SUMMARY OF PhD THESIS

Studies regarding landscape improvement pests in Covasna
(monitoring, morphology, bioecology and control)

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Keywords: Parectopa robiniella Clemens, Phyllonorycter robiniella Clemens, Cameraria ohridella Deschka-Dimić, monitoring, morphology, bioecology, chemical control, integrated control.

INTRODUCTION

In an increasingly urbanized society parks and other green areas are of strategic importance for the sustainable development of a modern city in terms of life quality. Urban parks enhance the quality of life through the following major functions:

- Air and water purification;
- Wind and noise filtering
- Produces social and psychological benefits for its residents.

Unfortunately, often the aesthetic value of these green spaces is strongly affected by a rich complex of pathogens and pests, which can affect both the vegetative and the generative organs of plants.

In order to reduce the effect of these pests it is necessary to know and monitor their population dynamics, in order to establish comprehensive strategies for prevention and control.

For pest control alternative methods are recommended (non-chemical, therefore non-poluting), methods which are based on the morphological characteristics, features of the behavior and of the biological cycle. In this context falls on the research conducted to develop this thesis.

CLIMATIC CONDITIONS OF THE AREA IN 2009-2011

Situated at the feets of the Brețcu Mountains, Covasna lies at the altitude of 564 m, surrounded by not so high mountains with rounded peaks by the external factors, covered by forests. The climate is subalpine with cool summers and mild winters. The air is richly negative ionized, often been called “the town of the 1000 springs”.

Thermally, the year of 2009 was cooler, the yearly average being of 9,1°C. Comparing with the multiannual average which is 9,4°C, it’s observed a decrease of 0,3°C. It is noteworthy that this year follows a year that was been very warm, the year 2008 having an annual average of 10,1°C (with 0,7°C higher then the multiannual average). Regarding the precipitation this was of 589,5 mm, lower than the multiannual average of 793,9 mm.

The climatic factors of 2010 shows that this year was warm, the annual average being 9,8°C, with 0,4°C above the multiannual average, recording a total rainfall of 1171,1 mm.

The thermal average of 2011 was characterizeic for the area, being noteworthy that the temperatures exceeding multiannual average in the July-September period are very favourable for the pest’s development. Also the precipitation is corresponding to the multiannual average, but with a very uneven distribution. The late summer autumn period was a drought period which collaborating with the higher temperatures favoured the growth and development of all pest species, making them extend their period of activity.
RESEARCH OBIECTIVES

Considering the fact that the rich complex of pests can strongly affect the aesthetic value of the landscape or can determine even the drying of some trees, shrubs and ornamental plants, between 2008 and 2011, in Covasna county’s parks we proceeded some observations and setting some experimental research fields (observations ar which took part also the employees of Fitosanitary Unit Covasna), with the following objectives:

- Monitoring the complex of harmful insects of park’s ornamental plant species from Covasna, Târgu Secuiesc and Sfântu Gheorghe (for the evaluation of the biologic reserve) and the attack frequency made by these, especially the microlepidoptera miners *Parectopa robiniella* Clemens, *Phyllonorycter robiniella* Clemens and *Cameraria ohridella* Deschka-Dimić;
- Studying the aspects of external morphology of the development stages of the miner *Phyllonorycter robiniella* Clemens;
- The biological cycle and the ecology tracking of the *Parectopa robiniella* Clemens, *Phyllonorycter robiniella* Clemens and *Cameraria ohridella* Deschka-Dimić species;
- Testing the effectiveness of various control methods of the *Parectopa robiniella* Clemens, *Phyllonorycter robiniella* Clemens and *Cameraria ohridella* Deschka-Dimić species

WORKING MATERIALS AND METHODS

- Monitoring the pest complex on the park’s ornamental plant species.

In the city’s central park, green areas, you can find a series of ornamental trees: black locust 73, willow 17, horse-chestnut 38, pine 12, maple 11, linden 12, beech 1, spruce 5, and douglas-fir 2. Between 2008 and 2011, in Covasna city’s central park, but also in Sfântu Gheorghe and Târgu Secuiesc cities, we proceeded on monitoring the two black locust leafminer species (*Parectopa robiniella* Clemens and *Phyllonorycter robiniella* Clemens) and of the horse-chestnut leafminer (*Cameraria ohridella* Deschka-Dimić). On all species we proceeded to establish the attack’s frequency and the number of attacked leaves, but also on establishing the number of developed mines on a leaf. The leaves sampling was made in three or four terms during the host’s vegetation period. The identification of the two species which attack the black locust it has been made after the developed mines features.

