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Researches Concerning Effectiveness of the Seed Treatment in Maize Crop for Controlling the Maize Leaf Weevil (*Tanymecus dilaticollis* Gyll) at NARDI Fundulea

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Abstract. In this paper, author collective present results and methodology of the insecticides testing against maize leaf weevil, in laboratory conditions. Year by year at NARDI Fundulea, in field conditions, it has tested insecticides used both like seed and vegetation treatment for controlling of the maize leaf weevil. Because climatic conditions from the spring are not favorable for this pest every year, laboratory testing is one of the best methods for evaluate of the insecticides used like seed treatment. At eight days after insects are added in the pots with maize plants, highest adults mortality and lowest attack intensity has registered in case of plants emerged from the seeds treated with products on base of thiametoxan (Cruiser 350 FS), clothianidin (Poncho 600 FS) or thiametoxan+teflutrin (Force Zea). In case of seeds treated with product on base of imidacloprid (Nuprid 600 FS 8,0 l/t), even if the insects mortality was lower, the attack intensity has low values. All plants from the untreated variant were destroyed. At treated variants, saved plants percent were at least 90 %. Seed treatments provide a satisfactory protection of the maize plants, in first vegetation stages against maize leaf weevil.

Keywords: maize, insect, seed treatment, control, laboratory conditions

INTRODUCTION

Maize leaf weevil (*Tanymecus dilaticollis* Gyll) is an economically important pest of maize in many areas from South-East and Central Europe countries (Meissle *et al.*, 2010). Recently, this insect was first time recorded attacking maize plants in Greece (Papadopoulou, 2010). In Romania, is one of the most dangerous pests for the maize crop (Barbulescu *et al.*, 2001). According to Paulian (1970), the highest damage potential of the maize leaf weevil is in south and south-east of the country. Same author mention that the second zone, where *T. dilaticollis* causes more limited damage are located in north-east, north-west and western part of the Romania.

The attack of this insect is very dangerous from the plant emergence until four leaf stage (Paulian *et al.*, 1969; Paulian *et al.*, 1979; Popov *et al.*, 2007). Drought from the spring period and maize cultivated after maize, consecutive years can favour maize leaf weevil attack (Barbulescu and Voinescu, 1998; Popov *et al.*, 2006). In some cases, maize plants can be destroyed immediately after emergence, before reaching at the soil surface (Kacso, 1974; Voinescu *et* Barbulescu, 1998; Draganova *et al.*, 2012).

The best method for control of this pest, when maize plants are in first vegetation phases is seed treatment (Voinescu *et al.*, 2001; Popov, 2002; Popov *et al.*, 2005). Year by year at NARDI Fundulea, in field conditions, it has tested insecticides used both like seed and vegetation treatment for controlling of the maize leaf weevil (Vasilescu, 2005; Popov and

Barbulescu, 2007). Because climatic conditions are not favourable for this pest every year, laboratory testing is one of the best method for evaluate of the insecticides used like seed treatment (Keszthelyi *et al*., 2008).

In this paper, author collective, study effectiveness of some insecticides used like seed treatment, in laboratory conditions, in case of heavy infestation of the maize seedlings with *T. dilaticollis* insects.

MATERIAL AND METHOD

The researches has been carried out at Plant Protection Laboratory, in frame of National Agricultural Research Development Institute, Fundulea, Calarasi County, Romania.

For laboratory experiments, adult insects of *T. dilaticollis* were collected at the beginning of May, from the untreated maize crops, cultivated in monoculture system, located on the Plant Protection Laboratory experimental field (44° 30′ N, 24° 1′ E). Until seedlings infestation, insects collected from the field are maintaining in laboratory for a few days at 15 ± 2 ºC air temperature and 80 - 85 % relative air humidity.

In this experiment, the tested insecticide like seed treatment were on base of thiametoxan+teflutrin (Force Zea in dose of 6.5 l/t and 12.5 l/t). imidacloprid (Nuprid 600 FS in dose of 4.0 l/t and 8,0 l/t), thiametoxan (Cruiser 350 FS in dose of 9.0 l/t), clothianidin (Poncho 600 FS in dose of 4.0 l/t) and thiacloprid (Sonido in dose of 8,0 l/t).

Maize seeds were sowing in plastic pots (12 x 12 x 10 cm). Before sowing, pots are filing ¾ with soil (brown chernozem). In each pot, it has sowing five maize seeds. Each experimental variant have four replications, each pot is one replication.

