

# THE IDENTIFICATION AND CONTROL OF DIPTERA PEST SPECIES ON WHEAT CROPS

Dana Malschi<sup>1)</sup>

## ABSTRACT

The group of *Diptera* may be considered important within the structure of pests existing in wheat crops in România. In the last years, the increase of damages produced by *Diptera* larvae was registered at the crops intensely affected by climatic unfavourable conditions (excessive drought, low temperatures) and by the exploitation system with incomplete or incorrect crop technologies. The present work offers an ensemble of knowledge necessary to the species identification by the correlation of morphological, ecological, habitat and geographical criteria, for a real pointed out of the importance and for the forecast of losses.

**Key words:** *Opomyzidae*, *Anthomyiidae*, *Chloropidae*, *Cecidomyiidae*; distribution in Romania; morphology; life-cycle, and control in Transylvania.

## INTRODUCTION

The described main *Diptera* species are on their geographical area and perform a considerable high biological reserves and attack possibilities on winter wheat crops. The ecological factors and agrotechnical methods determined the distribution range, the composition of species and the economic importance of the attack in different cereal areas of the country. So, the early emergence of crops in September provided the dangerous manifestation of attack of frit fly (*Oscinella frit* L.), hessian fly (*Mayetiola destructor* Say.) and black fly (*Phorbia securia* Tiensuu). The biological potential and attack produced on the spring by yellow small fly (*Opomyza florum* F.) and wheat bulb fly (*Delia coarctata* Fll.) are increasing when the emergence of wheat is achieved in October. The late emergence of crops in November, provided the preferential attack of black flies (*Phorbia penicillifera* Jermy and *Ph. securis*) and the development of species populations, especially in Transylvania, Moldova and Oltenia (Alessandri, 1945; Bărbulescu et al., 1973; Mustea et al., 1982; Malschi, 1993).

In the cereal areas with an important biological reserves of *Diptera* pests, the following integrated plant protection preventive measures are suitable to forecast: the late

sowing date (in the first half of October); adequate technological measures providing for a good development of plants; cultivation of wheat hardy varieties with productive tillering compensatory capacity after the attack; the seed treatment with insecticides. Some special experimental insecticide treatments applied in autumn had an important effect on the yields increase of 15-32 %, using dimethoate, trichlorphon or dimethoate with deltamethrin. At the early spring the effect of insecticides applied in the early and in the late emergent wheat crops was significantly on the increasing yields with 9-15% when dimethoate, trichlorphon or carbaril, or dimethoate with deltamethrin or with methylpirimiphos were used (Malschi and Mustea, 1996).

## MATERIALS AND METHODS

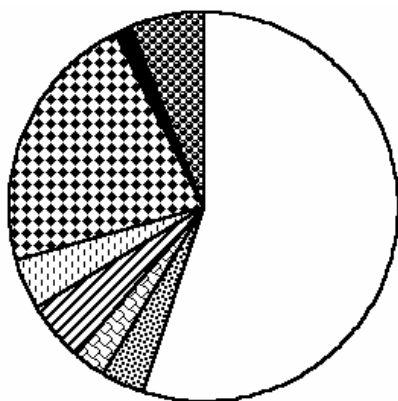
The paper presents data concerning the structure of *Diptera* species attacking wheat crops in autumn and in spring during 1978-1985 and the distribution maps of the main species in Romania. This study was made by author with the cooperation of Plant Protection County Centers, Central Laboratory of Phytosanitary Quarantine - Bucarest and Research Institute for Cereals and Industrial Crops - Fundulea, for the samples gathering.

The data related to the composition of species, biology and experimental control of phytophagous flies were studied from 1980 to 1997 at the Agricultural Research Station Turda.

## RESULTS ON THE STUDY OF SPECIES STRUCTURE AND ABUNDANCE

Sweep net catches of adults and larval instar examinations of tillers attacked (the dead – heart tillers) proved the presence of different species. Considering their structural

<sup>1)</sup> Agricultural Research Station, 3350 Turda, 27 Agriculturii Street, , Romania



□	Δ Fam.	<i>Opomyzidae</i>	
		<i>Opomyza florum</i>	55.0%
▣	Δ Fam.	<i>Anthomyiidae</i>	
		<i>Delia coarctata</i>	3.5%
▤		<i>Phorbia penicillifera</i>	3.0%
▥		<i>Phorbia securis</i>	5.0%
▦		<i>Delia platura</i>	4.0%
▧	Δ Fam.	<i>Chloropidae</i>	21.0%
▨	Δ Fam.	<i>Cecidomyidae</i>	1.5%
▩	Δ Fam.	<i>Ephydriidae Agromyzidae</i>	6.0%
			15.5%

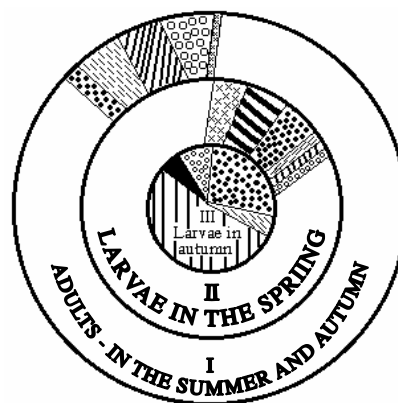
Figure 1. The structure of *Diptera* species attacking wheat crops in Romania during 1978-1985

dominance and the losses produced, the most important species belonged to the families: *Opomyzidae*, *Anthomyiidae*, *Chloropidae* and *Cecidomyidae* (Figure 1).