- Studying the aspects of external morphology of the development stages of the miner *Phyllonorycter robiniella* Clemens;

In order to study the aspects of external morphology, the biological material (adults, larvae and pupae) was collected from Covasna city’s parks. All the development stages were sampled from the leaves infested by this pest, preserved for 24 hours in glicerin, and after transported to the Electronic Micoscopy Center from Veterinary Medicine and Agricultural Sciences University from Cluj Napoca, where we made the photos.
The tracking of the biological cycle and ecology of the *Parectopa robiniella* Clemens, *Phyllonorycter robiniella* Clemens and *Cameraria ohridella* Deschka-Dimić species;

For establishing the mining moths biological cycle, annually we collected samples from attacked leaves (on every observation, 1000 samples), starting with the second half of the month of May until September. These leaves were analyzed in laboratory and were tracked at every development stages of the studied species.

At every observation we established the leaves frequency from the sample, the dead larvae number from the biological reserve and the biological reserves biological stage: larvae, pupae and adults. At each observation we made the correlation with the development phenophase of the host, but also the climatic factors evolution.

The effectiveness testing of various pest control methods of the *Parectopa robiniella* Clemens, *Phyllonorycter robiniella* Clemens and *Cameraria ohridella* Deschka-Dimić species.

For the control of these pests, we checked three methods:
- chemical method
- male mass catching method
- mecanical method

The testing of some pesticides effectiveness

For the chemical control of micromoth miners we made some experiences for testing the effectiveness of pesticides with active substances from different chemical groups. For each year of study, we worked with 6 treatment options each three times, applied on five trees located in Covasna city.

The pesticides used for the 6 experimental variations are:
- VANTEX 60 CS  (Cyhalothrin range),
- WARRANT 200 SL  (Imidacloprid),
- DIMILIN 25 WP (Diflubenzuron),
- CALYPSO 480 SC (Thiacloprid),
- CONFIDOR ENERGY (Imidacloprid + Deltamethrin),
- MOVENTO 100 SC (Spirotetramat).

Male mass catching method

This method was applied for the control of the horse-chestnut leafminer *Cameraria ohridella* Deschka-Dimić. The autochthonous sexual pheromone AtrCam was used, synthetised by the Research Institute „Raluca Ripan” from Cluj Napoca. For each of the horse-chestnut trees observed, we placed tree phermonal traps, and the phermonal bait was changed at every six weeks.

The mecanical method

For decreasing the biological reserve of the studied mining moths we collected and destroyed the fallen leaves in the autumn, leaves in which the hibernating biological reserve
of the moths *Cameraria ohridella* Deschka-Dimić and *Parectopa robiniella* Clemens can be found. It has been compared the frequency and the intensity of the attack made by these species on the trees located in area on which the collecting and destroying of the leaves was made comparing it were it doesn’t was applied.

**RESULTS ON SPREAD AND BIOECOLOGY OF PHYLLONORYCTER ROBINIELLA CLEMENS AND PARECTOPA ROBINIELLA CLEMENS SPECIES IN COVASNA COUNTY**

During the 2008-2011 period in three location of Covasna county (Covasna, Târgu Secuiesc și Sfântu Gheorghe cities), we monitored the attack frequency made by these two leafminer moths of the black locust tree, but also how many mines they develop on a leaf.

The monitoring of these elements has been made annually at approximately at the same date and with samples taken in every month for comparison and for a more correct observation of the two cantitative parameters. In Covasna and Tg. Secuiesc cities, we made yearly three observations and in Sf. Gheorghe four.

**Monitoring Robinia leafmining moths in Covasna city**

By doing a synthesis on the entire attack frequency made by the leafmining moths of the black locust tree, *Phyllonorycter robiniella* and *Parectopa robiniella* it can be discoveded the growth of this parameter, during the annual biological cycle, but also from one year to another. At the end of the biological cycle of the studied pests, the attack frequency was 9.2 % in 2008, 9.9 % in 2009 and 16.8 % in 2010 and 2011. In can be observed in warm years (especially in the development stages sample period) are very convenient for the black locust leafmining moths population increase.

