*Zagazig J. Agric. Res., Vol. 35 No. (6) 2008* 1423-1440

# RELATIVE SUSCEPTIBILITY OF SOME GRAIN VARIETIES TO INFESTATION WITH THE RICE WEEVIL, *SITOPHILUS ORYZAE* (L.)

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*Accepted 12/11/2008*

**ABSTRACT : Thirteen grain varieties belonging to five grain types were evaluated to infestation with the rice weevil, *Sitophilus oryzae* (L.) under no-choice rearing at constant conditions of 30 ± 1 °C. and 70 ± 5% R.H. The tested varieties were Single cross, T.W.C. 352, T.W.C. 327, T.W.C. 325 (maize); Giza 15, Dorado (sorghum); Giza 168, Sakha 93, Gemeza 7 (wheat); Giza 177, Sakha 101 (milled and husked rice) and Sakha 104 (milled rice) and Giza 2000 (barley). To clarify the differences between grain varieties and types as regard resistance, least and mean complete developmental period, number of F1 emerged adults and their sex ratio were determined. Moreover, susceptibility index, % infested grains, number of holes per infested grain and % weight loss were assessed as infestation parameters.**

**The obtained results showed that the differences between tested varieties in respect to number of $F_1$ emerged adults and susceptibility index proved to be statistically highly significant, whereas the other parameters clarified insignificant variations. Barley-Giza 2000 variety was the least susceptible showing the longest least developmental period (58.00 days) and the lowest values of 1.31, 0.40, 0.82 (rel. low), 1.00 and 1.14 for mean number of $F_1$ adult progeny, susceptibility index, % infested grains, mean number of holes per infested grain and % weight loss, successively. On the other hand, sorghum-Giza 15 and Dorado as well as maize – Single cross and T.W.C. 352 indicated high levels of susceptibility having the corresponding values in the ranges of 38.57 – 41.86 days, 23.38 – 43.33 adults / female, 4.43 – 5.31, 13.58 – 64.78%, 1.00 – 1.50 and 2.32 – 10.94% for the abovementioned biological and infestation parameters, respectively.**

**The differences between the tested grain types, proved to be statistically insignificant for mean developmental period and significant for sex ratio of emerged adults, while it was highly significant for the other parameters. According to susceptibility index, barley grains were the most resistant showing the lowest value of 0.40, whereas sorghum grains proved to be the most susceptible indicating the highest index value of 5.15. The other studied biological and infestation parameters nearly confirm the previous conclusion.**

**Key words : Grain, varieties, *Sitophilus oryzae*, susceptibility.**

## INTRODUCTION

Recently, grain breeders throughout the world have developed a very large number of new varieties of graminaceous crops which were bred for yield. Little attention has been paid to the storage qualities of these varieties, but it has been noticed by farmers that certain new varieties are more vulnerable than the traditional ones. The major primary pests are weevils belonging to genus *Sitophilus* especially the rice weevil, *S. oryzae* (L.) which is considered the most injurious due to its ability to fly and attack grains in both field and store (Gomez *et al.*, 1983, Kelany, 1988, Meikle *et al.*, 1998, Gudrups *et al.*, 2001 and Fouad, 2003).

Host plant resistance is considered to be an important part of a sustainable integrated pest management strategy as a safe, cheap and easy control method (Thomas and Waage, 1995, Lasker and Ghosh, 2004 and Ashamo, 2006).

Therefore, the present work has been conducted to study the effect of thirteen grain varieties belonging to five grain types on certain biological aspects and infestation parameters of the rice weevil, *S. oryzae* in order to determine the most and lowest resistant grain varieties. These findings enable geneticists and plant breeders to introduce the characteristics responsible of resistance in the recommended grain varieties having high yield and good quality aiming to gain a more store safe control method against this insect pest.