Autumn infestation was mainly caused by *Oscinela frit*, *Phorbia securis*, *Delia platura* Mg., *Mayetiola destructor*. The most important attack was caused at the beginning of spring by *Opomyza florum*, *Delia coarctata*, *Phorbia penicillifera* and *Phorbia securis* (Figure 2).

### EXPERIMENTAL CHEMICAL CONTROL MEASURES, INSECTICIDES EFFICIENCY

The variety of insecticidal products used in the cereal field crops was the support for the research on the efficiency of insecticides in order to control the main diptere species



Dominance structure	Percentage (%) in			Total number
	I May-Sept.	II April-May	III Oct.-Nov	
□ <i>Opomyza florum</i>	87.0	78.0	-	12723
▣ <i>Delia coarctata</i>	0.3	5.0	-	341
▤ <i>Delia platura</i>	3.3	0.5	2.0	365
▥ <i>Phorbia penicillifera</i>	-	5.0	-	318
▦ <i>Phorbia securis</i>	0.6	7.0	32.0	943
▧ <i>Chloropidae</i>	4.3	2.0	54.0	1419
▨ <i>Cecidomyidae</i>	-	0.5	7.0	135
▩ <i>Ephydriidae Agromyzidae</i>	4.5	2.0	5.0	608
Total individual number	2315	5925	1612	16582
Total sample number	316	483	235	1075
Average damagees (% plants)	-	8.8	3.5	-

Figure 2. The dominance structure *Diptera* pests of wheat during 1978 - 1986, determined by the different periods of samples gathering: I - in May - November (adults); II - in April - May (larvae); III - in October - November (larvae)

under central Transylvania conditions. During 1981 to 1997 we tested the biological efficiency and selective moment of application for different insecticides: organophosphorus, organochlorus, carbamats, syntethic pyrethroids etc. The insecticide treatments could be applied in the spring at the moment of the maximum biological efficiency (Figures 3 and 4). That is at the I<sup>th</sup> larval instar of *Opomyza florum* and *Delia coarctata* and simultaneously, at the adult flying of *Phorbia securis* and *Phorbia penicillifera*. At this special moment it is possible to achieve a partial larval mortality, about 50-75%, only (Table 1), because of the different species biological life-cycle and the feeding parasitical behaviours of larvae within the wheat tillers.

The preventive seed insecticide treatments had a partial efficiency on the control of *Diptera* pests too (Table 2).

