FIGHTING AGAINST *ADODXOPHYES ORANA* PEEL MOTH OF FRUITS THRU „ATTRACT AND KILL" METHOD

COMBATEREA MOLIEI PIELIȚEI FRUCTELOR *ADOXOPHYES ORANA* PRIN BIOTEHNICA "ATTRACT AND KILL"

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Abstract: *Using these products, from the biopesticides category, will allow the obtaining of a healthy fruit production, without pesticides residues. There using will not affect the ecological balance, these biopesticides being selected for the useful entomofauna from fruit-growing ecosystems. For evaluating the efficiency of every experimental variant in the abatement of the fruit peel moth was proceed at establishing the intensity of attack produced by both generations' grubs. At the hibernating generation was followed the attack produces by the grubs at the inflorescences, sprout and leafs level and for the summer generation was followed the attack at the leaf level. The high biological hibernating relay of this pest, in the 2008 spring affected and destroyed up to 37 % from the buds, leafs and growing top of apple-trees. Using the sexual attractants pheromones can decrease the attack produce at fruits up to 76.92 %. Applying the pheromone through „attract and kill„ method can increase the efficiency up to 15.38 %.*

Rezumat: *Utilizarea produselor, din categoria biopesticidelor, permite obținerea unei producții de fructe sănătoase, fară reziduuri de insecticide. Utilizarea lor nu afectează echilibrul ecologic, aceste biopesticide fiind selective pentru entomofauna utilă din ecosistemele pomicole. Pentru evaluarea eficacității fiecărei variante experimentale în reducerea atacului produs de molia pieliței fructelor, s-a procedat la stabilirea intensității atacului produs de larvele ambelor generații. La generația hibernantă s-a urmărit atacul produs de larve la nivelul inflorescențelor, lăstarilor şi frunzelor, iar pentru generația de vară s-a urmărit atacul la nivelul fructelor. Rezerva biologică hibernată ridicată a acestui dăunător, în primăvara anului 2008 a afectat şi a distrus până la 37% din mugurii, frunzele şi vârfurile de creştere ale merilor. Utilizarea feronilor atractanți sexuali pot diminua frecvența atacului produs la fructe cu până la 76,92%. Aplicarea feromonului prin metoda „Atract and kill", poate mării eficacitatea acestuia cu până la 15,38%.*

INTRODUCTION

Adoxophyes orana peel moth of fruits still remains, for the apple plantations the most frequent pest of economical importance. The level of population at these species often outruns the value of the economical damage level and so in the fruit plantation are met unusual damages.

For maintaining the population under the PED value, it is enforced the setting-up of a complex strategy of preventing and fighting of *Adoxophyes orana* peel moth of fruits. Regarding this strategy, unfortunately, most often are used chemical treatments with different insecticides. Although the method shows a high biological efficiency, in time was shown that side effects of chemotherapy didn't late to appear.

For avoiding the contamination of fruits it must be used the using of other fighting methods, which must develop from the morphological, biological and behavioral features of the specie. For this specie was launched on the market the specific sexual atractant pheromone. This pheromone is synthesized at the Chemical Institute from Cluj-Napoca. Using these products, from the biopesticides category, will allow the obtaining of a healthy fruit production, without insecticides residues. Their using doesn't affect the ecological balance,

these biopesticides being selective for the useful entomofauna from the fruit plantation ecosystems.

MATERIALS ANT WORK METHOD

In 2008, near Cluj area plantations, we proposed the following objectives, regarding the fruit peel moth, *Adoxophyes reticulana*:

- tracking the pest biological cycles
- monitoring the population by catching the males with feromonale traps
- evaluating the fighting method of fruit peel moth *Adoxophyes orana,* with „attract and kill„ biotehnique with the product **MESAJ AR;**

For achieving these objectives we used the specific sexual atractant pheromone traps, pheromone synthesized and commercialized by the Chemical Research Institute Raluca Ripan from Cluj-Napoca.

The experimental variants were:

- V1 = Untreated witness in which were placed traps with the specific sexual atractant pheromone ATRARET. In this lot was pursued the pest biology
- V2 = Lot in which the „attract and kill" method was used. In this lot, the product MESAJ AR was applied as drops on the trunk of apple-trees at a high of 1.5 m, on the Nordic side .The product was applied in 2 rounds, a dose for each generation of fruit peel moth.
- V3 = Lot in which chemical treatments were applied.
- V4 = Untreated witness lot in which weren't placed neither pheromone traps, lot for evaluating the attack made by the fruit peel moth.