## MATERIALS AND METHODS

Stock culture of *S. oryzae* was maintained in glass jars containing an amount of wheat grains (Sakha 93 var.) at constant conditions of 30 ± 1°C. and 70 ± 5% R.H. In this investigation, 13 grain varieties belonging to five grain types namely Three way cross 352 (T.W.C. 352), Three way cross 325 (T.W.C. 325), Three way cross 327 (T.W.C. 327), Single cross (maize grains), Giza 15 and Dorado (sorghum grains), Sakha 93, Giza 168, Gemeza 7 (wheat grains), Giza 177, Sakha 101, Sakha 104 (husked and milled rice grains) and Giza 2000 (barley grains). Wheat and rice varieties were supplied by the Genetics Department, Faculty of Agriculture, Zagazig University, whereas those of maize, sorghum and barley were supplied by the Field Crops Research Institute, Agricultural Research Center, Cairo. All grains were heated at 70°C. for continuous six hours to kill any internal insect stages and then conditioned for three weeks at 30 ± 1 °C. and 70 ± 5% R.H (Hassan, 1975).

To study the susceptibility of the tested grain varieties, fifty gramms of each variety were placed separately in half-kg glass jars. Six pairs of *S. oryzae* (one day old) were carefully separated according to Halstead (1963) who stated that rostrum of males is distinctly rough, shorter and wider than that of females, and introduced after marking them to each jar. For each variety, seven replicates were used and kept at 30±1°C. and 70 ± 5% R.H. Adults of the replicates were let in the jars until death. For each treatment, the emergence date of $F_1$ was recorded and the total number of emerged adults was daily counted and sexed. Developmental periods were also recorded for each treatment starting from the first adult emergence (Fouad, 1995). Numbers of total grains, uninfested as well infested and holes were determined for each replicate. Susceptibility index for each variety was calculated according to Howe (1971). Every infested grain sample was weighed at the beginning of the experiment and again at its end after all the insects and all the created dust had been removed to calculate the loss in weight.

All the obtained results were statistically analysed according to complete randomized design and

factorial experiments (Little and Hills, 1975). The proper "F" value was calculated as described by Fisher (1944 and 1950) and Snedecor (1957). To make all possible comparisons between the means of different treatments which proved to be statistically significant, Duncan's (1955) multiple range test was used.

## RESULTS AND DISCUSSION

### Complete Developmental Period

The least and mean complete developmental periods of *S. oryzae* on the thirteen tested grain varieties are presented in Table 1. Statistical analysis of variance clearly indicate that both least and mean developmental periods did not vary significantly according to the different tested varieties. The least developmental period for barley-Giza 2000 variety and rice (milled) – Sakha 101 required 58.00 and 57.14 days, respectively as compared with the other tested grain varieties (ranging from 38.57 days for maize – T.W.C. 352 to 53.14 for milled rice – Giza 177). Concerning the effect of grain type, it is obvious that this effect proved to be highly significant at 0.01 level of probability. The obtained results obviously demonstrate that rice weevil develops more faster on sorghum grains showing the lowest least developmental period of 40.79 days, whereas on barley kernels, the development was slower indicating the prolongest period of 58.00 days. On maize, wheat and rice grains, the insect completed its development in median periods of 43.14, 46.14 and 48.94 days, successively.

With respect to mean developmental period, the results show that although the differences in this biological aspect between the tested grain varieties did not reach significancy degree at 0.05 level of probability, the insect differently developed in a wide range. The tested grain varieties can be arranged according to the mean developmental period into three groups, the first group includes varieties on which the weevils developed faster : husked rice – Giza 177 and Sakha 101 (58.18 and 53.04 days, resp.). The second group contains varieties having median developmental rate : wheat – Gemeza 7, sorghum – Dorado, maize – T.W.C. 325, wheat – Sakha 93, maize – Single cross, maize – T.W.C. 352, milled rice – Sakha 104 and barley – Giza