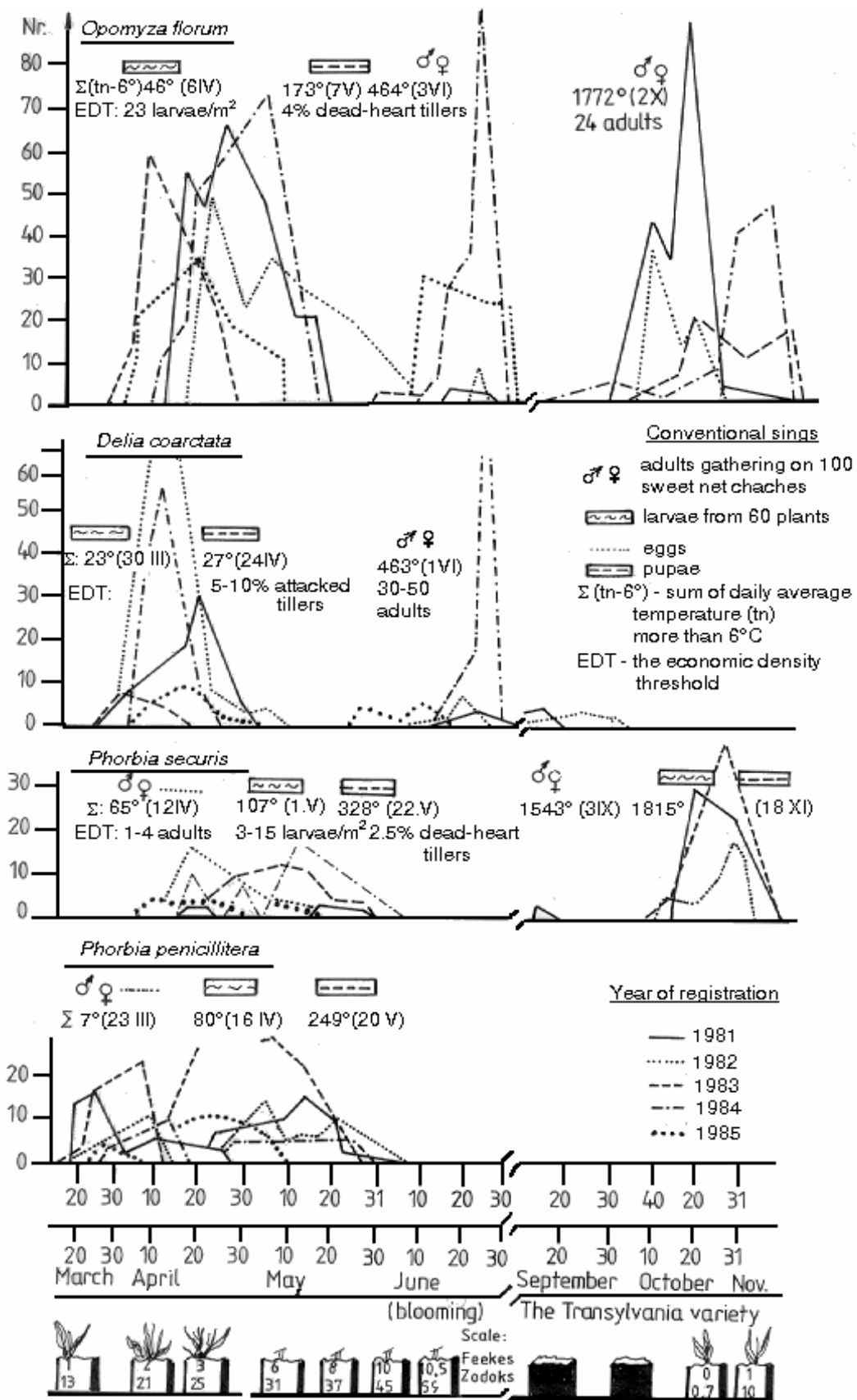


Figure 3. Dynamics abundance and life-cycle of principal Diptera species damaging on wheat crops at Agricultural Research Station - Turda in 1981 – 1985 period

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Months	Sept.		Oct.			Nov.-March			April			May			June			July	
Decades	II	III	I	II	III	I	II-II	III	I	II	III	I	II	III	I	II	III	I	
$\Sigma$ (tn - 6°C)	1600		1800			12 24			46	70	100	123	250	400	485				
Keller - Baggiolini			A (D)			D(E)	D(E)		EF	G	H	I	J	K	N	O	P	Q	R
Feeckes scale			0 (1)			1(2)	1(2)		2	3		6		8	10	10.5			11.1
Control operations			IST	IT					IT						IT				
<i>Opomyza florum</i>			A	0	0	0	0	0	L			P		A				A	
<i>Delia coarctata</i>	A	0		0		0	0	0	L		P			A					
<i>Phorbia penicillifera</i>							A		A	0	L	P							
<i>Phorbia securis</i>	AOL	P							A	0		L	P						
<i>Oscinella frit</i>	AOL	P								A	0		L	P	A	0	L	P	
<i>Macrosteles sexnotatus</i>			A	0						L				AL					
<i>Javesella pelucida</i>			A	0								A	L	A					
<i>Sitobion avenae</i>			AP									AP							
<i>Schizaphiz graminum</i>			AP	0								AP							
<i>Haplothrips tritici</i>									A					A	0	L	L		
<i>Lema melanopa</i>									A			A		L					

Conventional signs: The vegetative phases from Keller - Baggiolini scale: A = emergence; D, leaf; EF = tillering; I = jointing of first node; K = the flag leaf; N-O = heading; P-Q = blooming stage; R-U = kernel formation and ripening.

Control operations: IST = insecticide seed treatments; IT = insecticide treatments; A = adults; 0 = eggs; L = larvae; P = pupae; AP = aphids; tn = daily average temperatures

Figure 4. The main pests of wheat, their biological evolution and control possibilities connected on the termic conditions and on the growth stages of wheat plants in central Transylvania (completed from Baicu and Săvescu)

Table 1. Insecticides efficiency on the experimental control of *Diptera* species spring attack in winter wheat fields (*Opomyza florum* F., *Delia coarctata* Fll., *Phorbia securis* Tiensuu și *Ph. penicillifera* Jermy.)

