STIGMATROPHIC ACTIVITY A NEW PEST *DIABROTICA VIRGIFERA VIRGIFERA* LE CONTÈ CONNECTED WITHIN A „PIONEER“ MAYZE DIVERSITY

ACTIVITATEA STIGMATROFICĂ A NOULUI DĂUNĂTOR *DIABROTICA VIRGIFERA VIRGIFERA* LE CONTÈ CONEXAT ÎNTR-O DIVERSITATE DE PORUMB „PIONEER“

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Abstract: *The most harmful pest in maize crops from the Western part of Romania is Diabrotica virgifera virgifera or the Western maize root worm. In the Western part of our country, Diabrotica virgifera virgifera Le Conté adults attack leaves – phylotrophy, silk – stigmatrophy, pollen – androtrophy, fulcrant roots – rhyzotrophy and cob – spermatrophy. In order to establish this pest's attack, we have founded an experience, in Sagu (Arad region), on 8 American-origin maize hybrids (Pioneer Al Dupont Company), belonging to different maturity groups. They have represented the trophic background for the pathogens within the pathosystems and for the new pest larvae as well. In the case of silk-based nutrition, the frequency of cobs affected by the Diabrotica virgifera virgifera Le Conté adults is recorded with the biggest values, namely: 35.91% (early hybrid PR 38A24) and 55.74% (mid-early hybrid PR 37M34, in 2006 and 53.4%-96.2%, percentages achieved by the early hybrid PR 37D25 and extra-early PR 39D81). From a statistical point of view, distinctly and very distinctly significant attack pluses were recorded toward the control variant, and also toward the experimental mean, in both years of research. The high percentage achieved place all Pioneer maize hybrids into the sensitiveness reaction field.*

Rezumat*: In culturile de porumb din partea de vest a României cea mai păgubitoare insectă este Diabrotica virgifera virgifera sau viermele vestic al rădăcinilor de porumb. În partea de vest a ţării noastre, adulţii de Diabrotica virgifera virgifera Le Conté, atacă frunzele - filotrofie, mătasea – stigmatrofie, polenul –androtrofie, rădăcinile fulcrante – rizotrofie şi ştiuletele – spermatrofie. Pentru stabilirea atacului acestui dăunător s-a înfiinţat în localitatea Şagu (zona Arad) o experienţă care a avut sub observaţie 8 hibrizi de porumb de provenienţă americana (Pioneer Al Dupont Comapny), din diferite grupe de maturitate. Aceştia au reprezentat baza trofică atât pentru patogenii din patosisteme, cât şi pentru larvele şi adulţii dăunătorii ai insectei. În cazul nutriţiei cu mătase, frecventa ştiuleţilor afectaţi de adulţii speciei Diabrotica virgifera virgifera Le Conté, se înregistrează cu cele mai mari valori, şi anume: 35.91% (hibridul timpuriu PR 38A24) şi 55.74% (hibridul semitimpuriu PR 37M34, în anul 2006 şi de 53.4% - 96.2% - procente realizate de hibridul timpuriu PR 37D25 şi extratimpuriu PR 39D81). Din punct de vedere statistic înregistrează plusuri de atac distinct şi foarte distinct semnificative, atât faţă de martor sau varianta de control, cât şi faţă de media experienţei, în ambii ani de cercetare. Procentele ridicate realizate propulsează toţi hibrizii de porumb Pioneer în sfera reacţiei de sensibilitate.*

Key words: *Zea mays, Diabrotica, agresivitate, stigmatrofică, mătase, grupă de maturitate*
Cuvinte cheie: *Zea mays, stigmatrophic agressivitty, Diabrotica, silk, maturity group*

INTODUCTION

In maize crops from our country, there are about 25 species of pests with economic importance, among which maize leaf weevil (*Tanymecus dilaticollis*) and wireworms (*Agriotes* sp.). We may add to these pests another species, recently introduced in our country, namely *Diabrotica virgifera virgifera* Le Conté, the Western maize root worm (IOANA GROZEA, 2006).

This is one of the most harmful pests of maize crops in North America, due to the fact that it causes annual losses of more than 1 million dollars (R.L. METCALF, 1986; quoted by IOANA GROZEA, 2003; C.H. ENGELBERG, 2004; J. KISS et al., 2005; S. TOEPFER et al., 2006). In Romania, this pest has been observed for the first time in 1996, in Nadlac, Arad country, and its spreading has been continuing in other 17 counties (I. VONICA, 1998; MARIANA HANCU et al., 2001; IOANA GROZEA, 2006).

Maize represents the main host plant or trophic base, offering the pest the possibility to reproduce massively. AL. BARBULESCU (1999, 2000); IOANA GROZEA (2003, 2003a, 2003b); W. JOSSI, J. DERON (2000) consider that the maize is the preferred plant and mention that occasionally the pest feeds on alfalfa, trefoil, rye and wheat. According to IOANA GROZEA (2003), the host plants for adults belong to the families *Poaceae*, *Asteraceae*, *Fabaceae* and *Curcubitaceae* (T.F. BRANSON, J.L. KRYSAN, 1981; J. MOESER and S. VIDAL, 2005).

