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RESEARCHES CONCERNING VEGETATION TREATMENT OF THE MAIZE CROP FOR CONTROLLING OF THE MAIZE LEAF WEEVIL (*TANYMECUS DILATICOLLIS* GYLL)

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Abstract

Maize leaf weevil (Tanymecus dilaticollis Gyll) is the main pest of this crop in south and south-east of the Romania. Every year, over 1 million hectares with maize are attacked by this pest, crop can be totally damaged if wasn't effected seed or vegetation treatments. In experimental field of Plant Protection Laboratory in frame of National Agricultural Research and Development Institute Fundulea it has studied new generation insecticides, used like correction vegetation treatment for maize leaf weevil control (Calypso 480 SC 0,09 l/ha, Decis Mega 50 EW 0,15 l/ha, Karate Zeon 5 CS 0,15 l/ha, Karate 2,5 WG 0,3 kg/ha). The insecticides assigned a satisfactory protection of the maize plants against this pest, saved plants percent were over 94 % at all treated variants while at untreated plants saved average plants percent, in period 2009-2011, were 79,02 %. Plants height at 50 days after sowing were higher than 159 cm at all treated variants while at control variant were 137,63 cm.

Key words**:** *control, maize, pest, treatment.*

INTRODUCTION

Maize is one of the most important crops in Romania [12]. According the data of Ministry of Agriculture and Rural Development, in 2010 it has cultivated 2.1 million hectares and in 2011 it has cultivated more then 2.6 million hectares of maize [13]. Because of heavy drought, especially from last autumn, many surfaces with oilseed rape were replaced with maize in spring of the year 2012, as result surface occupied with this crop will be higher than year 2011. Maize leaf weevil is the main pest in south and south east of the country [3, 4, 5]. The attack occurs when maize plants are in first phase of vegetation, from emergence until five leaf stage [6, 8, 9]. In some cases, young plants are destroyed before arrive at soil surface [1]. Even it is considered to be polyphagous, *Tanymecus dilaticollis* exhibits preference for maize, a crop which provides optimal development for the larvae and is the most preferred food by adults [1, 2, 10]. Due to this fact, the traditional practice in small farms of cropping maize after maize for several consecutive years contributes to the reproduction of this insect and thus to an increase in its population [2]. Year by year, at least one million hectares cultivated with maize are affected by *Tanymecus dilaticollis* [6, 7]. According Torus E. et all. (2011) the maize yields losses were on average 23% only because of the pests attack [12]. For avoiding yield losses because of this pest, the best control method is seed treatment [2, 6, 7, 9]. The most used products for seed treatment in Romania are on base of imidacloprid, clotianidin and thiametoxan [7]. These new insecticides replace treatments with products on base of carbofuran (Furadan, Carbofuran, Diafuran, etc). Even these products were effective against maize leaf weevil and generalized in agricultural production more than 30 years, they are high toxic for human and animals [6, 7]. In some cases, when is not effectuated seed treatment or this is effectuated wrong is necessary vegetation treatment [4, 11]. Otherwise maize leaf weevil attack level can be high; in some cases plants can be destroyed and areas with this crop must be sowing again. In this paper

author collective has tested, in field conditions, some insecticides for controlling in vegetation, maize leaf weevil (*Tanymecus dilaticollis* Gyll), at NARDI Fundulea, in different climatic conditions of the period 2009-2011. The products are on base of tiacloprid (Calypso 480 SC), deltametrin (Decis Mega 50 EW), or different formulation of the lambda-cihalotrin (Karate Zeon 5 CS and Karate 2.5 WG).

MATERIAL AND METHOD

The experiments were carried at NARDI Fundulea, in spring period of the years 2009, 2010 and 2011. Every year the maize was sowing at third decade of the April. For favoring the attack of *Tanymecus dilaticollis*, the experimental plots were sowing after maize monoculture (at least three consecutive years with maize, before). 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 maize. The distance between rows is 70 cm. The maize seeds were sowed manually with planter, at 35 cm distance between seeds on row, this is equivalent with a density of 40816 plants/ha. This low density have purpose to concentrate maize leaf weevil on the emerged maize plants to evaluate effectiveness of the insecticides used at vegetation treatment. 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 [1, 2, 8, 9, 10]. The vegetation treatment will be effectuated when maize plants are in BBCH stage 12-13 (two-three leaf stage). Attack intensity will be evaluated when maize 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, as follows:

- Note 1: plant not attacked;
- Note 2: plant with 2-3 simple bites on the leaf edge;
- Note 3: plants with bites or clips on leaf edge;
- Note 4: plants with leafs chafed in proportion of 25 %;
- Note 5: plants with leafs chafed in proportion of 50 %;
- Note 6: plants with leafs chafed in proportion of 75 %;
- Note 7: plants with leafs chafed almost at the level of the stem;
- Note 8: plants with leafs complete chafed and beginning of the stem destroyed;
- Note 9: plants destroyed, with stem chafed until, close to soil level.