Diptera species			<i>Opomyza</i> , <i>Delia</i>	<i>Phorbia</i>	<i>Opomyza</i> , <i>Delia</i> , <i>Phorbia</i>
Period of treatments (April)			1983 - 85	1986 - 88	1990 - 97
Dead-heart tillers percent (attack average)			9,9	9,7	8,3 - 7,8
Insecticide	Product	Doze / ha	Insecticide efficiency (E%)		
Lindane	LINDATOX 20 EC	2,0 l	39,4	-	-
Endosulfan	THIONEX 35 EC	2,0 l	-	-	49
Lindane+ dimethoate	SINOLINTOX 10 G	20,0 kg	-	72,9	-
Dimethoate	SINORATOX 35 EC	2,0 l	53,5	72,5	52,0
Dimethoate	SINORATOX 35 EC	3,0 l	30,3*	70,4	-
Dimethoate	SINORATOX 5 G	40,0 kg	-	51,7	-
Dimethoate+ Deltamethrin	SINORATOX 35 + DECIS 2,5	1,5 l + 0,4 l	65,6 *	68,4	-
Dimethoate+ Methylpirimiphos	SINORATOX 35 EC+ACTELIC 50 EC	1,5 l + 0,5 l	-	84,0	-
Methylpirimiphos	ACTELIC 50	1,0 l	-	70,7	-
Trichlorphon	ONEFON 80	1,2 kg	41,4*	75,5	63,2
Malathion	CARBETOX 50	1,0 l	-	63,3	-
Quinalphos	ECALUX 25 CE	1,5 l	-	61,5	-
Phonophos	DYFONAT	3,0 kg	-	68,6	-
Fhonophos	DYFONAT 10 G	10,0 kg	-	70,7	-
Phoxim	FOXIM 0,1 %	0,3 l	-	66,3	-
Phoxim	VOLATON 5 G	15,0 kg	-	64,4	-
Diazinon	BASUDINE 10 G	15,0 kg	-	75,0	-
Diazinon	BASUDINE 600 EC	2,0 l	-	-	69
Diazinon	DIAZOL 48 EC	0,9 l	-	-	53
Chlorpiryphos	PYRINEX 50 EW	2,5 l	-	-	29
Fenoxycarb	INSEGAR 25 WP	0,3 kg	-	-	66
Pirimicarb	FERNOS 50 DP	0,6 kg	-	72,7	-
Carbaril	OLTITOX 50	1,0 kg	-	61,2	-
Bensultap	VICTENON 50 WP	0,5 kg	-	68,8	51,6
Methamil	LANNATE 80 WS	0,3 kg	-	72,4	-
Oxamyl	VYDATE 24 L	0,6 l	-	74,0	-
Oxamyl	VYDATE 10 G	20,0 kg	-	66,4	-
Cypermethrin	POLYTRIN 200 SC	0,1 l	-	-	50,5
Alphamethrin	FASTAC 10 EC	0,2 l	-	67,6	56,8
Beta-Cyfluthrin	BULLDOCK 25 EC	0,3 l	-	-	31
Thurintox	THURINTOX	0,06 l	-	67,3	-
Acetamiprid	MOSPILAN 20 SP	0,06 kg	-	-	51
Fipronil	REGENT 80 WG	0,025 kg	-	-	45

L.S.D p 0,1 % (arcsin  $\sqrt{\%}$ )

\*) - Special autumn treatments

3,81 4,79 5,65

Table 2. Efficiency of insecticide seed treatments tests on the control of *Diptera* species spring attack in winter wheat (*Opomyza florum*, *Delia coarctata*, *Phorbia securis*, *Ph. penicillifera*)

Insecticide	Product	Dose/seed			Efficiency		
		g/plant	1989-1995	1990-1996	1987-1996	1989-1995	1990-1995
Lindane	$d \pm sd\bar{x}$	$-1.06 \pm 0.40$	$-1.38 \pm 0.57$	$-1.22 \pm 0.36$	$-1.47 \pm 0.39$	$-1.13 \pm 0.41$	$-1.07 \pm 0.27$
	t	2.650°	2.417°	3.342°	3.769°	2.756°	3.962°
	†58: p5% = 2.004; p1% = 2.669; p 0,1% = 3.476						
Carbofural							
Furathioca							
Percent difference (grain losses plant)							
C %		73.4	70.7	68.6	62.4	75.7	71.5
Wheat varieties:		TRANSILVANIA			TURDA 81		

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The application of insecticides on a pestory of different species. The grain yield after the spring attack of cultivated winter wheat, *Turda coarctata* losses/plant effect on the spring attack, 0.71-84.4 % after the application of 1.03-1.22 g/plant. 71.5 % of plants. The average yield between 414 and 297-621 kg/ha and 549 kg/ha wheat variety crop conditions in spring.

