ORIGINAL ARTICLE

# THE CONTROL OF PESTS IN ECOSYSTEMS BY UNCHEMICAL METHODS
# COMBATEREA DĂUNĂTORILOR DIN ECOSISTEME METODE NECHIMICE

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## REZUMAT

Cel mai important mod de a combate dăunătorii este evitarea utilizării produselor chimice, prevenind poluarea mediului în diferitele ecosisteme. În acest scop, colectivul nostru şi-a propus să studieze şi să aplice metode nechimice, conform cerinţelor combaterii ecologice a dăunătorilor, pentru a combate câţiva dăunători rezistenţi la pesticide. Au fost utilizate 2 categorii de metode fizice: cele care au ca principiu utilizarea radiaţiei luminoase reflectate de diferite materiale, aplicate direct pe frunzele plantelor-gazdă, sau pe substrat, care îndepărtează insectele de la locul dăunării şi metode care au ca principiu utilizarea unor capcane vizuale (panouri şi farfurii colorate), pentru atragerea insectelor. Cercetările s-au desfăşurat în anul 2002 prin organizarea a cinci experienţe, în două ecosisteme (livadă şi păşune montană). Ambele categorii de metode şi-au dovedit eficacitatea.

**CUVINTE-CHEIE: combatere, metode nechimice, dăunători, ecosisteme**

## ABSTRACT

The most important way to control the pests is to not use chemicals, preventing the environmental pollution in the different ecosystems. We proposed to study and apply the unchemical methods according to ecological pest management, to control some pesticide resistant pests. The research has been oriented to the physical methods: the use of the light radiation reflected by different materials (supports), directly applied on the host-plant leaves or on the ground, which remove the insects from the damaged zone; the use of visual traps (coloured panels and coloured plates), which attract and capture the insects. The researches were carried out in 2002, with five experiences organised in two ecosystems (orchard and mountain grazing). The both categories of methods were very effective.

**KEY WORDS: control, unchemical methods, pests, ecosystems**

Manuscript received: 19. February, 2003.
Accepted for publication: 2. March, 2003.

JOURNAL
Central European Agriculture
ISSN 1332-9049

## DETAILED ABSTRACT

The most important way to control the pests is not to use chemicals, preventing the environmental pollution in the different ecosystems. We proposed to study and apply the unchemical methods according to ecological pest management, to control some pesticide resistant pests. The research has been oriented to the physical methods: the use of the light radiation reflected by different materials (supports), directly applied on the host-plant leaves or on the ground, which remove the insects from the damaged zone; the use of visual traps (coloured panels and coloured plates) which attract and capture the insects. The researches were carried out in 2002, at Cluj-Napoca and Sinaia, in some private gardens. Four experiences have been organised in an orchard: two on plum-tree, *Prunus domestica* L. (infected with *Hyalopterus pruni* Geoff.) and on apple-tree, *Malus domestica* L (infected with *Aphis pomi* L.), using a reflective material (micronized mica powder) and two using visual traps (coloured sticky panels) at the same species. One experience has been organised on a mountain grazing ecosystem with *Lolium* spp. and *Trifolium* spp., using as visual traps coloured plates. After one week we noted the results. The both categories of methods were very effective.

## INTRODUCTION

The permanent attention to the action of pests in agrohorticultural ecosystems is absolutely necessary, because of the great damages. As the pests are very resistant, the efficacy of classical control methods decreased very much.

The irrational use of pesticides in agrohorticultural ecosystems' chemiotherapy, had a negative impact to the environment, due to the pollutant residues and their long persistence and this fact, imposed a plant protection redirect towards the ecological way, unpollutant, applying some alternative methods and using some modern pesticides. Even these products have a low toxicity (easy to manipulate and use), an increased selectivity for beneficial fauna (bees, fish, zoophags, etc.), quick effects to the target, etc., the ecological problem is not solved by a satisfying point of view. So, the integrated pest management of agrohorticultural ecosystems, needs the priority use of some unconventional methods of pest control. The use of unchemical methods is the main ring of ecological technology, of modern agriculture.

In the world wide plant protection field, it has been introduced and applied the modern integrated pest management concept, where the unpollutant or unchemical methods have the main role (6, 10). For example, among these methods, the biological, physical, mechanical and hormonal control, are notable (16).

The biological control methods, as integrated part of biotechnology, means to rear and launch of zoophags (parasits and predators) (1, 2, 3, 4, 8), using microbiological products (bacterians, virotics, fungical, etc.) (7, 11) or applying biological active substances (especially sexual atractant pheromones) (12).

Other unchemical pest control methods are the physical ones: modification of environmental factors (temperature, humidity, light), use of visual or optical traps - coloured sticky panels (12), coloured plates, ultrasound generators, high frequency electric and electromagnetic fields, radiation emission (X, UV, etc.).

The mechanical methods, using some adequate equipment and devices (15) and the hormonal ones by applying some synthetic analogs of hormones and especially the use of analogs of juvenille hormone (13, 14) represent an alternative to chemiotherapy.

In Romania, the chemical control is widely used by integrated pest management, at a superior level (5, 9). Besides the negative impact on the environment, the high price of modern pesticides settle the direction to unpollutant methods, cheaper, like the unchemical control methods of pests.

