HOST GENETIC FACTOR'S INFLUENCE ON THE PESTS *OSTRINIA NUBILALIS – FUSARIUM ROSEUM* – UNDER CONDITIONS OF GENETICALLY-DIFFERENT TROPHIC BASE

INFLUENȚA FACTORULUI GENETIC GAZDĂ ASUPRA DĂUNĂTORILOR *OSTRINIA NUBILALIS – FUSARIUM ROSEUM* – ÎN CONDIȚII DE BAZĂ TROFICĂ DIFERITĂ GENETIC

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Abstract: *Since any resistance to the parasitical attack (Ostrinia nubilalis – European maize gimlet and Fusarium roseum – stalk rot or fusariosis) has not been induced so far, excepting the genetic engineering preoccupations, which managed to do this in the transgenic way, we considered it was necessary to experiment a genetically-different trophic base, represented by conventional and transgenic maize hybrids, attempting to constitute new resistance sources in the first case or to ameliorate the sensibility in the conventional maize hybrids cultivated at the moment. Successive to our results regarding the genetic reaction of the hybrids studied, in Arad County, we may conclude the following: Under conditions of comparative crop, in the refuge area system, the tolerance gets lost, proving that under normal experimental conditions the tolerance is not total, but relative; under such conditions, the genetic response is of sensibility; The type of the conventional maize genetic response is of sensibility to fusariosis at cob level ; The type of the Yield-gard maize genetic response is of transgenic resistance to fusariosis at cob level, and not of euresistance or genetic resistance ;*

Rezumat: *Cum până în prezent nu s-a indus o rezistenţă la atacul paraziţilor (Ostrinia nubilalis - sfredelitorul european al porumbului şi Fusarium roseum – putregaiul roşu sau fuzarioza), exceptând preocupările de inginerie genetică, care au reuşit acest lucru pe cale transgenică în privinţa sfredelitorului european al porumbului, am considerat necesară experimentarea unei baze trofice, diferită genetic, reprezentată prin hibrizi de porumb convenţional şi transgenic, în speranţa, că în primul caz, se vor constitui noi surse de rezistenţă sau de ameliorarea sensibilităţii la hibrizii de porumb convenţionali cultivaţi în momentul de faţă. În urma rezultatelor obţinute, referitor la tipul de reacţie genetică a hibrizilor experimentaţi, în judeţul Arad, putem spune următoarele: În condiţii de cultură comparativă în sistem zona de refugiu, toleranţa se pierde, ceea ce dovedeşte că în condiţii de experiment normal, toleranţa nu este totală, ci relativă; în condiţiile amintite reacţia genetică este de sensibilitate; Tipul de reacţie genetică al porumbului convenţional este cel de sensibilitate la fuzarioza ştiuleţilor; Tipul de reacţie genetică al porumbului Yield Gard este cel de rezistenţă transgenică la fuzarioză ştiuleţilor, şi nu de eurezistenţă sau rezistenţă genetică;*

Key words: *conventional hybrids, YG hybrids, genic complementarity, prophylaxis*
Cuvinte cheies: *hibrizi convenţionali, hibrizi YG, complementaritate genică, profilaxie*

INTRODUCTION

The fight against these maize parasites (*Ostrinia nubilalis* – European maize gimlet and *Fusarium roseum* – stalk rot or fusariosis) does not rely on the therapeutic measure, namely the chemical one, because the control percentages were below 80% and this does not mean efficiency (80-100%). In this situation, the fight against these pests relies especially on prophylactic or prevention measures, which reduce the biological reserve or the inoculum (parasitical) source, on one hand, and do not multiply it in the maize crops, on the other hand.

