BIOLOGIA GARGARITEI FLORILOR DE MAR IN CONDITIILE METEOROLOGICE ALE ANULUI 2015 LA S.C.D.P. BISTRITA

BIOLOGY OF THE APPLE BLOSSOM WEEVIL (*ANTHONOMUS POMORUM*, L.) ACCORDING TO THE METEOROLOGICAL CONDITIONS OF YEAR 2015 AT R.S.F.G. BISTRIŢA

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Abstract

The apple blossom weevil (*Anthonomus pomorum* L.) is dispersed in almost every European country in the pome fruit growing regions; in Romania it can be observed between the *Quercus* forest steppe region and the steppe region, the economic impact being very important due to the damage produced by the pest which can achieve very high rates of losses. Forecasting the main biological development stages of the pest is a key element in the control of this pest. The main research objectives of the experiment were: the study of the biology of colonization dynamics of the pest according to the biological development stages; the comparing of the efficiency of two monitoring techniques: classical limb jarring method and newly designed bubble wrap method; the study of the main meteorological factors which had an impact of the apple blossom weevil biology. Capture results by the two monitoring techniques show close values, the seasonal culmination of the apple blossom weevil colonization occurred at the end of March (27.03.2015) with more than 50 adults/tree. Observations were effectuated according to the phenological stages of apple bud development (BBCH method); feeding of both female and male adults occurred between silvery green tip (BBCH 52) and pink bud stage (BBCH 57), thus crawling, feeding, mating, oviposition occurred on the days with temperatures above 6 ˚C. For every holometabolic development stage it was calculated the sum of temperatures at the beginning and at the end of the biological phase. For the newly designed bubble wrap method there where used two kind of bubble wrap types, results showed that the bubble wrap with larger spaces within the bubble wrap is more suitable for the weevil capture than smaller ones. With the use of the transparent bubble wrap method it was possible not only the reutilization of the wrap by tightening back on the trunk of trees but also the easy numbering of weevils without the risk of damaging the buds and the branches. The gathered data indicated that the main environmental factors expressed by the mean, minimum, maximum temperatures, relative humidity and rainfall influenced directly the completing of the biological developmental stages of the apple blossom weevil (*Anthonomus pomorum* L.).

Cuvinte cheie: gărgăriţa florilor de măr, condiţii climatice, stadii de dezvoltare
Keywords: apple blossom weevil, climatic conditions, development stages

1. Introduction

The apple blossom weevil (*Anthonomus pomorum L.*) is a widespread horticultural pest; it attacks a few number of plants especially members from the *Rosaceae* family, apples, pears and hawthorn. The insect was studied by many researchers abroad but also in Romania, e.g. Săvescu (1960), Ghizdavu (1997), Lazăr et al. (1980), Şuta (1980) and others. The adult insect attacks early in the spring the floral buds, piercing them and tacking small bites from the internal part of the bud or from the leaves of trees. The pest has one generation per year, early in the spring the immature adults come out from the hiding places from the barks, leaves, stones, in the mid of February and begin to crawl in March-April when mean temperatures are above 6 °C.

The immature weevils emerges when climatic conditions are favorable for its biology, the time of appearing is different from year to year due to meteorological conditions. After feeding, it reaches the sexual maturity and mates. A few days later the female weevil deposit eggs singly in floral buds, each inside a flower bud between B2 and C2 phenologycal stage (BBCH 52-57). The emerging larva feeds on the reproductive parts (ovaries and stamens) and all the inner part of buds including petals, remaining just the exterior sepals. The name of the blossom being attacked popularly is named “clove like blossom” or capped blossom. The adult has 4.5-5.0 mm length; his body is black-brown coated with fine pubescence. It has a grey V shaped band on the elytra. The rostrum is long, sometimes 30% of the body length. With the rostrum it sticks the floral bud. The larva has a black head, without legs, firstly the body has a white-dirty color and when reaches maturity it is yellow, measuring 5-8 mm in length, at the posterior part

having two brown spots. The changing nymph is yellowish, having a length of 3-4 mm. If bud bursting is slow (cold spring) the apple weevil can lay down a high number of eggs. The egg has a white-milky color, is elliptic and glitters. For the eggs, the female makes a tiny opening in the floral bud and lays down the eggs by putting them inside the bud with the aim of the rostrum. A 10-20 % attack grade of apple blossom weevil (*Anthonomus pomorum* L.) in an orchard with few flower buds could damage the yield of that year (Şuta et al. 1980).

