THE INFLUENCE OF THE CLIMATIC CONDITIONS WHICH CONTRIBUTE TO THE EMERGENCE OF THE HIBERNATE ADULTS OF THE COLORADO BEETLE (*LEPTINOTARSA DECEMLINEATA SAY)* AT SUCEAVA

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Abstract

The reduced quantity of rainfall in the period preceding the emergence of the hibernate adults correlated with the mild and gradual warming of the soil and with the growth of the shinning period of the sun it makes that their emergence to be made with a few days earlier until two weeks.
From a total of 25 emergences in the year 1976-1995 and 2005-2009, 68% from these were produced in April and only 32% in May. During 1976-1991 the tendency of emergence of the hibernate adults was towards the end of April and the first decade of May, following that in the last 10-15 years due to the general global worming, the apparition of the hibernate adults to be produced earlier, respectively the decade second and third of April.

Key words: hibernate adults, low temperatures, emergence date

The Colorado beetle hibernates as adult in the soil, for depths ranged between 10-90 cm according to the nature of the soil. During winter, a great part of the regions from Europe, the emergence begins at the end of April and beginning of May (C.I., Manolache, 1953). In our country the adults' apparition begins from the third decade of March and it is continued until the end of May. The first adults start to show up when the daily average temperatures are beyond 10ºC, for a period of 10-12 days (Gh., Boguleanu, 1980). Because of the soil gradual warming into depth, the individuals appear gradually, for 2-3 weeks. The positive temperatures influence the same the biological cycle of the Colorado beetle. The temperatures lower than 15ºC and the high humidity determine the adults of the Colorado beetle to become cannibals, they destroy their eggs in a percentage that varies from 10 to 100%.The temperatures higher than 38°C are fatal for the larvas which could explain that in certain tropical regions the Colorado beetle doesn't exist.

Regarding the rainfall, the best area for development and breeding is featured by annual rainfall ranged between 600-1500 mm, divided in 25-35% days/year. In the regions where the rainfall quantity falls under 200 mm/year, the insect is rarely found (C.I., Manolache).

The climatic conditions exert a significant influence over the spreading, the population dynamics, of the life cycle, of the infesting pressure and emergence in the Colorado beetle culture.

MATERIAL AND METHOD

In order to determine the influence of the climatic conditions which contribute to the emergence of the hibernate adults of the Colorado beetle, we have analyzed a few climatic elements which preced its emergence. There have been analyzed the soil, air temperatures and the daily quantities of rainfall for 20 days from the emergence day and there have been established certain correlations between the registered values and the emergence of the insect. The years taken into study were 2006, 2007, 2007, 2008 and 2009. The meteorological data used are those registered at the Meteorological Station Suceava during 2006-2009.

RESULTS AND DISCUSSIONS

The requests of the insect for a better development are almost similar to the agro-biological requests of the potato culture, but in proportion to the plant, the insect is submitted more to the climatic fluctuations during the year.

Regarding the temperature, the necessities of the insect, even if it is a species which is adapting very well, they must be fulfilled. The cold during the frosty winters, especially in the regions where it doesn't exist a snow layer, it destroys a great part from the insects retired in the soil for the

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hibernation. Exactly the same the cold and late autumns decimate the insects surprised before retiring in the soil at the normal depth of hibernation.

An analysis of the climatic fluctuations registered at Suceava, suggest that the winters have gone milder at a certain measure, the quantity of rainfall from the cold season has increased and the temperatures from the warm season has increased considerably what makes that the development of the insect and implicitly its biology to het other valences in comparison to the emergence years from Suceava area.

