

**RESEARCH ON THE FLIGHT EVOLUTION OF
MELOLONTHA MELOLONTHA L. (COLEOPTERA,
SCARABAEIDAE) SPECIES IN THE CENTRAL OF
MOLDAVIA CONDITIONS, ROMANIA**

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ABSTRACT. The cockchafer (*Melolontha melolontha* L.) is the most widespread and best known bug. It is a polyphagous bug, being harmful both in adulthood and in larva stage. The researches were conducted at Agricultural Research and Development Station (A.R.D.S.) of Secuieni, Neamț county, Romania, and followed the evolution of adult flight, during 1993 – 2012 with a light trap help. The gatherings and records were made daily from 1 April to 31 October every year, during the observation period. Dividing the observation period into four stages of five years each, it was found that the largest number of specimens, 38059, was collected in the second stage (1998 – 2002), followed by the third stage (2003 – 2007) with 18167 specimens, first stage with 12173 specimens, and the lowest number of 286 specimens was recorded in the fourth stage (2008 – 2012). The adults flight started in all the years in the second or the third decade of April and lasted until the second or the third decade of May, with the exception of 1995 și 2009 when he finished in the first decade of June. The average

duration of the flight was 39 days. The maximum flight curve was reached, in all years of observation, in the third decade of April and first decade of May. The maximum intensity of flight curves was recorded every three years, as follows: 1994, 1997, 2000, 2003, 2006, 2009, 2012. This shows that, in Secuieni conditions, the insect has one generation at 3 years. Highest intensity of flights has been in the years 2000, when the top flight was conducted by 38059 specimens, 2003 with 13912 specimens/flight and 1997 with 10221 specimens/flight.

Key words: Beetle; Flight; Years; Specimens.

REZUMAT. Cercetări privind evoluția zborului speciei *Melolontha Melolontha* L. (Coleoptera, Scarabaeidae) în condițiile din centrul Moldovei. Cărbușul de mai (*Melolontha melolontha* L.) este cel mai răspândit și mai cunoscut gândac. Este o specie polifagă, fiind dăunătoare atât în stadiul de adult, cât și în cel de larvă.

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Cercetările s-au efectuat la S.C.D.A. Secuieni – Neamț și au urmărit evoluția zborului adulților în perioada anilor 1993 – 2012, cu ajutorul unei capcane luminoase. Colectările și înregistrările s-au efectuat zilnic, începând cu 1 aprilie și până la 31 octombrie, în fiecare an pe parcursul perioadei de observație. Împărțind perioada de observație în patru etape a câte cinci ani fiecare, s-a constatat că cel mai mare număr de exemplare, de 38059, s-a colectat în etapa a doua (1998 – 2002), urmat de etapa a treia (2003 – 2007) cu 18167 exemplare, etapa întâia cu 12173 exemplare, iar cel mai redus număr, de 286 exemplare, s-a înregistrat în etapa a patra (2008 – 2012). Zborul adulților a început, în toți anii, în decada a doua sau a treia a lunii aprilie și a durat până în decada a doua sau a treia a lunii mai, cu excepția anilor 1995 și 2009, când s-a încheiat în prima decadă a lunii iunie. Durata medie a zborului a fost de 39 de zile. Curba maximă de zbor s-a atins, în toți anii de observație, în decada a treia a lunii aprilie și în prima decadă a lunii mai. Intensitatea maximă a curbelor de zbor s-a înregistrat din trei în trei ani, după cum urmează: 1994, 1997, 2000, 2003, 2006, 2009, 2012. Aceasta demonstrează că, în condițiile de la Secuieni, insecta prezintă o generație la 3 ani. Intensitatea cea mai ridicată a zborurilor s-a înregistrat în anii 2000, când vârful de zbor a fost realizat de 38059 exemplare, 2003 cu 13912 exemplare/zbor și 1997 cu 10221 exemplare/zbor.

Cuvinte cheie: gândac; zbor; ani; exemplare.