**Table 1. Effect of some grain varieties belonging to five grain types on certain biological aspects of the rice weevil, *Sitophilus oryzae* (L.) reared at constant conditions of 30 ± 1°C. and 70 ± 5% R.H.**

| Grain varieties | Least developmental period | Mean developmental period | Mean number of emerged adults/ female | Sex ratio (% emerged males) |
|---|---|---|---|---|
| Maize - Single cross | 40.86 | 69.07 | 23.38 dp | 51.93 |
| - T.W.C. 352 | 38.57 | 69.55 | 24.19 cp | 45.64 |
| - T.W.C. 327 | 48.71 | 70.74 | 3.67 ltuw | 49.87 |
| - T.W.C. 325 | 44.43 | 68.50 | 8.24 grs | 50.53 |
| Mean | 43.14 D | 69.49 | 14.87 B | 49.49 D |
| Sorghum - Giza 15 | 39.71 | 71.07 | 43.33 a | 51.31 |
| - Dorado | 41.86 | 64.80 | 26.21 bq | 57.94 |
| Mean | 40.79 E | 67.94 | 34.77 A | 54.62 CE |
| Wheat - Giza 168 | 47.57 | 62.54 | 5.91 iru | 59.46 |
| - Sakha 93 | 44.14 | 69.49 | 11.86 eq | 57.35 |
| - Gemeza7 | 46.71 | 63.06 | 5.81 jstu | 57.40 |
| Mean | 46.14 C | 65.03 | 7.86 C | 58.07 AE |
| Rice (milled) - Giza 177 | 53.14 | 72.25 | 6.50 hrt | 74.44 |
| - Sakha 101 | 57.14 | 76.46 | 1.74 mvw | 70.54 |
| - Sakha 104 | 48.43 | 69.59 | 9.12 fq | 69.06 |
| Rice (husked) - Giza 177 | 39.57 | 58.18 | 4.52 ktuv | 32.33 |
| - Sakha 101 | 46.43 | 53.04 | 1.71 nvw | 53.57 |
| Mean | 48.94 B | 65.90 | 4.72 D | 59.99 A |
| Barley – Giza 2000 | 58.00 | 69.90 | 1.31 ovw | 55.10 |
| Mean | 58.00 A | 69.90 | 1.31 E | 55.10 BE |
| F.test for grain varieties | 0.47 NS | 1.54 NS | 5.52** | 1.42 NS |
| F.test for grain types | 7.45** | 0.98 NS | 69.48** | 2.65* |

| | F. 0.05 | F. 0.01 |
|---|---|---|
| - Grain varieties | 1.82 | 2.32 |
| - Grain types | 2.48 | 3.56 |

- Means followed by similar letters indicate that the differences between means are not significant at 0.05 level of probability.
- NS indicate that the differences between means are not significant at 0.05 level of probability.
- * indicates that the differences between means are significant at 0.05 level of probability.
- ** indicate that the differences between means are highly significant at 0.01 level of probability.

Small letters were used to distinguish the significance between grain varieties' whereas capital ones were used for grain types.

2000 showing intermediate mean complete developmental periods ranged between 63.06 and 69.90 days. The third group is represented by varieties on which the insect developed more slowly : maize – T.W.C. 327 (70.74 days), sorghum – Giza 15 (71.07), milled rice-Giza 177 (72.25) and milled rice – Sakha 101 (76.46). The present results clearly prove that the differences between mean complete developmental periods of the five tested types of grains were not significant at 0.05 level of probability. The tested types of grains can be arranged according to their suitability to rice weevil development as follows : wheat, rice, sorghum, maize and barley showing mean developmental periods of 65.03, 65.90, 67.94, 69.49 and 69.90 days, consecutively.

The obtained results agree with those of Adetunji (1988), Kucerova and Stejskal (1994), Gursharan – Singh *et al.* (1998), Gupta *et al.* (1999), Gudrups *et al.* (2001), Ruchira-Tiwari *et al.* (2002), Fouad (2003), Gharib and El-Lakwah (2005) and Piasecka-Kwiatkowska *et al.* (2005) who reported that the complete developmental period of three species of grain weevils (*Sitophilus oryzae, S. granarius* and *S. zeamais*) varied according to variety of different grain types; wheat, maize, sorghum, rice and barley.

