THE RESPONSE OF DIFFERENT LOCAL POPULATIONS OF *CALENDULA OFFICINALIS L.* TO *THRIPS TABACI* ATTACK

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Abstract: *Marigold is one of the best known and versatile herbs in herbal medicine and is also a popular domestic remedy. The thrips can cause serious damages and they also represent the main vectors of viruses. That is why one of the objectives of this study is to analyze their response to Thrips tabaci attack. In purpose of identification attack frequency, attack intensity and attack degree it had been study 20 of local population of Calendula officinalis L. from diffrent localities of Caras-Severin district. In Romania relatively realised a few investigations concerning response of Calendula crops to Thrips tabaci attack. Being a success the ones mentioned, it was assessed to make some complex investigations for teoretical argumentation and methods advancement used in identification of common thrips attack degree, which constituted an actual matter for our country concerning the best moment of treatments applying in the crop flowers to obtain a high production and of superior quality, because that medical plant was one of those plants appreciated for its therapeutic qualities based on complex of active biologic substances. From among all local population, 20 (representing 100%) have been attacked. Even if 10 local population have provided statistical differences for the serious attack frequency and eight for intensity of the attack, only two of these have provided statistical differentiations for attack degree. The results demonstrate that thrips are pests that occur in the culture of Calendula officinalis with significant frequency, intensity and attack degree. The local population really influences the attack, some of them being registered with small attack signs, while others were obviously preferred by pests. The results obtained through the attack of frequency and intensity identification to local populations of Calendula officinalis L.it had permitted the attack degree of tobacco trips in the marigolds' crop from the western part of the country. The present paper belongs to a big work which had like study "Resistance testing of some species of Calendula officinalis L. to Thysanoptera pest attack through different methods/techniques of analysis concerning the improvement of raw material quality", that represented the theme of postdoctoral- dissertation.*

Key words: *local population, marigold, common thrips, frequency, intensity and attack degree*

INTRODUCTION

Calendula officinalis (marigold) is a plant in the genus *Calendula*, in the family *Asteraceae*. It is probably native to southern Europe though its long history of cultivation makes its precise origin unknown, and may possibly be of garden origin. It is also widely naturalised further north in Europe (north to southern England) and elsewhere in warm temperate regions of the world (UKIYA ET AL., 2006).

Calendula officinalis is widely cultivated as a herb and can be grown easily in sunny locations in most kinds of soils. Although perennial, it is commonly treated as an annual plant, particularly in colder regions where its winter survival is poor, or in hot summer locations where is also does not survive. (YOSHIKAWA ET AL., 2001).

Calendula are considered by many gardening experts as one of the most versatile flowers to grow in a garden, especially since they are easy to grow, and tolerate most soils.

Marigold florets are considered edible. They are often used to add color to salads, or

added to dishes as a garnish and in lieu of saffron. The leaves are edible but are often not palatable. They have a history of use as a potherb and in salads.

Flowers were used in ancient Greek, Roman, Middle Eastern and Indian cultures as a medicinal herb as well as a dye for fabrics, foods and cosmetics. Many of these uses persist today.

Plant pharmacological studies have suggested that *Calendula* extracts may have anti-viral, anti-genotoxic and anti-inflammatory properties (JIMENEZ-MEDINA ET AL., 2006).

Calendula is used as food plants by the *Thysanoptera* species. Thrips can colonizes crops from sea level up to 2000 meters above sea level. (ANDALORO and SHELTON, 1983).

Onion thrips (*Thrips tabaci* Lindeman) is a polyphagous insect, which has spread to all continents and is recognized as an economically harmful pest of cultivated plants (LIU and SPARKS, 2003). It has been recorded on plants from 29 families (RASPUDIC and IVEZIC, 1999) and is regarded in Europe, Africa and in other continents as a pest of vegetables and ornamental plants (PENZES ET AL., 1996; SHELTON ET AL., 1998; THEUNISSEN and SCHELLING, 1998; RICHTER ET AL., 1999; MANIANIA ET AL., 2003).

The economic importance of the onion thrips can be significant because it is hard to detect and is usually found only at harvest. (STONER and SHELTON, 1988).

