Scientific Papers. Series A. Agronomy, Vol. LVI, 2013
ISSN 2285-5785; ISSN CD-ROM 2285-5793; ISSN Online 2285-5807; ISSN-L 2285-5785

INFLUENCE OF THE CLIMATIC CONDITIONS CONCERNING MAIZE LEAF WEEVIL (*Tanymecus dilaticollis* GYLL) ATTACK ON SUNFLOWER CROPS AT NARDI FUNDULEA

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Abstract

The climatic conditions of the year 2012 were favorable for the maize leaf weevil attack (Tanymecus dilaticollis Gyll) on sunflower crops in south and south-east of the Romania. At NARDI Fundulea, the attack intensity of this pest at untreated plants, on a scale from 1 (not attacked) to 9 (plant complete destroyed) was of 4.09 in 2012, 3.54 in 2011 and 2.99 in 2010. Saved plants percent at untreated plants was of 80.75% in 2012, 87.75% in 2011 and 92.5% in 2010. In case of treated seed with thiametoxan, clotianidin or two active ingredients combination (clotianidin+betaciflutrin), the saved plants percent was higher then 98,25% in all of the three years taken in study. Seed treatment is the most effective method to protect sunflower crop in first vegetation stages against maize leaf weevil attack.

Key words: *climatic conditions, sunflower, pest, seed treatment.*

INTRODUCTION

The climatic conditions of the year 2012 were favorable for the maize leaf weevil attack (*Tanymecus dilaticollis* Gyll) on sunflower crops in south and south-east of the Romania. At NARDI Fundulea, the attack intensity of this pest at untreated plants, on a scale from 1 (not attacked) to 9 (plant complete destroyed) was of 4.09 in 2012, 3.54 in 2011 and 2.99 in 2010. Saved plants percent at untreated plants was of 80.75% in 2012, 87.75% in 2011 and 92.5% in 2010. In case of treated seed with thiametoxan, clotianidin or two active ingredients combination (clotianidin + betaciflutrin), the saved plants percent was higher then 98.25% in all of the three years taken in study. Seed treatment is the most effective method to protect sunflower crop in first vegetation stages against maize leaf weevil attack.

MATERIALS AND METHODS

The experiments were carried at NARDI Fundulea, Calarasi County between 2010 and 2012. Every year the sunflower crop was sowing at third decade of the April. For favoring the attack of *Tanymecus dilaticollis*, the experimental plots were sowing after three consecutive years of maize monoculture. The experiments were arranged according randomized block design, with plots length of 10 m and plot width of 4.2 m, equivalent of the 6 rows of sunflower. The distance between rows is 70 cm. The sunflower seeds were sowed manually with planter, at 35 cm distance between seeds on row. This low density have purpose to concentrate maize leaf weevil on the emerged sunflower plants. To avoid migration of *Tanymecus dilaticollis* adults from one plot to another, the experimental plots were laterally isolated with a 2 m wide strip sown with pea, a plant repellent to this insect. Seed treatment was effectuated two days before sowing with seed treating machine, HEGE 11. Attack intensity was evaluated when sunflower plants are in BBCH stage 14 (four leaf stage). From each plot will be assessed 20 plants, from four rows. The plants from marginal rows of the plot weren't assessed. Five plants per each row will be marked with stakes. On the four rows assessed, marked plants will be in "stairs" system. Attacked plants will be rated by a scale from 1 to 9, similar with scale used at maize

(note 1, plant not attacked-note 4, plants with leafs chafed in proportion of 25%-note 9, plants destroyed). After 30 days from plant emergence it has evaluated saved plants percent by counting the all emerged plants from a plot and comparing with sowing seeds number/plot. After 50 days from plant emergence, on the same 20 plants that we assessed before attack intensity, it has measuring plants height. The data were statistical analyzed through variance analyze method by using of the Microsoft Excel 2003 and ARM 8 programs.

RESULTS AND DISCUSSIONS

Temperatures and precipitations from April and May, varied between 2010 and 2012. As result the attack of the maize leaf weevil (*Tanymecus dilaticollis* Gyll) at untreated sunflower plants have oscillations from one spring to another.