The purpose of this paper is to investigate the biology of apple blossom weevil (*Anthonomus pomorum*, L.) depending on the meteorological conditions of year 2015 at R.S.F.G BISTRIŢA, in the northern part of Romania, in order to use the results in fruit growing.

2. Material and methods

In order to investigate the migration and the amount of weevils in relation to climatic factors we designed a trial with two methods of capturing: transparent bubble wrap bands (Fig. 1) and the classical “limb jarring “ method (Fig. 2).

3. Results

The most important development stage from the horticultural point of view is the *larva development* in which the larva feeds on stamens, pistils, ovaries and consumes the whole inner part of the flowers (Fig.9-10). This development stage this year was between 14.05.2015-05.05.2015 (Table 1).

The *pupa development* (the nymph stage) period was between 06.05.2015-21.05.2015 when "summer weevils" began to appear (Fig.11).

We can observe that the bubble wrap method adopted gave quite similar results as the limb jarring method (Fig.12), being effective to observe the weevils in colder days after emerging, because the weevils seek hiding places when temperatures drop below their biological optimum. The limb jarring method gave good results also, being easy to apply and it is more accurate in observing the total amount of weevils per tree. The maximum of captured weevils as the seasonal maximum peak occurred in 27.03.2015, when 40 weevils were captured by the bubble wrap method. By the classical limb jarring method more than 50 weevils were captured.

Table 1 presents the development stages of the apple blossom weevil in 2015 at RSFG Bistrita, showing that the larva development stage occurred between 14.04-05.05, accumulating a sum of active temperatures of 210.95 degrees, the pink bud stage occurred between 23-27 April (in the middle of the larva development period).

Table 2 presents the correlation statistics regarding average temperatures and capturing method, results indicate a good correlation between average temperatures and both capturing methods (0,77 and 0,72) respectively a very close correlation between the two capturing methods (0,97).

The numeric density of the insects in the orchard plot (in Romanian PED) is a key element in forecasting and pest management, so it needs to be correlated with the floral bud amount. Some researchers says that at normal floral bud amount the critical apple weevil amount which could affect the floral buds and the yield of the orchard could be affected to is 0.5-1.0 weevil / m^3 of trees canopy, (Şuta et al., 1980).

Other researchers (Lazăr et al. 1980) conclude that there is a little numerical density when 20% of flowers are attacked and there are less than 10 weevils / tree, medium density is when 20-30 % of floral buds are attacked and there are 10-20 weevils/tree and at more than 30 % of flowers attacked with more than 20 weevils/tree represents a high numeric density. More important is the starting day of the spraying, thus phenologicaly the optimum spraying period is at the beginning of bud brake, when 10-15 % of the buds braked and are opened at silvery green tip. This time corresponds to the feeding phase of the immature adults. The early observation of crawling, the counting of the weevils and the biological development stage observations are the key elements in the forecasting and pest management methods improvement.

4. Conclusions

The conclusion of the research is that the “transparent bubble wrap method” can be used also as a monitoring technique with good results showing the dynamics of apple blossom weevil movement, in completion with the “limb jarring”, as this method could give answers regarding the crawling of weevils which seek hiding places in colder days.

The accurate monitoring of the colonization by “the bubble wrap method” gives good results, the use of this technique being possible to be set up by a single researcher. “The limb jarring method” is however a more complex method, as it requires two persons of laying down the white textile material and parts of the buds could be affected by the jarring, it is still a good observation method.

In conclusion, the two methods could complete each other, by using both of them showing the real image on the biology of weevils, thus the dynamics of the pest.