Because the two species of mining moths have the same spreading area, they can attack lonely or in a complex way the tree leaves. For highlighting of this aspect, the attacked leaves were analyzed depending on the attack made by only one species or together.

We could observe a growth of the frequency attack made in lonely or simultaniosly by both species, so between two observations, but also from one year to another. The biggest growth of the attacked leaves number could be observed in 2011, when the attacked leaves number by a single specie has reached at the final of the mining moths biological cycle 15.8% of the leaves and the number of the ones attacked simultaniously reached 3.9% in 2010 with a collapse of the attacked leaves number in 2011, when the frequency of these was 1%.

On black locust leafmining moths, besides monitoring the attack frequency, we proceeded on the fixing the number of mines developed by each species on a leaf. This parameter was followed on the leaves attacked by only one species, but also on the leaves attacked simultaniously by *Phyllonorycter robiniella* Clemens și *Parectopa robiniella* Clemens.

In 2008 the average number of mines on a leaf attacked by a single species at the end of September reached 2.9 mines/leaf for *Phyllonorycter robiniella* and 2.3 mines/leaf for
Parectopa robiniella, and when the two species attacked simultaneously this number was 2.2 mines/leaf at Phyllonorycter robiniella and 1.8 mines/leaf at Parectopa robiniella.

In September 2009, the average number of mines on a leaf attacked by a single species was 3.3 mines/leaf for Phyllonorycter robiniella and 2.2 mines/leaf for Parectopa robiniella, and when the two species attacked simultaneously the medium number 2.1 mines/leaf at Phyllonorycter robiniella and 1.7 mines/leaf at Parectopa robiniella. It can be observed that in comparison with 2008, the number mines/leaf has grown only for Phyllonorycter robiniella.

In 2010, on the last observation made, the average number of mines on a leaf attacked by single species was 3.7 mines/leaf for Phyllonorycter robiniella and 2.1 mines/leaf for Parectopa robiniella; when these species attacked simultaneously the number of mines/leaf was 1.8 at Phyllonorycter robiniella and 1.6 mines/leaf at Parectopa robiniella.

In 2011, the average number of mines on a leaf attacked by single specie has reached 4.7 mines/leaf for Phyllonorycter robiniella and 1.4 mines/leaf for Parectopa robiniella. In this year was observed the least number of mines/leaf at Parectopa robiniella from all the four years of observation. When the miner moths attacked simultaneously the number was 2.9 mines/leaf at Phyllonorycter robiniella and 1.3 mines/leaf at Parectopa robiniella.

Monitoring of the black locust leafminer moths in Tg. Secuiesc city

In 2008 the final attack frequency reached 5.4% for Phyllonorycter robiniella with 2 mines/leaf and 2.7% for Parectopa robiniella with 1.8 mines/leaf.

In September 2009, at the final evaluation we observed an attack frequency of 6.1% at Phyllonorycter robiniella with 3.2 mines/leaf and 3.9% at Parectopa robiniella with a medium number of 2.1 mines/leaf.

In September 2010, at the final evaluation we observed an attack frequency of 9.8% for Phyllonorycter robiniella with 3.5 mines/leaf and 5.9% for Parectopa robiniella with 2.9 mines/leaf.

In 2011, at the final evaluation we observed an attack frequency of 14.3% for Phyllonorycter robiniella with 3.9 mines/leaf and 2.7% for Parectopa robiniella with 1.7 mines/leaf.

Following the population dynamics of the leafminer moths in Tg Secuiesc area, it can be observed a slowly, but constant growth at Phyllonorycter robiniella Clemens during the four year monitoring. The attack frequency has grown from 5.4 % in 2008 to 14.3% in 2011 and the average number of mines/leaf from 2 mines/leaf in 2008 to 3.9 mines/leaf in 2011. It can be observed a direct proportional relation between the attack frequency and the average number of mines/leaf.

