

## THE EFFECT OF PHYTOPROTECTION PROGRAMS ON THE CONTROL OF THE MAIN APPLE PESTS

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**ABSTRACT.** In recent decades, positive changes have been occurred on the fruit crops protection, because of new synthetic or natural substances, more effective and less toxic. In 2011, at Fruit Growing Research and Development Station Iași, Romania, was tested a phytosanitary program that aimed especially to control the main pest of apple, being introduced the next generation of plant protection products, such as: Coragen, Proteus, Calypso, Decis 25 WG. The research was carried out for Idared, Golden delicious and Florina, on two variants for each variety. Phytosanitary treatments applied for pest control were supplemented with fungicides used to combat major apple diseases. Until blooming two treatments were applied for each variant, and after the petals fall, treatments were carried out at warning. Observation and measurements were performed after the treatments and they showed, at the end of each generation, the percentage of attacked fruits by the main apple pests. These products applied in a few treatments have provided a strong efficacy in combating major apple pests: codling moth (*Cydia pomonella* L.), fruit skin moth

(*Adoxophyes reticulana* Hb.), leaf miner moth (*Phyllonorycter* sp.) and mites (*Panonychus* sp.). To combat lepidoptera, best result were obtained with Calypso 480 SC and Coragen insecticides, and also, products such as Decis 25 WG and Proteus, have ensured a good health in apple plantation.

**Key words:** Apple pests; Control; Insecticides efficacy; Phytosanitary treatments.

**REZUMAT.** Efectul aplicării programelor de fitoprotecție asupra combaterii principalilor dăunători ai mărului. În ultimele decenii, au avut loc schimbări pozitive în protecția culturilor de fructe, datorită noilor substanțe sintetice sau naturale, mai eficiente și mai puțin toxice. În anul 2011, la Stațiunea de Cercetare-Dezvoltare pentru Pomicultură Iași, a fost experimentat un program fitosanitar, care a urmărit, în special, combaterea principalilor dăunători ai mărului, în care au fost introduse produse de protecția plantelor de ultimă generație: Coragen, Proteus, Calypso, Decis 25 WG.

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Cercetările s-au efectuat la soiurile Idared, Golden delicious și Florina. Tratamentele fitosanitare, aplicate pentru combaterea dăunătorilor, au fost complexate cu fungicide corespunzătoare principalelor boli ale mărului. Până la înflorit s-au aplicat câte două tratamente cu aceleași complexe pentru ambele variante, iar după scuturarea petalelor, tratamentele s-au efectuat la avertizare. Observațiile și determinările s-au efectuat după aplicarea tratamentelor, la sfârșitul fiecărei generații, și s-au referit la procentul de fructe atacate de către principalii dăunători ai mărului. Aceste produse, aplicate într-un număr redus de tratamente, au asigurat o eficacitate deosebită în combaterea principalilor dăunători ai mărului: viermele merelor (*Cydia pomonella* L.), molia cojii fructelor (*Adoxophyes reticulana* Hb.), molia mineră (*Phyllonorycter* sp.) și acarienii (*Panonychus* sp.). În combaterea lepidopterei, cele mai bune rezultate au fost obținute cu insecticidele Calypso 480 SC și Coragen; de asemenea, produse cum ar fi Decis 25 WG și Proteus au asigurat o stare bună de sănătate în plantația de măr.

**Cuvinte cheie:** combatere; eficacitate; fitoprotecție; insecticide; dăunători.

## INTRODUCTION

Just like any other cultivated plants, the fruit trees may be attacked by a significant number of pathogen agents and a series of pests, the most damaging of all being the insects. This is the reason for which phytoprotection of fruit-growing plantations becomes a necessity, mainly in pedoclimatic conditions favorable to the development of such parasites.

Without the application of a complex of protective measures

against pests, quantitative and qualitative production losses may vary between 28.8-50% up to the total destruction of the fruit production (Amzăr, 2002; Cârdei *et al.*, 2007).

In the past decades, positive changes have appeared in terms of phytoprotection of fruit-growing cultures following the emergence of some new synthesis or natural active substances that are more efficient and less toxic.

The use of modern phytoprotection technologies also implies an important component of data collection and processing related to the meteorological conditions, the study of behavior of the biologic material under the attack of pests, the monitoring of the biologic cycle of the key parasites, and the forecast of evolution of the parasite populations, etc. The selection of the most efficacious active substances and the most adequate application measures in plantations is extremely important as well (Amzăr and Ivașcu, 2003; Drosu *et al.*, 2007; Hatman *et al.*, 1986; Teodorescu *et al.*, 2003; Beșleagă *et al.*, 2012).