**Mean Number of Emerged Adults/Female**

The results given in Table 1 revealed that mean number of $F_1$ emerged adults of rice weevil, reared for one generation on thirteen different grain varieties belonging to five grain types. Statistical analysis of variance of the results using F. test proved that the differences between both grain varieties and types were highly significant at 0.01 level of probability. With regard to the varietal effect, it is clear that the insect was more fecund on sorghum – Giza 15 variety showing the highest mean number of emerged adults per female (43.33). On the other hand, grains of barley – Giza 2000 proved to be unsuitable for insect growth indicating the lowest mean number of emerged adults of 1.31 adults/female. The other tested varieties occupy a median rank between the two aforementioned limits to clarify an intermediate rate of the mean number of emerged adults ranging from 1.71 adults/female for husked rice – Sakha 101 to 26.21 for sorghum – Dorado.

In respect of the differences in the mean number of emerged adults between the five tested grain types, the obtained results clearly reveal that grain types can be ascendingly arranged according to their suitability for insect development and growth as follows : barley, rice, wheat, maize and sorghum indicating mean number of emerged adults per female of 1.31, 4.72, 7.86, 14.87 and 34.77, respectively.

Similar results were recorded by some authors such as Nawrot (1981), Adetunji (1988), Singh *et al.* (1991), Fouad (2003), Lasker and Ghosh (2004), Gharib and El-Lakwah (2005), Arong and Njila (2006) and Ashamo (2006) working on *Sitophilus oryzae, S. granarius* and *S. zeamais* when reared on the different grain varieties of wheat, maize, sorghum, rice and barley. They found that grain variety of each type greatly affected the number of $F_1$ emerged adults for each insect species.

**Sex Ratio of Emerged Adults**

As clearly shown in Table 1, the sex ratio of *S. oryzae* $F_1$ adults was calculated as adult male percentage from the total number of emerged adults for both sexes. In regard to the impact of grain variety on the sex ratio of emerged adults, the obtained results obviously revealed that this biological criterion did not respond significantly in different tested varieties, whereas the differences between the five tested grain types reached significancy degree at 0.05 level of probability. Regardless of insignificancy between different tested varieties in the sex ratio of emerged adults, the percentages of emerged males may be put in a somewhat wide range from 32.33% for husked rice – Giza 177 to 74.44% for milled rice of the same variety. This means that the husk of rice grain greatly affected the sex ratio of emerged adults when rice weevil were reared on husked and milled grains. The previous observation can be demonstrated as the sex ratios of emerged adults; 74.44, 70.54 and 69.06% of emerged males for milled rice Giza 177, Sakha 101 and Sakha 104, meanwhile they were lowest being 32.33 and 53.57% for the first two varieties when rice grains were husked. The other tested grain varieties varied in sex ratio of emerged adults showing the lowest percentage of emerged males (51.31) with

sorghum – Giza 15 and the highest one (59.46) with wheat – Giza 168. The other tested grain varieties gave intermediate percentages of emerged males.

Concerning the differences in *S. oryzae* sex ratio between the five tested grain types, the obtained results obviously indicate that the highest percentages of emerged males were 58.07% for wheat grains and 59.99% for rice grains. However the lowest one of 49.49% in favour of females population was detected with maize grains. The other tested grain types showed median values of sex ratio being 54.62 and 55.10% of emerged males in case of sorghum and barley grains, consecutively.

The present results in agreement with the findings obtained by Borikar and Jayde (1979) in India who stated that an overall higher percentage of *Sitophilus oryzae* females was observed on the majority of sorghum varieties tested. Moreover, in Belgium, Rodriguez-Cobos *et al.* (1990) mentioned that the sex ratio of $F_1$ progeny of *S. granarius* developing on ten wheat varieties varied from one variety to another.

**Susceptibility Index**

Varietal resistance of the thirteen tested grain varieties belonging to five grain types to the rice weevil was assessed as a susceptibility index depending on the complete developmental period and the mean number of emerged adults for each variety. The results concerning this infestation parameter are given in Table 2. Statistical analysis of variance obviously reveal that both grain variety and type had highly significant effect on grain susceptibility index to rice weevil at 0.01 level of probability. From the present results, it is very obvious that the most resistant variety of the tested grains was barley – Giza 2000 having the lowest value of susceptibility index of 0.40. On the other hand, sorghum – Giza 15 grain variety proved to be more vulnerable to infestation with rice weevil showing the highest susceptibility index of 5.31. The other tested varieties showed intermediate values for this infestation parameter ranging from 0.65 for milled rice – Sakha 101 to 4.56 for maize – T.W.C. 352.