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

Meteorological conditions, especially from last two decades of the April and first decade of the May is important for maize leaf weevil (*Tanymecus dilaticollis* Gyll). Drought and high temperatures in period when maize plants are in first phases stage (until BBCH 14) favorite attack of this pest. Data from table 1 show that in 2009, temperatures from April and May were higher them multiyear average, especially from the last two decades of the May.

Table 1. Influence of the temperature on the attack of the maize leaf weevil (*Tanymecus dilaticollis* Gyll) at NARDI Fundulea, period 2009-2011 (data recorded at NARDI Fundulea meteo station)

Year	Attack intensity	Saved plants (%)	Temperature (°C)						Average Temp.	Multiyear average Temp.	Deviation (°C)
			April			May					
			I	II	III	I	II	III			
2009	6.05	75.91	12.0	11.6	10.9	14.2	19.2	19.3	14.55	14.00	-0.55
2010	4.83	85.25	11.2	11.2	13.4	15.9	16.4	19.7	14.63	14.00	-0.63
2011	5.79	79.50	9.7	9.0	12.2	11.8	17.1	19.8	13.27	14.00	+0.73

Table 2. Influence of the rainfall on the attack of the maize leaf weevil (*Tanymecus dilaticollis* Gyll) at NARDI Fundulea, period 2009-2011 (data recorded at NARDI Fundulea meteo station)

Year	Attack intensity	Saved plants (%)	Precipitations (mm)						Total Prep. (mm)	Multiyear average (mm)	Deviation (mm)
			April			May					
			I	II	III	I	II	III			
2009	6.05	75.91	0.9	13.7	7.5	9.8	4.7	21.3	57.9	144.5	+86.6
2010	4.83	85.25	22.6	14.8	4.4	2.6	13.3	15.3	73.0	144.5	+71.5
2011	5.79	79.50	3.2	23.6	2.1	48.4	23.0	5.6	105.9	144.5	+38.6

In 2010 temperatures were higher than multiyear average, especially from last decade of the April. Contrary in 2011 the temperatures from the April and first decade of the May were lower than multiyear average and the temperatures from last two decades of the May were higher than multiyear average (Fig. 1).

The attack at untreated plants in this three year was different. Data from table 2 show that precipitation level were lower than multiyear average in all of three years taken in study (2009-2011). From this year, in 2009 were recorded the lowest level of precipitations. For example in last decade of the April were 7.5 mm of precipitations, in first decade of the May were 9.8 mm of precipitations and in second decade of the May were only 4.7 mm of the rain. As result, combined with high temperatures, especially from May (table 1) in 2009 the attack intensity at untreated plants were of 6.05 and saved plant percent were of 75.91%.

