NEW DATA REGARDING *OULEMA MELANOPA* L. (*COLEOPTERA: CHRYSOMELIDAE*) ATTACK IN WESTERN PART OF ROMANIA

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Abstract. *In our country, the areas cultivated with oats have oscillated over time. After a pronounced decrease of these surfaces, in recent years there has been a slight increase in both the surface area and the yields achieved per unit area. The low attention paid by the farmers to the oat culture has made the research on the pests of this crop less numerous than the other cereals. Pest monitoring, the establishment of biological reserves and the potential for attack in cereal agro ecosystems, in particular oats, are issues of interest in applied research on system optimization integrated control, suitable climate and current technology. In this context, we mention that Oulema melanopa, which is considered to be one of the major pests in this crop, is of interest for oat. The main purpose of this paper is to assess the current status of the Oulema melanopa populations and to determine the economic impact of this species in the Western part of Romania. The paper includes original results on the researches carried out on Oulema melanopa in oat crops in the area of Şag, Timiş County, bringing new explanations and clarifying some aspects less known. Oulema melanopa adults were collected using entomological net and data on larval abundance were made by direct observations on plants. The researches regarding Oulema melanopa were made from the second decade of April up to harvest. In the present study, the Oulema melanopa species presented the highest abundance in the larval stage. After the research carried out in western part of Romania, we can indicate that Oulema melanopa is a bioindicator of climate change in cereal ecosystems.*

Keywords*: Oulema melanopa, attack, oat crops, climate changes, western Romania*

INTRODUCTION

The cereal leaf beetle (*Oulema melanopa* L.) is one of the most important species of oat crop, which is native to Europe and Asia (DIFONZO, 2009; HERBERT JR & VAN DUYN, 2009). In 1962 was officially reported in North America, in the state of Michigan (CASTRO ET AL, 1965; OLFERT ET AL, 2004; LESAGE ET AL., 2007).

Since 1737 until now *Oulema melanopa* L. has spread naturally causing major yield losses to cereal crops in Europe (TANASKOVIĆ ET AL., 2012).

Oulema melanopa was initially a frequent pest of oat and barley crops, but lately it has also been encountered mainly in winter wheat crops, yield losses can be reduced considerably by this pest attack (BUNTIN ET AL., 2004; GRALA ET AL., 2004; ULRICH ET AL., 2004; BIENKOWSKI, 2010).

In Romania, among *Oulema* species, *Oulema melanopa* is most common in oat crops. The economic impact of this species is significant. MALSCHI (2003) estimated that a single larva reduces the uptake of chlorophyll by up to 10%. Also, massive larval attack of this species can reduce it up to 80%, causing yield losses of about one tone/ha.

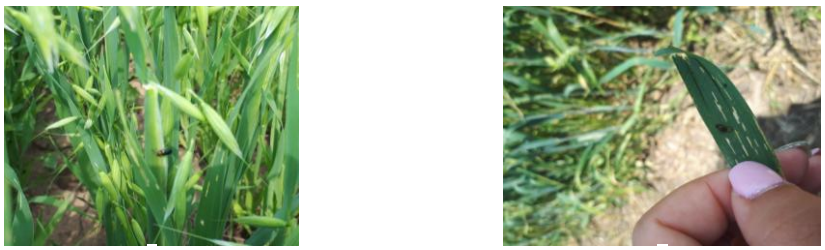
In this paper we intend to answer the question about the current status and economic impact of this species in the Western part of Romania. Thus, in the present paper we will expose the abundance of this species, and also the evolution of the dynamics of *Oulema melanopa* population, in the context of current climate change. The second objective of this study is to evaluate the damage caused by this species. Knowing the level of attack should help

us answer the question if economic damage has been achieved and when is the optimal time to apply the treatments?

MATERIAL AND METHODS

In order to establish the dynamics of *Oulema melanopa* populations and the attack produced by this species in an oat crop located in the area of Şag village, Timiş County, the experiments has been carried out from the second decade of April and the first half of May to assess adult attack and early June to assess larvae attack, in 2017.

Oulema melanopa adults were collected using entomological net after the method of RUESINK & HAYNES (1973).



a b

Fig. 1. Assessment of *Oulema melanopa* abundance and dynamics: a – adults, b – larvae
(photo: Dumitru Florina, 2017)

To assess the abundance and to achieve the dynamics of *Oulema melanopa* population, the samples collecting were taken at 15 days intervals (2/ month). Each sample represents the insects collected in 25 double mowing (fig. 1).

Fig. 2. The method of direct observations on plants
(photo: Dumitru Florina, 2017)

Larvae were sampled in the same time with adults. Data on the abundance of larvae were done by direct observation of the plants (fig.2.). The number of larvae/ plant, the date of occurrence of the first specimens and the period in which they were present on the plants, were initially noted.

a b

Fig. 3. The attack produced by *Oulema melanopa*: a – adults, b – larvae
(photo: Dumitru Florina, 2017)

In order to determine the larval attack, we used the metric frame; the intensity of attack was noted, using 4 classes of intensity: I - up to 10% leaf area damage, II - 10-30% damage, III - 30 – 60% damage, IV - over 60 damage percentages (fig. 3.) (ULRICH ET AL., 2004).

RESULTS AND DISCUSSIONS

The mean number of *Oulema melanopa* specimens did not show significant differences over the study period (table 1). The average number of adults of *Oulema melanopa* was 11 specimens / sample with a standard deviation of 5.14 specimens. The average number of larvae present on oat plants was 11.85 ± 5.88 specimens / sample.

Table 1.