As regards the variance between the five tested grain types in their susceptibility index, it is

**Table 2. Effect of some grain varieties belonging to five grain types on certain infestation parameters of the rice weevil, *Sitophilus oryzae* (L.) reared at constant conditions of 30 ± 1°C. and 70 ± 5% R.H.**

| Grain varieties | Susceptibility index | % infested grains | Mean number of holes per infested grain | % weight loss |
|---|---|---|---|---|
| Maize - Single cross | 4.43 cp | 64.78 | 1.30 | 10.67 |
| - T.W.C. 352 | 4.56 bop | 48.14 | 1.50 | 10.94 |
| - T.W.C. 327 | 1.76 k | 12.72 | 1.42 | 5.39 |
| - T.W.C. 325 | 2.99 fqrs | 27.20 | 1.31 | 7.23 |
| Mean | 3.43 B | 38.21 A | 1.38 A | 8.56 A |
| Sorghum - Giza 15 | 5.31 a | 20.85 | 1.00 | 7.50 |
| - Dorado | 4.99 ao | 13.58 | 1.00 | 2.32 |
| Mean | 5.15 A | 17.22 B | 1.00 EF | 4.91 B |
| Wheat - Giza 168 | 2.49 istu | 2.22 | 1.00 | 2.58 |
| - Sakha 93 | 3.20 dq | 6.49 | 1.01 | 2.68 |
| - Gemeza7 | 2.44 jtu | 4.28 | 1.00 | 2.12 |
| Mean | 2.71 C | 4.33 CF | 1.00 DF | 2.46 CF |
| Rice (milled) - Giza 177 | 2.55 hru | 1.90 | 1.02 | 1.25 |
| - Sakha 101 | 0.65 mvw | 0.42 | 1.07 | 0.27 |
| - Sakha 104 | 3.06 eqr | 2.41 | 1.01 | 1.91 |
| Rice (husked) - Giza 177 | 2.63 grt | 0.75 | 1.02 | 5.56 |
| - Sakha 101 | 0.97 lv | 0.27 | 1.09 | 1.95 |
| Mean | 1.97 D | 1.15 EF | 1.04 B | 2.19 DF |
| Barley – Giza 2000 | 0.40 nw | 0.82 | 1.00 | 1.14 |
| Mean | 0.40 E | 0.82 DF | 1.00 CF | 1.14 E |
| F.test for grain varieties | 2.40** | 1.76 NS | 0.72 NS | 1.28 NS |
| F.test for grain types | 35.08** | 46.39** | 37.83** | 27.10** |

| | F. 0.05 | F. 0.01 |
|---|---|---|
| - Grain varieties | 1.82 | 2.32 |
| - Grain types | 2.48 | 3.56 |

clear that their resistance can be arranged descendingly as follows : barley, rice, wheat, maize and sorghum showing susceptibility indices of 0.40, 1.97, 2.71, 3.43 and 5.15, respectively.

These findings are in harmony with those recorded by some investigators such as Dobie and Kilminster (1978), Nagarajaiah (1984), Kucerova and Stejskal (1994), Thakur (1999), Fouad (2003), Gharib and El-Lakwah (2005) and Ashamo (2006). They reported that the susceptibility indices of different varieties belonging to the grain types of wheat, triticale, maize, barley, rice and sorghum to infestation with *Sitophilus oryzae, S. granarius* and *S. zeamais* vary in different grain varieties and types according to their resistance degree against insect infestation.

**Percentage of Infested Grains**

The percentage of infested grains with rice weevil counted in different tested varieties can be considered as an infestation parameter. Regarding the varietal susceptibility, the data compiled in Table 2 show that the differences between tested varieties in their percentage of infested grains due to infestation with rice weevil did not reach significancy degree at 0.05 level of probability. In spite of this insignificant impact, the tested grain varieties can be arranged in three distinct groups as follows : the first group is represented by the less susceptible varieties; husked and milled rice – Sakha 101, husked rice – Giza 177, barley – Giza 2000, milled rice – Giza 177 and wheat – Giza 168 showing the lowest percentages of infested grains of 0.27, 0.42, 0.75, 0.82, 1.90 and 2.22%, susccessively. The second group includes the varieties having a median degree of resistance; wheat – Gemeza 7 and Sakha 93, sorghum – Dorado and Giza 15, and maize – T.W.C. 327 and T.W.C. 325 indicating moderate percentages of infested grains ranging between 4.28 and 27.20%. The third group comprises the two more susceptible varieties of maize – Single cross and T.W.C. 352 having the highest percentages of infested grains (64.78 and 48.14%, resp.).