On the *Calendula* plants after attack leaves are silvered, scarred and distorted; plants stunted; flowers lightly to heavily discoloured, turning brown.

MATERIAL AND METHODS

Thrips are easily detected by visual inspection of the marigold plant. Commercial monitoring of thrips is done by inspecting individual plants in the field. On the selected plants, inspection should concentrated on the newest leaves and flowers. For each plant the number of thrips and the amount of tissue damage should be recorded.

The response of *Calendula* to *Thrips tabaci* attack was studied at Didactical Base fields of USAB Timi□oara, being analyzed 20 local population of *Calendula* belongs to Caras-Severin district (Tirol, Bocsa, Ocna de Fier, Calnic, Resita, Sacu, Prisaca, Jupa, Caransebes, Iaz, Glimboca, Otelu-Rosu, Zavoi, Valea Bistrei, Voislova, Vama Marga, Bautar, Berzovia, Slatina-Timis, Armenis). Evaluation of the attack was carried out under natural infestation conditions, without using insecticide treatments to combat pests and diseases. For each studied local population was determined the attack on the plants.

The attack produced by *Thrips tabaci* was examined decadal, in the dynamic, in June and July, in the year 2011. The attack has affected only primary shoots, upper third of them, to the base of inflorescences (antodias).

Pest attack was estimated using the following indicators: frequency of attack (F%), intensity of attack (I%) and attack degree (AD%):

- attack frequency (F%):

$$F\% = \frac{n \times 100}{N}$$

where: n – no. attacked plants/organs;
N – no. analyzed plants/organs;

- attack intensity (I%):

$$I\% = \frac{\Sigma (i \times f)}{n}$$

where: f – no. attacked plants/organs at the same rate of attack;
i – the percentage of attacked plants/organs;

n – no. total of plants/organs attacked;

- attack degree (AD%):

$$AD\% = \frac{F(\%) \times I(\%)}{100}$$

where: (F%) - attack frequency;

(I%) - attack intensity;

The dynamics studies, attack intensity and frequency to the attack of marigolds' plant pests were made during the periods, beginning of the blooming and until the whole maturation of seeds with the purpose of tolerance/resistance determination of local populations to the pest tisanoptera attack and number attenuation of controlling treatments.

RESULTS AND DISCUSSIONS

Between attacked local population were registered obvious differences of frequency, intensity and attack degree of *Thrips tabaci*.

The results demonstrate that thrips are pests which occur in the culture of *Calendula* with a significant frequency, intensity and attack degree. Local population really influences the attack, some local population being less attacked, while others were obviously preferred by pests (Table 1).

Table 1.

The local populations' sensibility of marigolds to the tobacco trips attack, 2011

No. crt.	District	Local population	Attack			Observations (notes)
			Attack frequency (%)	Attack intensity (%)	Attack degree (%)	
1.	Caraş-Severin	Tirol	32.2	29.1	9.37	4
2.		Bocşa	83.3	23.0	19.15	3
3.		Ocna de Fier	64.4	23.2	14.94	3
4.		Calnic	32.2	16.5	5.31	3
5.		Reşiţa	44.4	43.0	19.09	4
6.		Sacu	35.5	32.2	11.43	4
7.		Prisaca	36.6	33.8	12.37	4
8.		Jupa	35.5	16.5	5.85	3
9.		Caransebeş	87.7	72.7	63.75	5
10.		Iaz	28.8	31.4	9.04	4
11.		Glimboca	23.3	14.9	3.47	3
12.		Oţelu-Roşu	15.5	20.0	3.10	3
13.		Zăvoi	8.8	13.5	1.18	3
14.		Valea Bistrei	31.1	28.1	8.73	4
15.		Voislova	33.3	44.1	14.68	4
16.		Vama Marga	32.2	58.0	18.67	5
17.		Băuţar	47.7	33.2	15.83	4
18.		Berzovia	56.6	9.0	5.09	2
19.		Slatina-Timiş	58.8	30.4	17.87	4
20.		Armeniş	72.2	59.6	43.03	5

where:

- note 0- percentage of attack of zero
- note 1- percentage of attack between 1-3%
- note 2- percentage of attack between 3-10%
- note 3- percentage of attack between 10-25%
- note 4- percentage of attack between 25-50%
- note 5- percentage of attack between 50-75%

- note 6- percentage of attack between 75-100%, from the plant or the attacked and analyzed organ

The attack intensity to local populations Bocsa, Ocna de Fier, Jupa, Glimboca, Otelu-Rosu, Zavoi, was noted with the note 3, it varied between 10% and 25%. (fig.1).