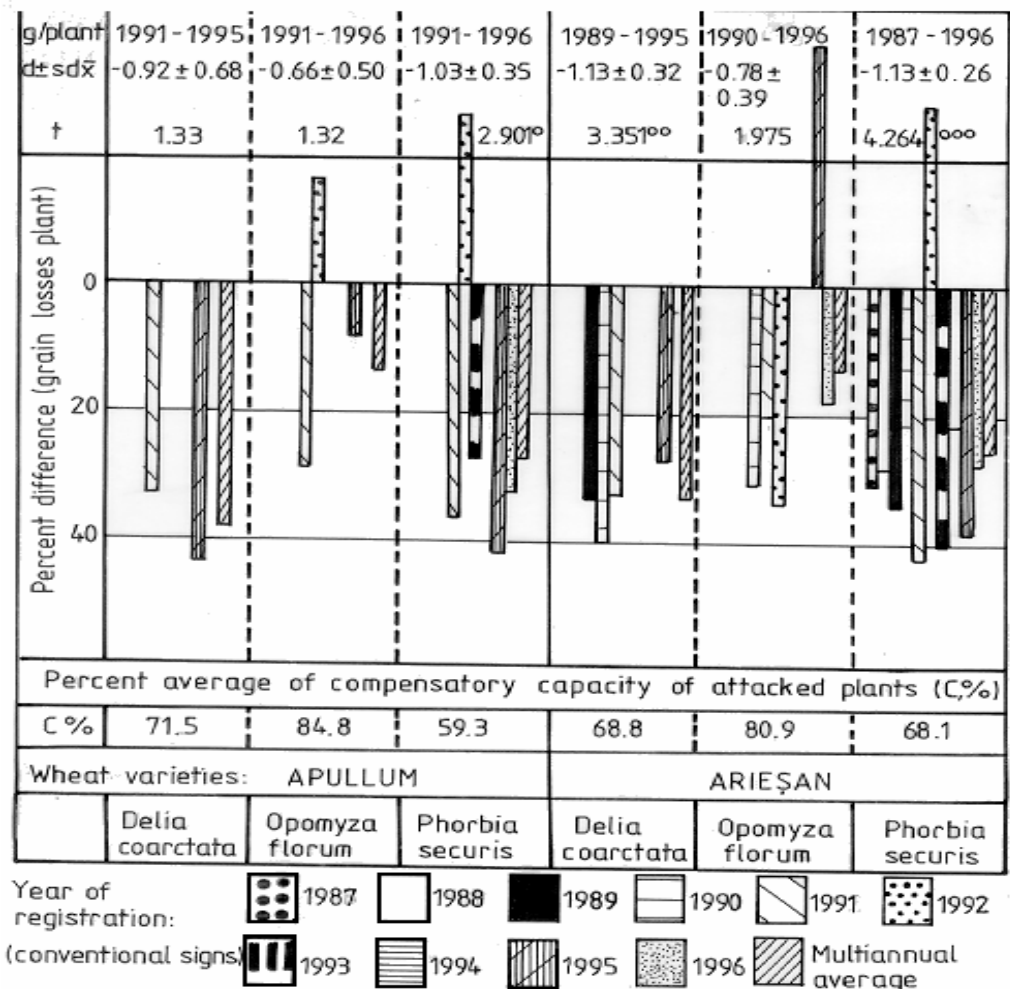


Figure 5. Grain yield losses and the compensatory effect of wheat plants after the spring attack of *Diptera* pests under the agroecological field test conditions of Central Transylvania at Agricultural Research Station - Turda, in 1987-1996

## ROMANIAN AGRICULTURAL RESEARCH

Table 3. Prey composition and minimum feeding rate of main entomophagous predators in feeding laboratory trials with *Diptera* pests according to the natural model of wheat entomocoenosis in Transylvania

Entomophagous predators species ( individual daily feeding rate with phytophagous )	<i>Opomyza florum</i>		<i>Phorbia securis</i>	
	(Number)		(Number)	
	larvae	pupae	larvae	pupae
<i>Chrysopa carnea</i> Stephn.( <i>Chrysopidae</i> )	3	1	2	-
<i>Nabis ferus</i> L.(adult) ( <i>Nabidae</i> )	3	2	3	4
<i>Coccinella septempunctata</i> L. (adult) ( <i>Coccinellidae</i> )	5	7	2	7
<i>Propylaea quatuordecimpunctata</i> L. ( <i>Coccinellidae</i> )	-	2	-	-
<i>Malachius bipustulatus</i> L. ( <i>Malachiidae</i> )	-	-	3	-
<i>Cantharis fusca</i> L. ( <i>Chantariidae</i> )	2	4	-	-
<i>Staphylinus caesareus</i> Cederh ( <i>Staphylinidae</i> )	1	-	1	4
<i>Tachyporus hypnorum</i> L. ( <i>Staphylinidae</i> )	1	-	1	-
<i>Poecilus cupreus</i> L. ( <i>Carabidae</i> )	4	10	5	7
<i>Pseudophonus pubescens</i> De Geer ( <i>Carabidae</i> )	1	-	2	1
<i>Harpalus distinguendus</i> Duft. ( <i>Carabidae</i> )	4	-	2	2
<i>Harpalus aeneus</i> L. ( <i>Carabidae</i> )	-	2	4	2
<i>Amara aenea</i> De Geer ( <i>Carabidae</i> )	-	-	8	-
<i>Sylpha obscura</i> L. ( <i>Sylphidae</i> )	1	4	2	4
<i>Necrophorus vespillo</i> L. ( <i>Sylphidae</i> )	-	-	4	8

Table 4. Side-effects of insecticides on beneficial arthropods. Results of the field and semi-field initial toxicity tests on the treatments for the wheat pests control in Transylvania ( 1994-1996 )

Beneficial predator species :			A	B	C	D	E			F	G	H	I			
Date of treatments :			02 02	31 20	31 02	20 02	20 02	20 02	20 06*	20 06*	20 06	20 06	20 06			
Insecticides	Preparation	Dose/ha	Initial toxicity on beneficials													
Endosulfan	THIONEX 35 EC	2.01	4	-	-	4	4	-	4	-	3	3	4	4	-	4
Dimethoate	SINORATOX 35 EC	1.51	-	-	4	3	-	-	1	-	4	-	-	-	-	-
Dimethoate	SINORATOX 35 EC	3.51	-	-	4	3	4	-	4	-	4	4	4	4	4	4
Diazinon	BASUDINE 600 EC	1.01	-	-	4	-	4	-	4	-	4	-	-	4	4	4
Diazinon	DIAZOL 48 EC	0.91	-	-	4	4	-	4	-	3	2	4	3	-	4	4
Chlorpiryphos	PYRINEX 50 EW	2.01	-	-	-	4	4	-	4	-	3	3	4	4	-	-
Cypermethrin	POLYTRIN 200 SC	0.11	2	1	2	1	4	1	4	4	1	2	3	4	-	-
Alphamethrin	FASTAC 10 EC	0.11	1	-	-	1	4	-	4	2	3	2	4	3	4	4
Zetamethrin	FURY 10 EC	0.11	-	-	1	1	4	-	4	-	3	-	4	4	4	4
Deltamethrin	DECIS 2.5 EC	0.31	-	-	-	2	4	-	4	-	4	2	2	3	4	1
Esfenvalerat	SUMI-ALPHA 5 EC	0.21	-	-	1	-	3	-	3	-	4	-	4	3	4	4
Bensultap	VICTENON 50 WP	0.5 kg	-	-	1	-	4	-	4	-	4	-	-	4	4	4
Acetamidrid	MOSPILAN 20 SP	0.1 kg	-	-	1	-	4	-	4	-	-	2	4	-	-	4
Fipronil	REGENT 80 WG	25 g	-	-	2	-	3	-	3	-	4	-	4	4	-	-