In 2010, at NARDI Fundulea, the mean air temperature was higher than the multi-year average, especially for the last 10-day period of April and all May (Table 1). Low values of the average air temperatures registered on 9th and 17th May while higher value of the temperatures registered on 27th May (Figure 2). The precipitations from April and May 2010 were lower comparative with the multiyear average. Data from figure 1 show that, at NARDI Fundulea, in the last 10-day period of April 2010, only 4.4 mm of rain occurred, while in the first 10-day period of May only 2.6 mm. Total amount of precipitation from this two months in 2010 was of 73 mm, comparative with the multiyear average (144.5 mm). The attack intensity in untreated plants, on a scale from 1 to 9 was 2.99; that means the young plants were damaged in proportion between 10 and 25%. In conditions of the lower attack intensity values at untreated plants, saved plants percent was of 92.50%.

Table 1. Influence of air temperatures from April and May (10-day periods) concerning the attack of the maize leaf weevil (*Tanymecus dilaticollis* Gyll) at NARDI Fundulea (2010-2012)

Year	Attack intensity	Saved plants (%)	Temperature (°C)						Average Temp.	Multiyear average Temp.	Deviation (°C)
			April			May					
			I	II	III	I	II	III			
2010	2.99	92.50	11.2	11.2	13.4	15.9	16.4	19.7	14.63	14.00	-0.63
2011	3.54	87.75	9.7	9.0	12.2	11.8	17.1	19.8	13.27	14.00	+0.73
2012	4.08	80.75	11.6	13.6	17.4	20.8	16.6	16.7	16.12	14.00	+2.12

In 2011, at NARDI Fundulea, average temperatures recorded in first two 10-day periods of April were 9.7 and 9.0°C, lower then multiyear average Table 1). Average air temperature recorded in first 10-day period of May were lower then average temperature for last 10-day period of April. The values of the temperature recorded in the second and third 10-day periods of May were higher versus the values recorded in 2010 (Figure 3). The precipitation in last 10-day period of April was of 2.1 mm and in first 10-day period of May this was 48.4 mm. Data from figure 4 show that in first 10-day period of May, more of the half precipitations from this period was registered only in two days, on the 8th and 9th. Temperatures recorded in last two 10-day period of May and low precipitations favored attack, especially in the second 10-day period of May when plants get to the BBCH 14 stage. Meteorological data from table 1 show that in the second 10-day period of May, the average air temperature was 17.1°C and in third 10-day period of May, average air temperature was 19.8°C. Precipitations from the second and third 10-day periods of May, 2011, were lower comparative the first 10-day period of May (Table 2). Data from figure 2 show that in the first three days from the second 10-day period of May, temperatures had a lower level, then temperature increasing by more than 16.2°C, reaching 19.4°C in the 15th of May and 19.3°C on May 16. In last 10-day period of May 2011, daily average temperatures were higher than 19°C and even 21°C in the 25th of May, while precipitation was lower versus the multi-year average. In this conditions, the attack of the maize leaf weevil (*Tanymecus dilaticollis* Gyll) at untreated sunflower plants were higher then year 2010, with an attack intensity of 3,54 on a scale from 1 to 9 and saved plants percent was of 87.75%.

In 2012, at NARDI Fundulea, data from table 1 show that the average air temperature recorded in April and May were higher than the multi-year average by +2.12°C. In the last 10-day period of April, the average air temperature was 17.4°C, the highest level of this parameter from all of the three years taken in study (Figure 1).

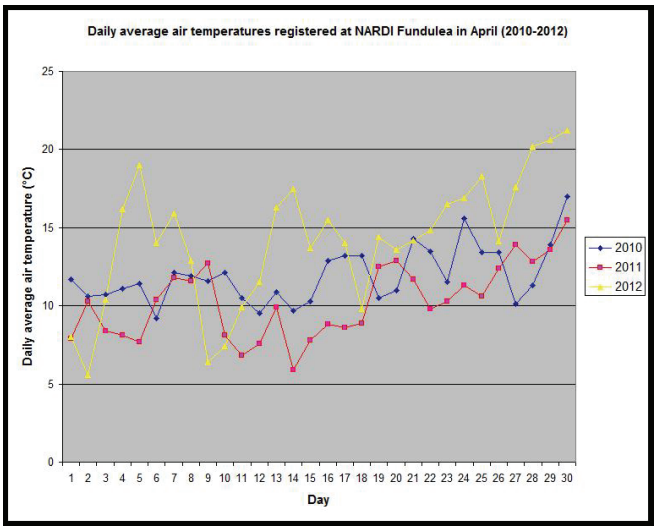

Figure 1. Daily average air temperatures registered at NARDI Fundulea in April (2010-2012)