After beginning of the plant emergence, when maize seedlings arrive above soil surface, it has added insects collected from the open field. In each pot it has added 20 insects to have a pest density of 4 adults per plant (Barbulescu *et al.*, 2001).

Insects must manipulated carefully for not hurt then. After insects are added, the pots were covered with isolators, bonnet with bolter (Fig. 1).

Died insects was counted at 1, 2, 3, 5 and 8 days after pots infestation. Dead insects in all treatments were removed after each assessment.

Attack intensity of *T. dilaticollis* adults on maize plants was evaluated at 3 and 8 days after pots infestation. This laboratory assessment is similar with field assessment for maize leaf weevil (Vasilescu *et al.*, 2005; Popov *et al.*, 2006). The attacked plants have been 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 completely chafed and beginning of the stem destroyed;
- Note 9: plants destroyed, with stem chafed close to soil level.

Saved plant percent were determined at 8 days after pots infestation, by counting all plants from the pots and comparing with total number of seeds. It has considered that plants with heavy attack (note 8 or 9) can't regenerate, and there are not saved.

The data were statistical analyzed through variance analysis method, using Microsoft Excel, version 2003 and ARM, version 8.5, software.

RESULTS AND DISCUSSIONS

After insects were added in pots, they were starting immediately feeding with maize young leafs (Fig. 2). However, even if the adults of *T. dilaticollis* starting be affected by the insecticides, at the majority of the experimental variants, the mortality in first 24 hours has low values (Tab. 1). Highest values of this parameter were registered in case of variant treated with Force Zea (both doses), Cruiser 350 FS and Poncho 600 FS. Lowest values of adults mortality, in first 24 hours were registered at variants treated with Nuprid 600 FS in dose of 4,0 l/t and Sonido.

Tab. 1

Mortality of *Tanymecus dilaticollis* Gyll adults, as result of the maize seed treatments, at NARDI Fundulea, in laboratory conditions

No.	Insecticide	Dose (l/t)	Number of dead adults					Total number of died adults
			DAY 1	DAY 2	DAY 3	DAY 5	DAY 8	
1	Control	—	0	0	0.25	0	0	0.25
2	Force Zea	6.5	1.75	2.00	3.00	3.00	1.25	11.00***
3	Force Zea	12.5	2.00	2.25	5.25	3.75	1.25	14.50***
4	Nuprid 600 FS	4.0	0.25	0.25	2.25	1.00	0.75	4.50***
5	Nuprid 600 FS	8.0	1.00	2.50	3.50	1.75	1.50	10.25***
6	Cruiser 350 FS	9.0	1.75	3.50	4.75	2.50	1.50	14.00***
7	Poncho 600 FS	4.0	1.50	2.50	7.00	1.50	1.25	13.75***
8	Sonido	8.0	0.50	2.00	2.50	0.50	0	5.50***

$LSD_{5\%}$= 2.25
$LSD_{1\%}$= 3.06
$LSD_{0.1\%}$= 4.13

At two days after pots infestation, adults mortality has registered higher values in case of variants treated with Cruiser 350 FS (3.5 dead adults/pot) while lower value of this parameter were registered at variant treated with lower dose of Nuprid 600 FS (0.25 dead adults/pot). Except control, at others treated variants, average mortality of the adults ranged from 2 to 2.5 dead insects/pot.

Data from table 1 show that highest values of the adults mortality were registered at three days after insects are added in the pots, at all treated variants. In case of the variant treated with Nuprid 600 FS in dose of 8.0 l/t, it has registered an average mortality value of 7 adults/pot. Higher value of adults mortality was registered at variants treated with higher dose of Force Zea and variant treated with Cruiser 350 FS. At variant treated with lower dose of Nuprid 600 FS, average mortality value was of 2.25 adults/pot.

At five days after pots infestation, highest insect mortality were registered at variants treated both with lower and higher dose of Force Zea (3.0 and 3.75 dead adults/pot) while lowest mortality were registered at variant treated with Sonido (0.5 dead adult/pot).

At eight days after pots infestation, the insect mortality registered lower values, comparative with previous days and ranged between 1.25 and 1.5 adults/pot, except lower dose of Nuprid 600 FS (0.75 dead adults/pot) and Sonido (0 dead adults/pot).

At the end of the observation period, at eight days after maize leaf weevil adults were added in the pots with plants emerged from treated and untreated seeds, insect mortality were highest in all treated variants comparative with control variant (Fig. 3). The differences between untreated and treated seeds were statistically assigned. However, at treated variants,

adults mortality percent ranged from 22.5 % (lower dose of Nuprid 600 FS) to 72.5 % (higher dose of Force Zea). Higher mortality percent registered at variants treated with Cruiser 350 FS and Poncho 600 FS while at variant treated with Sonido, insect mortality percent registered low value (27.5 %).