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Tables and figures

Fig. 1. Transparent bubble wrap method - in the classical low density orchard

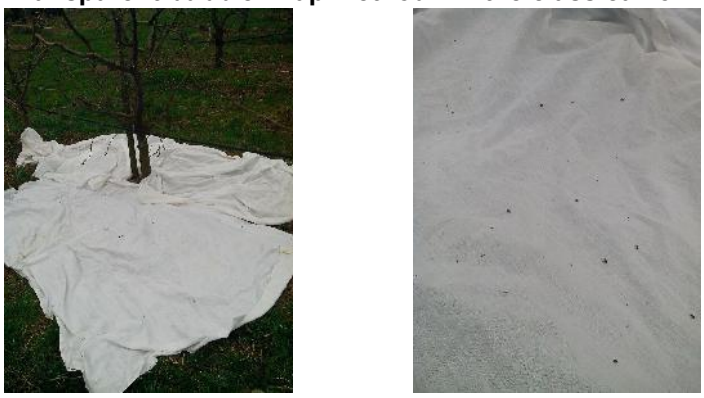


Fig.2a. Limb jarring method in the high density orchard; white textile material for capturing the apple blossom weevils, 2b Apple blossom weevils captured on the white textile material

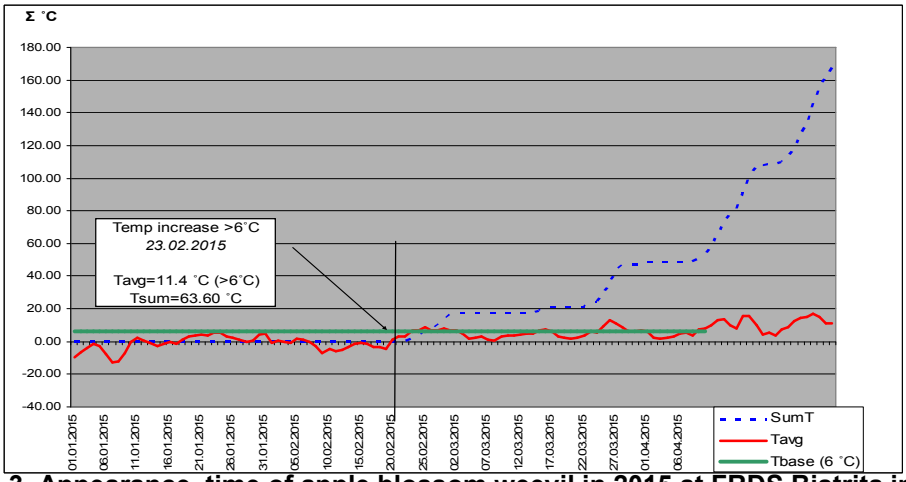


Fig. 3. Appearance time of apple blossom weevil in 2015 at FRDS Bistriţa in the orchard, mean temperatures above 6 ˚C and sum of active temperatures