At Parectopa robiniella Clemens, in the first three years, the tendencies were identical to the other species (both the attack frequency and the average number of mines/leaf), but in 2011 we observed a significant decrease of these parameters, going back to the 2008 values. The ecological factors from 2010’s autumn and 2011’s spring have strongly affected the hibernating biological reserve.
Monitoring of the black locust leafminer moths in Sf. Gheorghe city

In 2008 the attack frequency reached 5.4% for *Phyllonorycter robiniella* with 3.9 mines/leaf and 2.8% for *Parectopa robiniella* with 2.1 mines/leaf.

In September 2009, at the final evaluation we observed an attack frequency of 6.1% at *Phyllonorycter robiniella* with 3.5 mines/leaf and 4.9% at *Parectopa robiniella* with an average number of 2.5 mines/leaf.

In 2010, at the final evaluation we observed an attack frequency of 7.1% at *Phyllonorycter robiniella* with 3.8 mines/leaf and 5.8% at *Parectopa robiniella* with 2.4 mines/leaf.

In 2011, at the final evaluation from September we observed an attack frequency of 18.5% at *Phyllonorycter robiniella* with 4.8 mines/leaf and 3.6% at *Parectopa robiniella* with 2.1 mines/leaf.

Following the population dynamics of the leafminer moths in Sf Gheorghe area, it can be observed the same tendencies as in the other studied locations. It is a slowly growth of *Phyllonorycter robiniella* during the four years of observation and it can be observed a direct proportional relation between the attack frequency and the average number of mines/leaf.

At the September observation, the attack frequency made by *Phyllonorycter robiniella* had values between 5.4% (in Tg. Secuiesc and Sf Gheorghe in 2008) and 18.5% (in Sf. Gheorghe in 2011). Comparing these three locations, we can observe that the strongest attack (in the first three years of observation) was in Covasna and Sf. Gheorghe in 2011.

The attack frequency made by *Phyllonorycter robiniella* Clemens in September, varied between 2.7% (in Tg. Secuiesc in 2008 and 2011) and 7.3% (in Covasna in 2010). In each year the lowest attack was on the black locust trees from Tg. Secuiesc.

In every studied area, the dominant species was *Phyllonorycter robiniella* Clemens, a species on which a growth of the attack frequency can be observed from one year to another having an ascending populational density.

At *Parectopa robiniella* Clemens can be observed that in every location it was a growth for the attack frequency in the first three years of monitoring and a decrease in 2011.

In every studied city, on *Robinia ambigua* trees (red locust tree) we observed an attack made only by *Phyllonorycter robiniella* Clemens. On this *Robinia* species, the attack frequency is much lower than on *Robinia pseudoacaccia*. Generally, we observed at most two mines/leaflet.

**RESULTS REGARDING STUDIES ON THE EXTERNAL MORPHOLOGY OF THE Phyllonorycter robiniella Clemens SPECIES**

The black locust leaf miner at hatching has a 0.45-0.95 mm bodylength, and the larva at his last development stage has a 3.7-4.75 mm length. At the material studied in Covasna this dimensions were found at the upper limits met in the literature. The dimension 4.75 mm was not found in the consulted literature.

The larvar stages of the species *Phyllonorycter robiniella* Clemens are recognized by their corporal dimension, integumentary ornamentations and chaetotaxy elements.
In the first two larval stages the width of the cephalic capsule is bigger than its length, in the third stage these two dimensions are equal, and in the last two stages the length of the cephalic capsule is bigger than its width.

In the first larval stages the biggest segment is the prothorax, and beginning from the third larval stage the 3th, 4th, and 5th abdominal segments are the most developed.

At the larva of this species four prolegs are found on the 3th, 4th and 5th abdominal segments and on the anal segment.

The length of the true legs increases from the first pair to the last pair, and at the prolegs it decreases from the first to the last pair.

On the dorsal part of the 6th and 7th segments (toward their forward), they have a characteristic integumental ornamentation, there are found 6 good developed warts, which have a conical form, slightly curved to the posterior.

On the ventral part of the 7th segment, on its posterior part, its characteristic ornamentation, a transversal elevation in form of a border on which 18 rows of transversal microtuberations are found.

On the ventral part of the last abdominal segment two transversal dents are found, like a fissure, towards the lateral part of the segment.

The posterior part of the last abdominal segment ends with a formation in the shape of a crown, with a rich ornamentation.