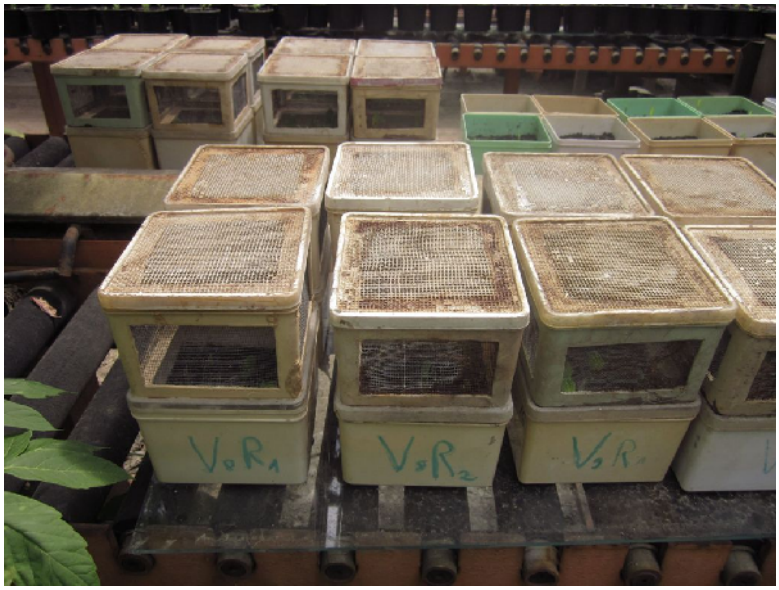

Fig. 1. Plastic pot with isolators (bonnet with bolter).

Tab. 2

The effectiveness of some insecticides used for seed treatment at maize crop against *Tanymecus dilaticollis* Gyll. at NARDI Fundulea. in laboratory conditions

No.crt.	Insecticide	Dose (l/t)	Atack intensity (1-9)		Saved plants percent (%)
			DAY 3	DAY 8	
1	Control	—	6.50	8.75	0
2	Force Zea	6.5	4.22***	5.40***	92.50***
3	Force Zea	12.5	3.59***	3.72***	100***
4	Nuprid 600 FS	4.0	5.97***	6.18***	90.00***
5	Nuprid 600 FS	8.0	4.53***	3.69***	100***
6	Cruiser 350 FS	9.0	2.73***	2.78***	100***
7	Poncho 600 FS	4.0	2.85***	3.07***	100***
8	Sonido	8.0	5.58***	5.75***	90.00***
			$LSD_{5\%}$= 0.28 $LSD_{1\%}$= 0.38 $LSD_{0.1\%}$= 0.51	$LSD_{5\%}$= 0.37 $LSD_{1\%}$= 0.50 $LSD_{0.1\%}$= 0.67	$LSD_{5\%}$= 4.05 $LSD_{1\%}$= 5.51 $LSD_{0.1\%}$= 7.44

Data from table 2 show that, at three days after insects are added in pots, the attack intensity of the *T. dilaticollis* at untreated maize plants, on a scale from 1 to 9, was 6.50. That means, in case of heavy infestation, maize young plants were with leaf damaged more then 75 %. Higher value of the attack intensity were registered at variants treated with lower dose of Nuprid 600 FS (I = 5.97) and Sonido (I = 5.58). At variant treated with Nuprid 600 FS in dose of 8.0 l/t, attack intensity, in case of heavy pest density, was 3.53. At variants treated with Cruiser 350 FS and Poncho 600 FS it has registered lowest values of the attack intensity from

this laboratory experiment. These values of the attack intensity were in correlation with adults mortality values, registered after three days from pots infestation.

Fig. 2. *T. dilaticollis* adult feeding on maize leaf.