Table 2. Influence of rainfall from April and May (10-day periods) concerning the attack of the maize leaf weevil (*Tanymecus dilaticollis* Gyll) at NARDI Fundulea (2010-2012)

Year	Attack intensity	Saved plants (%)	Precipitations (mm)						Total Prep. (mm)	Multiyear average (mm)	De-viation (mm)
			April			May					
			I	II	III	I	II	III			
2010	2.99	92.50	22.6	14.8	4.4	2.6	13.3	15.3	73.0	144.5	+71.5
2011	3.54	87.75	3.2	23.6	2.1	48.4	23.0	5.6	105.9	144.5	+38.6
2012	4.08	80.75	4.0	29.3	1.8	14.2	87.8	57.5	194.6	144.5	-50.1

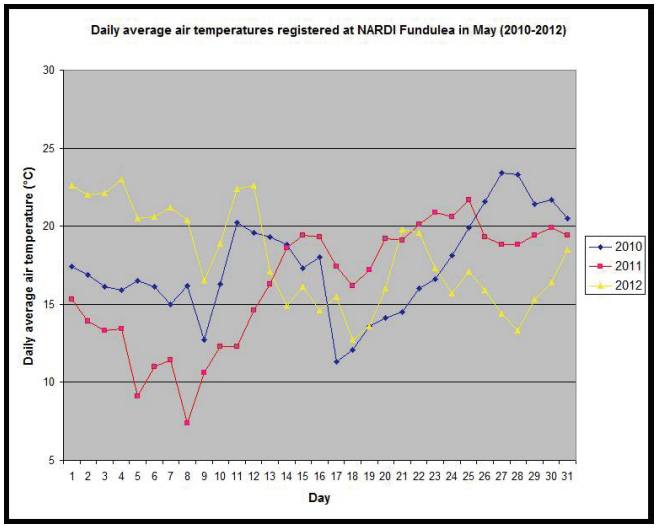

Figure 2. Daily average air temperatures registered at NARDI Fundulea in May (2010-2012)

Similarly, in the first 10-day period of May there were higher temperature values from all of the similar periods between 2010 and 2012 (T=20.8°C, Figure 2). The daily average temperature was below 14°C only in 20 April, while on April 25, the average temperature was of 18.3°C and more than 20°C in the 28th and 29th of April, values higher than the multi-year average (Figure 1). Maximum temperatures, higher than 30°C, were recorded in the 25th, 29th April and from 1th to 3th May. Regard precipitation level, data from table 2 shows that average values of this parameter were lower then multiyear average in April and higher then multiyear average in May. In fact, 2012 have some particularities regard as daily distribution of the precipitations. In most of the time, in April and May it has drought. For example, in last 10-day period of April and the first 10-day period of May the precipitation level was lower, while in the second 10-day period of May it was 87.8 mm and in the last 10-day period of this month there were 57.5 mm of rain. Data from figure 4 show that most of the precipitation from the second 10-day period of May occurred only in one day, on the 19th of May (52.7 mm of rain). As a result, the attack of maize leaf weevil (*Tanymecus dilaticollis* Gyll) at untreated plants were higher comparative with 2010 and 2011, with an intensity of 4.08 on a scale from 1 to 9, that means that most of the plants were with leafs damaged in proportion of 25% (tables 1 and 2). Saved plants percent at sunflower untreated plants was of 80.75%, that means almost 20% of the plants were damaged as result of the pest attack.

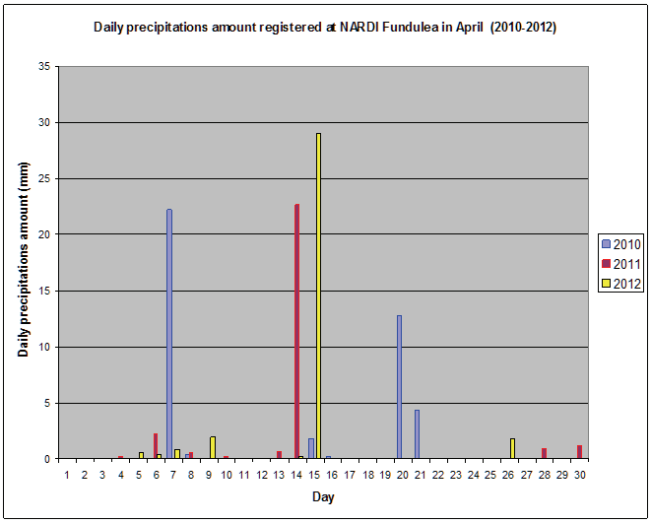

Figure 3. Daily precipitations amount registered at NARDI Fundulea in April (2010-2012)

