



RESEARCH PAPER

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The effects of the thermal and pluviometric regime over the adults reserve from the soil of the colorado beetle (*Leptinotarsa decemlineata* Say) in the climatic conditions from Suceava area

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Abstract

In our experiment we observe the autumn and spring surveys. After these surveys we can determine the way in which has evolved the pest during winter and we can quantify the biological reserve from the soil. There were made some surveys on the lots cultivated with corn, barley, autumn wheat and spring mash and potato cultures. The results of the surveys show that in the analyzed winters only 29% were registered significant losses of the hibernate adults. The homogeneity of the values could suggest that during the less cold winters, the biological reserve could be diminished with approximately half from the number of the hibernated adults from the potato cultivated field.

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Introduction

The climatic changes due to the increase of the temperatures could have a major impact on the populations of insects (Bale *et al.*, 2002). The growth of the beetle population from Colorado in many countries from Europe is owed to this fact (Rafoss, 2003; Hansen, 2007).

This presents a high affinity for higher temperatures for feeding, egg laying, the shortage of the incubation period, the decrease of the larva development period. The low temperatures represent the main impediment for the circulation and survival of this species (Haverkort, 2008).

An analysis of the climatic fluctuations registered at Suceava, suggests that the winters are milder in a certain measure, the rainfall quantity from the cold season has grown and the temperatures from the hot season has increased considerably what makes that the insect's development and implicitly its biology to receive other valences towards the emergence years in Suceava area (Gontariu, 2005).

Before the retreat, the insects evacuate completely the digestive tube by suffering a general dehydration which has as affect the falling of the frosting point of the body fluids. This process continues during the winter months. The diapause stage depends also on the type of food, the insects which feed in the fall with tubercles have entered into hibernation after 13 days, and those fed with potato leaves or other Solonaceae plants after 16 or 23 days.

To the former ones there has been registered a mortality which got to 55% even before entering in the hibernation (Manolache, 1953).

The aim of this study was to observe in the lots cultivated with corn, barley, autumn wheat and spring mash, if the hibernated adults coming from the potato cultivated areas, even if they didn't have the chance of a supplementary nutrition (at least in

the superficial layer of soil), during the fall the frequency of the cases.

Materials and methods

In order to evaluate the biological reserve there have been made 15 surveys for the 0-40 m depth, at the end of October and in the following year after the defrosting of the whole soil profile. For the autumn surveys there was counted the number of the adults which were ready for the hibernation, following that in spring to evaluate the losses suffered by the hibernated adults, owed to the meteorological conditions. The spring surveys were made after the defrosting before the soil's warming in the areas where there were made the autumn observations. After these surveys we can determine the way in which has evolved the pest during winter and we can quantify the biological reserve from the soil. There were made some surveys on the lots cultivated with corn, barley, autumn wheat and spring mash and potato cultures.

The meteorological data used are those registered at the Meteorological Station Suceava during 2005-2009 (Table 1). The data written in table 1 underline that the most cold hibernation season was registered in 2006, when was registered the most significant frequency of the decades (d) with the average of the minimum values lower than minus 5°C and 10°C in the air and to the soil as well (Fig. 1).

Results

To these it is added also the fact that the succession of the decades with the average of the minimum values lower than minus 5°C in the air and to the soil as well, was of respectively 5 and 8 decades. In comparison with 2005-2006, the cold season from 2006-2007 (fig.2) can be considered the least chilly, having a single decade with the average of the minimum values smaller than minus 5°C. The seasons 2007-2008 and 2008-2009 are registered between the two examples, respectively 2005-2006 and 2006-2007.

Table 1. Particularities of the hibernal season from 2005-2009.

Specification	outdoor				ground			
	2005-2006	2006-2007	2007-2008	2008-2009	2005-2006	2006-2007	2007-2008	2008-2009
number of decades with the average of the minimum < -5°C	8	1	6	5	10	3	6	6
From which the consecutive	5	0	4	3	8	0	4	3 + 3
number of decades with the average of the minimum < -10°C	2	0	2	1	5	1	2	3
average temperatures < -5°C	3	0	2	1	-	-	-	-
number of days with absolute temperatures < -20°C	1	1	1	0	5	1	2	1

Table 2. Some meteorological features of the thermal and pluviometer regime from the cold season.