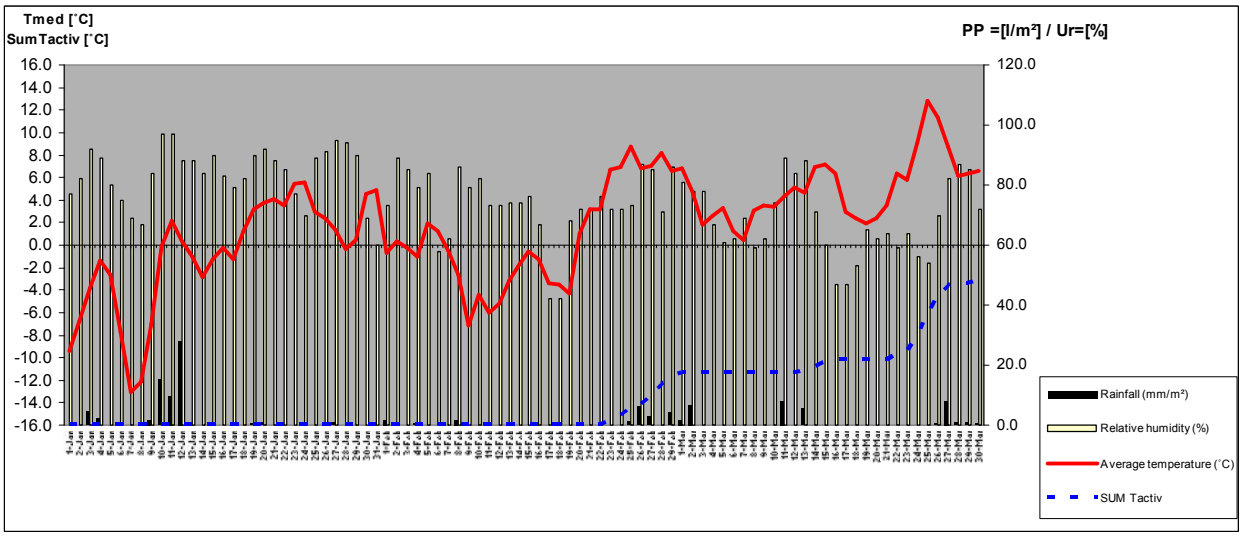


Fig. 4. Meteorological conditions in early spring period (01.01.2015-30.03.2015) at the time of appearance of apple blossom weevil at FRDS Bistriţa in 2015 (temperatures > 6.0 ˚C).

5a

5b

Fig. 5a. Apple blossom weevil (*Anthonomus pomorum* L.) on the white textile capturing material 5b. Small feeding bites from fresh new leaves (silvery green tip) before weevils mating and egg laying

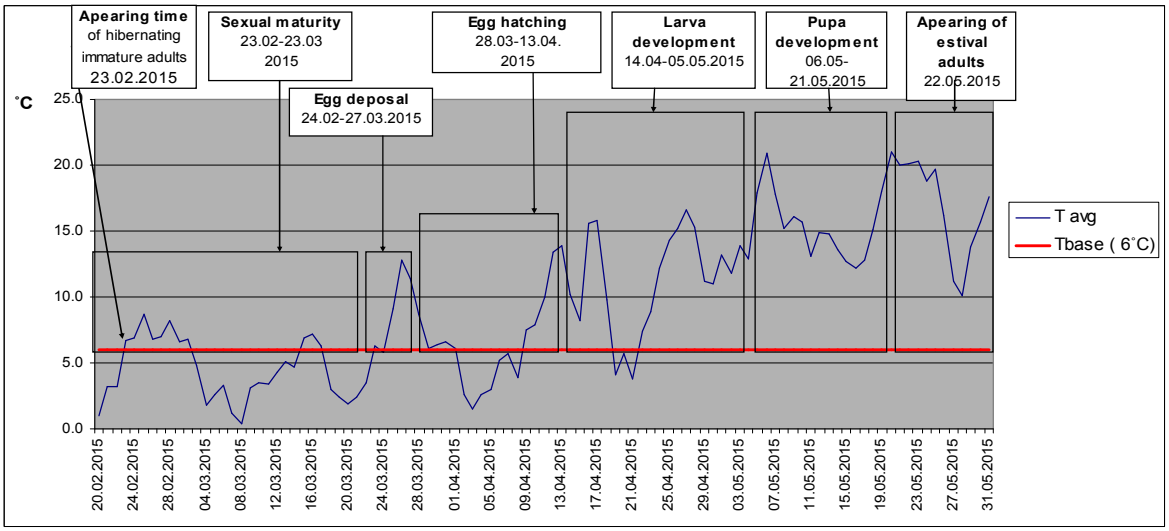


Fig. 6. Biology of apple blossom weevil in relation with climatic factors, threshold line of 6 ˚C being the optimum biological level for crawling and migrating to the canopy of trees.

