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ORIGINAL ARTICLE

A STUDY ON *MELIGETHES* SPECIES IN KESZTHELY, 2002

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ABSTRACT

In 2002 we examined when the *Meligethes* adults emerged from the wintering places and settled in the rape field. We wanted to know how many species within the genus *Meligethes*, when and in what proportion and rate appeared in oilseed rape as a feed plant. In our investigations we found the following species: *Meligethes aeneus* (Fabricius, 1775), *M. coracinus* (Sturm, 1845), *M. viridescens* (Fabricius, 1787), *M. picipes* (Sturm, 1845), *M. nigrescens* (Stephens, 1830), *M. maurus* (Sturm, 1845), *M. atratus* (Olivier, 1890), *M. denticulatus* (Heer, 1841), *M. erythropus* (Marsham, 1802).

KEYWORDS: oilseed rape, Meligethes species, yellow plates, netting

ÖSSZEFOGLALÁS

2002-ben egy kísérleti repcetáblán vizsgáltuk a *Meligethes fajok* telelő helyről való előjövetelének, és a táblába való betelepedésének idejét. Arra voltunk kíváncsiak, hogy a Meligethes nemzetségen belül hány faj, és egymáshoz viszonyítva milyen arányban fordul elő a repcén, mint tápnövényen. Vizsgálataink során a következő fajokat találtuk: *Meligethes aeneus* (Fabricius, 1775), *M. coracinus* (Sturm, 1845), *M. viridescens* (Fabricius, 1787), *M. picipes* (Sturm, 1845), *M. nigrescens* (Stephens, 1830), *M. maurus* (Sturm, 1845), *M. atratus* (Olivier, 1890), *M. denticulatus* (Heer, 1841), *M. erythropus* (Marsham, 1802).

KULCSSZAVAK: őszi káposztarepce, Meligethes fajok, sárga tálak, hálózás

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DETAILED ABSTRACT

In 2002 we examined when the *Meligethes* adults emerged from the wintering places and settled in the rape field. We wanted to know how many species within the genus *Meligethes*, when and in what proportion and rate appeared in oilseed rape as a feed plant. In our investigations we found the following species: *Meligethes aeneus* (Fabricius, 1775), *M. coracinus* (Sturm, 1845), *M. viridescens* (Fabricius, 1787), *M. picipes* (Sturm, 1845), *M. nigrescens* (Stephens, 1830), *M. maurus* (Sturm, 1845), *M. atratus* (Olivier, 1890), *M. denticulatus* (Heer, 1841), *M. erythropus* (Marsham, 1802). The individual number of *M. aeneus* was all along remarkably higher than those of other *Meligethes* species present at the same time. It was found in all netted material, that is, its occurrence was 100%. *M. coracinus* was detected in 78%, *M. viridescens* in 50%, *M. picipes* in 58%, *M. nigrescens* in 29%, *M. maurus* in 43%, *M. atratus* in 21%, *M. denticulatus* in 14% and *M. erythropus* in 7% of the collected material. It can be established that towards the end of flowering the species *M. aeneus* still remained dominant within the genus *Meligethes*, though beside it more and more *Meligethes* species in ever increasing individual number caused damages in oilseed rape.

As regards the individual number totaled for the whole collecting period we pointed out the decisive dominance of *M. aeneus* in the examined field. The occurrence of three other species: *M. coracinus*, *M. viridescens* and *M. picipes* was considered considerable. Out of the further five species the presence of *M. nigrescens* and *M. maurus* was rare, while the occurrence of *M. atratus*, *M. denticulatus* and *M. erythropus* was sporadic.

INTRODUCTION

In the case of the oilseed rape one of the preconditions of attaining outstanding yield averages is to satisfy the agrotechnical demands of the plant (soil cultivation, variety, sowing time, nutrient replacement, etc.), the other is a successful pest control. One of the most important pests in spring is the pollen beetle which greatly endangers the yield. It causes considerable damages in years when its settling is followed by changeable weather, cool and warmer periods alternating each other. Under such environmental conditions the development of plants is protracted, the pollen beetles have more time to do damages. Those engaged in plant protection take all pollen beetles found in oilseed rape for *M. aeneus*, although other *Meligethes* species may also occur there at the same time. The time of controlling the spring pests of oilseed rape is in general practically linked with the mass appearance of the pollen beetle, but from time to time it may be modified by an extensive occurrence of the cabbage-stem weevil, which makes it necessary to carry out the control operation much earlier so as to reduce the damages.

