INSECT PEST MANAGEMENT OF *LEMA MELANOPA* IN ROMANIA

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ABSTRACT

In Romania, the *Lema* genus is represented by six species, of which, *Lema melanopa* is dominant and very harmful. *Lema melanopa* is spread all over the country and has a damaging area of about 200,000 ha. The most affected counties are in West and center of the country as well as in Southern hilly regions. Among the natural parasites, one can mention *Trichogramma* species (on eggs) as well as predators of eggs and larva (*Chrysopa carnea, Nabis ferus, Coccinella septempunctata*). The natural parasites do not present practical importance. The small grain protection is achieved by chemical treatments, annually applied on 50,000-100,000 ha. The research regarding testing of insecticides emphasize the high efficiency of synthesis pyrethroids based on deltametrin, cipermetrin, alfacipermetrin, lambdacipermetrin, zetacipermetrin. The treatments are applied against both adults and larvae, the economic damage threshold (EDT) being 10 adults/m^2, respectively 250 larvae/m^2.

Key words: chemical treatment, EDT, IPM, *Lema melanopa* species

INTRODUCTION

Among the 800 species of *Lema* genus, many of them, identified as pests of various crops, *Lema melanopa* is a very dangerous pest of small grains (Arion, 1957; Boguleanu, 1994; Weloso, 1973). Both as adult and larva, the attack of this insect produces significant qualitative and quantitative damages in oats, barley, two-rowed barley, wheat or rye (Barbulescu et al., 1993, 1998; Hulea et al., 1975; Rogojanu and Perju, 1979; Savescu, 1962-1964). Beside the yield reduction, the attacked plants cannot be used as green fodder due to repellent taste (Balachowschi and Mesnil, 1935-1936; Barbulescu, 1998; Barbulescu et al., 2002; Sandru, 1996).

Mentioned as pest since the end of XIX century, in the center of Europe (Salo, 1893, quoted by Knechtel, 1951; Knechtel and Knechtel, 1909; Knechtel and Manolache, 1936), oats beetle was permanently, during the XX Century, in attention of small grain cultivators from all European countries (Sajov, 1893; Vassiliev, 1910; Sacchi, 1932; Rubtov, 1951; Sther, 1970; Papp, 1987; Kaniuczak, 1988; Mamedov, 1994, quoted by Knechtel, 1951; Venturi, 1936; Manolache et al., 1946-1957; Szabolcs, 1974; Sin et al., 2000), Asia (Mueata and Ikeda, 1926; Yun, 1967; Koralov, 1988, quoted by Knechtel, 1951) but also in USA, where the pest manifested very aggressive by (Webster, 1972; Wilson and Treece, 1969).

In Romania, since the first occurrence (Knechtel and Knechtel, 1909; Leon, 1912, quoted by Knechtel and Manolache, 1936), oats beetle was identified as dangerous pest, fact mentioned further on (Knechtel and Manolache, 1936; Paulian et al., 1974, 1978; Barbulescu et al., 1993, 1998; Popov, 1991, 2003; Popov et al., 2003, 2004; Bucurean, 1998).

The paper present recent data about spreading and composition of *Lema* species, the level of populations and damages as well as data regarding the biotic and abiotic factors, including the chemical treatments, which present importance in *Lema* population dynamics in Romania.

MATERIAL AND METHODS

Research regarding the spreading and composition of *Lema* species were performed based on biological material collected from most counties during 1998-2003. The statistical analysis of small grain infestation as well as the treatments performed at the country level include the 1993-2002 period. The studies regarding the influence of biotic and abiotic factors were made in areas representative for *Lema melanopa* evolution, respectively Romanian Plain and Transylvanian Plateau.

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The testing of insecticide efficiency was performed at A.R.D.I. Fundulea, A.R.D.S. Caracal, A.R.D.S. Oradea, A.R.D.S. Marculesti and A.R.D.S. Turda during 2000-2005. The insecticides were tested against both adults and larvae, under high infestation conditions, over the economic damage threshold of 10 adults/m^2 respectively 250 larvae/m^2. The experiments were placed in wheat, barley and oats fields as randomized blocks in five reps. Plots were of 100 m^2 (10 m x 10 m) for adults and 25 m^2 (5 m x 5 m) for larvae. The treatments application was done based on warning, when larvae occurrence was at least 80% from total, mainly in the first two ages. The control of efficiency was performed after 24 hours from treatment application by countings on 50 x 50 m areas, ten testings per each plot. The results were statistically processed.

RESULTS AND DISCUSSION

In Romania, *Lema* genus is represented by many species but *Lema melanopa* is dominant. *Lema lichenis* is present too, while species *L. spetentrionis*, *L. rufocyanea*, or *L. galiacciana* are only occasionally identified (Table 1). Analyzing the level of oats beetle populations in the last decade (Table 2) one can ascertain that 600,000-900,000 ha cultivated with small grains are infested, and on about 200,000 ha, infestation levels over EDT limit are registered. The applied treatments ranged between 56,364 (2001) and 103,500 ha (1997).