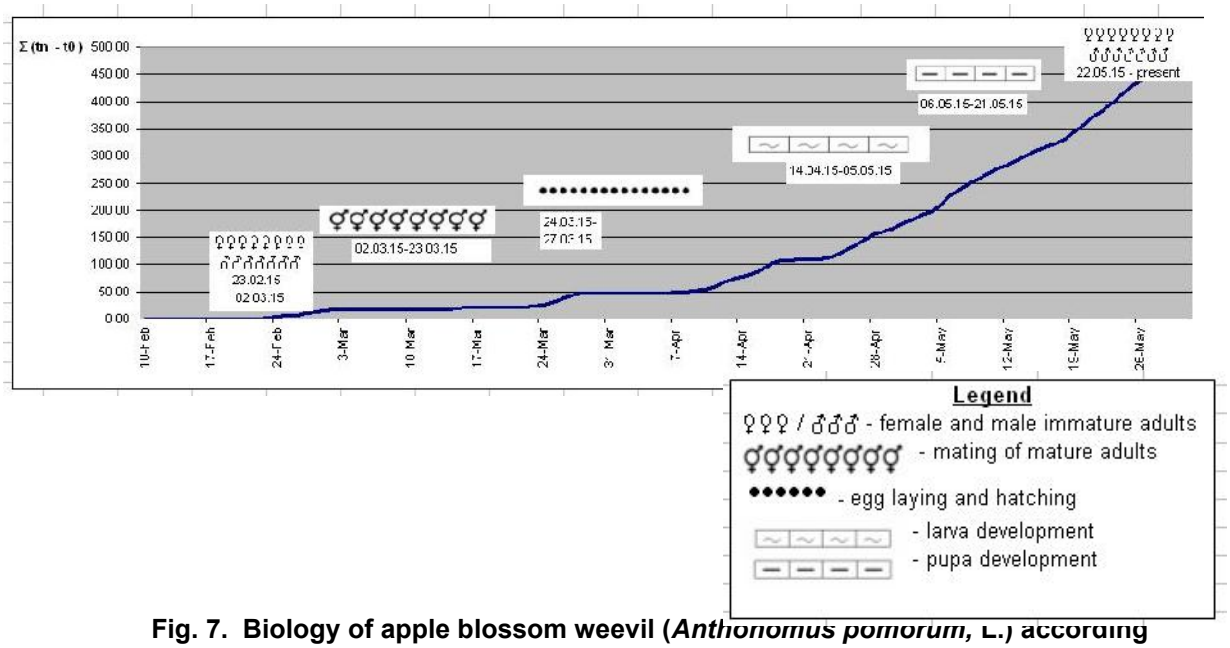
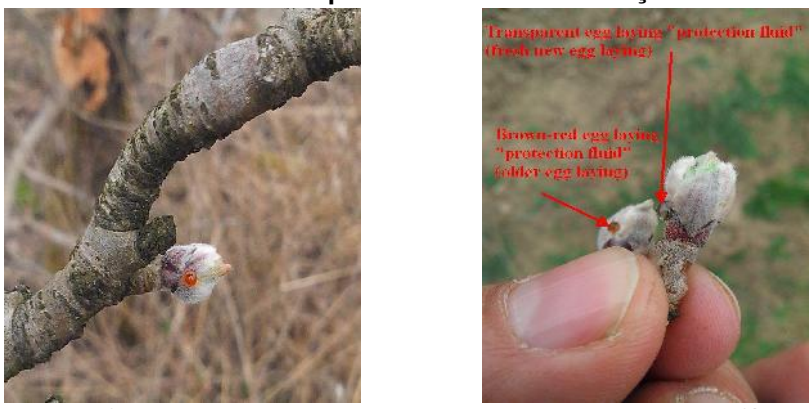


Fig. 7. Biology of apple blossom weevil (*Anthonomus pomorum*, L.) according the sum of temperatures at RSFG Bistriţa in 2015



8 a 8b

Fig 8. Egg laying pearcings (8b transparent, 8a brow-reddish) of the apple blossom weevil in 27.03.2015 at FRDS Bistriţa

