THE EFFICACY OF SOME BIOPESTICIDES AND VEGETAL METABOLITES IN THE CONTROL OF SPIREAS APHID *APHIS SPIRAEPHAGA MŰLLER* (*O. HOMOPTERA – F. APHIDIDAE*)

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The aim of experiments was to establish the efficacy of some bio pesticides and vegetal metabolites from autochthon plants which can be used in the control of aphids on agricultural and ornamental crops. The experiments were carried out under laboratory conditions, the treatments being applied on shoots with leaves affected by aphids, placed in growth boxes. The efficacy (E%) after the percentages of mortality was calculated according to the Schneider-Orelli formula.

Four days after the treatment, the efficacy of the bio insecticides to control spireas aphid varied between 95 - 100% (active ingredients: spinosad, azadirachtin and milbecmectin). By application of the water extract, after four days, high efficacy was registered on Aristolochia clematidis (90%), Artemisia absinthium (80%), Urtica dioica (50%), Sambucus ebulus (50%) and Tanacetum vulgare (54%). The alcohol extracts increased the efficacy on plants like Tanacetum vulgare (70%), Urtica dioica (60%), Sambucus ebulus (85%), Aristolochia clematidis (95%), but decreased on Artemisia absinthium (55%).

Key words*: bio insecticides, vegetal metabolites, Aphis spiraephaga*

The narrowing sphere of application of chemical insecticides, used abusively up to the present, imposes their substitution by the development of other components of integrated management, namely the increase of preventive measures number and in the case of repressive measures accent must be put on biological means. There is envisaged the use of bio pesticides or of the so called "bio rational", with reduced impact both on non target organism and on environment.

The diversity of secondary metabolites, considered not long ago "metabolic garbage" is due to a long evolution process in response to different states of stress (climate, pests, etc). They proved very valuable from a pharmacological point of view and they have special qualities in the integrated pest management, thus becoming important models for the projection of future bio pesticides. In order to defend themselves against excessive consumption of the phytophagous, plants produce defensive metabolites. Researches on the interrelations between metabolites and insects are ways to develop new biocides, safer for man and environment.

We must underline the importance of alternate measures in maintaining and reconstructing the equilibrium between ecosystems, measures that preserve biodiversity in a rational management and reduce anthropic interventions, with favourable implications in the preservation of natural structures.

From the research of over 2.500 plants there were isolated 350 compounds with insecticide characteristics and 900 compounds that inhibit feeding [6]. Recently, it has been appreciated that over 6.000 species of plants (from over 235 families) were tested for their action against insects. Efforts are being made to develop insecticides based on phytochemical products like annonin, azadirachtin, limonoides, citrus, isobutylamide, benzofuran, etc. the presence of compounds with insecticide qualities was identified at the species from the families *Meliaceae, Rutaceae, Asteraceae, Annonaceae, Abiatae* and *Canellaceae.* Although every year thousands of insecticide phytochemical compounds are identified, the percentage of superior plants studied is small. Over 70% are superior tropical and subtropical angiosperms and in the next decades 20-50% of them are endangered by the extinction or fragmentation of habitat areas [1].

Inclusion of phytochemical compounds in pest control is an important direction in the improvement of some IPM schemes. The researches carried out were meant to establish the efficacy of some bio pesticides that are available on the market, as well as that of some secondary metabolites extracted from autochthon plants.

MATERIAL AND METHOD

The experiments were carried out under laboratory conditions, treatments being applied on shoots with leaves affected by aphids, placed in growth boxes. Each variant had three replications and each replication contained three infested shoots. The treatments were applied with manual small pumps. Efficacy (E%) was calculated after the percentages of mortality according to the Schneider-Orelli formula.