Table 1. Weight of *Lema* species, under various conditions of Romania

Species	Area				
	Baragan Plain	West Plain	Dobrudja	Getic Plateau	Moldavian Plateau
Lema melanopa	96	98	95	89	83
Lema lichenis	3	2	5	8	12
Lema septentrionis	1	Occasionally	Occasionally	2	5
Lema rufocyanea	Occasionally	Occasionally	Occasionally	Occasionally	1
Lema cyanipennis	Occasionally	Occasionally	Occasionally	1	Occasionally
Lema gallacciana	Occasionally	Occasionally	Occasionally	Occasionally	Occasionally

Table 2. Level of small grain infestation (ha) by *Lema melanopa* in the last period, in Romania

Infestation level		Year							
		1993	1995	1997	2000	2001	2002	2004	2005
Occasionally		626,400	697,000	887,000	612,000	704,620	654,000	637,000	624,000
Moderate	>250	96,500	100,250	78,200	80,560	105,000	123,800	89,000	73,000
Strong	<250	68,538	18,758	67,830	72,270	66,497	74,539	63,280	46,500
Treated areas		65,805	58,457	103,500	63,364	56,428	57,022	45,829	38,000

Note: Economic damage threshold (EDT) – 250 individuals/m^2

It is well-known that oats beetle prefers oat crops, but, the strong reduction of oats cultivation in the last 50 years, determined the insect migration to wheat, well-represented in Romania. The highest infestations are noticed on fresh plants, sown in spring, fact proved by the infestation level registered in spring barley or oats, sown at different time. Although many plants of different crops were present, oats beetle prefers young plants (Table 3).

Thus, the winter crops presented a reduced infestation as compared to spring crops. Among the spring crops, the youngest ones are preferred.

Table 3. Influence of crop and sowing time on level of infestation with *Lema melanopa*, in Fundulea area

Crop	Sowing time	Density (larvae/m^2)			
		2001		2002	
		in area	average	in area	average
Wheat	12nd October	86	28.4	37	12.4
Rye	12nd October	68	20.7	17	9.3
Triticale	12nd October	45	14.2	13	2.8
Winter barley	8th October	103	75.8	79	32.4
Spring barley	3nd-7th April	265	178.7	204	125.3

Spring barley	27th-30th April	386	243.3	314	186.8
Oats	3nd-11th April	435	280.8	367	231.0
Oats	27th-30th April	572	311.2	458	287.6

The oats beetle populations support the higher pressure of a large number of antagonistic insects, capable to diminish their numerical level.

Among parasites, oophagous parasites belonging to *Trichogramma* genus have strong influence, with attack levels up to 40%, as well as *Tensolchus moderator* which parasitizes up to 1/3 of larvae (Table 4). The species *Chrysopa carnea, Nabis ferus* or *Coccinella septempunctata* behave as predators of both eggs and larvae.

The chemical control is the main protection method against *Lema melanopa*. Research of the last years revealed the good efficiency of many products, especially synthesis pyrethroids, which are presently approved for utilization (Tables 5, 6 and 7). As a rule, the treatments to control oats beetle larvae are applied in the last decade of May and first decade of June. The infestation level is very high, exceeding the EDT, considered to be 250 larvae/m^2. The high efficiency of all products, depends on correct warning, at the occurrence of the first larvae age, which determines both a high efficiency of control and avoidance of damages by lack of rearing.

Table 4. Parasites and predators of oats beetle

Parasites	Attack level (%)	Predators	Attack level (%)
Oophagous parasites		Predators of eggs	
Trichogramma spp.	3-40	*Chrysopa carnea*	2-15
Anaphes flavipes	1-5	*Nabis ferus*	9-33
		Coccinela 7-punctata	5-25
		Sylpha obscura	2-17
		Poecilus cupreus	5-16
		Cantaris fusca	1-8
		Prolylaea 4 punctata	4-19
Parasites of larva		Predators of larva	
Trissolchus moderator	12-32	*Chrysopa carnea*	2-10
Tetrastychus julis	1-7	*Malachius bipustulatus*	4-22
Lemophagus curtus	1-2	*Nabis ferus*	5-10
		Coccinela 7-punctata	3-12
		Pseudophonus spp.	4-15
Parasites of pupae		Predators of adults	
Meigenia mutabilis	2-5	*Asilus crabroniformis*	2-5
		Dioctria atricopilla	1-3