## MATERIALS AND METHOD

The researches regarding the control of main apple pests were carried out in an apple-tree plantation, located in the experimental polygon of the Fruit Growing Research-Development Station of Iași, in 2011. The species under study were Idared, Golden delicious and Florina, the trees being planted at a 3x1m distance and trained as a vertical cordon.

It is well known that in the field of plant protection the climatic conditions

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play an essential role in the evolution of pathogens and pests. The evolution of the climatic conditions was recorded by means of AgroExpert equipment placed in the experimental polygon. Thus, in 2011,

at Fruit Growing Research and Development Station Iași, the climatic conditions recorded favored the development of pests (*Table 1*).

**Table 1 - Climate characterization for 2011, in Iași County**

Month	Normal average	Temperature °C			Precipitations average	Precipitation (mm)
		mean	high	low		
I	-2,6	-2,2	10,4	-16,2	32,7	15,8
II	-0,2	-2,6	0,9	-5,8	25,6	6,0
III	4,3	3,5	8,7	-1,3	35,0	13,2
IV	11,5	10,0	15,1	4,8	44,0	81,2
V	16,6	15,8	30,1	2,3	51,3	39,0
VI	20,2	19,6	33,5	8,7	65,4	98,4
VII	22,1	21,8	34,1	9,6	91,0	72,4
VIII	21,4	20,4	30,9	8,9	45,8	38,8
IX	15,7	17,7	30,4	5,5	46,7	18,4
X	11,2	8,5	26,7	-3,3	51,9	39,4
XI	5,2	2,5	13,1	-5,5	35,9	1,8
XII	-1,0	2,4	14,5	-9,3	23,5	8,0
<b>Total</b>	<b>10,4</b>	<b>9,6</b>	<b>34.1</b>	<b>-16.2</b>	<b>548,7</b>	<b>432,4</b>

In general, the main climatic elements for year 2011 do not differ much from the multiannual averages. The annual average temperature was lower by 0.6°C as compared to the multiannual average and the average values during May-August were lower than the multiannual values, namely 0.6-0.8°C. The maximum temperatures from May-August above 33.5°C (even 34.1°C in July) corroborated with the precipitations of 81.2-98.4 mm during April-July favored the attack and evolution of the main apple pests such as mites, the San José scale, the woolly apple aphids, the leaf-mining moths, etc.

In this experiment, we took into consideration the efficiency of insecticides used to control the apple maggot, the skin moth, the mining larvae and mites. The researches were carried

out on two variants for each species, each variant being represented by 15 trees (*Table 2*).

The phytosanitary treatments applied for the control of pests were supplemented with fungicides corresponding to the main apple diseases. Two treatments with the same complexes were applied to both variants until blooming and, after the petals have fallen, the treatments were applied in the warning phase depending on the evolution of the climatic conditions, the biology of pests and the plant phenology.

Observations and determinations were carried out after the application of treatments at the end of each generation and they referred to the percentage of fruits attacked by the main apple pests.

Table 2 - Treatments applied in 2011, in Iași County

Number of treatments	Phenophases	Pathogens and pests to combat	Used Products	
			Variant I	Variant II
1	opening of the buds	scab, San José scale, hibernatings eggs, moths	Champion 0,2%+ Confidor Oil 1,5%	Champion 0,2%+ Confidor Oil 1,5%
2	corolla increase	scab, mildew, mined, summer fruit tortrix, defoliator caterpillars	Antracol 0,2%+ Sulf muiabil 0,3%+ Decis 25 WG 0,003%	Antracol 0,2%+ Sulf muiabil 0,3%+ Decis 25 WG 0,003%
3	the fall of petals	scab, mildew, mites, aphids	Maccani 0,11%+ Decis 25 WG 0,003%	Clarinet 0,1%+ Decis 25 WG 0,003%
4	fruit ø 0,5 cm	scab,mildew, Cydia T1GI	Flint plus 0,1%+ Coragen 0,0075%	Maccani 0,11%+ Proteus 0,04%
5	fruit 1,5 cm	scab, mildew, Cydia T2 GI	Chorus 0,015%+ Calypso 0,02%	Clarinet 0,1%+ Decis 25 WG 0,003%
6	fruit 2 cm	scab, mildew, mites, Cydia aphids, mined	Maccani 0,11%+ Decis 25 WG 0,003%	Maccani 0,11%+ Coragen 0,0075%
7	fruit 2-3 cm	scab, mildew, San José scaleT1GI	Flint plus 0,01%+ Reldan 0,15%	Folicur Solo 0,5%+ Movento
8	fruit 1/2 of normal size	scab, mildew, San José scaleT2GI, summer fruit tortrix	Folicur Solo 0,5%+ Novadim 0,15%	Shavit F72 0,2%+ Reldan 0,15%
9		scab, mildew, Cydia T1GI, summer fruit tortrix,	Flint plus 0,1%+ Coragen 0,0075%	Maccani 0,11%+ Proteus 0,04%
10	fruit 3/4 of normal size	scab, mildew, Cydia T2GI	Chorus 0,015%+ Coragen 0,0075%	Clarinet 0,1%+ Decis 25 WG 0,003%