In Hungary few faunistic investigations have been made so far concerning the species belonging to the genus *Meligethes* (Fritzsche 1955; Manninger 1960; Audisio 1980). On the species causing damages in Hungary apart from *M. aeneus* only a single report is available. Among the pollen beetles collected by Manninger in May 1956 in Hódmezővásárhely *M. coracinus* (Sturm, 1845), *M. viridescens* (Fabricius, 1787), and *M. picipes* (Sturm, 1845) were found besides *M. aeneus*. On an international level substantially more sources are available about similar investigations (Fritzsche 1957, 1971; Nolte – Fritzsche 1952; Nielsen 1959; Goos 1961; Goos – Goos 1960; ZURANSKA et. al. 1998, WINFIELD 1992, FINCH et. al 1990, ALBERTINI et. al 1988, FOUGEROUX 1987).

Our investigations were aimed at giving a comprehensive picture of the *Meligethes* species doing damage in oilseed rape to those engaged in entomology and plant protection. We examined the pollen beetle species occurring in Keszthely in 2002, and determined their percentage proportions. The family of pollen beetles is very large, about 2500 species of them are known in the world (Audisio 1980). The species of the family *Nitidulidae* practically are found all over the world, but most of the genera and species are tropical. The fauna of the south-eastern part of tropical Africa and Asia is particularly rich. In the Palaearcticum a relatively small number of species live, only the genera *Meligethes* and *Epuraea* are rich in species. In the Carpathian basin and in Hungary 140 species belonging to 24 genera are known, and further 48 species are supposed to occur there. The genus *Meligethes* is less rich in species; some 350 species have been described so far, they are spread all over the world except South-America. In Europe more than 100 *Meligethes* species occur; in Hungary 57 of them are known for certain, and further 21 are supported to occur (Audisio 1980).

MATERIAL AND METHOD

In 2001 a 0,1 ha field was sown to autumn oilseed rape in Újmajor, on the skirts of the city Keszthely for experimental purposes. When choosing the area the distance of a former year's rape field was taken in consideration. Since the trial plot was relatively small, we had to find a place that the adults emerging form wintering would find. We succeeded in choosing an area less than 2 km distant from a former year's rape field. In autumn 2001 overwintering adults were collected and put in paper bags together with the leaf-litter. The bags were then placed in an insectary, and early next spring the adults first emerging from the bags notified us that emergence from wintering would soon begin. To watch the beetles to settle colour traps, Moericke's yellow plates placed in the field on 15 February were used. Every two or three days after settling beetles were collected by netting on the edge and in the middle of the field separately, using Manninger's sweep-net. In order to obtain a sufficient number of adults for the identification of species, on each occasion three times ten net-strokes were made both on the edge and in the middle. Adults caught per ten net-strokes were handled separately.

Separating the species is a rather difficult and time-consuming task. For the identification stereo-microscopes were used. The separation was based on morphological characteristics, for example: the rear border of the back of the prethorax, the size of segments in the clubby antenna, the size and shape of the body, the colour and dottiness of the legs and wing-cases, the thickness of the hind femur, the denticulation of the outer edge of the fore-leg, the shape of the male and female sexual organ and spiculum. Also, we had to examine the sexual

organs, as this provided the most solid basis for the precise identification of the different species.

RESULTS

We studied the emergence from wintering of *Meligethes* species occurring in an oilseed rape field and found 8 species besides *M. aeneus*. Among the 9 species *M. aeneus* was the first to settle. Owing to the mild spring weather settling began early, on 18 March. The other 8 species appeared about 2-3 weeks later. When the first adults appeared on 14 February on the paper bags we placed yellow plates in the fields. The first pollen beetles were found in the plates on 18 March. When the beetles began to settle (25 March) we studied the flying dynamics of the *Meligethes* species by means of netting. The number of adults collected in the course of netting can be seen in Table 1.

Table 1: Times and results of netting on the edge and in the middle of the field

Date of netting	Number of adults caught with the first, second and thirt net-srokes						Average number of adults	
	edge	middle	edge	middle	edge	middle	edge	middle
2002. 03. 25.	12	1	13	1	17	0	14	1
2002. 03. 27.	15	0	21	1	19	2	18	1
2002. 03. 29.	22	2	15	1	22	1	20	1
2002. 03. 31.	28	2	31	2	27	2	29	2
2002. 04. 02.	38	5	33	4	37	11	36	7
2002. 04. 05.	42	22	35	15	39	18	39	18
2002. 04.07.	59	23	47	27	47	21	51	24
2002. 04. 10.	74	45	68	51	69	49	70	48
2002. 04. 12.	89	59	78	59	70	66	79	61
2002. 04. 15.	107	71	94	77	89	74	97	74
2002. 04. 17.	135	84	117	92	109	103	120	93
2002. 04. 20.	161	215	158	254	151	232	157	234
2002. 04. 23.	206	244	198	277	192	269	199	263
2002. 04. 25.	187	251	179	247	176	234	181	244

Note: Adults collected per 10 net-strokes were handled separately. The beetles were counted in each separately, then averaged and represented in Fig. 1.