As conclusion, the notes obtained by local populations as consequence of the attack intensity of Thrips tabaci were the following:

- note 2: Berzovia;
- note 3: Ocna de Fier, Jupa, Glimboca, Otelu- Rosu, Zavoi;
- note 4: Tirol, Resita, Sacu, Iaz, Valea Bistrei, Voislova, Bautar, Slatina- Timis;
- note 5: Caransebes;

It was necessary make treatments of controlling to tobacco trips.

The local population Caransebeş, Ocna de Fier, Bocşa, and Armeniş, presented the highest frequency values of the attack followed by Berzovia and Slatina-Timiş. The highest frequency (F%=87.7) was registered at Caransebeş local population, followed by Bocşa (F%= 83.3) (figure 1).

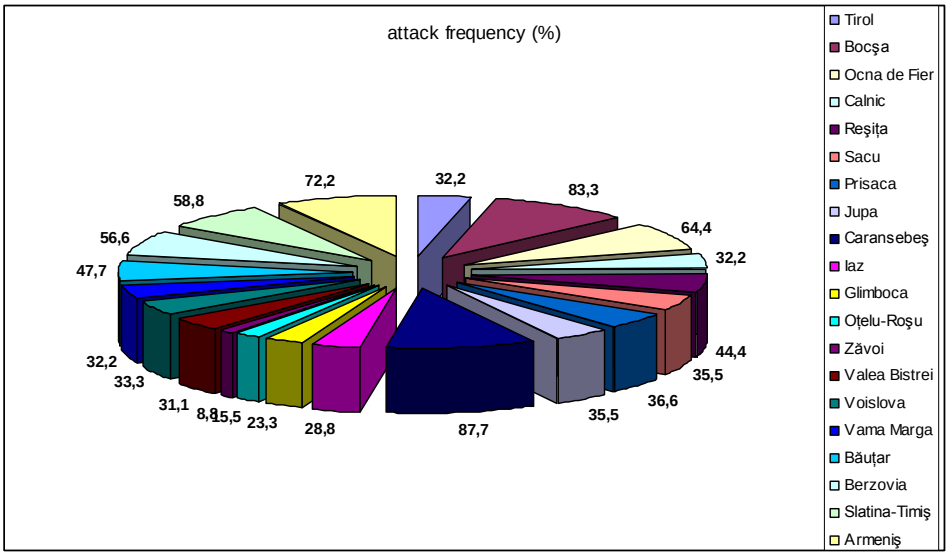

Figure 1- Value of attack frequency -*Calendula officinalis* L.- Caras-Severin district

From among 20 studied local population of *Calendula* only three local populations (Caransebes, Vama Marga, Armenis) had a percentage of attack between 50-75%, the others registering a smaller intensity of attack of 50% (figure 2).

The Caransebeş, Armeniş and Vama Marga were the most sensitive local population as intensity of attack, all of them presenting very significant differences compared to the mean of experiment, as control.