There were tested bio pesticides Laser 240 SC (active ingredient spinosad), NeemAzal – T/S (active ingredient azadirachtin) and Milbecknock (active ingredient milbecmectin). The autochthon plants extracts were made from dried ground plants, using 25 g/ 1 litter of cold water, stirred for 24 hours. The extracts in ethylic alcohol were made using the same method; 25 g dried plants in 200 ml alcohol and completed up to 1 litter with water. There were used the following plants: There were used the following plants: the common ladyfern (*Drioperis filix mas*), the perennial Sage (*Salvia nemorosa*), the parsley (*Petroselenium crispum*), the wormwood (*Artemisia dracunculus, A. vulgaris, A. absinthium*) the European birthwort (*Aristolochia clematidis*), (*Heracleum spondylium*), the hedge nettle (*Stachis sylvatica*), the speedwell (*Tanacetum vulgare*), the nettle (*Urtica dioica*), the danewort (*Sambucus ebulus*) and the yew tree (*Taxus baccata*).

The plants were collected by chief lecturer Ph. D. in engineering Mr. Tomescu C.V. and extracts were made by doctorand in engineering Risca I-M (Forestry Faculty Suceava).

The plant extracts contain the following secondary metabolites: *Driopterix filix-mas* (dimer: desaspidin); *Artemisia absinthium* (lignan: lirioresinol A, norsesquiterpenoide: 3,6-dihydrochamazulene, 5,6-dihydrochamazulene, diterpenoid: absinth in, sesquiterpenoide: anabsin, anabsinin, artabsin, artabsinolides A, B, C and

D,artemolin-a, artemolin-b, 2,3-diepi-artabsinolide C, hydroxypelenolide, ketopelenolide, ketopelenolide a, ketopelenolide b; *A. dracunculus*: (isocumarine: (E)-artemidin, (Z)-artemidin, artemidinol, capillarin, sesquiterpenoid: pathulenol); *A. vulgaris* (monoterpenoid: vulgarole, sesquiterpenoide: spathulenol, vulgarin, triterpenoide: α-amyrin, α-amryin acetate, fernenol); *Aristolochia clematidis* (alkaloid: aristolochine); *Heracleum spondylium* (coumarine: angelicin, bergapten, byakangelicin, heraclesol, imperatorin, isobergapten, isopimpinellin, phellopterin, pimpinellin, xanthotoxin); *Taxus baccata* (alcaloids taxine: taxine I, taxine B, ester: ester myo-inositol-p-coumaric); *Stachis sylvatica* (quaternar alcaloids: betonicine, turicine, iridoide: harpagide, harpagide acetate, diterpenoid: acid stachysic); *Tanacetum vulgare* (sesquiterpenoid: crispolide); *Sambucus ebulus* (iridoid: ebuloside, steroid: stigmast-4-ene-3,6-dione); *Salvia nemorosa* (diterpenoid: nemorone) [7]; *Urtica dioica* (caffeic, p-cumarinic and ferulic acids, carotenoide and flavonoids of qercetol) [5].

RESULTS AND DISCUSSIONS

The efficacy tests on vegetal metabolites were oriented on aphid *Aphis spiraephaga* because it produces annually natural infestations without a noticeable increase in number of insects.

From testing some bio pesticides available on the market, we can observe high efficacy at the neem vegetal preparation (NeemAzal T-S) which acts more rapidly on leaf aphids than on coleoptera species [2, 10] (*tab. 1*). Microbian bio pesticides spinosad (Laser 240 SC) and milbecmectin (Milbecknok) had an efficacy ranged between 95 and 98%, which recommends them to replace some synthetic pyrethroids such as Faster 10 CE.

Table 1

Efficacy of some bio pesticides and water extracts on spireas aphid *Aphis spiraephaga Müller*

No.	Variants	E %, after number of days:	
		2	4
1	Laser 240 SC doza 0,033%	0	95
2	NeemAzal T/S doza 0,5%	85	98
3	Milbecknok doza 0,075%	97	100
4	Faster 10 CE doza 0,02% Mt.	100	100
5	*Driopteris filix mas*	2	5
6	*Salvia nemorosa*	0	0
7	*Petroselenium crispum*	5	35
8	*Artemisia dracunculus*	10	35
9	*Stachis sylvatica*	3	25
10	*Tanacetum vulgare*	45	45
11	*Urtica dioica*	10	50
12	*Sambucus ebulus*	25	50
13	*Artemisia absinthium*	0	80
14	*Aristolochia clematidis*	40	90
15	*Artemisia vulgaris*	5	10
16	*Heracleum spondylium*	0	0
17	*Taxus baccata*	5	5
18	Martor netratat	0	0

In testing water metabolite extracts, four days after the treatment, higher efficacy was obtained after foliar treatment with *Artemisia absinthium* (80%), *Aristolochia clematidis* (90%), *Urtica dioica* (50%), *Sambucus ebulus* (50%) and *Tanacetum vulgare* (45%) (*fig. 1, 2*).