The abundance of *Oulema melanopa* in oat crop, in 2017

Collecting date	Adults	Larvae	Total number	%
16 April	15 ± 5,14	7 ± 5,88	22	13,75
29 April	21 ± 5,14	5 ± 5,88	26	16,25
13 May	14 ± 5,14	3 ± 5,88	17	10,63
28 May	12 ± 5,14	14 ± 5,88	26	16,25
10 June	9 ± 5,14	19 ± 5,88	28	17,50
24 June	4 ± 5,14	21 ± 5,88	25	15,62
7 July	2 ± 5,14	14 ± 5,88	16	10,00
		Total	160	

Maximum larval density (n = 21) was recorded on June 24, and the lowest (n = 3) on May 13. Recorded data on larval activity of *Oulema melanopa* indicate an increase in abundance from one collection date to another, although statistically this was insignificant. Throughout the studied period, the *Oulema melanopa* species exhibited the highest abundance in the larval stage.

Comparing the data with those present in the literature, we can see that over the last two decades, *Oulema melanopa* has become one of the major pests of cereal crops in the world. So, according to some authors, the average larval infestation rate was 88 larvae/plants, resulting in yield losses ranging from 2 to 4% (HITCHCOX ET AL., 2000). According to other authors, an average infestation ranging from one larvae / plants to 2-5 larvae / plants was reported in Europe (SCHÄRER, 1994; HEYER & WETZEL, 1990).

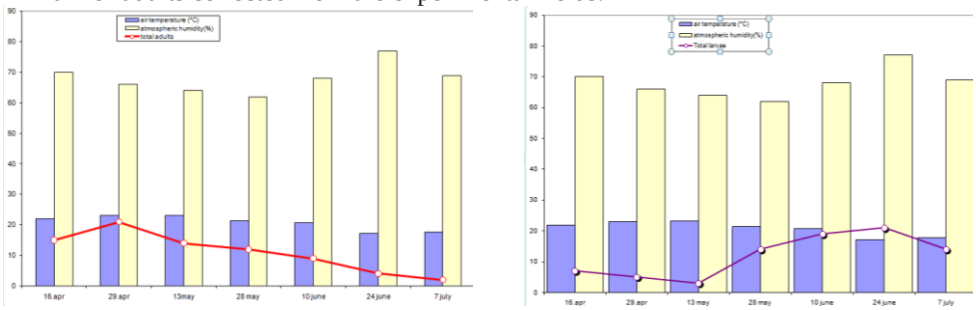
10 years ago, MALSCHI (2003) reported for Romania the infestation rate for *Oulema melanopa*, of 10 adults / m2. In 2017, DĂRAB ET ALL reported an infestation rate of 8 specimens / 100 mowing.

The data reported in this paper are very similar to those in the Romanian literature, ranging from 11 adults / sample to 11.85 larvae / sample, showing a trend of growth. This trend

requires further investigation into the causes and future impacts of *Oulema melanopa* populations on oat crops.

The study of the dynamics of *Oulema melanopa* population in oat crops in Sag, in 2017, targets both adults and larvae.

The largest number of adults was collected on April 29 at the beginning of the collection period, followed by a continuous decrease in the number of specimens from one collection date to another, because at the end of the period, on the 7th July to register the minimum of adults collected from the experimental fields.



a b

Fig. 4. The dynamics of *Oulema melanopa* population in oat crop, Șag (Timiș county), 2017: a – adults; b - larvae

From figure 1 – a, it can be seen that the dynamics of *Oulema melanopa* adult populations showed a sharp decrease in the number of specimens on 24 June, due to less favorable climatic conditions when the temperatures decreased relatively slowly, on average by 3°. From figure 1 - b, it can be noticed that since the third decade of May and May 28, when climatic conditions were most favorable to species development, the larvae number began to increase until the third decade of the month June, when the maximum threshold of 21 larvae / plant was reached. After this date the number of larvae begins to decrease.

The climatic conditions of the last time, in constant change, with temperatures that show significant increases from one year to the next, with more and more pronounced droughts, favored the development of the *Oulema melanopa* species, and we can even say that they have favored the population growth of the species *Oulema melanopa* in the researched area.

This affirmation is corroborated with the literature, which shows that in North America and Europe there has been an increase in the abundance of *Oulema melanopa* in both adults and larvae (SCHÄRER, 1994; PIKE ET AL., 2002; ULRICH ET AL., 2004)

Regarding the damage caused by *Oulema melanopa* in oat crops, it was found that the economic threshold of damage has been exceeded

Table 2.

The percent of leaves damaged by *Oulema melanopa* larvae

Variants	Damage class				Sum
	I (< 10%)	II (10 – 30%)	III (30 – 60%)	IV (> 60%)	
V_1	25	9	12	5	51
V_2	15	16	10	11	52
V_3	17	13	5	8	43
V_4	13	10	9	7	39
V_5	11	7	7	9	34
Mean	16,2	11	8,6	8	

The percentage of *Oulema melanopa* larvae damage ranges from 34 to 52% of the total plants analyzed (table 2). An average of 16.2 plants fell in first class of damage (less than 10% attack), 11% in class II (10-30% damage), 8.6% in attack class III (30-60% damage) and 8% in attack class IV (with over 60% damage).

Of the total variants analyzed, it can be noticed that the attack rate is higher for all 4 attack classes, for variant 2, and the lowest attack for variant 5.

We can conclude that in the case of such an attack, which exceeds 50% of the attacked leaf surface area, yield losses are considerable, which requires the application of chemical treatments

CONCLUSIONS

In the context of current climate change, in the western part of Romania, *Oulema melanopa* continues to be a serious problem for cereal crops.

Monthly average air temperatures in the geographical agents' category are a prevalent abiotic factor upon the development and evolution of *Oulema melanopa* population.

In the case of an attack that exceeds an average of 50% leaves damaged, the production losses are considerable, reaching 5 -6% of the total estimated production.

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