Traps were installed on 14th of May 2008, pheromone capsules being changed at a 6 weeks cycle. Traps with specifically pheromones of *Adoxophyes orana,* pests were taken for good at 10th of September 2008. At the placed traps was made the weekly reading of captures.

For underline the biological cycle of moth, in year 2008 was followed in the parcels the appearance of each developing level, adults with the help of sexual atractant pheromone, and the grubs and sterns thru direct observation, made in the attacked trees.

RESULTS AND DISCUSSIONS

The results obtained in year 2008 in monitoring the population of fruit peel moth, *Adoxophyes orana,* by catching the males with pheromone traps are preceded in table 1.

With the help of 3 traps, in V1, were captured a total number of 624 males, from which 374 from hibernated generation, and 250 are males from the first generation. In year 2008, the flight of the hibernated adult generation started on 20th of May. The flight of this generation was divided on an 8 weeks gap, with the flight curve maximum in the 4th week, meaning the end of the first part of June month, when the number of captures was of 102 adults per week. The flight of these generations ended at the end of the first decade of July. In this period was started also the flight of the summer generation adults. The flight of the last adults of the hibernating generation easily superposed with the flight of the adults of the first generation. This new generation had the flight spaced on a period of 7 generations, with the flight curve maximum accomplished from the fourth week from the flight beginning, when the number of captures was of 67 adult per week. The flight of this generation was interrupt at the end of august.

In year 2008 we followed also the spacing in time of the development degrees of fruit peel moth (table 2). This specie hibernates in the grub age (third age).The hibernating grubs made appearance in the tree crown at the date of 23 of April. Starting with this date the grubs started to migrate towards the buds and flowers, where they proceeded with the feeding period. The grubs, of green-dirty yellow color, with the body dimension of 17-19 mm, feed isolated

and in small groups. The first grubs which made it to the complete development and which started the recession in the transformation places were seen on the 29th of April. This means that the hibernating feeding, in spring, lasts at least 6-7 days (period depending specially of the climatic factors). The appearance of the hibernating generation was produce at approximate 26 days from the transformation.

Table 1

Situation of recorded captures at the *Adoxophyes orana,*(U.S.A.M.V. Cluj-Napoca, 2008, V1)

No. Cap	Observation date															
	20 05	27. 05	03. 06	10. 06	17. 06	24. 06	01. 07	08. 07	15. 07	22. 07	29. 07	05. 08	14. 08	21. 08	29. 08	Total
1	4	12	22	37	25	18	10	1	2	12	21	16	5	7	0	192
2	0	16	19	26	21	13	7	0	0	9	19	27	22	14	12	205
3	5	21	28	39	18	19	11	2	4	8	17	24	15	9	7	227
Total	9	49	69	102	64	50	28	3	6	29	57	67	42	30	19	624

Table 2

The spacing of the main development degrees at the *Adoxophyes reticulana* species (U.S.A.M.V. Cluj-Napoca, 2008)

No.	Development stage	The start date
1	The rerun of the hibernated grub activity	23 April
2	The appearance of the first sterns	29 April
3	The flight of the hibernating adults generation	20 May
4	The appearance of grubs G1	10 June
5	The appearance of adults	15 June
6	The appearance of grubs G2	5 August

On the 10th of June, the first generation grubs appeared. Their appearance it is much spaced and spreads on a wide range as well as the hibernating adult's generation flight. The grubs of this generation feed especially on leaf and on young trees, fruit attack being more reduced.

The flight of the first generation adults started on 15th of July, and the first grubs of the second generation were seen on 5th of August. The grubs of this generation feed most on mature leaf and on fruits peel especially. The attack on fruits was seen in the caliciary zone and especially on sides of fruits , there where they touch each other or on the leafs. The leafs stocked on the fruits were captured on silk wire.