\*Larvae; A-*Harpalus distinguendus*; B-*Poecilus cupreus*; C-*Pseudophonus pubescens*; D-*Araneae*; E-*Coccinella 7-punctata*; F-*Chrysopa carnea*; G-*Nabis ferus*; H-*Tachyporus hypnorum*; I-*Malachius bipustulatus*. Scale (percent mortality): 1=harmless(< 25%); 2=slightly harmful(25-50%); 3=moderately harmful(51-75%); 4=harmful(> 75 %). (Hassan, 1985).

## CONCLUSIONS

The present study provided faunistic, biological and ecological data necessary to implement different possible measures in order to achieve a real integrated system for the control of the main *Diptera* species damaging winter wheat crops.

The integrated pest control system has to be a synthesis of means to use the bio-technological favourable factors, firstly, for the plant protection against *Diptera* pests of wheat: - optimum zonal agro-technological measures of wheat crops; wheat varieties with good compensatory capacity after the attack; preventive plant protection measures.

The special chemical control has to be related with the adequate economic damage thresholds, the knowledge on the side-effects of insecticides on the beneficial arthropod fauna, protection and use of auxiliary activity of entomophagous natural reservoir in cereal agroecosystems. The spring treatments for *Diptera* pest control are very difficult to be applied at the optimal moment because of the agroecological zone conditions and because of the different *Diptera* species attacking on wheat crops. The average efficiency of treatments are only partial (50-75% larval mortality).

## REFERENCE

- Alessandri, A. V., 1945. Hessian fly and the sowing time of wheat. (In Romanian) Ogorul românesc VII, 9.
- Baicu, T., Săvescu, A., 1986. Integrated control systems of diseases and pests. (In Romanian) Edit. Ceres, Bucuresti.
- Bărbulescu, Al., Mustea, D., Baniță, E., Popov, C., 1973. Cereals flies, limitativ factor of yeld on the straw cereals and maize. (In Romanian) Probleme agricole, nr. 25, IX : 22-30.
- Hassan, S.A., 1985. Standard methods to test the side - effects of pesticides on natural enemies of insectes and mites developed by the IOBC/WPRS Working Group Pesticides and Beneficial Organisms. Buletin OEPP/EPPO, 15:214-255.
- Malschi, D., 1993. Contributions to the study of *Diptera* pests of wheat crops in Transylvania. (In Romanian) Ann. of Research Institute for Cereals and Industrial Crops-Fundulea, Vol. LX, București: 199-211.
- Malschi, D., Mustea, D., 1995. Protection and use of entomophagous arthropod fauna in cereals. Romania Agricultural Research, 4/1995: 93-99.
- Malschi, D., Mustea, D., 1996. Insecticides effect on the control of phytophagous *Diptera* of wheat crops in central Transylvania. (In Romanian). Lucrările Simpozionului "Proplant '96", Vol. II, Călimănești: 417-434.
- Mustea, D., Perju, T., Bilauș, I., Tîmpeanu, I., 1982. Aspects of the attack of phytophagous *Diptera* in winter wheat and the integrated control measures. (In Romanian) Contribuții ale Cercetării Științifice la dezvoltarea agriculturii, Edit. Dacia, Cluj: 223-241.

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## ROMANIAN AGRICULTURAL RESEARCH