Table 1. Development stages of the apple blossom weevil at FRDS Bistriţa in 2015

Development stage	Data of first appearing	Data of last appearing	Sum of active temperatures in the beginning Σ(t-6) ˚ C	Sum of active temperatures at the final Σ(t-6) ˚ C
Appearing time of hibernating adults	23.02.2015	02.03.2015	1.45	17.60
Sexual maturity and mating	02.03.2015	23.03.2015	17.60	23.50
Egg laying	24.03.2015	27.03.2015	24.75	43.05
Egg hatching	28.03.2015	13.04.2015	46.30	72.90
Larva development	14.04.2015	05.05.2015	77.90	210.95
Pupae (nymph) development	06.05.2015	21.05.2015	226.40	371.30
Appearance time and hiding of immature summer diapause adults	22.05.2015	Until May-June 2015	382.35	Until May-June 2015 (end May 476.15)

Fig. 9. Apple blossom "cove like blossom" with the larva inside

Fig.10. Stamens, pistils, ovaries consumed by the apple blossom weevil larva

Fig. 11. Nymph stage of the apple blossom weevil

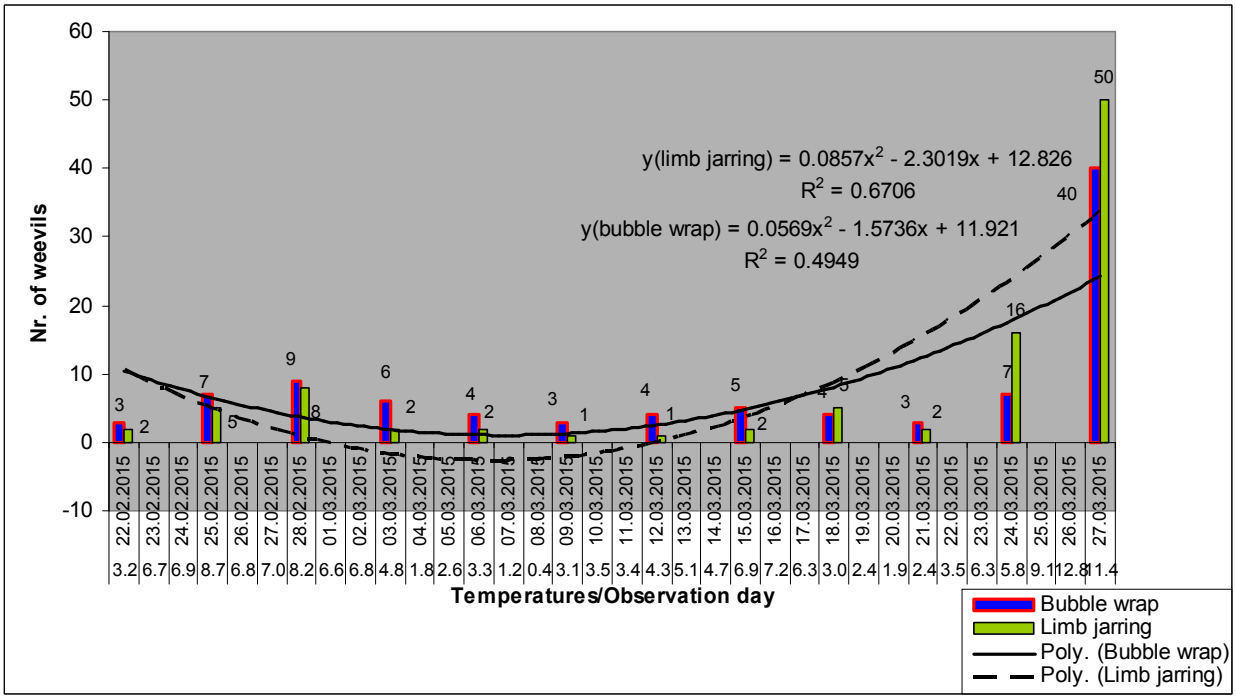


Fig.12 Dynamics of apple blossom weevil according the two capturing method at FRDS Bistrita in 2015

Table 2. Correlation table of average temperatures and capturing method

	Average temperatures (°C)	*Bubble wrap*	*Limb jarring*
Average temperatures (°C)	1		
Bubble wrap	0.774369136	1	
Limb jarring	0.72790044	0.97223623	1