Year	month	decade	Air temperature (°C)			Soil temperature (°C)		Rainfall (mm)	Average Snow cover (cm)
			average	min. average	abs. min.	min. average	abs. Min.		
2008	I	1	-7,6	-10,9	-23,0	-12,7	-27,2	3	17
		2	-2,9	-5,5	-14,1	-7,0	-16,8	0	10
		3	1,6	-1,4	-4,9	-3,3	-9,4	2	-
	II	1	1,0	-0,9	-4,0	-2,0	-8,0	19	0
		2	-3,3	-6,1	-11,6	-7,5	-14,8	4	3
	III	3	5,6	1,7	-1,8	-1,3	-3,0	0	-
		1	4,0	1,7	-2,0	0,1	-3,0	7	-
		2	5,3	0,9	-3,9	0,2	-5,3	2	-
	IV	3	4,8	-1,1	-4,4	-2,0	-5,3	7	0
		1	7,9	5,0	1,1	4,3	1,0	37	-
		2	11,2	5,7	2,5	4,8	1,5	27	-
	XI	3	9,6	5,8	1,4	5,4	0,2	72	-
1		8,1	5,1	-2,2	4,4	-3,5	1	-	
2		-2,4	-0,5	-3,6	-2,5	-5,8	0	-	
XII	3	0,9	-2,4	-5,5	-2,6	-5,8	0	3	
	1	3,7	1,2	-4,6	-0,4	-7,9	10	-	
	2	1,4	-0,1	-3,2	-0,4	-3,9	2	-	
2009	I	3	-3,1	-5,5	-13,0	-6,9	-18,6	17	12
		1	-6,7	-10,7	-15,7	-15,1	-22,0	1	11
		2	-3,2	-6,6	-13,2	-10,5	-19,0	4	7
	II	3	2,0	0,8	-2,5	0,1	-2,6	40	0
		1	2,6	-0,3	-4,6	-1,4	-8,0	2	0
		2	-2,3	-4,4	-	-6,5	-10,0	17	0
	III	3	-3,9	-6,9	-	-12,1	-19,6	0	0
		1	0,7	-2,1	-8,6	-5,5	-17,0	12	2
		2	1,8	-0,6	-3,1	-1,5	-4,4	14	2
	IV	3	4,3	-0,1	-5,5	-1,0	-7,0	4	0
		1	11,3	4,9	-1,2	2,1	-3,0	0	0
		2	10,2	4,0	1,3	1,9	-1,5	8	0
		3	11,0	3,7	-0,4	1,2	-1,3	0	0

Discussion

The passing into the hibernation stage is preceded by a period of active nutrition, during which in the body of the insects is accumulating considerable reserves of carbon hydrates and fats which serve as energy source during the diapauses, and also in the

period of spring recovery. Regarding the probable effects of the thermal regime over the adults' hibernation, the data from table 2 prove that during all winters the soil has been obviously protected by low temperatures, by the presence of an 8-12 m

thick snow coat in the temporal sequences with the lowest temperatures.

The results of the surveys show that in the analyzed winters, only 29% of the cases were registered significant losses of the hibernated adults and that these were only registered on the potato cultivated lot. Numerically, the significant losses represent 0.53-0.54 hibernated adults to m². The homogeneity of the values could suggest that during the less cold winters, the biological reserve could be diminished with approximately half from the number of the hibernated adults from the potato cultivated field.

In the lots cultivated with corn, barley, autumn wheat and spring mash, the hibernated adults coming from the potato cultivated areas, even if they didn't have the chance of a supplementary nutrition (at least in the superficial layer of soil), during the fall the frequency of the cases where it did not register losses represents 39%. To these are added 23% from the cases with reductions of the biological reserve ranged between 35 and 40%. Even if in numeric values the volume of the losses isn't significant, taking into account that in 39% from the cases it hasn't registered any decrease of the biological reserve, this tendency could be owed to a more underlined vitality of the adults (3).

Fig. 1. The features of the thermal regime in the winter 2005-2006.

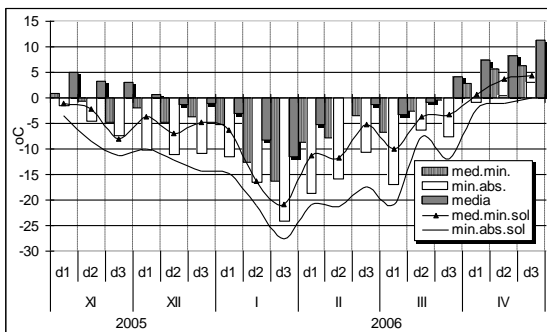
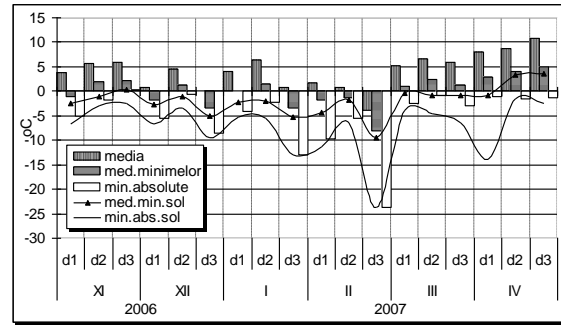


Fig. 2. The features of the thermal regime in the winter 2006-2007.



Conclusions

The results of the survey show that in the analyzed winters, only 29% from the cases were registered significant losses of the hibernate adults and these were registered only in the potato, cultivated plot. Numerically the significant losses represent 0.53-0.54 hibernate adults to m².

On the lots cultivated with corn, barley, autumn wheat and spring mash, the frequency of the cases where didn't register losses represents 39%. To this it is added 23% from the cases with decreases of the biological reserve ranged between 35 and 40%. Even if in numerical values the volume of the losses isn't significant, taking into account that in 39% of the cases it hasn't been registered any decrease of the biological reserve, this tendency could be owed to a more accentuated vitality of the adults.

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