Every year, in experimental field of the Plant Protection Laboratory from NARDI Fundulea it has tested insecticides used like seed treatment at sunflower crop against maize leaf weevil (*Tanymecus dilaticollis* Gyll) attack. The tested insecticides, between 2010 and 2012 were based on thiametoxan (Cruiser 350 FS), clothianidin (Poncho 600 FS) and the two active ingredients combination: clothianidin+betaciflutrin (Modesto 480 FS). Data from table 3 show that attack intensity at plants treated with Cruiser 350 FS was low, of 1.79 on a scale from 1 to 9. Plants treated with Modesto 510 FS have an attack intensity of 2.16 while plants treated with Poncho 600 FS have higher values of this parameter form treated plants variants (I=2.33). The untreated plants present lower attack intensity values (I=2.99). Regard plants height, at 50 days from plant emergence, in 2010, untreated sunflower plants measured 109.44 cm while plants height at variant treated with Poncho 600 FS was of 118.84 cm, plants height at variant treated with Modesto 480 FS was of 119.81 cm while plants height at variant treated with Cruiser 350 FS was of 121.56 cm, the highest value of this

parameter from the treated variants. There are not high differences between treated plants variants regard as plant height or saved plant percent in climatic conditions of the year. Differences between untreated and treated plants are statistically assigned (Table 3).

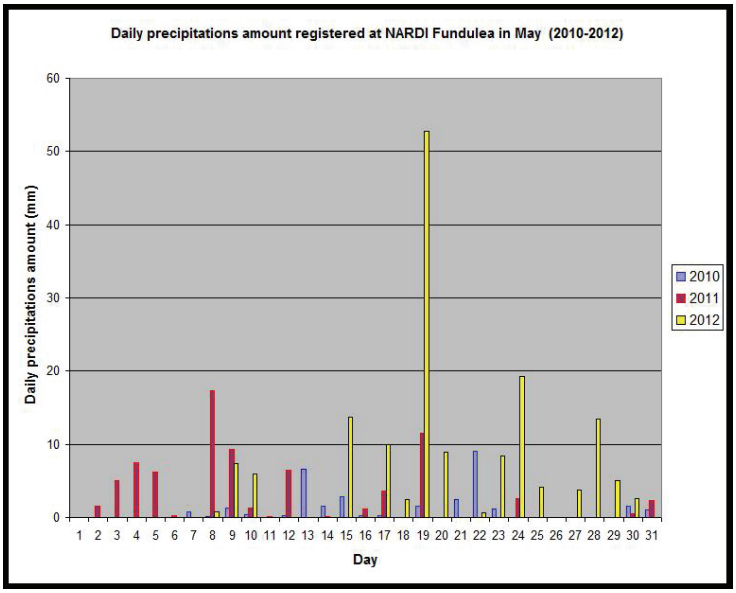

Figure 4. Daily precipitations amount registered at NARDI Fundulea in May (2010-2012)

Table 3. The effectiveness of some products used for seed treatment in sunflower crops against *Tanymecus dilaticollis* Gyll, at NARDI Fundulea, year 2010

Nr. crt.	Variant	Rate (l/t)	Attack intensity (1-9)	Plants height (cm)	Saved plants percent (%)
1	Control (untreated)	—	2.99	109.44	92.50
2	Cruiser 350 FS (std)	10.0	2.33**	121.56**	99.25***
3	Poncho 600 FS (std)	9.0	1.79***	118.84**	99.25***
4	Modesto 480 FS	4.5	2.16***	119.81**	98.50***
			DL5%=0.37	DL5%=6.28	DL5%=1.86
			DL1%=0.52	DL1%=8.81	DL1%=2.62
			DL0.1%=0.75	DL0.1%=12.75	DL0.1%=3.79

In climatic conditions of the year 2011, the attack intensity at untreated plants was higher then year 2010 (I=3.54). Also, the attack intensity at treated variants was slightly higher in 2011 comparative with 2010. However there are not high differences between treated variants, in 2011. Attack intensity at variants treated with Poncho 600 FS and Modesto 480 FS was basically, equal (Table 4) while variant treated with Cruiser 350 FS present the highest value of this parameter (I=2.48). Regard as plants height at 50 days from plant emergence, at untreated sunflower plants this parameter were below 100 cm. At variants treated with Cruiser 350 FS and Modesto 480 FS this parameter were, basically, equal (109.06 cm and 108,93 cm). Plants height at variant treated with Poncho 600 FS was of 105.79 cm, the lowest value of this parameter from the treated variants. Saved plant percent was of 87.75% at untreated plants and higher then 98% at all treated variants. The differences between treated and untreated variants are statistically assigned.