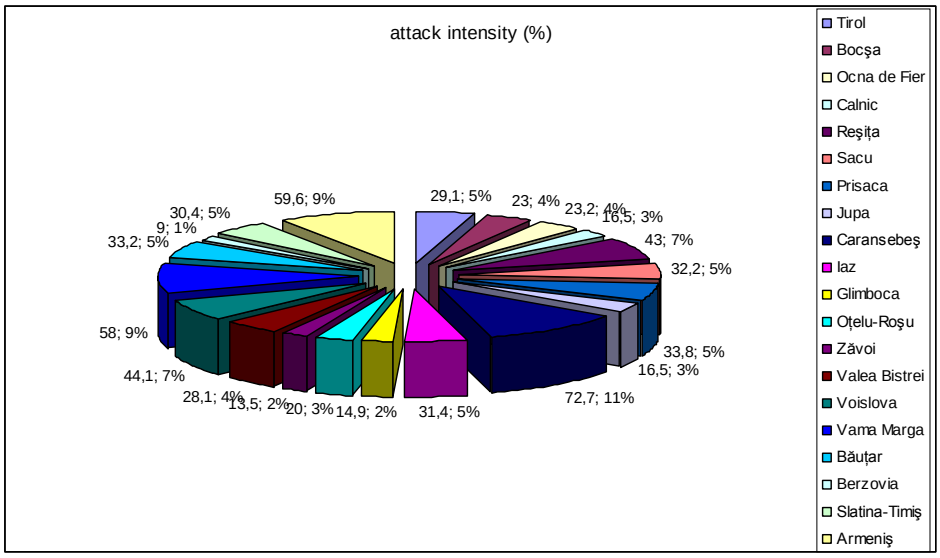

Figure 2- Value of attack intensity -*Calendula officinalis* L.- Caras-Severin district

The local population Clopotiva, Otelu- Rosu and Zavoi presented a reduced degree of attack, under 5,0% (figure 3).

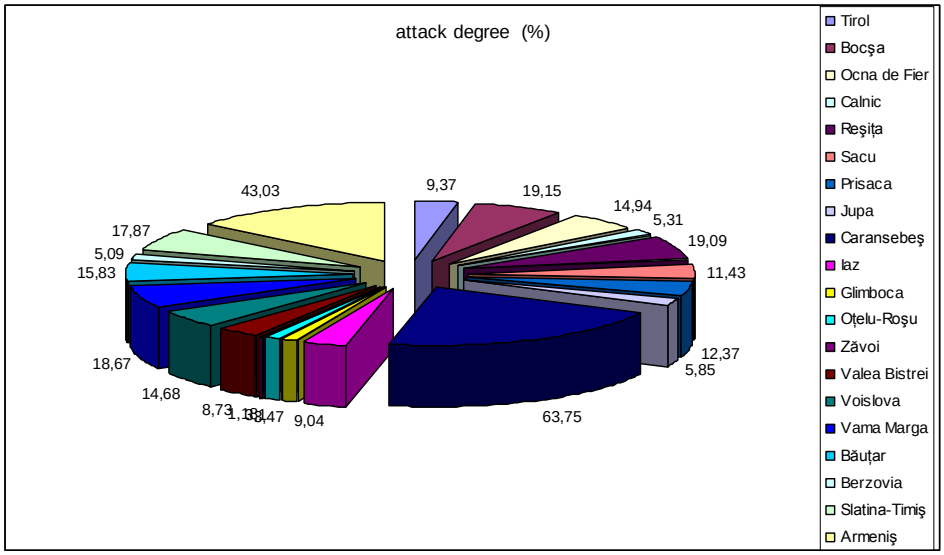

Fig. 3- Value of attack degree -*Calendula officinalis* L.- Caras-Severin district

The local population Caransebes and Armenis were very sensitive to the pest attack, the attack degree being bigger than 40%.

CONCLUSIONS

Even if 10 local population have provided statistical differences for the serious attack frequency and eight for intensity of the attack, only two of these have provided statistical differentiations for attack degree.

From among 20 studied local population of *Calendula* only three local populations had a percentage of attack between 50-75%, the others registering an intensity of attack smaller than 50%. The local population Caransebes presented the highest values concerning the frequency, the intensity and attack degree of tobacco trips. Thus, it concluded the fact that the local population was the most sensitive to that pest attack.

The results demonstrate that thrips are pests that occur in the culture of Calendula officinalis with significant frequency, intensity and attack degree. The local population really influences the attack, some of them being registered with small attack signs, while others were obviously preferred by pests.

ACKNOWLEDGEMENT

This work was published during the project "POSTDOCTORAL SCHOOL OF AGRICULTURE AND VETERINARY MEDICINE", POSDRU/89/1.5/S/62371, co-financed by the European Social Fund through the Sectorial Operational Programme for the Human Resources Development 2007-2013.

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