In the Western part of our country, *Diabrotica virgifera virgifera* Le Conté adults attack leaves - phylotrophy, silk – stigmatrophy, pollen – androtrophy, fulcrant roots – rhyzotrophy and cob – spermatrophy. Among the aerial organs specified, according to IOANA GROZEA (2003) and our observations, *Diabrotica virgifera virgifera* Le Conté prefer the foliar limb and the silk. Adults feed on the aerial maize parts, especially with leaves (phylotrophy), pollen (androtrophy) and silk (stigmatrophy) – K.A. LUDWIG, R.E. HILL, 1975, and with flowers from gardens, occasionally adults causing andro-stigmatrophic problems to flowers and gardens, where they have a resident status (J. L. WEDBERG, 1996). According to J. MOESER, S. VIDAL (2003), females consume more pollen than males. IOANA GROZEA (2003) mentions attack also on the adventive or fulcrant roots, generating plant inclination (rhyzotrophy).

MATERIAL AND METHOD

The attack frequency of the pest *Diabrotica virgifera virgifera* Le Conté or the Western maize root worm was established during 2006-2007 in an experience located near Sagu – S.C. Agrogil (Arad region), whose structure was represented by 8 maize hybrids. The American-origin maize hybrids, belonging to different maturity groups, represented the trophic base for the parasite fungi within the pathosystems, and also for the *Diabrotica virgifera virgifera* Le Conté larvae and adults. In the case of the feeding on silk, like in the "goose neck" injuring way, the observations were performed in dynamics, in both years of research, namely: 1-15 August in 2006, respectively 22 July - 5 August in 2007. The values achieved in dynamics (1-15 August 2006; 22 July – 5 August 2007) were expressed as percentages and reported to the control variant PR 37D25, and also to the experimental mean as well.

RESULTATES AND DISSCUSION

Concerning the attack performed by the *Diabrotica virgifera virgifera* Le Conté adults on the maize cob silk, the observations were carried out on 1 and 14 August 2006. The frequency of plants attacked on silk or stigma have evolved in this way:

- on 1 August, the frequency of cobs with attack on silk oscillates between 35.91% - the mid-early hybrid PR 38A24 and 51.72% - the mid-early hybrid PR 37W05, quite similar limits (table 1); only two hybrids are near the maximal tolerance limit and, compared to the control hybrid PR 37D25 with 41.66% attack, lead to minuses of aggression of 3-6%, namely PR 38R92 and PR 38A24 (table 1).

- on 14 August 2006, all hybrids enter the sensitiveness field within the resistance source scale, namely with attack frequencies of more than 40% (table 1). The mid-early hybrids PR 37M34, PR 37W05 are the most attacked ones, being followed by the extra-early hybrid PR 39D81 with an attack frequency of 54.02% and the mid-late hybrids PR 35P12 and

PR 36K67, with attack percentages of 52.29%, respectively 53.73% (table 1). The biggest percentage belongs, like in the case of the other harming ways, to the extra-early hybrid PR 39D81 (fig. 1).

On 22 July 2007, the frequency of cobs attacked on silk had an amplitude between 53.4% - the control variant represented by the hybrid PR 37D25 and 63.7%, recorded by the extra-early hybrid PR 39D81 (table 2). Actually, this hybrid presented the biggest attack difference compared to the control variant, namely 10.3% (table 2). Big differences are achieved by the mid-early hybrids PR 35P12 (8.6%) and PR 36K67 (7.1%), too – table 2. The hybrids mentioned, from a statistical point of view, lead to distinct and very distinctly significant attack pluses compared to the control variant. The attack mean per experience was 58.3%, and the extra-early hybrid achieves the biggest difference, too (5.4%), which is very distinctly significant in the statistical assurance (table 2). In 5 August 2007, we had the biggest values of attack on silk, namely above 88% (table 2); the adults' attack oscillated between 88.4% - the control hybrid PR 37D25 and 96.2%, a destructive value recorded by the extra-early hybrid PR 39D81 (table 2). In this observation date, too, the biggest attack differences compared to the control variant are recorded by the same hybrids, namely PR 39D81 (7.8%) and PR 36K67 (6.3%) – table 2. In the case of these statistically assured variants, the differences compared to the control variant are distinctly significant. For an experimental mean of 92.3%, the differences achieved by the maize hybrids are more reduced compared to 17 July, namely 3.9% for the extra-early hybrid PR 39D81 (attack plus not assured statistically) and only 1.9 and 2.4% for the mid-late hybrids PR 35P12 and PR 36K67 (attack plus not assured statistically) – table 2. The big values of attack on silk of *Diabrotica virgifera virgifera* Le Conté adults, of 96.2% in the extra-early hybrid (PR 39D81), of 90.0% for the early hybrids (PR38R92) and mid-early (PR 38A24, PR 37D25, PR 37M34, PR 37W05) and of 94.4% (PR 35P12, PR 36K67) – figure 2 confirm the conclusions elaborated by T. TUSKA et al., 2002, saying that the attack on silk becomes very dangerous when the PED of 1-3 adults per maize cob is reached.