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Diptera species		Opomyza, Delia	Phorbis	Opomyza Delia și Phorbis
Period of treatments (April)		1983 - 85	1986 - 88	1990 - 97
Dead-heart tillers percent (attack average)		9,9	9,7	8,3 - 7,8
Insecticide	Product	Doze / ha	Insecticide efficiency (E %)	
Lindane	LINDATOX 20 EC	2,0 l	39,4	-
Endosulfan	THIONEX 35 EC	2,0 l	-	49
Lindane+ dimethoate	SINOLINTOX 10 G	20,0 kg	-	72,9
Dimethoate	SINORATOX 35 EC	2,0 l	53,5	72,5
Dimethoate	SINORATOX 35 EC	3,0 l	30,3*	70,4
Dimethoate	SINORATOX 5 G	40,0 kg	-	51,7
Dimethoate+ Deltamethrin	SINORATOX 35 + DECIS 2,5	1,5 l + 0,4 l	65,6 *	68,4
Dimethoate+ Methylpirimiphos	SINORATOX 35 EC+ACTELIC 50 EC	1,5 l + 0,5 l	-	84,0
Methylpirimiphos	ACTELIC 50	1,0 l	-	70,7
Trichlorphon	ONEFON 80	1,2 kg	41,4*	75,5
Malathion	CARBETOX 50	1,0 l	-	63,3
Quinalphos	ECALUX 25 CE	1,5 l	-	61,5
Phonophos	DYFONAT	3,0 kg	-	68,6
Phonophos	DYFONAT 10 G	10,0 kg	-	70,7
Phoxim	FOXIM 0,1 %	0,3 l	-	66,3
Phoxim	VOLATON 5 G	15,0 kg	-	64,4
Diazinon	BASUDINE 10 G	15,0 kg	-	75,0
Diazinon	BASUDINE 600 EC	2,0 l	-	-
Diazinon	DIAZOL 48 EC	0,9 l	-	-
Chlorpiriphos	PYRINEX 50 EW	2,5 l	-	-
Fenoxycarb	INSEGAR 25 WP	0,3 kg	-	-
Pirimicarb	FERNOS 50 DP	0,6 kg	-	72,7
Carbaril	OLTITOX 50	1,0 kg	-	61,2
Bensultap	VICTENON 50 WP	0,5 kg	-	68,8
Methamil	LANNATE 80 WS	0,3 kg	-	72,4
Oxamyl	VYDATE 24 L	0,6 l	-	74,0
Oxamyl	VYDATE 10 G	20,0 kg	-	66,4
Cypermethrin	POLYTRIN 200 SC	0,1 l	-	-
Alphamethrin	FASTAC 10 EC	0,2 l	-	67,6
Beta-Cyfluthrin	BULLDOCK 25 EC	0,3 l	-	-
Thurintox	THURINTOX	0,06 l	-	67,3
Acetamiprid	MOSPILAN 20 SP	0,06 kg	-	-
Fipronil	REGENT 80 WG	0,025 kg	-	-

D.L. p 0,1 % (arcsin  $\sqrt{\%}$ )

3,81

4,79

5,65

\*) - Special autumn treatments

Table 2. Efficiency of insecticide seed treatments tests on the control of *Diptera* species spring attack in winter wheat (*Opomyza florum*, *Delia coarctata*, *Phorbis securis*, *Ph. penicillifera*)

Insecticide	Product	Dose/t seed	Efficiency
Lindane	TIRAMETOX 90 PTS	3.0 kg	67 %
	GAMMAVIT 500 SC	5.0 l	53 %
	MICLODAN 45 PTS	2.5 kg	56 %
	SUPERCARB 550 SC	3.0 l	65 %
	LINDAN 400 SC	2.5 l	51 %
Carbofuran	FURADAN 35 ST	14.2 l	75.3%
Furathiocarb	PROMET 400 CS	25.0 l	23.3 %



Table 3. Prey composition and minimum feeding rate of main entomophagous predators in feeding laboratory trials with Diptera pests according to the natural model of wheat entomocoenosis in Transylvania

Entomophagous predators species	Opomyza (Number)	Florum	Phorbia (Number)	Securis
( individual daily feeding rate with phytophagous )	Larvae	Pupae	Larvae	Pupae
Chrysopa carnea Stephn.(Chrysopidae)	3	1	2	-
Nabis ferus L.(adult) (Nabidae)	3	2	3	4
Coccinella septempunctata L. (adult) (Coccinellidae)	5	7	2	7
Propylaea quatuordecimpunctata L. (Coccinellidae)	-	2	-	-
Malachius bipustulatus L. (Malachiidae)	-	-	3	-
Cantharis fusca L. (Chantaridae)	2	4	-	-
Staphylinus caesareus Cederh (Staphylinidae)	1	-	1	4
Tachyporus hypnorum L. (Staphylinidae)	1	-	1	-
Poecilus cupreus L. (Carabidae)	4	10	5	7
Pseudophonus pubescens De Geer (Carabidae)	1	-	2	1
Harpalus distinguendus Duft. (Carabidae)	4	-	2	2
Harpalus aeneus L. (Carabidae)	-	2	4	2
Amara aenea De Geer (Carabidae)	-	-	8	-
Sylpha obscura L. (Sylphidae)	1	4	2	4
Necrophorus vespillo L. (Sylphidae)	-	-	4	8

Table 4. Side-effects of insecticides on beneficial arthropods. Results of the field and semi-field initial toxicity tests on the treatments for the wheat pests control in Transylvania ( 1994-1996 )