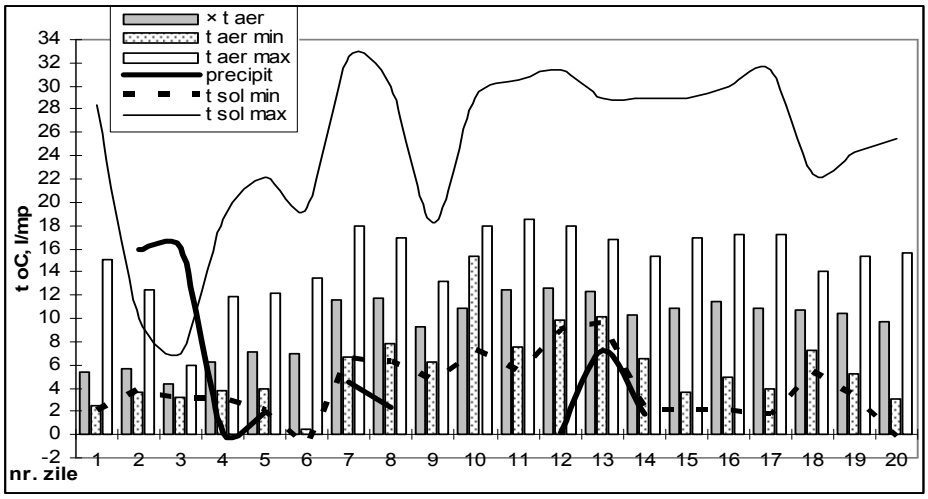

Figure 1 **The climatic conditions from the year 2006**

In 2006 the first hibernated adults of the Colorado beetles have appeared on the 1st of May. In the period preceding its emergence, the average of the air temperatures have not exceed 12.6°C, and the lowest value has been of 4.3°C. There have been registered moderate quantities of rainfall (64 l/m2) distributed in 11 days and it was found out 2 days when it took place the phenomenon of soil frosting. The minimum temperatures on the soil surface in this period have varied from 0.1° to 9.5°C. The maximum did not have very high values, the highest value being of 31.4°C. The minimum temperatures from the air were between 0.4 and 15.3°C and the maximum ones were between 6.0° and 18.6°C (fig. 1).

In the following year, the date of emergence of the hibernated adults was the 29th of April. In the 20 days of analysis, the average of the air temperatures was polarized between 6.2 and 14.1°C in the pre-day of the insect's emergence. The air minimum values were between -1.4 and 7.2°C. Four days before the emergence, the air minimums didn't go below 5°C and the maximum values less than 18.6°C. The rainfall quantity from this period was reduced (21 l/m2) divided in 8 days. The soil minimum values were between -2.4 and 8.7°C, the negative temperature days have determined a frosting of the soil superficial layer in three situations. The maximum values on the soil surface did not have relative big values, being ranged between 15.5 and 43.6°. Five days before the emergence, the soil maximums didn't go below the value of 34°C, in the last two days being registered 43.6° and respectively 44.0° (fig. 2).

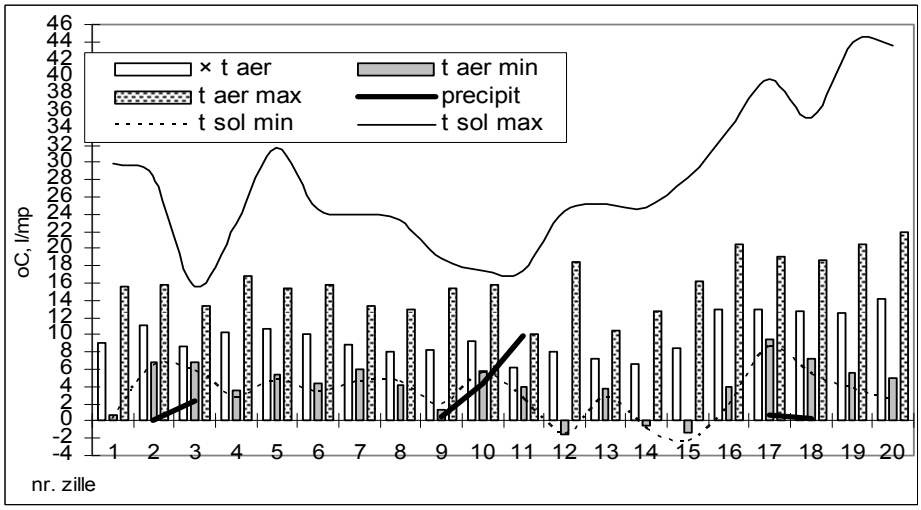

Figure 2 **The climatic conditions from 2007**

The emergence of the Colorado beetle in 2008 took place on the 21st of April. In the period preceding the emergence, the average of the air temperatures was between 4.4 and 15.1°C. The average temperatures were situated between 1.5 and 9.5°C for the minimum values and 7.2 -21.5°C for the maximum values. The rainfall quantity was much reduced the greatest part of the quantity being of 16.0 l /m2 which decreased with a week before the insect's appearance. The minimum soil temperatures did not register negative values, and the maximum values were between 7.4 and 33.4°C (fig. 3).

