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STUDIES REGARDING THE COMPLEXITY OF HOST-PARASITE RELATIONSHIPS IN THE FRUIT-GROWING AGROECOSYSTEMS

Aurel MAXIM
University of Agricultural Sciences and Veterinary Medicine
3-5, Calea-Mănăştur str., **RO–400372 Cluj-Napoca, Romania**
e-mail: maxim0067@yahoo.com

Abstract: The experiments were carried out in the city of Bistriţa (Fruit Research Station), between 2002 – 2003. It was followed the evolution of fire-blight of rosaceous (*Erwinia amylovora*) and the red-mite (*Panonychus ulmi*) of the apple trees in the following variants: V1 – plantation treated against diseases and pests (10 – 12 treatments/year) and fertilisation; V2 – untreated control against parasites, but normally fertilised with chemical fertilisers; V3 – untreated and unfertilised plantation for 9 and 10 years.

The studies show that the fertilisation and chemical treatments sensitize the trees regarding to animal and vegetal parasites. The chemically untreated orchards had the smallest range of attack on both kinds of parasites: - the red –mites appeared only sporadical phases on the leaves, and the frequency of the affected shoots by *E. amylovora* was null.

The result is that the minor attack of the parasites affecting the chemically untreated trees with pesticides and fertilizers is not only due to the useful entomofauna and hyperparasites, as of the growth of the natural resistance against these attacks and pests.

Because of this, in behalf of the production losses on the plantations, and for the obtainance of healthy fruits, there are necessary both protection of the flora and useful fauna, and balanced fertilization.

Key words: apple trees, orchard, agroecosystem, fire-blight of rosaceous, red-mite, attack, phytosanitary treatment, fertilizer, useful fauna, hyperparasite.

Introduction

The experiments on which this work is done started from the observations made in the fruit-growing plantations given back after 1990 to the legal owners. In the majority of these plantations no minor cultural technology has been applied: cuttings, phytosanitary treatments, fertilizations for the soil and plant. With all this, trees from these plantations couldn't stand as an untreated control for a series of several diseases and pests, because the attack is sporadic or totally missing.

Chaboussou (1985) noticed that, the exacerbation of the attack of some diseases and pests at fruit trees and grapevine, is mostly due to the high sensitiveness of the plants, generated by the organic synthesis products (pesticides, chemical fertilizations, and foliar fertilizations),applied in an irrational manner on the plantations [2].

The plant-parasite relationship is based on nutrition and the plant's sensitivity to diseases and pests is strictly related to the level of soluble substances. A series of pesticides (organo-halide, ditiocarbamats, benzimidiazols) reduces the protein synthesis encouraging their decomposing in amino acids. The insecticides based on carbaryl and some phosphoric esters stimulate, by nutrition, the mite's fecundity and longevity, also changing the sex-ration in favor of females.

Materials and Method

The research was done between 2002-2003, in the fruit tree plantations from Fruit Research Station Bistriţa.

For the studies regarding the fruit tree behavior to *Erwinia amylovora*, in a treated and fertilized orchard, 11 fungicide treatments were done in 2002 and 10 treatments in 2003. In 2002 the following fungicides were used: bordelaises mixture 0.5% (4 treatments out of which 3 were prefloral), Zato 50 WG – 0,013%; Shavit F 71,5 WP – 0,2%; Dithane M 45 – 0,1%; Dithane M 45 – 0,2% + Shavit 25 EC – 0,05%; Kocide 101 – 0,04%; Merpan 80 DGW – 0,15%; Topsin M 70 – 0,1%. In the next year sprinkles were done with bordelaise mixture (three prefloral treatments), Stroby DF 0,013%; Zato 50 WG – 0,013%; Shavit F 71,5 WP – 0,2%; Kocide 101 – 0,04%; Merpan 80 DGW – 0,15%; Topsin M 70 – 0,1%; Score Top - 0,025%.

Fertilizations were made for soil and also for leaves. For soil the complex fertilization NPK (15:15:15) was used in a quantity of 300-350 kg/ha. At the level of the foliar system Folifag was used, being applied in combination with the phytosanitary treatment. In both years of the study, this was applied post floral: in 2002 - two treatments, in 2003 - three treatments. Concerning fertilization, the untreated but fertilized control had the same regime; in the years of the study (2002 and 2003), on the same trees there weren't made any sprinkles with pesticides.

Studies were made on James Grieve, Jonathan and Auriu de Bistrița where a major fire blight attack was signaled.

The untreated and unfertilized orchard was planted in 1988, following the same technology and in the same cultural system (intensive). After 1993, the orchard wasn't chemically treated, but some cuttings were rarely made.

