RESISTANCE TO THE MAIZE WEEVIL, *SITOPHILUS ZEAMAIS*, AMONG ENTRIES FROM THE NATIONAL AGRONOMIC PERFORMANCE TRIAL FOR QPM CORN GENOTYPES.

Jamilton Pereira Santos[(1)], Paulo Evaristo Oliveira Guimaraes[(1)], Jose Magid. Waquil[(1)], Paulo Afonso Viana[(1)] & Ivan Cruz[(1)]; [(1)] Embrapa Milho e Sorgo, Cx. Postal-151, 35701-970, Sete Lagoas, MG, Brazil.

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Corn is the most widely grown grain crop in Brazil, occupying more than 12 million hectares. Grain storage remains a problem. The maize weevil, *Sitophilus zeamais*, has long been considered one of the most important pests of stored corn grain in Brazil (Santos and Fontes 1990). Mertz et al. (1964) reported the discovery of a corn type with the Opaque-2 (O_2), a mutant gene that changes the protein composition and increases the content of lysine and tryptophan, in the maize endosperm. However, the endosperm of the O_2 gene corn was found to be light and soft (Dimler 1966). The softness of the endosperm caused the O_2 maize to be very attractive to the stored grain pest (Ortega 1974). To solve this problem, researchers in CYMMIT, Mexico, transferred the O_2 gene to corn with normal kernels. This new type of maize was called Quality Protein Maize (QPM). Additional breeding selections made at Embrapa Maize and Sorghum Research Center in Brazil produced some white and yellow color QPM lines and/or hybrids. Many different approaches have been used to evaluate grain for resistance to insects. One technique which seems to be very appropriate for measuring susceptibility was reported and named by Dobie (1974) as Index of Susceptibility (IS). This method is based on the number of progeny from the first generation of insects emerged after a set of females were allowed to oviposit for a fixed number of days on test material and on the developmental period (egg to adult) of this progeny. The objective of this research was to evaluate a selected group of QPM experimental genotypes in relation to the susceptible check, IAC- I O_2 IV, from the germplasm bank and BR-106 a commercial variety for genetic resistance to the maize weevil.

This research was conducted at the Embrapa Maize and Sorghum Research Center, Sete Lagoas, MG, Brazil. The seed samples, which had never been treated with insecticide, were placed in the freezer (-15°C) for five days to eliminate any insect infestation. The insects used came from a *S. zeamais* laboratory culture maintained in controlled environment (70% R.H. and 27±0.5°C). Neonate to 5-day-old insects were placed in a small sample of each tested entry to allow them to adjust to the new food source and oviposition site on the experimental materials. The parameter derived from the procedure referred above is the IS and defined as:

$$MDP = \frac{\Sigma (x, y)}{\Sigma x}, \quad \text{and} \quad IS = \frac{\log_e \Sigma x}{MDP} \times 100$$

Where:

MDP = Mean of the Developmental Period

x = Number of insects emerged daily from the F1 generation

y = Number of days from initial infestation to emergence of insects

IS = Index of Susceptibility

The Index of Susceptibility (IS) has been described in detail and found to be correlated with important genetic resistant factors like grain weight loss number of F1 progeny grain hardness and rate of insect increase (Classen et al.1990). The antibiosis and nonpreference were observed acting together as mechanisms of resistance to the maize weevil in corn grain (Santos and Foster 1983), and they would possibly be responsible for the variation of the IS value.

In Table 1 it is possible to see the IS to maize weevil for all genotypes tested. The higher the IS the more susceptible is the genotype. Entries followed by the same letter are not different from one another at the α=0.05 level of significance. The IS value ranked from 7.78 for the CMS 456 to 10.78 for the CMS 28, with the IS for the susceptible check being 9.98. Nine QPM genotypes had the IS lower than the BR 106, the normal endosperm resistant check but other three QPMs had IS higher than the susceptible check. The fact that some QPM genotypes had IS very similar to the normal endosperm resistant check is a very significant result. It is one indication that some of the QPM corn tested, in addition to carrying genes for enhanced protein quality, also carry genes for resistance to maize weevil. This observation opens the possibility to increase the resistance to insect attack by means of specific selection for resistance, since this trait was not included in the breeding process of the QPM hybrids tested. Also, it indicates the possibility to develop QPM commercial hybrids with resistance to stored grain insects in levels compatible with those of the normal endosperm commercial hybrids. It should also be mentioned here that some of these QPM hybrids have yielded as much grain as some of the commercial hybrids tested (EMBRAPA-CNPMS, 1994). Many authors have attempted to explain the genetic resistance in corn grain to maize weevil based on the chemical composition of the grain (Singh and MacCain,1963. Whitney (1973) observed that vitreum endosperm contributed to resistance in corn. Some more recent research on resistance to maize weevil in corn grain (Serratos et al. 1987, 1993; Classen et al. 1990) have discovered that 90% of phenolic acid compounds, mainly in the form of (E)-ferulic acid were found concentrated in the pericarp, testa, and aleurone layer of the seeds, which play a very important role in suppressing weevil development, most possibly due to antibiosis effect. The results observed in this research agree with those reported by Arnason et al. (1992) when they studied one group of QPM genotypes in relation to maize weevil resistance. The ultimate conclusion possible to draw from this research is the discovery of a group of QPM corn that carry genes for resistance to the maize weevil, *S. zeamais*. It can also be said that the QPM corn is not necessarily, or not always, more susceptible to weevil damage than is the normal endosperm type of corn.

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Table 01 - Index of Susceptibility (IS) of some Quality Protein Maize (QPM) from the National Agronomic Performance Trial, tested for genetic resistance to maize weevil. Sete Lagoas, MG, Brazil. 1998.

ORDER	GENOTYPE NAME	INDEX OF SUSCEPTIBILITY (IS)[1]
01	CMS-28	10.78 A
02	CMS-50	10.54 A
03	IAC I O_2 IV[2]	9.98 A
04	BR 106**[3]	9.33 A
05	BR 473	9.23 A
06	CMS- 454	9.15 A
07	CMS-455 CE	9.08 A
08	CMS-52	9.05 A
09	CMS-452	8.64 A
10	CMS-474	8.56 A
11	CMS-476	8.26 A
12	CMS-59	8.10 A
13	CMS-456	7.78 A

[1] Mean followed by the same letter are not significantly different from one another at 0.05 level, according to the Duncan`s Tesst.
[2] Opaque-2 (O_2) genotype maize
[3] Normal endosperm open pollinated maize variety