Figure 1: Average of adults collected on the edge and in the middle of the field

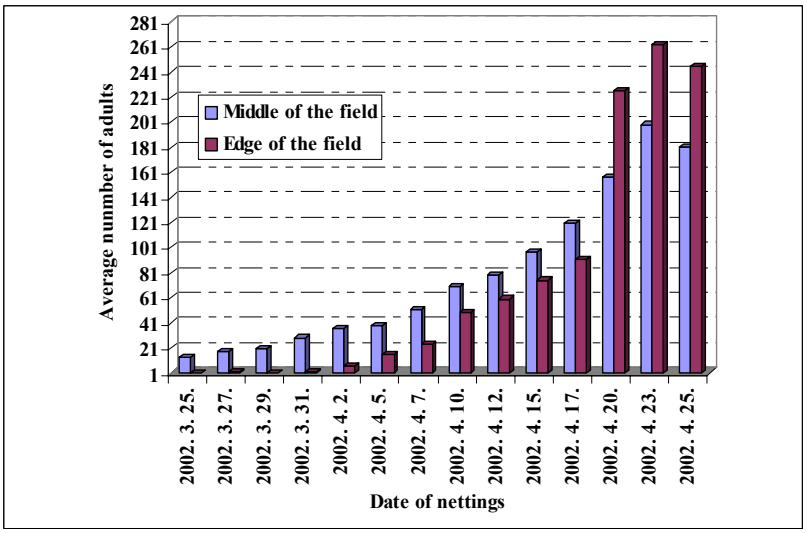

Table 1. shows the result of netting on the edge and in the middle of the field is seen. Table 1. Indicate that the individual number in the first third of the settling period was always about ten times higher on the edge than in the middle of the field. In the first decade of April this difference fell to fifth. From the time of the full blossom of oilseed rape (second half of April) the population was evenly distributed over the edge and the middle of the field. From the third decade of April, however, the number of adults grew higher in the middle. The data of the Table are represented in the form of diagram in Fig. 1.Fig. 1. shows that the number of the individuals caught increased exponentially with the advance of time in both parts of the field. The character of the increase was more even on the edge than in the middle.

The results of identification are contained in Table 2. We found the following species: *Meligethes aeneus* (Fabricius, 1775), *M. coracinus* (Sturm, 1845), *M. viridescens* (Fabricius, 1787), *M. picipes* (Sturm, 1845), *M. nigrescens* (Stephens, 1830), *M. maurus* (Sturm, 1845), *M. atratus* (Olivier, 1890), *M. denticulatus* (Heer, 1841), *M. erythropus* (Marsham, 1802).

Table 2: Result of identification

Date of collecting	*M. aeneus*	*M. coracinus*	*M. viridescens*	*M. picipes*	*M. nigrescens*	*M. maurus*	*M. atratus*	*M. denticulatus*	*M. erythropus*
2002. 03. 25.	60	-	-	-	-	-	-	-	-
2002. 03. 27.	60	-	-	-	-	-	-	-	-
2002. 03. 29.	60	-	-	-	-	-	-	-	-
2002. 03. 31.	58	2	-	-	-	-	-	-	-
2002. 04. 02.	56	4	-	-	-	-	-	-	--
2002. 04. 05.	58	2	-	-	-	-	-	-	-
2002. 04.07.	54	2	-	2	-	-	-	-	-
2002. 04. 10.	55	2	1	1	-	1	-	-	-
2002. 04. 12.	52	5	2	1	-	-	-	-	-
2002. 04. 15.	48	4	3	2	1	1	-	-	-
2002. 04. 17.	44	6	5	1	-	2	-	1	-
2002. 04. 20.	40	7	3	3	2	3	1	1	1
2002. 04. 23.	37	9	4	2	4	1	2	-	-
2002. 04. 25.	38	7	6	3	1	2	2	-	-
Σ	720	50	24	15	8	10	5	2	1
%	85,71	5,95	2,86	1,79	0,95	1,19	0,60	0,24	0,12

Note: From the adults caught by each 10 net-strokes we picked out 20 at random, so that from those caught by three times 10 net-strokes a total of 60 adults were identified for each colecting day.

The individual number of *M. aeneus* was all along remarkably higher than those of the related species present at the same time. *M. aeneus* was detected in all netted materials, that is, its occurrence was 100%. *M. coracinus* was detected in 78%, *M. viridescens* in 50%, *M. picipes* in 58%, *M. nigrescens* in 29%, *M. maurus* in 43%, *M. atratus* in 21%, *M. denticulatus* in 14% and *M. erythropus* in 7% of the collected material. Toward the end of flowering *M. aeneus* within the genus *Meligethes* still remained dominant, but beside it an ever increasing individual number of more and more related species caused damages.