The genetic resistance of the conventional maize to fusariosis was researched, for the first time in the U.S.A., by S. JINAHION, W.A. RUSSEL (1969), AL. HOOKER, K.M.S SAXENA (1971). In Romania, these researches were performed at S.C. Turda (SARCA TRAIAN, MARINA ȚÎRCOMNICU, 1974; I. CĂBULEA et al., 1977; MARIANA ITTU et al., 1979; D. CRAICIU, 1980). In Banat, the researches were performed during 2006-2007 by FLOAREA ADAM and GH. POPESCU (2008), in order to get to know the resistance degree and the value, in terms of initial selection material, for the creation of some new American-origin maize hybrids (Pioneer Al Dupont Company), which proved tolerance or sensibility to fusariosis, namely which were not important in terms of initial selection material in the creation of new hybrids or of amelioration of the resistance to fusariosis. The conventional maize resistance to fusariosis is determined by polygenes or by the minor gene blocks located on the chromosomes 5, 6, 8 and 9 from the maize genome, according to S. JINAHION, W.A RUSSEL (1969). Successively, the genetic resistance was proved to be controlled by the major genes as well (oligogenic resistance – L.M. REID et al., 1993, L.M. REID, HAMILTON, 1997; A. BATA et al., 2001; B. VIGIER et al., 2001, etc.).

MATERIALS AND METHOD

We arranged, in Horia, Arad County, experiences with conventional (DKC 5783, DK 315, DKC 3511, DK 440, DKC 4626 and DKC 5143) and Yield-gard type maize hybrids.

The conventional maize mentioned above was arranged in a refuge area, in order to maintain the populations of the European maize gimlet *Ostrinia nubilalis*, to verify the resistance of the genetically-modified maize (MON 810) represented by: DKC 5784 YG – obtained from DKC 5783; DKC 3496 YG – obtained from DK 315; DKC 3512 YG – obtained from DKC 3511; DKC 5018 YG – obtained from DKC 5143. For the first time, we used the ***scale of the resistance source***, in order to establish the marks for hybrid behavior when we identify the resistance sources for the amelioration or creation of new maize hybrids. This method is related to the pest *Fusarium roseum* and it concerns the larval and perforating organic aggression.

The scale of the resistance source is: attack absence (o) – immune hybrid (I); attack (virulence) of 0.1-2.0 (1-20%) – resistant hybrid (R); of 2.1-4.0 (21-40%) – medium resistant or tolerant hybrid (MR; T); of 4.1-9.0 (41-100%) – sensible hybrid (S).

Also for the first time, we established a scale of the resistance source expressed through values of ***attack intensity***, which selects even better the resistance sources for amelioration or creation of new hybrids. The mean of the larval and perforating organic density expressing intensity, in the establishment of marks, is: 0.5 - very resistant hybrid (FR); 1.0 resistant hybrid (R); 1.0-2.0 – medium resistant or tolerant hybrid (MR; T); more than 2.0 larvae per plant – sensible hybrid (S). The biotrophic process of the damaging organisms within the system is interpreted genetically, too, and this represents a premiere.

RESULTS AND DISCUSSION

We present below the reaction of the conventional hybrids DK 315, DK 440, DKC 5143, DKC 5783 to the attack of the insect *Ostrinia nubilalis*, being aware of the fact that, on the whole, it is difficult to obtain maize with genetic resistance to this pest and to maintain, at the same time, the genes providing yield quality and their combinative features, so important in the process of amelioration of this plant (I. ROȘCA, 2008).

Mean stem aggression, considered as the main damaging way of the pest *Ostrinia nubilalis*, ***below cob***, taken by us as the most important criterion in the crop damage PED establishment, which is 250 kg/ha, and of the other maize genomic expressions (with the specification that the warning of the chemical treatments should be performed at 50% of the

plants with foliar perforations or presence of 1-2 larvae/square meter) presents a total attack, in terms of mean per replications of the larval activity effect (penetrating orifices), in the hybrid DK 315 (table 1). The ***perforating intensity*** is higher compared with the presence of larvae: 4.38 below cob, 1.94 above cob and 1.79 at cob level; the mean of attack intensity per experience, per hybrids, is 2.33, including the 4 hybrids from the sensibility area.

According to the immune genetic reaction scale – o attack; 0.5 – very resistant (R); 1.0-2.0 medium resistant (MR) or tolerant (T) and higher than 2.0 – sensible, values provided by the mean intensity of the larval density and perforating activity, we may draw the following conclusion: the hybrids DK 315, DK 440, DKC 5143 and DKC 5783 present the reaction of sensibility to the attack of *Ostrinia nubilalis* (table 1). Obviously the fight against this pest relies especially on measures of prevention (IOANA GROZEA, 2006; I. GROZEA et al., 2008; I. ROŞCA, 2008), which are safe for human health and for the environment (R.E. HEIMLICH et al., 2000; G. BROOKES and BARFOOT, 2005), but the cultivation of these conventional maize hybrids do not present the trait of prophylaxis, so that it is difficult to obtain resistance to the attack of the pest (I. ROŞCA, 2008).