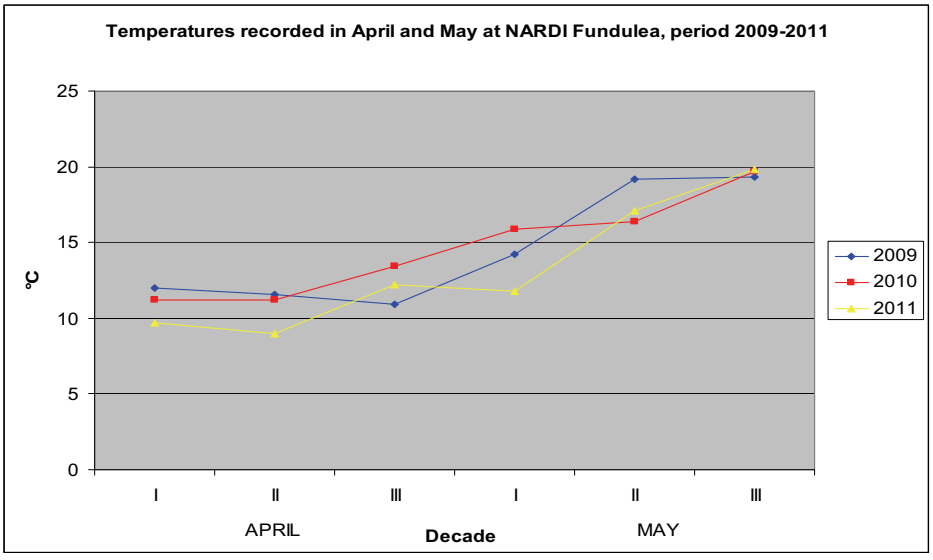

Fig. 1. Temperatures recorded in April and May at NARDI Fundulea, period 2009-2011

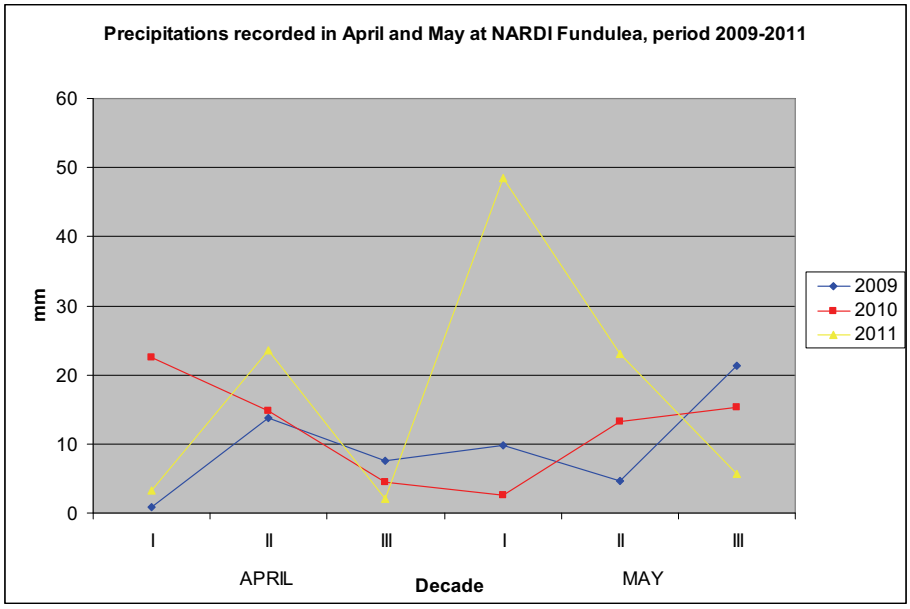

Fig. 2. Temperatures recorded in April and May at NARDI Fundulea, period 2009-2011

In 2010, even temperatures recorded in last decade of the April, when maize were sowed, and all decades of the May, attack level of maize leaf weevil on untreated plants have lowest level from all of three years taken in study (Tables 1, 2). In 2011 attack level on untreated plants was of 5.79 and save plant percent was of 79.50%. Temperatures from last decade of the April were high then 12.0 Celsius degree and precipitation level was low, only 2.1 mm (Fig. 2). As result, the attack of the *Tanymecus dilaticollis* at young emerged plants was higher.

In these different climatic conditions, from one year to another, at NARDI Fundulea it has tested some insecticides, for controlling *Tanymecus dilaticollis* Gyll. These insecticides were applied like vegetation treatments, when maize was in 2-3 leaf stage (BBCH 12-13). The tested insecticides are on base of tiacloprid (Calypso 480 SC), deltametrin (Decis Mega 50 EW), or different formulation of the lambda-cihalotrin (Karate Zeon 5 CS and Karate 2.5 WG). Data from table 3 show that in 2009 all products have effective control of the maize leaf weevil. The lowest value of the attack intensity was at variant treated with Karate Zeon 5 CS. Variant treated with Decis Mega 50 EW have an attack intensity of 4.01 and variant treated with Calypso 480 SC have highest value of the attack intensity from all of the treated variants (I=4.20). At untreated variant average attack intensity on scale from 1 to 9 were of 6.05, that means the most of the maize plants were with leafs chafed in proportion of 75%, while plants from treated variants were with leaf chafed in proportion of 25%. Plant height parameter have low variance at all treated variant, while at untreated variant, average plants height at 50 days after emergence was of 122.69 cm. Saved plants percent was 75.91% at untreated variants while at treated variants was over 95 %, except variant treated with Calypso 480 SC (92.50%). All products provided a satisfactory protection of the maize plants, in climatic conditions of the spring period, year 2009.