Table 4. The effectiveness of some products used for seed treatment in sunflower crops against *Tanymecus dilaticollis* Gyll, at NARDI Fundulea, year 2011

Nr. crt.	Variant	Rate (l/t)	Attack intensity (1-9)	Plants height (cm)	Saved plants percent (%)
1	Control (untreated)	—	3.54	99.91	87.75
2	Cruiser 350 FS (std)	10.0	2.48***	109.06**	98.75***
3	Poncho 600 FS (std)	9.0	2.23***	105.79*	98.50***
4	Modesto 480 FS	4.5	2.24***	108.93**	98.25***
			DL5%=0.28	DL5%=4.78	DL5%=2.03
			DL1%=0.40	DL1%=6.71	DL1%=2.85
			DL0.1%=0.57	DL0.1%=9.71	DL0.1%=4.13

Climatic conditions of the year 2012 (April and May) were the most favorable for the maize leaf weevil *Tanymecus dilaticollis* Gyll) attack on sunflower plants, especially in first phases of the vegetation (BBCH 10-BBCH 12). At untreated plants, attack intensity have the highest value from the all three year taken in study (I=4.08). However, data from table 5 show that, at treated variants there are not correlations between climatic conditions and attack intensity. This value is equal for all of the three variant treated with Cruiser 350 FS, Poncho 600 FS and Modesto 480 FS (I=1.79). Regard at plants height at 50 days after plant emergence, at untreated plants it has registered the lowest value of this parameter from all of the three study years. There are not high differences between plants height at treated variants. Plants height at variant treated with Cruiser 250 FS was of 100.06 cm, plants height at variant treated with Poncho 600 FS was of 101.98 cm while plants height at variant treated with Modesto 480 FS was of 121.56 cm, the highest value of this parameter from the treated variants. Regard as saved plants percent, at untreated plants was the lowest value of this parameter from period 2010-2012. Data from table 5 show that at treated variants, saved plant percent is higher then 98%. At variant treated with Cruiser 350 FS, saved plants percent was of 98.75% while at variants treated with Poncho 600 FS and Modesto 510, saved plant percent was of 98.50%.

Table 5. The effectiveness of some products used for seed treatment in sunflower crops against *Tanymecus dilaticollis* Gyll, at NARDI Fundulea, year 2012

Nr. crt.	Variant	Rate (l/t)	Attack intensity (1-9)	Plants height (cm)	Saved plants percent (%)
1	Control (untreated)	—	4.08	93.19	80.75
2	Cruiser 350 FS (std)	10.0	1.79***	100.06*	98.75***
3	Poncho 600 FS (std)	9.0	1.79***	101.98**	98.50***
4	Modesto 480 FS	4.5	1.79***	101.30**	98.50***
			DL5%=0.26	DL5%=5.20	DL5%=3.05
			DL1%=0.36	DL1%=7.29	DL1%=4.28
			DL0.1%=0.52	DL0.1%=10.56	DL0.1%=6.19

In three years with different climatic conditions, at NARDI Fundulea, products on base of thiametoxan (Cruiser 350 FS), clothianidin (Poncho 600 FS) and the two active ingredients combination: clothianidin+betaciflutrin (Modesto 480 FS) has offered satisfactory protection for sunflower plants against maize leaf weevil (*Tanymecus dilaticollis* Gyll) attack. Average attack intensity value at sunflower plants, in period taken in study was of 3.53 (Table 6). In all three years, attack intensity of this pest has lowest values at plants emerged from seeds treated with Poncho 600 FS (I=1.93). Promising results has product Modesto 480 FS (two active ingredients combinations), with average attack intensity, of 2.06 (Figure 5). Average attack intensity of this pest at plants treated with Cruiser 350 FS was of 2.20. There are not significantly differences between treated variants, in period 2010-2012, but all products was effective in control of this pest comparative with control variant. Saved plant percent at treated variants are higher then 98% in all years, at all variants (Figure 6).