Table 5. Efficiency of products tested for oats beetle control, in 2002

Variant	Dose ml;g/ha	Efficiency (%)						
		Fundulea		Caracal		Oradea		Turda
		wheat	oats	barley	oats	wheat	oats	wheat
Actara 25 WG	70	98	98	98	99	99	98	98
Bestseller 10EC	100	98	97	97	97	98	97	97
Calypso 480SC	80	98	98	98	99	98	99	99
Cipertrin 10CE	100	97	98	98	97	97	97	98
Dakillin 10CE	150	98	99	98	97	98	98	97
Decis 25WG	30	96	98	97	98	97	98	98
Efcymetrin 10CE	100	97	96	98	98	98	97	97
Mavrik 25EW	200	98	98	97	98	96	98	98
Pyrinex 25ME	3000	96	98	97	97	97	97	98
Vantex 225	70	96	97	97	97	96	97	99

KarateZeon (standard)	150	97	98	98	98	97	99	98
Untreated (larva/m^2)		237	386	325	457	304	425	275
Date of treatment		27th May		26th May		30th May		28th May

Table 6. Efficiency of products tested for oats beetle control, in 2004

Variant	Dose ml;g/ha	Efficiency (%)						
		Fundulea		Caracal		Oradea		Average
		wheat	oats	barley	oats	wheat	oats	
Alfasect 10CE	100	97.0	98.3	98.0	97.3	99.0	98.5	98.1
Dacin 1 20SP	100	98.0	97.8	98.2	98.7	99.0	98.8	98.4
Deltaplan 25EC	300	99.3	98.0	98.4	98.8	99.0	98.6	98.7
Cipermetrin 10EC	100	97.8	97.1	96.4	97.5	98.3	97.5	97.4
Faster 10EC	100	98.1	97.5	97.9	98.1	98.4	97.9	98.0
Grenade 10WDG	75	98.1	99.0	96.7	98.9	98.7	97.5	98.2
Lalothrin 5EC	150	98.8	98.1	97.4	98.5	99.3	98.5	98.4
MCW 449 5EC	150	98.6	99.1	97.6	98.3	98.5	97.7	98.3
Proteus OD110	400	98.0	97.8	99.0	97.8	98.5	98.4	98.3
Pyrinex Quick	1000	97.7	98.2	98.4	98.3	99.4	98.6	98.4
Supersect 10EC	100	96.3	97.0	96.6	96.5	97.3	95.3	96.5
KarateZeon (standard)	150	98.8	97.2	97.0	99.0	98.5	99.0	98.2
Untreated (larva/m^2)		268	380	355	450	333	418	368
Date of treatment		28th May		31th May		30th May		-

Table 7. Efficiency of products tested for oats beetle control, in 2005

Variant	Dose ml;g/ha	Efficiency (%)						
		Fundulea		Marculesti		Caracal		Average
		wheat	oats	barley	oats	wheat	oats	
Acetamiprid 20SL	100	98.5	98.4	98.0	98.3	97.9	98.0	98.2
Alfasect 10CE	100	97.0	98.3	98.0	97.3	99.0	98.5	98.1
Decis 50EW	150	99.0	98.4	98.8	98.5	98.9	98.5	98.7
Faster 10EC	100	98.8	97.5	97.9	98.1	98.4	97.9	98.1
Faster Forte	50	97.0	98.6	96.8	97.7	98.5	97.8	97.8
Imidan 50WP	1250	97.8	98.0	97.0	98.6	98.0	98.2	98.0
Kalipo 2,5EC	300	99.3	98.0	98.4	98.0	98.0	98.6	98.4
Legend EC	100	97.5	97.0	98.9	96.4	98.2	98.3	97.8
Lalothrin 5EC	150	98.8	98.1	97.4	98.5	99.3	98.5	98.5
Proteus OD110	350	98.0	98.8	99.0	97.8	98.5	98.4	98.5
Supersect 10EC	100	96.3	97.0	96.6	96.5	97.3	95.3	96.5
Vantex CIG 60CS	70	98.1	99.0	96.7	98.9	98.7	97.5	98.2
Vip	150	98.3	98.3	98.5	97.7	98.6	98.8	98.4
Viper	150	97.3	97.0	96.9	97.7	98.0	99.8	97.8
Voyager	100	97.6	97.3	97.4	96.9	97.7	98.8	97.7
Cipertrin 10EC (standard)	100	98.0	97.9	97.8	97.9	98.0	97.7	97.9
Untreated (larva/m^2)		270	408	329	372	298	378	343
Date of treatment		2nd June		30th May		4nd June		

CONCLUSIONS

In Romania, *Lema* genus is represented by six species, of which *Lema melanopa* is dominant and very hamful.

Lema melanopa species is spread all over the country and has a damaging area of about 200,000 ha.

The most affected counties are those of West and center of Romania, as well as the Southern hilly regions.

The natural parasitism of eggs determined by *Trichogramma* spp. and the predators of eggs and larvae (*Chrysopa carnea*, *Nabis ferus*, *Coccinella septempunctata*) strongly diminish the oats beetle populations, but without avoiding damages.

In order to protect small grains, treatments on 50,000-100,000 ha are annually applied.

Research in the pest control emphasizes the high efficiency of the tested insecticides.

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