INTRODUCTION

The cockhafer or hen beetle (*Melolontha melolontha* L.) is the most popular and most widespread bug. It can be found in all countries of Europe, and in Romania is present from the steppe regions and up to the

oak and beech forests regions (Perju *et al.*, 1983).

It is a polyphagous species, which attacks both in adult stage and larva stage. The adults attack the leaves from different species of forest trees and fruit trees preferring the oak, elm, beech, birch, hornbeam, plum, cherry and walnut; less attacked are the apple, pear, grapes, and so on. Also, attack various shrubs such as: rose, hawthorn, privet, and so on, and other herbaceous plant species (Baicu and Săvescu, 1978; Bîrliga, 1967; Lazăr *et al.*, 1980; Șuta *et al.*, 1974).

At strong attacks, the leaves are completely destroyed, leaving only the main ridge; sometimes attacks the flowers and fruits in training. As a result of the attack the trees remain leafless and the harvest is lost; the wood often enter green in the winter and froze, so that the harvest for next year is reduced.

Simionescu describes them as „very harmful, elders just out of the earth that pounce on young leafy trees and put on eaten. Their mouth is like scissors, that cut the leaf, cut the buds, eating until they swell, and to day, tired and numb from the cold, sit motionless on the leaves” (Simionescu, 1983).

The larvae, also called „white worms”, attacks the grassy and woody plant roots, producing, in some years, great damage in vineyards and orchards nurseries, agricultural land and vegetable crops, piercing galleries in potato tubers, rhizomes and bulbs, in which are locates various species of mites, nematodes, some bacteria and fungi that cause their decay.

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The voracity of larvae vary by their age and density and depending on the host plant.

In vineyards and fruit trees nurseries, and in rare rows crops (sugar beet, sunflower, corn) the low density of larvae is between 0.5 – 1 larvae/sqm present a hazard; instead at fodder crops and cereals crops the larval density may exceed 10 specimens/sqm without any danger of crops destruction (Lazăr *et al.*, 1980; Roșca *et al.*, 2011).

In this paper we present data on the flight evolution of the *Melolontha melolontha* L. species, during 1993 – 2012.

MATERIALS AND METHODS

The researches were conducted at A.R.D.S Secuieni, Neamț county, and consisted in the collection and recording of adults of *Melolontha melolontha* L. species with the help of a light trap.

The trap was installed in the experimental field of A.R.D.S. Secuieni, the collections and records were made

annually from 1 April to 31 October. In the laboratory, the collected insects were determined separately by species and recorded in the Observation Register.

The data obtained have established: beginning and end of the flight; the flight duration; intensity of flight; time of flight peak.

For ease of the results presentation the observation period was divided (1993 – 2012) into four phases of five years each, as follows: stage I consisted of the years 1993 – 1997, stage II (1998 – 2002), stage III (2003 – 2007) and stage IV with the years 2008 – 2012.

RESULTS AND DISCUSSION

Analyzing the collected insects in stage I (1993 – 1997) it was found that the total number of the adults of *Melolontha melolontha* L. species was 12173 specimens. The most intense flights were recorded in 1997 of 10221 specimens, followed by 1994 with 1889 specimens, and in 1993, 1995 and 1996 were collected 4 to 46 specimens (*Table 1*).

Table 1 - Number of adults of *Melolontha melolontha* L. species collected in light trap during 1993 – 1997

Year		1993	1994	1995	1996	1997	Total decade
Month	Decade						
April	I	0	0	0	0	0	0
	II	0	240	0	0	0	240
	III	3	1272	6	3	19	1303
May	I	1	18	2	38	9788	9847
	II	0	350	4	5	414	773
	III	0	9	0	0	0	9
June	I	0	0	1	0	0	1
	II	0	0	0	0	0	0
Total year		4	1889	13	46	10221	12173

In the second stage (1998 – 2002), the total number of adults collected was 38959 specimens, the most intense flight occurred in 2000 and totaled 38059 specimens, and in 1998, 1999, 2001 and 2002 the annual number collected ranged from 0 (2001) to 520 specimens (2002) (Table 2).