Although these are advance guard methods, they can lead to aquire of the interesting results, especially when the studied pests are resistant to pesticides. Because of this, they are a precious alternative from the scientific research point of view and a concrete solution for practical activity.

The national researches concerning these aspects are at the beginning, because the priority of biological methods and the world wide references of specialised litterature are relatively short.

## MATERIAL AND METHOD

We proposed to study and use some unchemical control pest methods, as a continuity of the past study made between 1999-2001 in a grant project. Used methods are based on: applying the principle of reflected light radiance by a material, applied on host-plant leaves, which set in motion the insects, removing them from the damaging place; using visual (coloured) traps (sticky panels) which attract the pests.

To proposed objectives achievement, the experiences were carried out according to experimental technics, in experimental field conditions at Cluj-Napoca and Sinaia, in some private gardens.

In orchard ecosystem conditions, 4 experiences have been organised.

The selection of host-plants was made according to their economical importance and the relationship with particular aphids. It has been selected: plum-tree - *Prunus domestica* L. and apple-tree – *Malus domestica* L.

The first experience has been organised at plum-tree in 2 variants: applied micronized mica powder on leaves (1$^{st}$ variant) and without reflective powder on the control (2$^{nd}$ variant). The second one, at apple-

tree with the same variants. The third experience has been organised at plum tree with visual traps (coloured sticky panels) in 6 variants (white, silver, light-green, emerald-green, light-blue, ultramarine) + control (yellow). The fourth one, at apple-tree with the same variants as to plum-tree.

About the infection with pest, to the plum-tree infected with *Hyalopterus pruni* Geoff. (the grey aphid of plum-tree), the average number of aphids was about 150/leaf and to apple-tree infected with *Aphis pomi* L. (the green aphid of apple-tree), the average number of aphids was about 160/leaf.

The studies were made 1 week after removing or attracting material's application.

In the mountain grazing ecosystem, with cu *Lolium* spp. and *Trifolium* spp., one experience has been organised. We used five ceramic coloured plates with water: 4 variants (white, green, blue) + the witness (yellow).

After one week, we noted the results.

## RESULTS AND DISSCUSION

Reffering to the experiences in the orchard ecosystem with reflective materials, after the experience developed at plum-tree, the result showed the total efficacy of the reflective material (micronized mica powder), determining the total removal of aphids from the crown. The same result was recorded at apple-tree experience with micronized mica powder.

About the experiences with attracting materials (coloured sticky panels), the results showed their good efficacy.

The experience at plum-tree recorded a very good efficacy of all variants.

The most effective traps were the ultramarine (variant 6) with 700 captures, yellow (the control) with 650 captures and emerald-green (variant 4) with 600 captures, followed by silver (variant 2) with 400 captures, light-green (variant 3) with 350 captures, light-blue (variant 5) with 300 captures and white (variant 1) with 300 captures.

At the other experience with visual traps at apple-tree (the same variants as to plum-tree), the results showed their very good efficacy.

The most effctive traps were the ultramarine (variant 6) with 600 captures, yellow (the control) with 500 captures and emerald-green (variant 4) with 450 captures, followed by silver (variant 2) with 400 captures, light-blue (variant 5) with 250 captures, white (variant 1) with 200 captures and light-green (variant 3) with 150 captures.

As a remark, all the visual traps captured excepting the aphids, a lot of other insects from different orders (***Diptera, Homoptera, Hymenoptera, Lepidoptera, Coleoptera***).

Concerning the experience organised on the mountain grazing ecosystem using coloured plates with water as traps, all the variants recorded a very good efficacy.

The most effective was the yellow trap (the control) with 600 captured insects (Ord. ***Diptera, Homoptera, Hymenoptera, Lepidoptera, Coleoptera***), followed by the blue one (variant 3) with 570 captured insects (Ord**.** ***Diptera, Hymenoptera, Homoptera, Lepidoptera***), white (variant 1) with 400 captured insects (Ord. ***Diptera, Hymenoptera, Homoptera, Coleoptera***) and green (variant 2) with 380 captured insects (Ord. ***Diptera, Hymenoptera, Homoptera, Coleoptera, Lepidoptera***).

## CONCLUSIONS

From the experimental data analysis, after the 4 organised experiences in orchard ecosystem conditions, it results that the use of a reflective material (micronized mica powder) at plum-tree and apple-tree, has a very good effect to remove the aphids (*Hyalopterus pruni* Geoff. and *Aphis pomi* L.), because of reflecting the light radiance with the change of wave lenght, which disturb the insects.

Reffering to the experiences with attracting material - visual traps (coloured sticky panels), the results showed a very good efficacy of all variants, capturing the aphids from a plum-tree and apple-tree orchards. The best traps were the ultramarine, yellow and emerald green.

As a remarck, a special attention needs the efficacy of the silver trap (Alluminium made) captured aphids, even it's a reflective material.

Concerning the experience on a mountain grazing ecosystem, using coloured plates with water as visual traps, all the variants showed their very good efficacy.

The researches concerning the use of some physical unchemical methods for pests control, can be continuated by application to other pests and to the larger number of host-plant species.

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