Table 1

Significance of difference compared to the control variant and the aggression experimental mean (F%) of maize cob silk, of the *Diabrotica virgifera virgifera Le Conté* adult, in 2006

No.	Hybrid	1 August			15 August		
		X	Significance compared to the control variant	Significance compared to the exper. mean	X	Significance compared to the control variant	Significance compared to the experimental mean
1	PR 39D81	51.43	***	*	51.02	-	-
2	PR 38R92	37.92	-	000	42.24	00	00
3	PR 38A24	35.91	00	000	42.81	00	0
4	PR 37D25	41.66	-	0	51.70	-	-
5	PR 37M34	51.43	***	*	55.75	-	-
6	PR 7W05	51.72	***	*	55.44	-	-
7	PR 35P12	49.70	***	-	52.29	-	-
8	PR 36K67	51.43	***	*	53.73	-	-
Mean average		46.40			51.00		
DL – 5%		3.76			6.15		
DL – 1%		5.22			8.53		
DL – 0.1%		7.25			11.85		

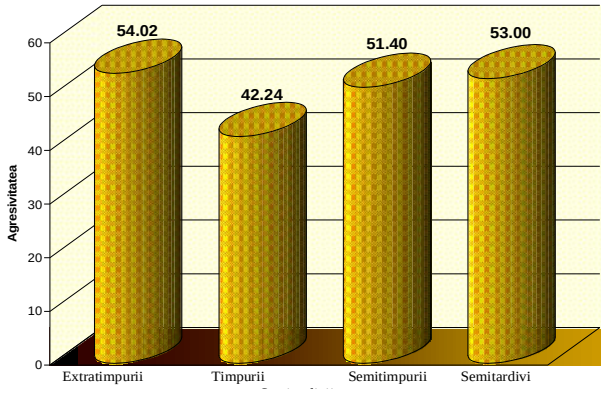

Figure 1. Aggression of *Diabrotica virgifera virgifera Le Conté* adults on the maize hybrid silk, depending on maturity group, in 2006

Table 2

Significance of difference compared to the control variant and the aggression experimental mean (F%) of maize cob silk, of the *Diabrotica virgifera virgifera Le Conté* adult, in 2007

No.	Hybrid	22 July			5 August		
		X	Signif. compared to the control variant	Significance compared to the exper. mean	X	Significance compared to the control variant	Signif. compared to the exper. mean
1	PR 39D81	63.7	***	*	96.2	**	-
2	PR 38R92	55.4	-	-	90.4	-	-
3	PR 38A24	58.8	*	-	91.0	-	-
4	PR 37D25	53.4	-	0	88.4	-	-
5	PR 37M34	54.5	-	-	92.7	*	-
6	PR37W05	58.6	*	-	91.1	-	-
7	PR 35P12	62.0	***	-	94.2	**	-
8	PR 36K67	60.5	**	-	94.7	**	-
Mean average		58.3			92.3		
DL – 5% DL – 1% DL – 0.1%		4.18 5.80 8.05			4.06 5.63 7.84		

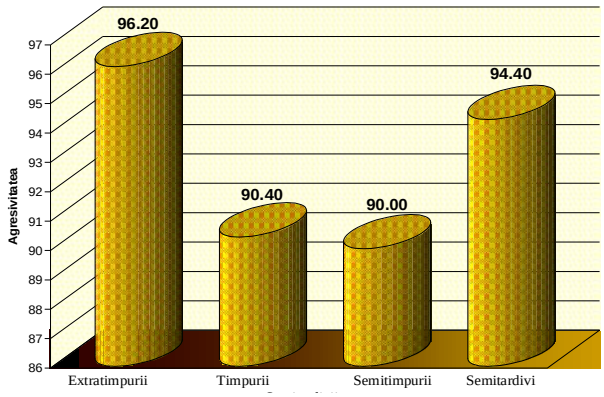

Figure 2. Aggression of *Diabrotica virgifera virgifera* Le Conté adults on the maize hybrid silk (stigmatrophy), depending on maturity group, in 2007

CONCLUSIONS

In 2006, the frequency of plants with attack on silk had a variability amplitude between 35.91% - the mid-early hybrid PR 38A24 and 55.74%, percentage achieved by the early hybrid PR 37M34.

In 2007, the control hybrid PR 37D25 achieved the lowest percentage, 53.4%, and the extra-early hybrid PR 39D81 was at the superior limit, with a percentage of 96.2%.

Depending upon the maturity group, if we consider the phenomenon in terms of "experimental mean", we may conclude that *Diabrotica virgifera virgifera* Le Conté adults prefer the silk belonging to the extra-early hybrids, and then to the mid-early and early ones. In the case of the silk feeding, the frequency of cobs affected by *Diabrotica virgifera virgifera* Le Conté adults records the biggest values, placing all hybrids into the sensitiveness reaction field.

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