The average length of the measured pupae was of 3,278 mm. The most developed abdominal segments are the 4th, 5th and 6th which lengths exceeds 0,300 mm.

The mouth appendixes in length touch the posterior part of the 6th abdominal segment.

The pupa is wrapped in a silky webbing, loose at the beginning, and its in a puparium made from a thicker webbing in form of an oval board.

**PHYLLONORYCTER ROBINIELLA CLEMENS BIOECOLOGY IN COVASNA COUNTY**

In Covasna *Phyllonorycter robiniella* Clemens develops two generations a year and the adults from the hibernating generation resume their activity starting with the end of the second decade of May. Immediately after the beginning of the flight the females start laying eggs on the black locust tree leaves.

At the first generation, the incubation period lasts 11-12 days, so, starting with the last days of May and the first days of June the mines have been noticed on the attacked leaves. The development period of the mines made by the larvae of the first generation lasts until the beginning of August, due to the fact that adults of the first hibernating generation appear gradually and the period of egglaying lasts during all June.

The miner moth larvae feed for approximately 40 days, followed by the pupation. The pupal stage lasts 10 – 11 days.

After studies, we concluded that an individual of this species goes through the egg, larval and pupal stages during 61 – 66 days.

Summer generation’s adults appear in the last decade of July and their flight lasts until the end of August.
For the second generation, the incubation period lasts 8 – 11 days, the first larvae of this generation being noticed at the beginning of August.

The larval stage lasts 24 -36 days. Part of the larvae population (those who made their appearance later) does not end their development, dying at the arrival of lower temperatures.

The second generation pupae are being noticed starting with the last days of August and the beginning of the second decade of September. The pupal stage lasts 11 – 15 days and the hibernating generation’s adults begin their flight with the second decade of September.

The development period of the egg, larval and pupal stages at this generation lasts between 48 and 55 days.

The biggest part of the \textit{Phyllonorycter robiniella} Clemens populations hibernates the winter in pupal stage.

In the developed mines by \textit{Phyllonorycter robiniella} Clemens we noticed also a parasite activity on the larvae and pupae by 3.9\% in 2009, 5.2\% in 2010 and 7.1\% in 2011.

Annually we detected (especially in 2011) a very large number of mines that had been developed on the superior part of the leaf, which represents a case unnoticed in the consulted literature in this area of research.

**RESULTS REGARDING THE HORSE-CHESTNUT LEAFMINER MOTHS BIOLOGY**

In Covasna area, the horse-chestnut leafminer develops annually three generations (the third generation is partially, the other part of the summer generation’s larvae going into diapause). The hibernating generation’s adults begin their flight in the first part of May. The adults’ Flight maximum can be observed at approximately 11 – 14 days after it started.

On the entire period of the hibernating generation’s flight with the 20 pheromonal traps placed annually, it was trapped:

- ♦ 4243 adults in 2008, (a medium of 212,15 adults/trap);
- ♦ 6607 adults in 2009, (a medium of 330,35 adults/trap);
- ♦ 8981 adults in 2010, (a medium of 449,05 adults/trap).

The incubation at the first generation lasts 19 days at an average temperature of 16,9 °C, 20 days at 14,9 °C and 22 days at 14,2 °C. In the last days of May or in the first days of June, the first mines on the horse-chestnut leaves show.

The evolution of this generations larvae was for about 23 days at a medium temperature of 16,9 – 18,3 °C, for 24 days at 14,9 – 17,2 °C and for 26 days at 14,2 – 18,1 °C; and in the last decade of June the pupae could be noticed. This pupal stage was between 9 – 10 days.

The new generation’s flight (summer generation) was reported in the first decade of July and the flight curve’s paramount was observed after approximately 8 – 13 days. In each year the population density of this generation was the highest of all, fact that leads to the growth of the attack frequency, but also of the attack intensity on the foliar apparatus of the horse-chestnut tree.
On the entire flight period of the summer generation, with the 20 pheromonal traps placed annually, it was trapped:

- ♦ 5806 adults in 2008, (a medium of 290.3 adults/trap);
- ♦ 6958 adults in 2009, (a medium of 347.9 adults/trap);
- ♦ 10075 adults in 2010, (a medium of 503.75 adults/trap).

