BIODIVERSITY OF MICOFLORA AND HARMFUL FAUNA IN APPLE ORCHARDS FROM UASVM BUCHAREST

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Abstract

In Romania the knowledge of the main diseases and pests that occur during the apple vegetation period is a priority in the cultivation technology of this fruit tree species. The proposed studies aim at collecting information on the control of diseases and the microlepidopter population in order to establish the phytosanitary status of apple plantation. The research was carried out in the USAMV - Bucharest didactic field, in the apple orchard, and all apple varieties were studied, where the degree of attack was calculated based on the frequency and intensity of the diseases. The distinctive Golden Orange variety was the most attacked, with the *Podosphaera leucotricha* shoots at 70% and the intensity of 85%. This variety has the same high sensitivity to *Venturia inaequalis*, namely 80% frequency and 65% intensity. Microlepidopter surveillance in the apple orchard was performed using the pheromone trap (AtraPom). Pheromone traps were placed in the tree crown from late April to June. They were placed on three diagonals and 1.5 m high. Weekly observations highlighted that the first catches were recorded at the beginning of May (3 adults / trap), with a maximum flight in the in the second decade of May (7 adults/trap) and the last catches were in the second decade of May (2 adults/trap), with a single flight corresponding to the first generation.

Key words: diseases, microlepidopters, pheromones

In Romania, the tree crops occupy an area of 138000 ha, concentrated mainly in hilly areas, where climatic conditions are more favorable than in the open, due to more frequent precipitation and the more balanced thermal regime (madr.ro).

Of the total area, the apple occupies 55500 ha, ranking first, with a production of over 467.2 million tonnes. Lately, small family apple plantations have been expanding, which will mostly ensure the farmers' own consumption. It is necessary that in Romania also, the apple production to grow based on a considerable increase in yields of orchards and not on their surfaces. Apples are the fruit with the greatest weight in human consumption. This impact is due to the wide range of distribution, the variety of assortment and storage throughout the year.

Therefore, knowing the main diseases and pests that occur during the vegetation period of the apple, is a priority in the cultivation technology of this fruit tree species.

The proposed studies aim at collecting information on disease control and microlepidopter population in order to determine the phytosanitary status of the apple plantation to apply the correct treatments to combat pest.

The importance of the using resistant varieties and chemicals that reduce the incidence of diseases (Manole, 2007; Popa *et al*, 2013) and the use of pheromones has been demonstrated in numerous papers by researchers from various institutes in the country: (Iacob, 1977; Iacob and Iacob, 1979; Susea, 1985; Ghizdavu, 1983; Drosu, 1993; Istrate, 2004; Rosca and Istrate, 2006; Istrate and Rosca, 2007, 2009; Teodorescu, 2001). However, we believe that we must maintain current the importance of the use of sex pheromones in integrated pest control programs, especially in pomiculture (Rosca *et al*, 2006).

MATERIAL AND METHOD

The research was carried out in the USAMV - Bucharest didactic field, in the apple orchard, and all the apple varieties in the orchard were studied. All trees were analyzed (*table 1*) as they are randomly placed on the row, at a planting distance of 3.5 x 1 m.

The quantitative assessment of the attack was carried out at two moments (May 3/ June 14) by examining the trees, determining the incidence of frequency (F%) and intensity (I%), based on which the degree of attack was calculated (D.A.%).

The surveillance of the microlepidopters in the apple orchard was performed using the

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AtraPom pheromone trap with adhesive (*figure 1*). The pheromone traps were placed in the tree crown, at the edges and in the center of experimental variations from the end of April to June. They were placed on three rows diagonally, and at a height of 1.5 m.

Through weekly tracing of the pheromone traps, the dynamics of the species *Cydia pomonella* (the apple worm) was compiled.

The research took place from April to June, in an apple plantation with a height of 2-3.5 m, with all apple varieties in the USAMV-Bucharest orchard, and the predominant varieties were: Redix and Generos.

Table 1

The varieties on which the quantitative assessment was carried out

Crt. No.	Variety	No.trees
1	*Golden Orange*	7
2	*Golden Reinders*	5
3	*Jonagored Morena*	5
4	*Red Chief*	1
5	*Pinova*	9
6	*Jonagold 'Red Prince'*	4
7	*Polka*	4
8	*Braeburn*	5
9	*Gala King*	10
10	*Red Elstar*	10
11	*Jonafree*	9
12	*Remo*	7
13	*Fuji 'kiku8'*	5
14	*Rene*	3
15	*Florina*	5
16	*Aura*	5
17	*Romus 3*	5
18	*Stark Prim*	5
19	*Jonaprim*	5
20	*Bistritean*	5
21	*Ciprian*	5
22	*Red Topaz*	5
23	*Iris*	5
24	*Rebra*	5
25	*Pionier*	5
26	*Generos*	53
27	*Redix*	53

a.

b.

Figure 1 **Installing pheromone traps**

RESULTS AND DISCUSSIONS

Following the observations made on the varieties of apple in the USAMV-Bucharest orchard, the following pathogens were identified: *Podosphaera leucotricha*, which produces apple mildew (*figure 2*), *Venturia inaequalis* (*figure 3*), responsible for producing leaf patches and branches and fruits scabbing, and *Monilinia fructigena*, producing moniliosis (*figure 4*).