For the apple scab combating (*Panonychus ulmi*), six sprinkles were organized in six variants (V1. Milbeknock EC – 0,075 %; V2. Torque 550 SC – 0,04%; V3. Neoron 500 SC – 0,1; V4. Omite 570 EW – 0.1%; V5. Mitac 20 EC – 0.2%; V6. Mitigan 18,5 EC – 0.2%), five next year (V1. Torque 550 SC – 0,04%; V2. Neoron 500 SC – 0,1; V3. Danirum 11 EC – 0,06%; V4. Demitan 200 EC – 0,07%; V5. Mitac 20 EC – 0.2%). For the untreated but fertilized witness no phytosanitary treatments were made between 2002-2003. However, in both cases foliar fertilizations were made on soil, like in the similar variants of *E. amylovora*. The untreated orchards are those described for the fire blight.

Observations were made in July and August and consisted of establishing the frequency, intensity and attack percentage on shoots for *E. amylovora*, but also the medium density of mites (*P. ulmi*) on the leaves. For the bacterial fire blight macroscopic observations were made, and the means of calculation of the three indicators is the one currently used in plant protection. For each variant a number of 3000 shoots were studied.

For the frequency calculation, this formula was applied:

F% = n x 100/N (n = number of attacked plants or organs, N = number of observed plants and organs). For the attack intensity calculation a six class notation system was used. According to this relation $I = \sum (i \times f)/ n$ (I = attack coverage percent, f = number of cases with each mark attack, n = total number of attack cases). The attack degree (DA %) is the expression of the development of serious attack upon the culture or number of observed plants. The value of DA is given by the formula: DA% = F x I/100.

The mites density on the leaves was established with the stereomicroscope. For each variant, the analyzed leaves average was made on one thousand leaves.

Results and Discussions

Our research shows that the chemical fertilization and phytopharmaceutical substances increase the trees' sensitivity at the fire blight attack and the red tree mite (*P. ulmi*).

In table 1 are presented data regarding the fire blight attack in 2002, in the three variants: treated and fertilized orchard, treated and fertilized control and untreated and unfertilized orchard.

Table 1: Comparative data regarding the fire blight (*Erwinia amylovora*) for apple in 2002, in Bistrița

Variety	Attack on shoots			Observations
	F%	I%	DA%	
Treated and fertilized orchard				
James Grieve	21	97.5	20.5	Sprinkling against phytopathogenic agents (including *E. amylovora*) were made with: Bordelaise mixture - 0,5% (four treatments); Zato 50 WG – 0,013%; Shavit F 71,5 WP – 0,2%; Dithane M 45 – 0,1%; Dithane M 45 – 0,2% + Shavit 25 EC – 0,05%; Kocide 101 – 0,04%; Merpan 80 DGW – 0,15%; Topsin M 70 – 0,1%
Jonathan	11	98.0	10.8	
Auriu de Bistrița	16	97.0	15.5	
Untreated fertilized control				
James Grieve	43	100	43.0	
Jonathan	33.5	99.5	33.3	
Auriu de Bistrița	30.6	99.5	30.5	
Untreated and unfertilized orchard				
James Grieve	0	0	0	Chemical untreated orchard (fertilization + parasites combat) for the past 9 years.
Jonathan	0	0	0	
Auriu de Bistrița	0	0	0	

Observation date: 24 July 2002

Table2: Comparative data regarding the fire blight attack (*Erwinia amylovora*) for apple, in 2003, in Bistrița

Variety	Attack on shoots			Observations
	F%	I%	GA%	
Treated and fertilized orchard				
James Grieve	18	100	18.0	Sprinkling against phytopathogenic agents (including *E. amylovora*) were made with: Bordelaise mixture - 0,5% (three treatments); Stroby DF 0,013%; Zato 50 WG – 0,013%; Shavit F 71,5 WP – 0,2%; Kocide 101 – 0,04%; Merpan 80 DGW – 0,15%; Topsin M 70 – 0,1%; Score Top - 0,025%
Jonathan	13	98.5	12.9	
Auriu de Bistrița	14	100	14.0	
Untreated fertilized control				
James Grieve	39.3	100	39.3	
Jonathan	28.5	99.3	28.3	
Auriu de Bistrița	24	100	24	
Untreated and unfertilized orchard				
James Grieve	0	0	0	Chemical untreated orchard (fertilization + parasites control) for the past 10 years.
Jonathan	0	0	0	
Auriu de Bistrița	0	0	0	

Observation data: 5 August 2003

In the orchard chemically treated with pesticides and fertilizers the attack degree of *E. amylovora* on shoots varies between 10.8 % (Jonathan) and 20.5% (James Grieve). For the fertilized but not treated with phytopharmaceutical substances control, the attack was more powerful. So the attack degree was 43% for James Grieve variety, 33.3% for the Jonathan variety, 30.5% for Auriu de Bistrița variety. In the orchard where no combating and fertilization technology was applied *E. amylovora* attack wasn't registered.

Data from table 2 show a similar situation for the fire blight attack in the three variants. The attack intensity outruns 98.5% in all variants where the attack was registered. The attack degree for fire blight varied between 14 and 18.9% in the fertilized and treated orchard, and between 24 and 39.3% in the control untreated with fungicides. In 2003 no attack was registered in the deserted orchards.