According to the comparative analysis of the ***conventional and Yield-gard type maize hybrids***, in terms of ***aggression*** of the fungus ***Fusarium roseum***, of the type of genetic response and of the genetic complementarity and Fusarium prophylaxis, presented in table 2, we may conclude the following:

- the aggression of the pathogen *Fusarium roseum* on the conventional maize (DK 315, DK 440, DKC 5143, DKC 5783) had limits of 40-60%, namely between 44.4 and 56.4%, values that allow their characterization as sensible to fusariosis, so that they cannot be recommended for initial selection material in the creation of new hybrids with resistance or tolerance to fusariosis; the mean of aggression per hybrids was 51.27%;
- the aggression of the fungus *Fusarium roseum*, as a result of the interaction with the Yield Gard maize (DKC 3946 YG, DKC 4442 YG – control variant, DKC 5018 YG and DKC 5784 YG) is much more reduced, namely between 7.7 and 11.1%, an amplitude of variability determined by the activity performed by the gene of the toxic protein Cry 1 Ab; the mean of aggression per hybrids was 9.34%;
- the transgenic maize (MON 810) gets involved in the reduction of the attack caused by *Fusarium roseum*, between the limits of 30-50%, concretely between 36 and 46%; the mean of attack reduction is 41%;
- the type of genetic reaction of the conventional maize is of sensibility to cob fusariosis ;
- the type of genetic reaction of the Yield gard maize is of transgenic resistance to cob fusariosis, and not of euresistance or genetic resistance ;
- the prevention of the *Fusarium roseum* attack at cob level or the Fusarium prophylaxis can be performed in a proportion of 40-60%, concretely between 44 and 56%, in the case of the conventional maize ;
- the involvement of the Yield gard-type maize in cob Fusarium prophylaxis is a very strong one, namely between 90-100%, concretely between 89 and 92%, namely an attack reduction that provides safety for human and animal health in terms of pathogen toxicity (mycotoxins), and also for the environment, by diminishing the chemical treatments ;
- the genic complementarity hybrid-maize is reduced in the case of the Yield gard-type maize 36-46.1%, percentages that are rather big in the lack of performance of the Fusarium pathogenicity.

CONCLUSIONS

Successive to the researches carried out, we may conclude that:

- Under conditions of comparative crop within the refuge area system, the tolerance gets lost, proving that under normal experimental conditions the tolerance is not total, but relative; under the specified conditions, the genetic reaction is of sensibility;
- The genic complementarity of the pest is of 86-98%, proving sensible hybrids, and the genetic reaction of sensibility induces a pest prophylaxis of below 11%;
- Because the conventional maize hybrids are sensible to the attack of this pest, they do not present value as initial selection material for the creation of resistant hybrids; however because these hybrids are productive, they must be helped with a high-performance phyto-technical and phyto-sanitary technology;
- The difficulty of obtaining resistance to this pest's attack was confirmed;
- The transgenic maize (MON 810) carries out the prophylaxis or the prevention of the *Ostrinia nubilalis* attack in maximal proportion, namely 100%, and determines pest migration into the conventional maize crop, refuge area system;
- The prevention of the *Fusarium roseum* attack in maize cobs or the fusarium prophylaxis is performed in proportion of 40-60%, concretely between 44 and 56%, in the case of the conventional maize;
- The involvement of the Yield gard-type maize in cob fusarium prophylaxis is a very strong one, namely between 90-100%, concretely between 89 and 92%, namely an attack reduction that provides safety for human and animal health in terms of pathogen toxicity (mycotoxins), and also for the environment, by diminishing the chemical treatments ;
- The type of genetic reaction of the conventional maize is of sensibility to cob fusariosis ;
- The type of genetic reaction of the Yield gard-type maize is of transgenic resistance to cob fusariosis, and not of euresistance or genetic resistance ;

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