Table 3. The effectiveness of some products used for vegetation treatment at maize crop against *Tanymecus dilaticollis* Gyll, at NARDI Fundulea, year 2009

Nr. crt.	Variant	Rate (l/ha, kg/ha)	Attack intensity (1-9)	Plants height (cm)	Saved plants percent (%)
1	Control (untreated)	—	6.05	122.69	75.91
2	Calypso 480 SC	0.09	4.20***	136.68***	92.50***
3	Decis Mega 50 EW	0.15	4.01***	135.16***	95.00***
4	Karate Zeon 5 CS	0.15	3.98***	138.77***	96.00***
5	Karate 2,5 WG	0.30	4.05***	137.65***	95.75***
			DL5%=0.59 DL1%=0.82 DL0.1%=1.16	DL5%=5.09 DL1%=7.14 DL0.1%=10.08	DL5%=4.56 DL1%=6.40 DL0.1%=9.04

Table 4. The effectiveness of some products used for vegetation treatment at maize crop against *Tanymecus dilaticollis* Gyll, at NARDI Fundulea, year 2010

Nr. crt.	Variant	Rate (l/ha, kg/ha)	Attack intensity (1-9)	Plants height (cm)	Saved plants percent (%)
1	Control (untreated)	—	4.83	145.53	85.25
2	Calypso 480 SC	0.09	3.49**	159.43**	98.00***
3	Decis Mega 50 EW	0.15	3.64**	160.25**	98.75***
4	Karate Zeon 5 CS	0.15	3.65**	160.00**	99.00***
5	Karate 2,5 WG	0.30	3.45***	159.00**	99.25***
			DL5%=0.69 DL1%=0.97 DL0.1%=1.37	DL5%=7.98 DL1%=11.20 DL0.1%=15.82	DL5%=2.02 DL1%=2.84 DL0.1%=4.01

Analyzing the data from table 4 it has ascertained that attack level at untreated plants was of 4.83. All plants from treated variants have an attack intensity lower then 3.5. The differences between treated variants were low, and at variants treated in vegetation with Decis Mega EW and Karate Zeon 5 CS the attack level was almost similar. The lowest value of the attack intensity was at variant treated with Karate 2.5 WG (I=3.45). Only at this variant statistical difference comparative with control variant were distinct significant (table 4). Regard as average maize plants height, after 50 days from plants emergence, at control variant this value was of 145.33 cm. At all treated variant this value ranged from 159.00 and 160.25 cm, almost equal. Saved plants percent, an important parameter regard plant losses because of the maize leaf weevil attack was of 85.25 % at control (untreated) variant and between 98.00 and 99.25 % at treated variants. There are low differences between treated variants. All products provided a satisfactory protection of the maize plants, in climatic conditions of the spring period, year 2010.

In climatic conditions of the spring period, from year 2011, the attack intensity at untreated maize plants was of 5.79 on a scale from 1 to 9. That means the majority of the maize plants from untreated variant were with leafs chafed in proportion of 75 %. The attack level at treated variants was highest from all of the three years taken in study. At variant treated in vegetation with Karate Zeon 5 CS was the lowest value of the attack intensity, of 4.30 followed very close by variant treated, in vegetation, with Calypso 480 SC (I=4.40). At variant treated, in vegetation with Karate 2.5 WG the attack intensity was of 4.50 while at variant treated, in vegetation, with Decis Mega EW the attack intensity was of 4.55. There are not significant differences between control variant and treated variants this year and the differences between treated variant were very low. Average plant height at treated variants has values bigger than 153.16 cm and low differences between these variants. At untreated variant, average plant height at 50 days after plants emergence was of 144.69 cm (Table 5).