The eggs incubation period for the second generation was lower than the one from the first generation, lasting 15 days at a medium temperature of 19.7 °C, 16 days at 19.2 °C and 17 days at 18.3 – 18.5 °C. The first mine of this generation were noticed in the last decade of June.

The larval stage of this generation lasted 19 days at a medium temperature of 19.7 °C, 20 days at 19.2 °C and 21 days at 18.5 °C. In the first decade of August the pupae were observed. This pupal stage was sampled in 7 – 9 days.

The last generation adults’ flight was noticed in the second half of August, and the flight curve’s maximum was noticed after approximately 10 – 13 days.

The eggs incubation for this generation lasted 14 days at an average temperature of 21.8 °C, 15 days at 19.2 °C and 16 days at 19.4 days. The first mines of this generation were noticed in the last decade of August and the first days of September.

The larval stage for this generation lasted 19 days at an average temperature of 19.8 °C, 20 days at 19.4 °C and in the last decade of September the pupae could be noticed. The pupal stage is also the hibernating stage of the specie.

On the entire adult’s flight period of this generation, using 20 pheromonal traps placed annually, it was trapped:

- ♦ 1322 adults in 2008, (a medium of 66.1 adults/trap);
- ♦ 2554 adults in 2009, (a medium of 127.7 adults/trap);
- ♦ 2837 adults in 2010, (a medium of 141.85 adults/trap).

It is important to notice that summer generations are overlapping, the adult’s flight being a continuous flight between July and August.

THE TESTING OF VARIOUS CONTROL METHODS’ EFFECTIVENESS AGAINST PARECTOPA ROBINIELLA CLEMENS, PHYLLONORYCTER ROBINIELLA CLEMENS AND CAMERARIA OHRIDELLA DESCHKA-DIMIĆ

For leafminer moth control was checked the effectiveness of various pesticides, and also was applied a series of alternative methods like the reserve destruction by gathering all infested leaves or males mass catching with pheromonal traps.

For the chemical control study of the micromoth miners, *Parectopa robiniella* Clemens, *Phyllonorycter robiniella* Clemens and *Cameraria ohridella* Deschka-Dimić was made experiments for testing the effectiveness of the pesticides with the active substance from different chemical groups.
The research was organized by monofactorial field experiments after the block method. For each year of study we worked with 6 treatment versions three times each, applied on five trees in Covasna.

The treatment application moment was established by a biological criteria, depending on the adults appearing moment and their mass flight observed visually, based on the white panels with adhesive material for black locust leafminers or based on the traps containing the specific sexual attraction pheromone (for *Cameraria ohridella*).

For the control of this pests, on each generation was applied a chemical treatment and the effectiveness of the tested product was checked at the end of the evolution cycle of the species by controlling the frequency and intensity of the attack of each experimental version and by comparing it with the one noticed on the untreated witness version.

➤ **Results on the testing of pesticides on leafminer moths**

On the untreated locust trees, the miner moths of the locust tree leaves, in the monitored years, it could be noticed an attack frequency of 9.9 % in 2009 and 16.7 % in 2010 and 2011, the species showing a growth tendency of the population density. The attack intensity varied between 31.4 % and 47.4 %, causing an attack rate between 3.11 % (in 2009) and 7.96 % (in 2011).

The administration of two chemical treatments (one for each generation), depending on the applied product, the attack rate can be decreased between 81.3 % and 97.44 %.

The best results in black locust leafminer control are obtained with Movemento 100 SC, which is a full systemic, his effectiveness in decreasing the attack rate was between 95.5 % and 97.44 %.

The Confidor Energy pesticide, which has a double action (systemic and by contact) has an efficiency between 92 % and 95.23 %.

The synthesis pyethroids (Vantex 60 CS) had the lowest efficiency, because they only affect the adults; on the population it has a lower efficiency, because they act upon it only in the hatching period and right after they penetrare into the mesophyll and they effectiveness was between 81.3 % and 89.6 %

The Dimilin 25 WP, a chitin inhibitor presents the efficiency between 84.9 % and 92.46 %.

The systemic products from cloronicotine group (Warrant 200 SL and Calypso 480 SC) has an efficiency of 87.8 % and 92.96 %.