From the obtained results given in Table 2, it is worthy to mention that the differences between grains of the five tested types regarding the percentage of infested grains as an infestation parameter to rice weevil proved to

be statistically highly significant at 0.01 level of probability. The results clearly indicate that barley grains were less susceptible to infestation with rice weevil showing the lowest percentage of infested grains of 0.82%, followed by rice (1.15), and by wheat (4.33). Maize grains proved to be the most susceptible to this insect pest having the highest percentage of infested grains (38.21), whereas sorghum grains were moderately susceptible showing a median percentage of infested grains of 17.22%.

Many authors such as Borah and Mohan (1982), Omar and Kamel (1984), Levchenko and Imshenetskii (1991), Reddy *et al.* (2002), Fouad (2003), Lasker and Ghosh (2004), Gharib and El-Lakwah (2005) and Ashamo (2006) reached findings that agree with the present results. They noticed that the percentage of infested grains of wheat, maize, barley, sorghum, rye, triticale, millet and rice with *Sitophilus oryzae* and *S. zeamais* in different countries varied from one grain variety or type to another according to their susceptibility to infestation in stores.

**Mean Number of Holes Per Infested Grain**

The results in Table 2 reveal the effect of grain varieties on the mean number of holes per infested grain as an infestation indicator to *S. oryzae* proved to be not significant at 0.05 level of probability. In the meantime, the differences concerning this infestation parameter between grains of the five tested types were highly significant at 0.01 level of probability. Maize varieties showed the highest means of 1.30, 1.50, 1.42 and 1.31 holes / infested grain, whereas the lowest ones ranging from 1.00 to 1.09 were detected with the other tested varieties.

In respect of the influence of grain type, it is clear that the highest mean of 1.38 was found with maize, meanwhile the lowest one of 1.00 was recorded with grains of sorghum, wheat and barley. Rice grains had somewhat intermediate mean numbers of holes per infested grain (1.04).

Similar results were obtained by Kurdikeri *et al.* (1995) who stated that there was a significant differences in grain damage resulting from holes of insect

emergence between five tested maize hybrids when were artificially infested with *Sitophilus oryzae.*

**Percentage of Weight Loss**

The preferability of each grain variety or type to infestation with rice weevil can be judged on the basis of the weight loss percentage. From the results presented in Table 2, it is clear that the differences between % weight loss of the tested thirteen grain varieties were statistically insignificant, whereas those respecting grain types proved to be highly significant. The weight loss percentage was higher for maize – Single cross and T.W.C. 352 varieties (10.67 and 10.94%, resp.) as compared to the other tested varieties ranging from 1.14% for barley – Giza 2000 to 7.50% for sorghum – Giza 15.

With regard to the impact of grain type on weight loss percentage, the present results clearly reveal that they can be arranged descendingly according to their weight loss as follows : maize, sorghum, wheat, rice and barley showing 8.56, 4.91, 2.46, 2.19 and 1.14% weight loss.

The present results are in agreement with those obtained by some authors such as Borikar and Jayde (1979), Omar and Kamel (1984), Levchenko and Imshenetskii (1991), Kucerova and Stejskal (1994), Balakai (1998), Saljoqi *et al.* (2002), Fouad (2003), Lasker and Ghosh (2004), Gharib and El-Lakwah (2005) and Ashamo (2006) working on the varietal resistance of the different types of grains of wheat, maize, sorghum, barley, millet, triticale, rye and rice against *Sitophilus oryzae* and *S. granarius*. They mentioned that there was a great variance in weight loss of grains due to infestation with *Sitophilus* weevils among the different tested varieties of each grain type as well among the tested grain types.