In the next experiment there were used the vegetal extracts that presented high efficacy in the previous one, but they were regriferated at $4^{o}C$, in order to observe if the metabolites' qualities were preserved. Low efficacies were noticed, between 5 and 15%. As literature specifies a better extraction and preservation of vegetal metabolites in other media, for the next researches ethylic alcohol was used and the extracts were compared to the water ones.

It was found out that at the variants with lower mortality aphids were situated only on the superior part of the leaves and on the twig (*tab. 2*). The water extract efficacy of *Sambucus ebulus* (100%) was similar to the alcoholic one (85%), that of *Artemisia absinthium* was better for the water extract (75%), that of *Aristolochia clematidis* for the alcohol extract (95%), and likewise that of *Tanacetum vulgare* (70%). An explanation of the differences in efficacy will be possible after biochemical analyses of metabolites obtained through these procedures.

Figure 1 **Mortality of *Aphis spiraephaga* after the treatment with *Artemisia absyntum***

Figure 2 **Mortality of *Aphis spiraephaga* after the treatment with NeemAzal T/S**

Table 2

Efficacy of water and alcohol extracts of different plants in controlling *Aphis spiraephaga*

No.	Variants	Extract	E %, after number of days:	
			2	4
1	*Petroselenium crispum*	water	10	23
2	*Tanacetum vulgare*	water	25	45
3	*Urtica dioica*	water	20	40
4	*Sambucus ebulus*	water	50	100
5	*Artemisia absinthium*	water	15	75
6	*Aristolochia clematidis*	water	10	65
7	Untreated control sample	simply water	0	0
8.	*Petroselenium crispum*	alcohol	7	25
9	*Tanacetum vulgare*	alcohol	60	70
10	*Urtica dioica*	alcohol	15	60
11	*Sambucus ebulus*	alcohol	35	85
12	*Artemisia absinthium*	alcohol	35	55
13	*Aristolochia clematidis*	alcohol	10	95
14	Unteatred control sample	simply alcohol	0	0

There are evident tendencies to replace conventional insecticides within integrated management of agricultural pests. In our country there is a tendency to cultivate organic surfaces but we must mention the lack of proper technologies and of various possibilities of pest control in the most natural way. Vegetal pesticides (neem) or microbian biorational insecticides (milbecmectin, spinosad), being less toxic for the useful fauna or for the environment, can replace conventional insecticides [2, 8, 10]. Similar researches confirm the efficacy of metabolites extracted from wormwood and speedwell in controlling some of the aphids, varying between 35 and 40% [4]. Mention must be made that the extracts did not influence negatively the predator species of leaf aphid. The tests with *Aphis spiraephaga* showed high efficacy of these extracts, similar in some cases with that of conventional insecticides which pleads for the continuation of researches in order to take advantage of the potential of autochthon plants. The use of active principles of aromatic and medicinal plants (*Menta piperita, Hypericum perforatum, Achilea milefolium*) led to a high degree of mortality of bean weevil *Acanthoscelides obtectus* [3].

CONCLUSIONS

In controlling *Aphis spiraephaga* the efficacy of the bio pesticides (NeemAzal T-S, Laser 240 SC, Milbecknok) ranged between 95 and 100%.

By the application of water extracts, high efficacy was registered at *Aristolochia clematidis* (90%), *Artemisia absinthium* (80%), *Urtica dioica* (50%), *Sambucus ebulus* (50%) şi *Tanacetum vulgare* (54%). Alcohol extracts presented an increased efficacy at *Tanacetum vulgare* (70%), *Urtica dioica* (60%), *Sambucus* *ebulus* (85%), *Aristolochia clematidis* (95%), and decreased at *Artemisia absinthium.*

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