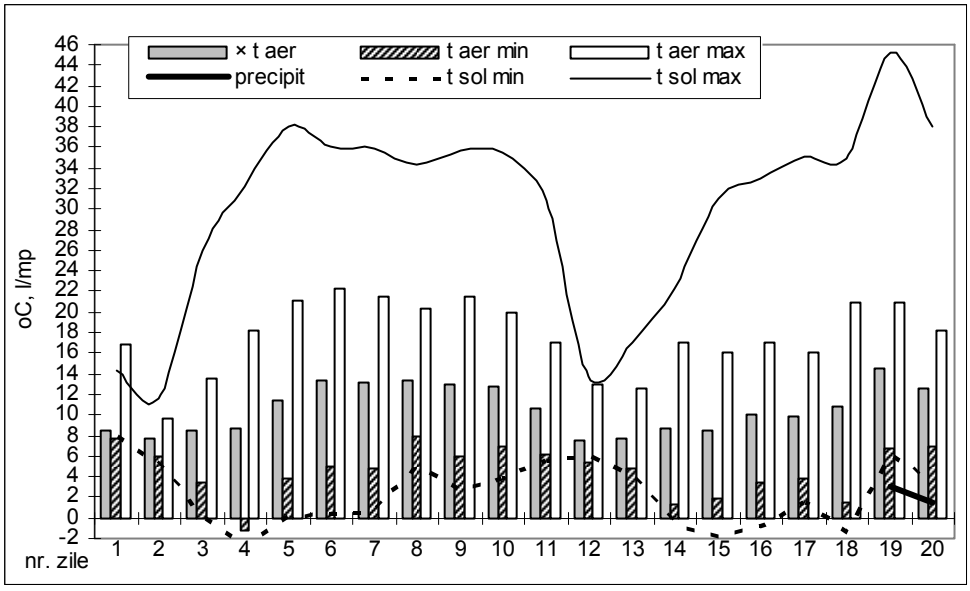

Figure 3 **The climatic conditions from 2008**

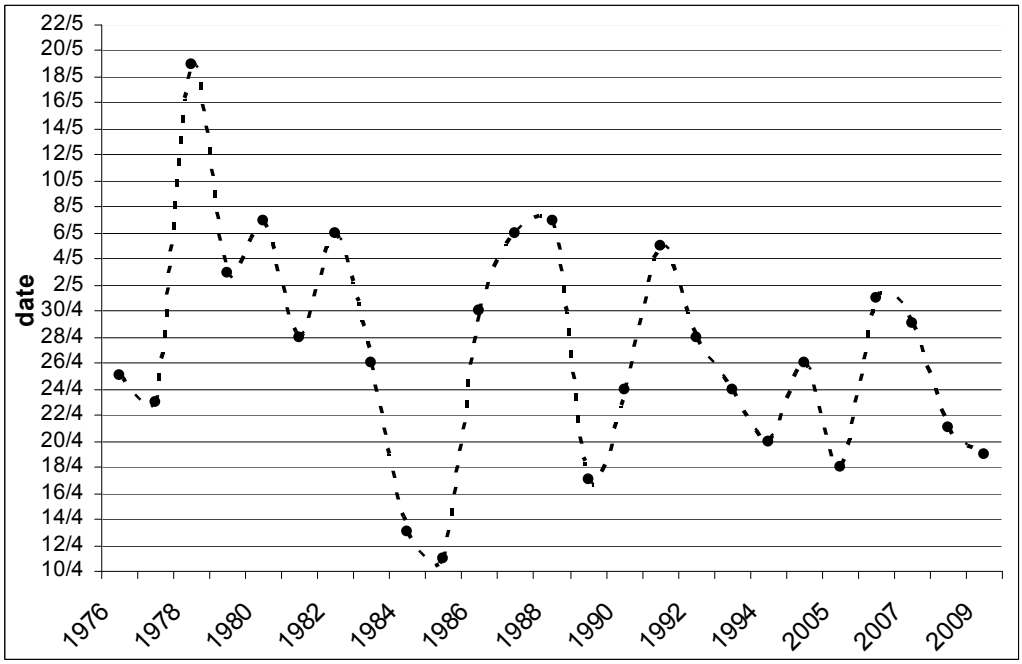

Figure 4 **The emergence of the hibernate adults at Suceava (25 years)**

The year 2009 was the most equilibrated year, where all the analyzed climatic elements were in perfect synchronization, which determined an earlier apparition of the Colorado beetle in comparison with the former year with 3 days. Even if there have been negative soil and air minimum values, the thermal compensation was made through the maximum temperatures and through the duration of sun's brightness, which in that period had higher values towards the former years. The same, the almost inexistent quantity of rainfall it made that in 2009, *Leptinotarsa Decemlineata Say* to appear earlier (19.04) from the last four years.

In the last 25-30 years, 80% from the emergences of hibernated adults in Suceava city are registered in the interval 14.04 and 07.05 with the mention that the extremes are polarized in a bigger interval, respectively 11.04 in 1985 and 19.05 in 1978. From a total of 25 emergences

between 1976-1995 and 2005-2009, 68% from these were produced in April and only 32% in May. In the interval 1976-1991 the tendency of emergence of the hibernate adults was towards the end of April month and the first decade of May, following that in the last 10-15 years because of the general global warming, the apparition of the hibernate adults to be produced earlier, respectively the second and third decade of April (fig. 4).

CONCLUSIONS

Because of the global warming the emergence of the hibernate adults is produced more quickly than in the beginning period of the insect at Suceava.

The reduced quantity of rainfall in the period preceding the emergence of hibernate adults correlated to the mild and gradual warming of the soil and with the growth of the brightness period of the sun it makes that their emergence to be made earlier with a few days of until two weeks.

It has been also found out that if the maximum soil temperatures are maintained in a high value for several days, even if the minimum values have fluctuations, and based on the gradual growth of the average air temperatures, the Colorado beetle can make its presence earlier as it has happened in the spring of 2009.

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