Figure 2 *Podosphaera leucotricha* **– attacked spring**

The incidence of frequency (%) and intensity (%) are shown in *table 2*. For mildewing were determined values of frequency on the first observation that do not exceed 55% for the Fuji 'kiku8' variety, and on the second observation, the maximum value of frequency was 70% at Golden Orange, which initially presented a percentage of 30%.

Figure 3 **Brown staining and apple scab - *Venturia inaequalis***

Figure 4 **Fruit mummification – *Monilinia fructigena***

Based on this data it was calculated the degree of attack on the apple varieties that presented attacks. (*table 3*).

Table 2

Incidence of pathogens in the varieties studied

Crt. No.	Variety	Frequency F %						Intensity I %					
		Podosphaera leucotricha		*Venturia inaequalis*		*Monilinia fructigena*		*Podosphaera leucotricha*		*Venturia inaequalis*		*Monilinia fructigena*	
	Moment of observations	1*	2*	1*	2*	1*	2*	1*	2*	1*	2*	1*	2*
1	*Golden Orange*	30	70	20	80	10	20	50	85	15	65	15	25
2	*Golden Reinders*	15	20	20	75	10	15	25	30	20	55	5	10
3	*Jonagored Morena*	30	35	10	30	5	5	30	40	15	45	15	20
4	*Red Chief*	0	0	15	25	5	10	0	0	15	25	10	20
5	*Pinova*	5	10	0	0	0	0	5	15	0	0	0	0
6	*Jonagold'RedPrince'*	40	50	20	45	5	5	50	65	10	30	10	15
7	*Polka*	25	30	0	0	0	0	30	45	0	0	0	0
8	*Braeburn*	40	55	20	65	20	25	30	40	25	55	25	30
9	*Gala King*	30	40	20	45	15	20	35	45	25	50	10	15
10	*Red Elstar*	15	20	5	10	5	5	20	25	5	15	5	10
11	*Jonafree*	30	40	0	5	0	0	25	35	0	5	0	0
12	*Remo*	0	0	0	0	0	0	0	0	0	0	0	0
13	*Fuji 'kiku8'*	55	65	5	10	0	0	40	50	10	15	0	0
14	*Rene*	5	10	10	25	0	0	10	15	5	20	0	0
15	*Florina*	0	0	0	0	0	0	0	0	0	0	0	0
16	*Aura*	0	0	0	0	0	0	0	0	0	0	0	0
17	*Romus 3*	0	0	0	0	0	0	0	0	0	0	0	0
18	*Stark Prim*	0	0	0	5	0	0	0	0	0	10	0	0
19	*Jonaprim*	0	0	0	0	0	0	0	0	0	0	0	0
20	*Bistriţean*	0	0	0	0	0	5	0	0	0	0	0	5
21	*Ciprian*	0	0	0	0	0	0	0	0	0	0	0	0
22	*Red Topaz*	0	0	0	0	0	0	0	0	0	0	0	0
23	*Iris*	0	0	0	0	0	10	0	0	0	0	0	5
24	*Rebra*	0	0	0	0	0	0	0	0	0	0	0	0
25	*Pionier*	0	0	0	0	0	0	0	0	0	0	0	0
26	*Generos*	0	0	0	0	0	0	0	0	0	0	0	0
27	*Redix*	0	0	0	0	0	0	0	0	0	0	0	0

1*= observations in May 3rd 2018

2*= observations in June 14th 2018

From the results we can say that the most sensitive varieties for pathogen attacks are: Golden Orange, Golden Reinders, Jonagold Morena, Jonagold 'Red Prince', Braeburn, Gala King, Red Elstar, Jonafree and Fuji 'kiku8'.

The Golden Orange variety was the most attacked, having a frequency for *Podosphaera leucotricha* on sprigs of 70% and an intensity of 85%. Also, this variety presents the same high sensitivity to the *Venturia inaequalis* pathogen,

with an 80% frequency and a 65% intensity, respectively.

Another variety that shows low resistance to mildew, scab and brown rot is Braeburn which exhibits a 55% attack rate on *Podosphaera leucotricha* and 65% on *Venturia inaequalis*. For *Monilinia fructigena*, the frequency values at first observation did not exceed 25% (Braeburn variety), 25% on the second survey respectively.

The intensity of the pathogen attack on the studied varieties varied depending on them, from 50% at the first assessment of the sanitary condition of the trees, to 85% at a second evaluation. The highest incidence was recorded in the pathogen *Podosphaera leucotricha* and the lowest incidence was found in the pathogen *Monilinia fructigena*.

For *Podosphaera leucotricha* at the first determination, although the highest degree of attack was recorded in the Jonagold 'Red Prince' variety, 20%, on 14 June it had an attack degree below the maximum value recorded in the Golden Orange variety with 59.5 % (*table 3*).