For the tree red mite (*P. ulmi*) there were found differences between the six (year 2002), and the five variants of treatment. The highest density of mites per leaf was registered in case of Neoron 500 SC (active substance brompropilate 500g/l) 0.1% with 3, 5 mite average/leaf, and the lowest for acaricides based on milbecmetin (Milbeknock EC – 0,075%) and fenbutatin oxid (Torque 550 SC – 0,04%) with 0.5 mites/leaf - table 3.

Table 3: Comparative data regarding the trees red mite (*Panonychus ulmi*) of apple trees, during 2002-2003 period, in Bistrița

Variant (commercial product + active substance)	Medium density of mites per leaf	Observations
2002 year – observation data: 22 July		
V 1. Milbeknock EC – 0,075 % (*milbecmetin - 9.3 g/l*)	0,5	Orchard in which the classic fertilization technology was applied (manure + complex fertilizers) and diseases and pests control
V 2. Torque 550 SC – 0,04% (*fenbutatin oxid 550 g/l*)	0,5	
V 3. Neoron 500 SC – 0,1 (*brompropilat 500 g/l*)	3,0	
V 4. Omite 570 EW – 0.1% (*propargit 570 g/l*)	1,9	
V 5. Mitac 20 EC – 0.2% (*amitraz 20 g/l*)	1,5	
V 6. Mitigan 18,5 EC – 0.2% (*dicofol 18,5%*)	4,0	
V 7. Untreated control	29,0	
V 8. Untreated orchards	sporadic	Chemical untreated orchard (fertilization + parasites control) for nine years
2003 year – observation data: 15 July		
V 1. Torque 550 SC – 0,04% (*fenbutatin oxid 550 g/l*)	1,0	Orchard in which the classic fertilization technology was applied (manure + complex fertilizers) and disease and pests control
V 2. Neoron 500 SC – 0,1 (*brompropilat 500 g/l*)	2,5	
V 3. Danirum 11 EC – 0,06% (*fenpropathrin + hexythiazox 3%*)	1,0	
V 4. Demitan 200 EC – 0,07% (*fenaquin – 200 g/l*)	1,5	
V 5. Mitac 20 EC – 0.2% (*amitraz 20 g/l*)	1,5	
V 6. Untreated control		
V 7. Untreated orchards		Chemical untreated orchard (fertilization + parasites control) for 10 years

Research results demonstrate the deficiencies in approaching the attack level of diseases and pests only from the prey-predator point of view. The importance of the soil factor in this

equation is extremely important, which confirms the conclusions that other researchers from the plant pathological field have reached [1, 3]. That is why for maintaining the parasite attack on crops under the economical damage brink an adequate nutrition is essential and also the study of all interactions in agrosystem, in all their complexity.

Conclusions

1. The inadequate and systematic appliance of chemical fertilizations and pesticides in apple growing plantations increases plants' sensitivity to pests and disease attacks.
2. The simplified approach on the level of pests attack only from the prey - predator point of view is wrong; besides the meteorological and biological factors, the soil factor has a special, important role in pests and disease control.
3. For maintaining the attack degree of pests and parasites on plants under the economical damage brink it is necessary to protect the hyperparasites and the useful entomofauna, an adequate nutrition, but also the study of all the factors and the interactions from the ecosystem which influence the natural plant resistance to parasites.

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STUDII PRIVIND COMPLEXITATEA RELAŢIILOR GAZDĂ-PARAZIT, ÎN AGROECOSISTEMELE POMICOLE

(Rezumat)

Experienţele s-au desfăşurat la Bistriţa, în perioada 2002-2003. S-a urmărit evoluţia focului bacterian al rozaceelor (*Erwinia amylovora*) şi acarianului roşu al pomilor (*Panonychus ulmi*) la măr, în următoarele variante: V_1 – plantaţie tratată împotriva bolilor şi dăunătorilor (10-12 tratamente/an) şi fertilizată; V_2 – martor netratat împotriva paraziţilor, dar fertilizat normal cu îngrăşăminte chimice; V_3 – plantaţie netratată şi nefertilizată de 9, respectiv 10 ani. Pomii luaţi în studiu erau în vârstă de 13, respectiv 14 ani şi aparţin soiurilor Starkrimson (pentru studiul atacului de acarieni), James Grieve, Jonathan şi Auriu de Bistriţa (pentru *Erwinia amylovora*).

Cercetările arată că fertilizarea si tratamentele chimice sensibilizează pomii la atacul paraziţilor vegetali si animali. Livezile netratate chimic au avut cel mai scăzut atac la ambele specii parazite: acarienii au fost semnalaţi doar sporadic, pe frunze, iar frecvenţa lăstarilor afectaţi de *E. amylovora* a fost zero. De aici rezultă că atacul redus al paraziţilor la pomii netrataţi chimic, cu pesticide şi îngrăşăminte, nu se datorează numai entomofaunei utile şi hiperparaziţilor ci şi creşterii rezistenţei naturale a acestora la atacul bolilor şi dăunătorilor. De aceea, pentru reducerea pierderilor de producţie în plantaţiile pomicole şi pentru obţinerea unor fructe sănătoase este necesară atât protejarea florei si faunei utile cât si o fertilizare echilibrată.

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