Table 5. The effectiveness of some products used for vegetation treatment at maize crop against *Tanymecus dilaticollis* Gyll, at NARDI Fundulea, year 2011

Nr. crt.	Variant	Rate (l/ha, kg/ha)	Attack intensity (1-9)	Plants height (cm)	Saved plants percent (%)
1	Control (untreated)	—	5.79	144.69	75.90
2	Calypso 480 SC	0.09	4.40**	155.18**	94.50***
3	Decis Mega 50 EW	0.15	4.55*	153.16*	96.50***
4	Karate Zeon 5 CS	0.15	4.38**	157.68**	96.50***
5	Karate 2,5 WG	0.30	4.50**	155.15**	96.75***
			DL5%=0.90 DL1%=1.27 DL0.1%=1.79	DL5%=7.04 DL1%=9.88 DL0.1%=13.95	DL5%=6.75 DL1%=9.48 DL0.1%=13.38

Table 6. The effectiveness of some products used for vegetation treatment at maize crop against *Tanymecus dilaticollis* Gyll, at NARDI Fundulea, average values of the years 2009-2011

Nr. crt.	Variant	Rate (l/ha, kg/ha)	Attack intensity (1-9)	Plants height (cm)	Saved plants percent (%)
1	Control (untreated)	—	5.55	137.63	79.02
2	Calypso 480 SC	0.09	4.03***	150.43***	95.00***
3	Decis Mega 50 EW	0.15	4.07***	149.52***	96.75***
4	Karate Zeon 5 CS	0.15	4.00***	152.15***	97.17***
5	Karate 2,5 WG	0.30	4.00***	150.60***	97.25***
			DL5%=0.48 DL1%=0.68 DL0.1%=0.96	DL5%=4.90 DL1%=6.88 DL0.1%=9.71	DL5%=2.65 DL1%=3.71 DL0.1%=5.24

Saved plants percent, was of 94.50 % at variant treated with Calypso 480 SC. This was lowest value from all treated variants. At the rest of treated variants, saved plants percent was almost similar, 96.50 % at variant treated with Decis Mega 50 EW and Karate Zeon 5 CS or 96.75 % at variant treated with Karate 2.5 WG. All products provided a satisfactory protection of the maize plants, in climatic conditions of the spring period, year 2011. Analyzing the average values of these parameters, from period 2009-2011, it has ascertained that all insecticides used in vegetation at maize crop against *Tanymecus dilaticollis* Gyll reduce attack intensity from average value of 5.55 at approximate 4.00 on an intensity scale from 1 to 9 (Table 6).

That means the majority of the maize plants from untreated variant were with leafs chafed in proportion between 50 and 75% and the majority of the maize plants from treated variants were with leafs chafed in proportion of 25%. In all of the three years there are not significant differences between insecticides used in this experiment, but significant differences between control variant and treated variants (Fig. 3). The situation is similar regarding average plant height parameter. On average, at untreated variant, plant height at 50 days after emergence was of 137.63 cm. At treated variants, this parameter ranged between 149.52 and 152.15 cm. The differences between untreated variant and treated variants were significant. Generally, at untreated variant, plant losses because of maize leaf weevil attack in first phase of the vegetation were more than 25% (Fig. 4). At treated variant saved plant percent was higher than 95%. At variants treated with Karate Zeon 5 CS and Karate 2.5 WG was the higher values of this parameter, but generally the differences between treated variants, in period 2009-2011 were low. In same time differences between control variant and treated variant was significant and statistical assigned.

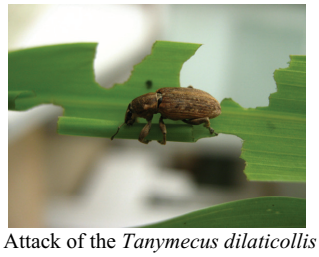

Photo 1. Attack of the *Tanymecus dilaticollis* Gyll on maize young leaf (original)

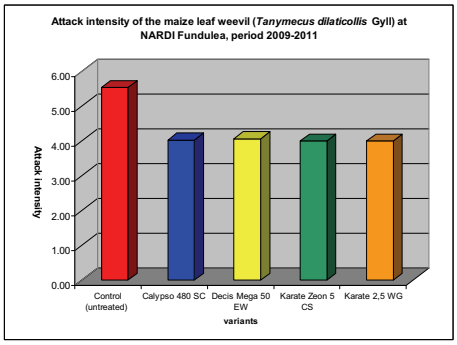

Fig. 3. Attack intensity of the maize leaf weevil (*Tanymecus dilaticollis* Gyll) at NARDI Fundulea, period 2009-2011

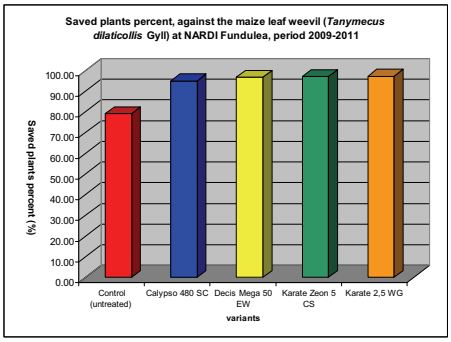

Fig. 4. Saved plants percent, against the maize leaf weevil (*Tanymecus dilaticollis* Gyll) at NARDI Fundulea, period 2009-2011

CONCLUSIONS

Although climatic conditions from one year to another are different, the maize leaf weevil (*Tanymecus dilaticollis* Gyll) is the main pest of maize crops in south and south east of the country.