The results obtained in year 2008 in pursuing the population of *Adoxophyes orana,* catching the males with the feromonale traps, in the variant in which the „attract and kill" method, are marked on table 3

In this year, with the help of the 3 control traps, were captured the total number of 110 males, from which 49 from the hibernating generation, and 61 are males of the first generation. The small number of captures accomplished at the hibernating generation flight, confirms the efficiency of the fighting strategy applied by the „attract and kill" method .In this variant the number of captures was reduced with 514 adults (with 325 at the hibernating generation and with 189 adults at the summer generation). The decreasing of the captured adults are explained thru the effect that **MESAJ AR**, which attracts and killed a most part of the male population.

The obtained results in year 2008 in the monitorised population of *Adoxophyes orana,* by catching the males with the help of feromonale traps, in the variant in which the chemical fighting method was applied, are passed in table 4.

Table 3

The situation of recorded captures at the *Adoxophyes orana*, species
(U.S.A.M.V. Cluj-Napoca, 2008, V2 „Attract and kill")

No. Cap	Observation date															
	20 05	27. 05	03. 06	10. 06	17. 06	24. 06	01. 07	08. 07	15. 07	22. 07	29. 07	05. 08	14. 08	21. 08	29. 08	Total
1	2	3	3	1	3	3	-	1	6	3	4	2	-	1	-	32
2	3	1	1	10	1	3	-	2	3	5	9	3	1	2	-	44
3	4	6	1	1	2	1	-	2	10	3	1	-	1	2	-	34
Total	9	10	5	12	6	7	-	5	19	11	14	5	2	5	-	110

Table 4

The situation of recorded captures of *Adoxophyes orana*, species
(U.S.A.M.V. Cluj-Napoca, 2008, V3 – chemical treatment)

No. Cap	Observation date															
	20 05	27. 05	03. 06	10. 06	17. 06	24. 06	01. 07	08. 07	15. 07	22. 07	29. 07	05. 08	14. 08	21. 08	29. 08	Total
1	1	2	3	-	-	-	-	1	6	3	-	-	-	-	-	16
2	3	3	1	-	-	-	-	-	3	-	-	-	-	-	-	10
3	4	3	1	-	-	-	-	2	14	3	1	-	-	-	-	28
Total	8	8	5	-	-	-	-	3	23	6	1	-	-	-	-	54

In this year, with the help of 3 control traps, were captured a total number of 54 males, from which 21 from the hibernating generation, and 33 are males of the first generation. The low number of captures accomplished at the hibernating generation flight, confirms the efficiency of the fighting strategy applied with insecticides. In this variant was reduced the number of captures with 570 adults (with 353 at the hibernating generation and with 217 adults at the summer generation). The decreasing of the adults capture is explained thru the effect that MESAJ AR had, product which attract and killed a big part of the male population.

In this year, in V3 were made 12 treatments.

For evaluating the efficiency of each experimental variant in reducing the attack made by the fruit peel moth, was established an intensity of the attack made by grubs of both generation. At the hibernating generation was followed the attack produced by the grubs at the flower, young trees and leafs levels, and for the summer generation was followed the attack at the fruit level.

In year 2008, regarding the high biological reserve from the past year, the hibernating generation grubs produced strong attacks. Their attack manifested mainly at the buds, leafs and growing tips. The attack was different from land plot to land plot, but for the studied ones the frequency of the attack made by the hibernating grubs is between 3 % and 37 % (table 5).

As it is normal, at the hibernating generation (which attacked in spring) could accomplished a reducing of the attack frequency only at V3 , variant in which were applied chemical treatments. In this variant\the attack frequency was strong lowered, down to 4 %, so the chemical treatments had an efficiency of 89.19 %.

In table 6 was shown the frequency of attack made by the summer generation grubs (G1) of *Adoxophyes orana*, at fruits. In the variant in which wasn't taken any fighting method the frequency of attacked fruits was of 34 %. By applying the chemical treatment the frequency of attack was reduced with 94.11 %. The decreasing of the attack frequency was felt also in the variants in which were used sexual attractant pheromones. By applying these after the standard

method (baits placed in traps), the attack decreased with 64.71 %, and by applying these thru the „Attract and kill „ method the frequency of attack lowered with 76.47 %.

BY using this variant, the pheromone parameters were amplified with 9.76 %.