Even with the individual numbers totaled for the whole collecting period taken into consideration, a decisive dominance of *M. aeneus* in the field in question can be established. The occurrence of three other species: *M. coracinus*, *M. viridescens* and *M. picipes* was considered considerable. Out of the further five species the presence of *M. nigrescens* and *M. maurus* was rare, while the occurrence of *M. atratus*, *M. denticulatus* and *M. erythropus* was sporadic.

CONCLUSIONS

The 9 species found in the examined oilseed rape field properly represent the genus, but the occurrence of other *Meligethes* species described for this fauna cannot naturally be excluded either.

The paper bags forecasted the early appearance of pollen beetles in 2002 as duly signalized by the yellow plates.

The explanation for the initially higher individual number on the edge of the field may be that as soon as the first flying adults emerging from wintering recognized – by colour and smell stimuli – the oilseed rape as their feed plant settled on the edge to feed. Later, in the course of mass settling the adult population became tool large, so more and more beetles were present in the inner part of the field. By the time of flowering the individual number became balanced over the field, and at the time of full blossom it was – for temporarily unknown reasons – even higher in the middle. Perhaps the quality of the pollen and the efficiency of natural enemies are not the same on the edge and in the middle of the field. Further investigations would be required to clear this question.

The emergence of *M. aeneus* as first among the species identified, as well as its high percentage occurrence unequivocally show its dominance within the genus, due probably to the different ecological demands of the species. The other 8 species are supposed to become activated at a higher temperature than the *M. aeneus*, whose obligate diapause is released during January. Its quiescence comes to an end under the influence of a rise of temperature. The beetles activate at 9°C, and at 15°C they fly. Further investigations are also necessary to find out the ecological demands of the other 8 species.

On the basis of the time of settling and frequency of occurrence *M. coracinus*, *M. viridescens* and *M. picipes* are regarded as species of importance for plant protection in Keszthely.

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REFERENCES

[1.] Albertini, A., Chianella, M., and Mallegni C. (1988): Insect pests in the cultivation of rape in Italy: biological data and control strategies. Informatore Agrario, 43: 40, 65–67.

[2.] Audisio, P. (1980): Fénybogarak-Nitidulidae. In: Magyarország Állatvilága, VII. 9. Akadémiai Kiadó, Budapest

[3.] Finch, S., Collier, R. H., and Elliott M. S. (1990): Seasonal variations in the timing of attacks of bronzed blossom beetles (*Meligethes aeneus/Meligethes viridescens*) on horticultural brassicas. Brighton Crop Protection Conference Pests and Diseases. 1: 349–354.

[4.] Fougeroux, A. (1987): The *Meligethes* of colza. Phytoma, No. 386, 42; 1.

[5.] Fritzsche, R. (1955): Zur Morphologie von *Meligethes aeneus* Fabr., *M. viridescens* Fabr., *M. coracinus* STURM und *M. picipes* STURM. Beitr. Entomol. 5, 309–333.

[6.] Fritzsche, R. (1957): Zur Biologie und Ökologie der Rapsschädlinge aus der Gattung *Meligethes*. Z. angew. Entomol. Berlin, 40. 222–281. *M. coracinus* Sturm, und *M. picipes* Sturm. Beitr. Ent., 5: 309–333.

[7.] Friezsche, R. (1971): Pfanzenschädlinge. Bd. 7. Käfer. Neumann Verl., Leipzig

[8.] Goos, A. (1961): Pollen beetle (*Meligethes aeneus* F.) as an experimental objekt for estimate of insecticides (Experiments with mobile populations). Zesz. Nauk. Wyzsz. Roln. Wroclaw, 14: 54–95.

[9.] Goos, A. and Goos, M.(1960): Observations on the cours of flight of pollen beetle-*Meligethes aeneus* F. In: 1955–1959. Pols. Pismo Entomol., 3–4: 185–198.

[10.] Manninger G. A. (1960): Szántóföldi növények állati kártevői. Mezőgazdasági Kiadó, Budapest

[11.] Nolte, H. W. und Fritzsche, R. (1952): Untersuchungen über das Vorkommen verschiedenen *Meligethes* Arten auf Raps. Beitr. Entomol. 2: 434–448.

[12.] Winfield, A. L. (1992): Management of oilseed rape pests in Europe. Agricultural Zoology Reviews, 5: 51–95.
[13.] Zuranska, I., Lubecka, A., Sledz, D. and Kordan, B. (1980): Occurence and harmfullness of pollen beetle (*Meligethes* sp.) on winter rape plants in the vicinity of Olsztyn. Acta Academiae Agriculturae ac Technicae Olstenensis, Agricultura, 65: 155–164.

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