During the experminetal period we observed the existence of some statistically assured differences between the climatic factors influence on the pesticides effectiveness. The obtained results in 2009 are very distinct semnificative negative, (one year colder than the others), those in 2010 are very distinct semnificative positive and the ones in 2011 are also distinct semnificative positive.

➤ **The results obtained in testing pesticides for the control of *Cameraria ohridella* Deschka-Dimić**

On the untreated horse-chestnut trees the leafminer moth *Cameraria ohridella* Deschka-Dimić, in the monitored years, showed an attack frequency between 49% in 2009
and 85% in 2011, the species having a growth tendency of the population density. The attack intensity has varied between 53% and 71%, causing an attack rate between 25.97% (in 2009) and 60.35% (in 2011).

By applying a chemical treatment on reaching the flight curve’s maximum, the rate of the attack made by *Cameraria ohridella* Deschka-Dimić can be decreased by 71.66% - 98.91%.

Movemento 100 SC had the efficiency between 94.45% and 98.91%. Confidor Energy decreased the attack grade by 93%-97.77%; Dimilin 25 WP had an efficiency of 83.37% - 94.34%, the cloronicotine 81.98% - 91.65% and the synthesis piethroid Vantex 60 SC had the lowest efficiency (71.66% - 83.18%).

▶ Results regarding the control of *Cameraria ohridella* Deschka-Dimić by male mass catching with the sexual attraction pheromone

The usage of the specific sexual attraction pheromone, AtraCam for *Cameraria ohridella* Deschka-Dimić male mass catching decreased the rate of the attack made by the miner moth to a value between 54.18% (in 2009) and 85.78% (in 2011). The male mass catching contributes to the reducing of the biological reserve, if it is applied consistently every year.

Annually on the entire *Cameraria ohridella* Deschka-Dimić male flight period, with the 20 pheromonal traps, we captured:

♦ 16119 adults in 2009, (a medium of 805.95 adults/trap);
♦ 21893 adults in 2010, (a medium of 1094.65 adults/trap);
♦ 14461 adults in 2011, (a medium of 723.03 adults/trap).

▶ Results regarding the control of Robinia leafminer moths by the method of gathering and destroying the infested leaves

The gathering and destroying the locust tree leaves which had been attacked by the miner moths led to a reduce of the attack rate by 38.58% (in 2009) and 54.4% (in 2010). The attack frequency has been decreased by 17.26% (in 2011) and 39.6% (in 2010) and the attack intensity by 10.51% (in 2009) and 32.91% (in 2011).

The attacked leaves frequency (affected only by the *Phyllonorycter robiniella* Clemens specie) was reduced by gathering the leaves with 6.57% (in 2011) and 26.32% (in 2010).

The attacked leaves frequency (affected only by the *Parectopa robiniella* specie) was reduced by gathering the leaves with 38.23% (in 2011) and 57.14% (in 2010).

The attacked leaves frequency affected simultaneously by the *Phyllonorycter robiniella* Clemens and *Parectopa robiniella* Clemens species was reduced by gathering the leaves with 47.62% (in 2009) and 80% (in 2011).

The gathering and destroying the attacked leaves affects in a larger proportion the biological reserve of the *Parectopa robiniella* Clemens. This fact is due to the features of the biological cycle of this species.
OTHER ORNAMENTAL TREE PEST SPECIES

On the lime tree, the most powerfull damage was made by the aphid *Myzus persicae* Sultzer witch causes the installation smut.

At the firsr observation the average number of aphids/leaf varied between 21 (in 2009) and 28,99 (in 2011), followed by an increase of numbers reaching an average between 43,67 aphids/leaf (in 2009) and 71 aphids/leaf (in 2011). At the last observation the aphids average density was between 42 aphids/leaf (in 2009) and 59,33 aphids/leaf (in 2011).

Beginning with July and especially in August on the aphid infested leaves an afdofauna is installed, mainly species from the genus *Coccinella*, which reduces the aphid density.

On the willow trees the main pests in the area are: *Cynips salicis strobili*, *Dicranura ulmi* Denis&Schiffermuller.

On broad-leaved trees strong damages are reported made by inchworms and *Euproctis chrysorrhoea* L.

The Viburnum species are forcefull damaged by *Aphis spiraephaga* Mull., and *Aphis fabae* Scopoli.