Table 5

The frequency of the attack produced by the hibernating grubs of *Adoxophyes orana*, at flowers, young trees and leafs (U.S.A.M.V. Cluj-Napoca, 2008)

Nr. crt.	Plot land name	Area Ha	Variety	The attack frequency %	Efficiency %
V.1	Land plot 1	0,5	Ionatan, Golden,Wagner	35	-
V.2	Land plot 2	0,5	Ionatan, Golden, Starkrimson	32	-
V.3	Land plot 3	0,5	Ionatan, Golden, Starkrimson	4	89,19
V.4	Land plot 4	0,1	Ionatan, Golden, Starkrimson	37	-

Table 6

The frequency of the attack made by the summer generation grubs (G1) of *A. reticulana* at fruits (U.S.A.M.V. Cluj-Napoca, 2008)

No. crt.	Land plot name	Area ha	Variety	Frequency of attack %	Eficiency %
V.1	Land plot 1	0,5	Ionatan, Golden,Wagner	12	64,71
V.2	Land plot 2	0,5	Ionatan, Golden,,Starkrimson	8	76,47
V.3	Land plot 3	0,5	Ionatan, Golden,Starkrimson	2	94,11
V.4	Land plot 4	0,1	Ionatan, Golden,Starkrimson	34	-

In table 7, is shown the frequency of attack made by the grubs of autumn generation (G2) of *Adoxophyes reticulana* at fruits.

Table 7

The frequency of attack made by the grubs of autumn generation (G2) of *Adoxophyes reticulana* at fruits (U.S.A.M.V. Cluj-Napoca, 2008)

No. crt.	Land plot name	Area ha	Variety	Frequency of attack %	Eficiency %
V.1	Land plot 1	0,5	Ionatan, Golden,Wagner	15	61,54
V.2	Land plot 2	0,5	Ionatan, Golden,,Starkrimson	9	76,92
V.3	Land plot 3	0,5	Ionatan, Golden,Starkrimson	1	97,44
V.4	Land plot 4	0,1	Ionatan, Golden,Starkrimson	39	

At the grubs from the second generation, which are starting their attack from autumn, the treatment program and the used insecticides determined a decreasing of the population of this pest, so that the damages could be reduced. The damaging degree of this new generation is between 1-2 % at the Wagner Premiat and Golden variety, and at Jonatan and Starkrimson variety was of 0.5 -1 %.

The chemical method had an efficiency of 97.44 % (tab.9). The reducing of the frequency and intensity shown at the second generation fruit peel moth is explained thru the good efficiency that the used products ha at the chemical treatment. In warning the chemical treatment and choosing the insecticides was taken in consideration the population of this pest.

Reducing the attack frequency was shown also in the variants in which were used sexual attractants pheromones. By applying these after the standard method (baits placed in traps) the attack was decreased up to 61.54 %, and with „Attract and kill" method, the frequency of attack was decreased with 76.92 %. By applying this variant, the functional parameters of the pheromone were amplified with 15.38 %.

Although, the applying of the sexual pheromones are having a reduced efficiency in reducing the attack frequency, in comparing with the chemical method , this one is enforced thru the ecologizating of the fruit production , these one without pesticides residues. Applying

this method can give very good results in the plantation in which the biological reserves is low, or the method is applied starting with the summer generation of pest , after at the grubs activity rerunning a fighting chemical treatment was applied.

CONCLUSIONS

1. Fruit peel moth, *Adoxophyes orana,*, was a very important pest in apple tree plantation in year 2008.
2. The upper hibernating biological reserve of this pest, affected and destroyed in the spring of 2008 up to 37 % of buds, leafs and growing tips of apple trees.
3. The fruit peel moth develops 2 generation per year, the adult's flight being strongly influenced by the dynamic of the climatic factors.
4. Monitoring the population of this pest, but also the following the biological cycle, also can be made with the help of the traps of the specific sexual atractant pheromone, which has a good atractivity and selectivity.
5. Using the sexual attractant pheromones can decrease the frequency of attack made at fruits up to 76.92 %.
6. Appling the pheromone with the method „attract and kill„ can increase the efficiency of this up to 15.38 %.
7. For fighting this pest it s recommended also the establishing the strategy of applying of insecticides.

- The applying period of treatments is established in accordance with the biological cycle of the specie :
  - the apparition of the hibernating grubs;
  - the starting of the flight period of adults
  - the appearance period of the first generation grubs.

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