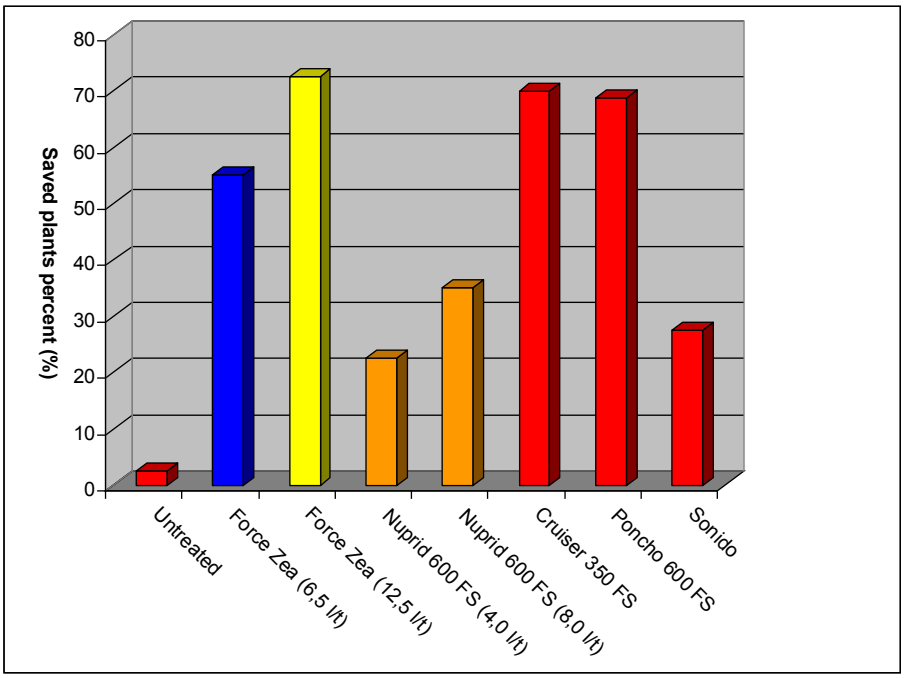

Fig. 3. Mortality percent (%) of maize leaf weevil adults, as result of the maize seed treatments, at NARDI Fundulea, in laboratory conditions

At the end of the observation period, at eight days after adults of *T. dilaticollis* were added in pots with maize plants, the attack intensity, on a scale from 1 to 9, ranged from 2.78 (variant treated with Cruiser 350 FS) and 8.75 (control variant). At variant with untreated seeds, at a density of 4 adults/plant, all maize plants were destroyed by this pest (Fig. 3). At variants with high mortality of the adults, it has registered lowest attack from this experiment (higher dose of Force Zea, Poncho 600 FS, Cruiser 350 FS) and saved plants percent were 100 %. At variant treated with lower dose of Nuprid 600 FS, were it has registered lower insects mortality, the attack intensity were highest from all treated variants (I = 6.18) and saved plats percent was 90 %. Similar situation were recorded in case of the variants treated with Sonido or lower dose of the Force Zea (I = 5.75 and 5.40).

Fig. 4. Maize plat from untreated seeds destroyed by *T. dilaticollis* adults

At variant treated with higher dose of Nuprid 600 FS (8.0 l/t), even if insects mortality was lower, the attack intensity was of 3.69 and saved plants percent was 100 %. At all treated variants, there are not high differences concerning attack intensity, between two assessments effectuated at three and eight days after pots infestation. Only at untreated variant were recorded differences concerning attack intensity at three and eight days after pots infestation with maize leaf weevil adults.

The laboratory experiments demonstrate that in case of high density of *T. dilaticollis* adults, at untreated seeds, the maize plants can be totally destroyed and saved plants percent is equal with zero. Seed treatments provide a satisfactory protection of the maize plants, in first vegetation stages against this pest.

Because new generation of the insecticides used like seed treatment affect nervous or muscular system of the insects and don't kill them immediately is necessary some changes of the experimental methodology used for laboratory testing.

CONCLUSION

Laboratory experiments with high density of the weevils (*T. dilaticollis*) on maize plants is an important tool for evaluate effectiveness of some insecticides used like seed treatments for controlling this pest.

Maize plants emerged from untreated seeds were destroyed after eight days from pots infestation with T. *dilaticollis* adults.

At variants treated with Cruiser 350 FS (thiametoxan), Poncho 600 FS (clothianidin) and Force Zea (thiametoxan + teflutrin) in dose of 12.5 l/t it has registered highest mortality of the insects and lowest attack intensity at maize plants. Saved plant percent was 100 %.

At variant treated with Nuprid 600 FS (imidacloprid) in dose of 8 l/t even if insects mortality was lower, the attack intensity on maize plants has low values and saved plants percent was 100 %.

Lower doses of the Force Zea (thiametoxan+teflutrin) and Nuprid 600 FS (imidacloprid) insecticides don't provide satisfactory protection of the maize plants against *T. dilaticollis* adults.

At variant treated with Sonido (thiacloprid) it has registered low insects mortality and high attack intensity on maize plants. Saved plant percent was 90 %.

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