In stage III (2003 – 2007) the total number of insects collected was of 18167 adults, the most intense flight occurred in 2003 of 13912 specimens, followed by 2006 with

3058 specimens, 2005 with 1165 specimens, and in the years 2004 and 2007, were recorded 25 and respectively seven specimens/year (Table 3).

In the fourth stage (2008 - 2012) was registered the lowest number of adults collected in total period of 286 specimens. The most intense flight, when were collected 176 specimens/year was recorded in 2009, in the remaining years were collected between six specimens (2010) and 50 specimens (2012) (Table 4).

Table 2 - Number of adults of *Melolontha melolontha* L. species collected in light trap during 1998 – 2002

Year		1998	1999	2000	2001	2002	Total decade
Month	Decade						
April	I	0	0	0	0	0	0
	II	0	0	14518	0	3	14521
	III	10	1	23187	0	427	23625
May	I	1	3	324	0	87	415
	II	0	1	28	0	2	31
	III	0	0	2	0	1	3
June	I	0	0	0	0	0	0
	II	0	0	0	0	0	0
Total year		11	5	38059	0	520	38959

Table 3 - Number of adults of *Melolontha melolontha* L. species collected in light trap during 2003 – 2007

Year		2003	2004	2005	2006	2007	Total decade
Month	Decade						
April	I	0	0	0	0	0	0
	II	0	0	73	0	0	73
	III	2410	7	201	1715	3	4336
May	I	11396	15	870	905	2	13188
	II	100	3	15	375	1	494
	III	6	0	6	63	1	76
June	I	0	0	0	0	0	0
	II	0	0	0	0	0	0
Total year		13912	25	1165	3058	7	18167

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Table 4 - Number of adults of *Melolontha melolontha* L. species collected in light trap during 2008 – 2012

Year		2008	2009	2010	2011	2012	Total decade
Month	Decade						
April	I	0	0	0	0	0	0
	II	0	0	0	0	1	1
	III	12	61	2	1	5	81
May	I	28	86	3	3	27	147
	II	1	21	1	7	17	47
	III	1	5	0	1	0	7
June	I	0	3	0	0	0	3
	II	0	0	0	0	0	0
Total year		42	176	6	12	50	286

Following the adults appearance and the beginning of flight depending on the climatic conditions with reference to the average soil and air temperature was found that they

started off at average soil temperature between 6.1°C and 14.2°C and air temperature between 5.5 °C and 13.2 °C (*Table 5*).

Table 5 - The average soil and air temperature at the appearance of adults of *Melolontha melolontha* L. species

STAGE I			STAGE II			STAGE III			STAGE IV		
April			April			April			April		
Year	Average air T°C	Average soil T°C	Year	Average air T°C	Average soil T°C	Year	Average air T°C	Average soil T°C	Year	Average air T°C	Average soil T°C
1993	8,0	9,0	1998	12,3	14,4	2003	8,4	9,6	2008	10,4	13,2
1994	11,0	12,9	1999	10,5	12,9	2004	10,2	11,1	2009	10,9	14,4
1995	9,5	11,2	2000	13,2	14,2	2005	9,4	10,5	2010	10,2	13,4
1996	8,2	8,3	2001	10,0	11,6	2006	10,2	12,4	2011	9,4	12,0
1997	5,5	6,1	2002	9,2	10,3	2007	9,6	11,9	2012	11,7	13,5

Analyzing the flight during the entire period of observation, grouped into four phases of five years each, it was found that in all the years of observation adult flight began in the second decade of April and lasted until the second decade of May, except 1993 and 2009 when the flight

ended in the first decade of June, the average flight was 39 days.

During this period the flight curve reached its apex in the first decade of May for the period 1993 – 1997, 2003 – 2007 and 2008 – 2012 and in the third decade of April for the period 1998 – 2012 (*Figure 1*)

Analyzing the flight curve, depending on the total number of adults collected annually it was found that the top flight curve was performed from 3 in 3 years (1994, 1997, 2000, 2003, 2006, 2009 și 2012), the flight intensity was

increasing from 1993 until 2000, when the flight reached its maximum of 38059 specimens/year, being then steadily decreased so that in 2012 the total number of adults collected was of 50 specimens (Figure 2).

