,5%.. For *Podosphaera leucotricha* on shoots the degree of attack was reduced to 4,5% in the Jonathan variety, and for *Monilinia laxa* the frequency was 1% (Golden variety) very low values compared to the untreated control.

In preventing and combating *Venturia inaequalis*, *Podosphaera leucotricha* and *Monilinia laxa* in apple trees have been very effective have been shown to be fungicides, Bouillie bordelaise 5,0 kg/ha, Folicur solo 0,7 l/ha, Fontelis 0,75 l/ha and Luna experience 0,7 l/ha.

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