Beneficial predator species :			A		B			C		D			E			F		G		H		I	
Date of treatments :			02 05	02 05	31 05	20 06	31 05	02 05	20 06	02 05	20 06	02 05	20 06	20 06*	20 06*	20 06	20 06	20 06	20 06	20 06	20 06		
Insecticides	Preparation	Dose/ha	Initial toxicity on beneficials																				
Endosulfan	THIONEX 35 EC	2.0 l	4	-	-	4	4	-	4	-	3	3	4	4	-	4							
Dimethoate	SINORATOX 35 EC	1.5 l	-	-	4	3	-	-	1	-	4	-	-	-	-	-	-	-	-	-	-		
Dimethoate	SINORATOX 35 EC	3.5 l	-	-	4	3	4	-	4	-	4	4	4	4	4	4	4	4	4	4	4		
Diazinon	BASUDINE 600 EC	1.0 l	-	-	4	-	4	-	4	-	4	-	-	-	4	4	4	4	4	4	4		
Diazinon	DIAZOL 48 EC	0.9 l	-	-	-	4	4	-	4	-	3	2	4	3	-	-	-	-	-	-	-		
Chlorpiryphos	PYRINEX 50 EW	2.0 l	-	-	-	4	4	-	4	-	3	3	4	4	-	-	-	-	-	-	-		
Cypermethrin	POLYTRIN 200 SC	0.1 l	2	1	2	1	4	1	4	4	1	2	3	4	-	-	-	-	-	-	-		
Alphamethrin	FASTAC 10 EC	0.1 l	1	-	-	1	4	-	4	2	3	2	4	3	4	4	4	4	4	4	4		
Zetamethrin	FURY 10 EC	0.1 l	-	-	1	1	4	-	4	-	3	-	4	4	4	4	4	4	4	4	4		
Deltamethrin	DECIS 2.5 EC	0.3 l	-	-	-	2	4	-	4	-	4	2	2	3	4	1							
Esfenvalerat	SUMI-ALPHA 5 EC	0.2 l	-	-	1	-	3	-	3	-	4	-	4	3	4	4	4	4	4	4	4		
Bensultap	VICTENON 50 WP	0.5 kg	-	-	1	-	4	-	4	-	4	-	-	4	4	4	4	4	4	4	4		
Acetamiprid	MOSPILAN 20 SP	0.1 kg	-	-	1	-	4	-	4	-	-	2	4	-	-	4							
Fipronil	REGENT 80 WG	25 g	-	-	2	-	3	-	3	-	4	-	4	4	-	-	4						

\*Larvae; A-Harpalus distinguendus; B-Poecilus cupreus; C-Pseudophonus pubescens; D-Araneae; E-Coccinella 7-punctata; F-Chrysopa carnea; G-Nabis ferus; H-Tachyporus hypnorum; I-Malachius bipustulatus. Scale (percent mortality): 1=harmless(< 25%); 2=slightly harmful(25-50%); 3=moderately harmful(51-75%); 4=harmful(> 75 %), (Hassan,col.1985).

Table 4. Side-effects of insecticides on beneficial arthropods. Results of the field and semi-field initial toxicity tests on the

treatments for the wheat pests control in Transylvania ( 1994-1996 )

## ROMANIAN AGRICULTURE RESEARCH

Beneficial predator species :			A	B				C	D			E			F	G	H	I
Date of treatments :			02 05	02 05	31 05	20 06	31 05	02 05	20 06	02 05	20 06	20 06*	20 06*	20 06	20 06	20 06	20 06	
Insecticides	Preparation	Dose/ha	Initial toxicity on beneficials															
Endosulfan	THONEX 35 EC	2.0 l	4	-	-	4	4	-	4	-	3	3	4	4	-	4		
Dimethoate	SINORATOX 35 EC	1.5 l	-	-	4	3	-	-	1	-	4	-	-	-	-	-		
Dimethoate	SINORATOX 35 EC	3.5 l	-	-	4	3	4	-	4	-	4	4	4	4	4	4		
Diazinon	BASUDINE 600 EC	1.0 l	-	-	4	-	4	-	4	-	4	-	-	4	4	4		
Diazinon	DIAZOL 48 EC	0.9 l	-	-	-	4	4	-	4	-	3	2	4	3	-	4		
Chlorpiryphos	PYRINEX 50 EW	2.0 l	-	-	-	4	4	-	4	-	3	3	4	4	-	-		
Cypermethrin	POLYTRIN 200 SC	0.1 l	2	1	2	1	4	1	4	4	1	2	3	4	-	-		
Alphamethrin	FASTAC 10 EC	0.1 l	1	-	-	1	4	-	4	2	3	2	4	3	4	4		
Zetamethrin	FURY 10 EC	0.1 l	-	-	1	1	4	-	4	-	3	-	4	4	4	4		
Deltamethrin	DECIS 2.5 EC	0.3 l	-	-	-	2	4	-	4	-	4	2	2	3	4	1		
Esfenvalerat	SUMI-ALPHA 5 EC	0.2 l	-	-	1	-	3	-	3	-	4	-	4	3	4	4		
Bensultap	VICTENON 50 WP	0.5 kg	-	-	1	-	4	-	4	-	4	-	-	4	4	4		
Acetamiprid	MOSPILAN 20 SP	0.1 kg	-	-	1	-	4	-	4	-	-	2	4	-	-	4		
Fipronil	REGENT 80 WG	25 g	-	-	2	-	3	-	3	-	4	-	4	4	-	-		

\*Larvae; A-Harpalus distinguendus; B-Poecilus cupreus; C-Pseudophonus pubescens; D-Araneae; E-Coccinella 7-punctata; F-Chrysopa carnea; G-Nabis ferus; H-Tachyporus hypnorum; I-Malachius bipustulatus. Scale (percent mortality): 1=harmless(< 25%); 2=slightly harmful(25-50%); 3=moderately harmful(51-75%); 4=harmful(> 75 %), (Hassan,col.1985).