## RESULTS AND DISCUSSION

The results regarding the efficaciousness of insecticides used to control the apple pests are given in Table 3.

As for the leaf-mining larvae, in 2011, at Fruit Growing Research and Development Station Iași, the predominant species were *Phyllonorycter corylifoliella* and

*Phyllonorycter blancardella*. Thus, the untreated control sample belonging to Idared species registered a percentage of 66.3% attacked leaves. When these pests attack intensively, the untreated trees may lose their leaves starting with July or August. In case of the treated variants, the highest density was recorded for Idared species with a percentage ranging between 0.3-0.7%.

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Table 3 - Efficacy of phytosanitary treatments for combating the main apple pests

Variant	mining moths	<i>Cydia pomonella</i> , % attacked fruits		<i>Adoxophyes reticulana</i> , % attacked fruits		mites
		generation I	generation II	generation I	generation II	
		<b>Variant I</b>				
Idared	0.3	0,8	1,0	1,5	1,3	6,4
Golden delicious	0.0	0,5	0,6	1,8	1,5	8,4
Florina	0.0	0,7	0,8	1,5	1,2	5,1
<b>Variant II</b>						
Idared	0.7	1,2	1,5	2,0	1,6	5,8
Golden delicious	0.0	0,7	1,0	1,8	1,6	8,1
Florina	0.7	0,5	0,5	1,3	1,0	4,7
Untreated control sample	66,3	88,5%		89,4%		172,9%

As for mites, the most violent attack was recorded for Golden delicious species (8.4% mites/10 leaves). The treatment with Confidor Oil 1.5% administered in “mouse ear” phenophase to destroy the hibernating eggs is also important in controlling mites.

The success in controlling these pests consists in the application of treatments during the warning phase. The products such as Decis 25 WG 0.003% and Calypso 0.02% used in experimentations drastically reduced the pest density.

Among the pests affecting the quantity and quality, we may enumerate the apple maggot and the skin moth, especially by the larvae coming from the second generation. Most fruits attacked by these pests were registered for the untreated control sample and Idared species had a percentage between 88.5-89.4%. In

case of the treated variants, the species most affected was again Idared which registered a percentage of attacked fruits between 0.8-1.5% for the apple maggot, and 1.3-1.6% for the skin moth.

To control these two species, we applied two chemical treatments to each generation during the warning period. Calypso in a concentration of 0.02%, Coragen in a concentration of 0.0075% and Decis 25 WG 0.003% reduced the insect attack up to 0.5% in Florina species and 1.3% in Idared species for the apple maggot, and up to 1.0% for the skin moth. Thus, in case of the treated variants we noticed that all insecticides used drastically reduced the attack of main apple pests as compared to the untreated control sample.

## CONCLUSIONS

In 2011, the climatic conditions were highly favorable for the development of the six pests encountered in the apple plantations.

As for all pests, the most affected species was Idared which registered a percentage of attacked fruits between 0.3-0.7% for the leaf-mining moths, 1.0-1.5% for the apple maggot and 1.3-1.6% for the skin moth.

Of all products used, Coragen and Calypso 480 SC proved to be highly efficient in the control of mining larvae, the apple maggot and the skin moth by providing an adequate percentage of maggot-free fruits.

As a conclusion, we found out that all insecticides used drastically reduced the attack of the main apple pests in all treated variants as compared to the untreated control sample.

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