The attack intensity at untreated plants is different from one year to another and depends of crop technology and climatic conditions.

All products from this experiment, used like vegetation treatment, provided a satisfactory protection of the maize plant, in climatic conditions of the spring, from years 2009-2011.

Using of the vegetation treatment at maize crop is recommended when it is not effectuated seed treatment or this is effectuated wrong.

REFERENCES

[1] Barbulescu, A., Voinescu, I., 1998. *Evolution of the maize leaf weevil (Tanymecus dilaticollis) in different crops concerning previous plant.* An. I.C.C.P.T., vol. 65, p. 321-326.

[2] Barbulescu, A., Voinescu, I., Sadagorschi, D., Penescu, A., Popov, C., Vasilescu, S., 2001. *Cruieser 350 FS-A new product for maize and sunflower seed treatment against Tanymecus dilaticollis Gyll.* Romanian Agricultural Research, nr. 15, p. 77-87.

[3] Cristea, M., Cabulea, I., Sarca, T., 2004. *Maize*. Monographic study, vol. 1, Cap. 14, p. 589-626, Romanian Academy Publishing-house.

[4] Popov, C., 2002. *Research concerning cereals, leguminous for grains, forage and technical plants protection regarding pathogens and pests, effected in year 2001*. Probl. Prot. Pl., vol.XXX, nr. 2, p. 109-190.

[5] Popov, C., Guran, M., Raranciuc, S., Rotarescu, M., Spiridon, C., Vasilescu, S., Gogu, F., 2005. *Phytosanitary state of the cereals, leguminous for grains, forage and technical crops from Romania, year 2004.* Probl. Prot. Pl., vol. XXXIII, nr. 1-2, p. 7-30.

[6] Popov, C., Barbulescu, A., 2007. 50 years of scientific activity in domain of field crop protections, against diseases and pests. An I.N.C.D.A. Fundulea, vol. LXXV, p. 371-404.

[7] Popov, C., Raranciuc, S., Spiridon, C, Vasilescu, S., *Cana L., 2007. Phytosanitary state of the cereals, leguminous for grains, forage and technical crops from Romania, year 2006*. Probl. Prot. Pl., vol. XXXV, nr. 1, p. 1-24.

[8] Vasilescu, V.S., Popov, C., Stoica, V., Negrila, M., Procopovici, E., 2005. *Results regarding control of maize leaf weevil (Tanymecus dilaticollis Gyll) by chemical seed treatment during 2000-2004*. Scientific Papers, USAMV, series A, vol. XLVIII, p. 343-350.

[9] Voinescu, I., Burdea, V., Burean, E., Luca, E., Mustea, D., Petcu, L., Sapunaru, T., Udrea, A., 1991. *Behavior of some maize varieties and hybrids concerning seed treatment with Diafuran 35 ST and Carbodan 35 ST*. Probl. Prot. Pl., vol. XIX, nr. 1-2, p. 7-11.

[10] Voinescu, I., Barbulescu, A., 1998. *Evolution of maize leaf weevil (tanymecus dilaticollis gyll.) in various crops depending on the preceding crop*. Proceedings of International Symposium on Integrated Protection of Filed Crops, Vrnjaka Banja, p. 157-164.

[11] Keszthelyi, S., Kurucsai, P., Szabó, T., Pál-Fám1, F., Marczali, Z., 2008. *Chemical protections against corn weevil (Tanymecus dilaticollis Gyll.) on different soil types*. VII. Alps-Adria Scientific Workshop, Stara Lesna, Slovakia, p. 191-194.

[12] Trotus, E., Buburuz, A.A., Zaharia, P., 2011. *Researches on the protection of maize crops against soil pests*. Agronomical Researches in Moldavia, vol. 4, p. 45-51.

[13] ***MADR data, 2012. http://www.madr.ro/pages/page.php?self=01&sub=0104&art=0402&var=0104