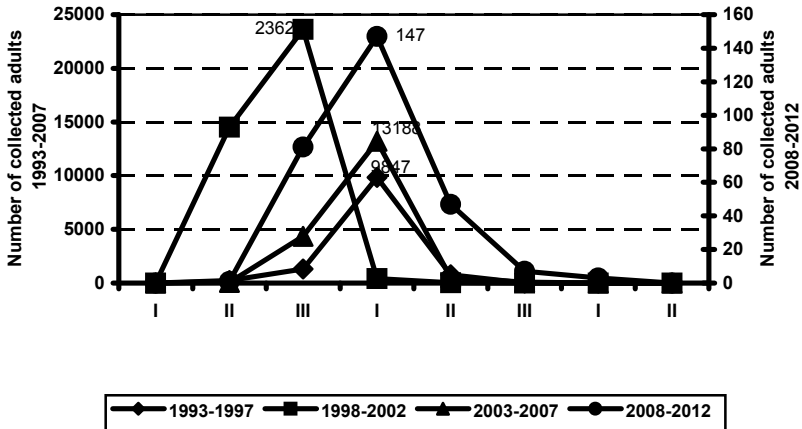


Figure 1 - The flight duration made by the adults of *Melolontha melolontha* L. species during 1993 – 2012, on stages

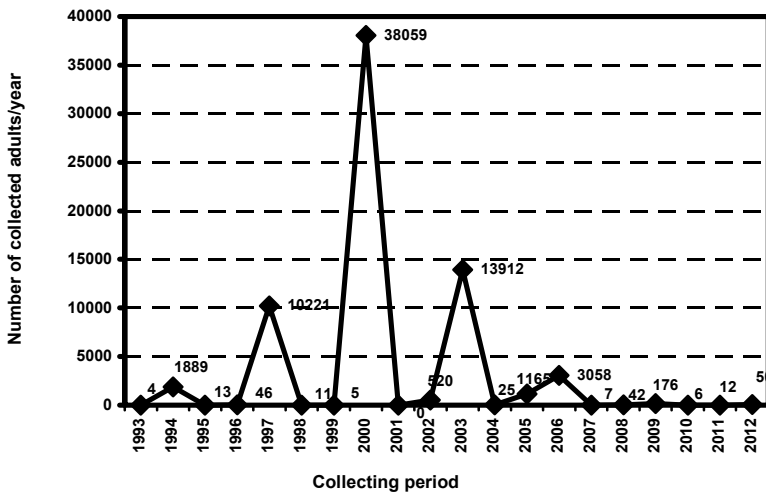


Figure 2 - The flight curve evolution made by the adults of *Melolontha melolontha* L. species during 1993 - 2012

CONCLUSIONS

Number of adults collected during 1993 – 2012 was: 12173 specimens in first stage (1993 – 1997), 38059 specimens in second stage (1998 – 2002), 18167 specimens in third stage (2003 – 2007) and 286 specimens in the fourth stage (2008 – 2012).

The flight of the adults started in all the years of observation in the second and third decade of April and lasted until the second or third decade of May, with the exception of 1995 and 2009 when it ended in the first decade of June.

The average duration of the flight was 39 days, on the entire period of observation.

The maximum flight curve was reached in all years of observation in the third decade of April and in the first decade of May.

Maximum intensity of flight curve was recorded from 3 to 3 years, as follow: 1994, 1997, 2000, 2003, 2006, 2009, 2012 which shows that in Secuieni conditions the insect has one generation to 3 years.

The most abundant flights were recorded in the years: 2003 with 13912 specimens/flight and 1997 with 10221 specimens/flight.

Since 2006 and until 2012 the flight intensity was continuously decreasing which shows that natural enemies, weather conditions and crop

preventive protection measures have helped to reduce the population under the EDT (economic damage threshold).

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