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# القابلية النسبية لإصابة بعض أصناف الحبوب بسوسة الأرز

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تم تقييم ثلاثة عشر صنفاً من الحبوب تابعة لخمسة أنواع للإصابة بسوسة الأرز تحت ظروف التربية الإجبارية وفى ظروف ثابتة من حيث درجة الحرارة (٣٠ ± ١ °م) والرطوبة النسبية (٧٠ ± ٥%). تمثلت الأصناف المختبرة فى أربعة أصناف من الذرة (هجين فردى ، هجين ثلاثى ٣٥٢ ، هجين ثلاثى ٣٢٧ وهجين ثلاثى ٣٢٥) ، صنفان ذرة رفيعة (جيزة ١٥ و دورادو) ، ثلاثة أصناف قمح (جيزة ١٦٨ ، سخا ٩٣ وجميزة ٧) ، ثلاثة أصناف أرز (جيزة ١٧٧ ، سخا ١٠١ وسخا ١٠٤) والشعير صنف جيزة ٢٠٠٠. لإظهار الفروق بين أصناف الحبوب وكذلك أنواعها من حيث مقاومتها للإصابة ، تم تقدير أقل ومتوسط فترة النمو كاملة ، عدد الحشرات الكاملة الخارجة فى الجيل الأول ونسبتها الجنسية. بالإضافة إلى ذلك ، فقد قدرت بعض مقاييس الإصابة والتى تمثلت فى معامل الإصابة ، النسبة المئوية للحبوب المصابة ، عدد ثقوب خروج الحشرات الكاملة فى الحبة المصابة والنسبة المئوية للفقد فى الوزن بسبب الإصابة.

أوضحت النتائج المتحصل عليها أن الفروق بين الأصناف المختبرة من حيث عدد الحشرات الكاملة الخارجة ومعامل الإصابة ثبت أنها كانت عالية المعنوية إحصائياً ، بينما أظهرت المقاييس الأخرى إختلافات غير معنوية. تبين أن صنف الشعير جيزة ٢٠٠٠ هو الأقل قابلية للإصابة حيث أظهر أطول فترة نمو (٥٨ يوماً) وكذلك أقل قيمة ١,٣١ ، ٠,٤٠ ، ٠,٨٢ (نسبياً) ، ١,٠٠ و ١,١٤ لمتوسط عدد أفراد الذرية من الحشرات الكاملة ، معامل الإصابة ، النسبة المئوية لإصابة الحبوب ، متوسط عدد الثقوب فى الحبة المصابة والنسبة المئوية للفقد فى وزن الحبوب. وعلى الجانب الآخر أظهرت حبوب الذرة الرفيعة صنفى جيزة ١٥ ودورادو وكذلك صنفى الذرة الشامية هجين فردى وهجين ثلاثى ٣٥٢ درجات عالية للقابلية للإصابة حيث أظهرت قيم مقابلة للقياسات السابقة تمثلت فى المدى ٣٨,٥٧ – ٤١,٨٦ يوماً ، ٢٣,٣٨ – ٤٣,٣٣ حشرات كاملة / أنثى ، ٤,٤٣ – ٥,٣١ ، ١٣,٥٨ – ٦٤,٧٨% ، ١,٠٠ – ١,٥٠ و ٢,٣٢ – ١٠,٩٤ ؛ على التوالى.

بخصوص الإختلافات بين أنواع الحبوب ، فقد وجد أنها كانت غير معنوية لمتوسط فترة النمو ، معنوية للنسبة الجنسية للحشرات الكاملة الخارجة وعالية المعنوية للمقاييس الأخرى. طبقاً لمعامل الإصابة ، إتضح أن حبوب الشعير هى الأكثر مقاومة للحشرة حيث أظهرت أقل قيمة لهذا المعامل (٠,٤٠) ، بينما كانت حبوب الذرة الرفيعة هى الأكثر قابلية للإصابة لأن لها أعلى قيمة للمعامل (٥,٣١). لوحظ أن المقاييس الأخرى البيولوجية وكذا الخاصة بالإصابة كانت تؤكد هذه النتيجة تقريباً.