Sporadic attacks were recorded in the other varieties, but with an insignificant percentage. Most of the varieties did not show symptoms of attack, due to their resistance to the pathogens studied, as well as due to the treatments to combat them.

Table 3

Evolution of pathogen attack (D.A.%)

Variety/ Pathogen	*Podosphaera leucotricha*		*Venturia inaequalis*		*Monilinia fructigena*	
	1*	2*	1*	2*	1*	2*
Golden Orange	15	59.5	3	52	1.5	5
Golden Reinders	3.75	6	4	41.2	0.5	1.5
Jonagored Morena	9	14	1.5	13.5	0.75	1
Red Chief	0	0	2.25	6.2	0.15	2
Pinova	0.25	1.5	0	0	0	0
Jonagold 'Red Prince'	20	32.5	2	13.5	0.15	0.7
Polka	7.5	13.5	0	0	0	0
Braeburn	12	22	5	35.7	5	7.5
Gala King	10.5	18	5	22.5	1.5	3
Red Elstar	3	5	0.25	1.5	0.25	0.5
Jonafree	7.5	14	0	0.25	0	0
Fuji 'kiku8'	22	32.5	0.5	1.5	0	0
Rene	0.5	1.5	0.5	5	0	0
Stark Prim	0	0	0	0.5	0	0
Bistriţean	0	0	0	0	0	0.2
Iris	0	0	0	0	0	0.5

1*= observations in May 3rd 2018

2*= observations in June 14th 2018

Observations on harmful fauna were carried out on *Cydia pomonella* (the apple worm) with the help of AtraPom pheromone traps. The catches were recorded weekly. with adults being taken out of the trap at each observation (*figure* 5).

Figure 5 **Capture of adults of the *Cydia pomonella* species**

The replacement of the pheromone capsules was done at 4 weeks. The data obtained from each trap was recorded in tables and. based on the butterflies captured at each observation. the flight curve was established. to track more easily the evolution of the pest population (*figure* 6).

The AtraPom pheromone proved to be specific to *Cydia pomonella L.*. no other species were caught in the traps. Under the conditions specific to Bucharest area. the apple worm presents three generations per year: G1 - April to June; G2 - July to early August; G3 – August to September (Istrate. 2009; Roşca. 2001) and in this paper we caught the first generation. In 2018. April began with a temperature of 9.8°C. followed by a period of low temperatures of 6.5-6.9°C.

The population of the first generation was less numerous. the first catches were made on 03.05.2018 (3 adults/ trap) at 25°C.
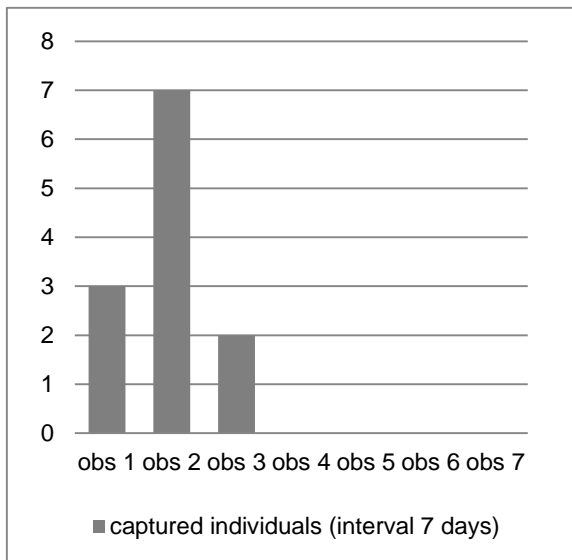
Figure 6 **Dynamics of the species _Cydia pomonella_**

The flight curve of the species has a progressive increase. reaching a maximum flight of 7 adults/ trap. recorded on 10.05.2018. and the last captures were recorded on 17.05.2018 (2 adults/ trap).

With the weekly tracing of pheromone traps. it was reported that the first catches were recorded in the first decade of May. and last in the second decade of May. recording a single flight. which corresponds to the first generation.

The use of pheromone traps provided us with objective and real data on the dynamics and number of the populations of _Cydia pomonella L.._. successfully used to establish the prognosis and warning of treatments.

CONCLUSIONS

The pathogen _Podosphaera leucotricha_ had an incidence of up to 70%. with a maximum intensity of 85%. the most attacked variety of apple being the Golden Orange.

Most attacked by _Venturia inaequalis_ was the Golden Orange apple variety. with a high frequency of 80% and a maximum intensity of 65%.

Most affected by the _Monilinia fructigena_ pathogen was the Braeburn apple variety with an attack rate of 7.5%.

The most resistant varieties that did not show any symptoms and were not attacked by the diseases described are: Redix. Generos. Pionier. Rebra. Red Topaz. Ciprian. Jonaprim. Romus 3. Aura. Florina and Remo.

The synthetic sex pheromone AtraPom has shown great power of attraction. proving practical and useful in knowing the population level of the

apple worm (_Cydia pomonella L._). the dynamics of its population. and the application of chemical treatments at optimal moments.

The dynamics of the _Cydia pomonella_ species during the months of May-June 2018. highlighted the evolution of the first generation.

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