Table 6. The effectiveness of some products used for seed treatment in sunflower crops against *Tanymecus dilaticollis* Gyll, at NARDI Fundulea (average values of the years 2010-2012)

Nr. crt.	Variant	Rate (l/t)	Attack intensity (1-9)	Plants height (cm)	Saved plants percent (%)
1	Control (untreated)	—	3.53	100.85	87.00
2	Cruiser 350 FS (std)	10.0	2.20***	110.23***	98.92***
3	Poncho 600 FS (std)	9.0	1.93***	108.87***	98.75***
4	Modesto 480 FS	4.5	2.06***	110.01***	98.42***
			DL5%=0.23	DL5%=3.11	DL5%=1.58
			DL1%=0.32	DL1%=4.37	DL1%=2.21
			DL0.1%=0.47	DL0.1%=6.33	DL0.1%=3.21

These results are similar with those obtained by Barbulescu et al. (2000, 2001). Further studies are necessary; both in field and laboratory conditions for evaluation of the climatic changes impact on the maize leaf weevil evolution and seed treatment effectiveness. Even the climatic conditions from spring period (April and May) are variable from one year to another; the seeds treatment is the most effective method to control the attack of the maize leaf weevil (*Tanymecus dilaticollis* Gyll) at sunflower crops.

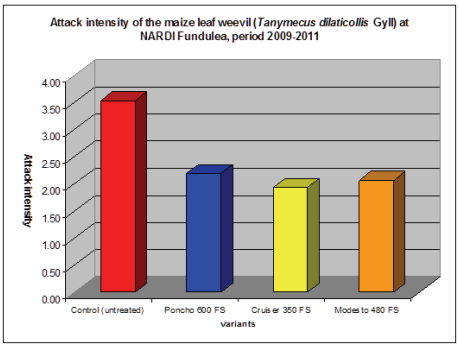

Figure 5. Attack intensity of the maize leaf weevil on sunflower plants at NARDI Fundulea, period 2010-2012

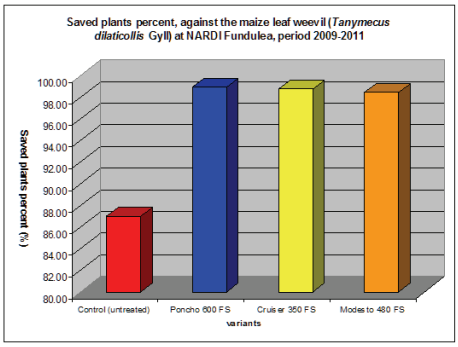

Figure 6. Saved plants percent, against the maize leaf weevil on sunflower plants at NARDI Fundulea, period 2010-2012

Figure 7. Sunflower plant attacked by the *Tanymecus dilaticollis* Gyll (INCDA Fundulea)

Figure 8. Adult of *Tanymecus dilaticollis* died after he feed with sunflower plant emerged from a treated seed (NARDI Fundulea)

CONCLUSIONS

Even if the attack is not with same intensity like maize, *Tanymecus dilaticollis* Gyll is the main pest of the sunflower plants in south and southeast areas from Romania.

The weather conditions from the spring period are different from one year to another, and in some years the amplitude of temperatures are higher from one 10-day period to another or from one day to another. High temperature and drought favored the maize leaf weevil attack on

sunflower plants, in first phases of vegetation (BBCH 10-14).

Climatic conditions registered in 2012 at NARDI Fundulea were the most favorable for maize leaf weevil attack. There were days with extreme drought and high temperatures and days with high precipitation amount. As result, the attack of the maize leaf weevil (*Tanymecus dilaticollis* Gyll) at sunflower crops was higher in 2012 versus 2010 and 2011, even if the precipitation amount was higher than the multi-annual average.

Seed treatment is the best method for controlling *Tanymecus dilaticollis* attack, when sunflower plants are in the first phases of vegetation (BBCH 10-14).

Products based on clothianidin (Poncho 600 FS in dose of 9 l/tone seeds) and thiametoxan (Cruiser 350 FS in dose of 10 l/tone seeds) provide better effectiveness for controlling of this pest. Promising results has product with two active ingredients combination clothianidin+betaciflutrin (Modesto 480 FS in dose of 4.5 l/tone seeds).

Further studies are necessary; both in field and laboratory conditions for evaluation of the climatic changes impact on the maize leaf weevil evolution and seed treatment effectiveness.

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