

**RELATIVE SUSCEPTIBILITIES OF RICE VARIETIES TO  
THE RICE STEM BORER, *CHILO AGAMEMNON* BLES.  
(LEPIDOPTERA: CRAMBIDAE) AND RICE LEAF  
WHORL MAGGOT; *HYDRELLIA PROSTERNALIS*  
DEEMING (DIPTERA : EPHYDRIDAE) INFESTATIONS**

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**Abstract**

The relative susceptibilities of certain rice varieties to infestation with the rice stem borer *Chilo agamemnon* Bles. and rice leaf miner *Hydrellia prosternalis* Deem. was studied in field experiments carried out in 1997 and 1998 at Serw, Damietta Governorate, for two successive rice growing seasons.

- 1. Monitoring the resistance or rice varieties against the rice stem borer *Chilo agamemnon* Bles:** Rice varieties differ in their susceptibility or resistance to the infestation by the rice borer at different stages of rice plant growth. Sakha 101 and Sakha 102 were the least susceptible in the tillering stage than in the flowering stage 2.2 and 2.8 to 3.8 and 5.0, respectively. Giza 178, Giza 176 and Giza 181 demonstrate moderate infestation levels, while Giza 177, Giza 175 and Giza 11 were comparatively high susceptibility.
- 2. Role action (preferendum) and reflex action (antibiosis) between rice varieties to infestation and *Hydrellia prosternalis* Deem infestations:** Tested rice varieties were classified according to damage leaf into the following three groups:
  - a. Less susceptible: Giza 177, Giza 178 and Giza 175, mean infestation were ranged between with an average of 54 %
  - b. Moderately susceptible: Sakha 102 and Sakha 101, mean infestation averaged of 76 %.
  - c. Highly susceptible: Giza 178, Giza 181 and Giza 176, mean infestation with an average infestation of 86%.

## INTRODUCTION

Rice stem borer *Chilo agamemnon* Bles. and rice leaf miner *Hydrellia prostermalis* Deem. are considered key insect pests that causing considerable range and reliable losses in rice crop varieties yearly. Selection of resistant varieties is an important item in IPM field. These variations due to (1) plant growth stage; (2) hardness and thickness of the both sheath and stem at different growth stages; (3) It is a well known fact that sclerenchymatous which is developed with hardness characteristics at advanced stage.

Varietal resistance to rice stem borers were studied in Egypt by several authors (Catting and Islam, 1981; Tantawi, 1982; Chandhary *et al.*, 1984; Tantawi, 1989; Soliman, *et al.* 1997).

Resistance of rice varieties to the rice whorl maggot was studied by Issa *et al.*, 1979, Ismail *et al.*, 1979, Pathak 1981, Tantawy 1989 Abdallah 1995 and soliman 1997.

The present work was carried out to study the relationship between rice stem borer and leaf miner infestations to certain local and foreign breeding rice varieties.

## MATERIALS AND METHODS

### A. Relative susceptibility of certain rice varieties to rice stem borer *Chilo agamemnon* Bles. Infestations

A field trial was conducted at the El Serw Agricultural Experiment Station, Domietta Governorate in 1997 and 1998 crop seasons. A field about  $1/2$  feddan, for each season was divided into 32 plots of 42 sq. m each. Eight rice varieties were sown on May 15 and transplanted 30 days later. Each variety was planted in 4 replicates in a randomized complete block design. All agricultural practices were done as usually practiced. Varieties were exposed to natural borer infestation in the field. Samples of 40 hills were taken at random from each variety (ten hills/replicate) and the dead hearts or white head symptoms were counted. Percentages of dead hearts and white head were recorded separately as different varieties may respond differently to bore infestation at different stages of rice plant growth.

### **B. Relative susceptibility of rice varieties of *Hydrellia prosternalis* Deem infestations**

Monitoring the tested varieties for *Hydrellia prosternalis* infestations, rice varieties were sown late on 15<sup>th</sup> of June and transplanted 30 days later. The field was divided into 32 plots 42 sq. m. each. The seedlings of each variety were distributed in 4 plots in a complete randomized block design. Sampling was conducted in 4<sup>th</sup> week of July until 4<sup>th</sup> week of September. One hundred tillers taken weekly, at random from each studied variety, were examined for the leaf miner infestation.

The percentage of infested leaves was calculated. The average number of mines per leaf was estimated. Damage of infestation was calculated by the following formula :

$$\text{D.L.A.} = \% \text{ infestation} \times \text{mean number of mine/leaf} \times \text{mean length mine.}$$

A ratio correlation co-efficient values were estimated between rice varieties and infestation levels.

Analysis of variance to determine whether or not there were significant differences between different varieties and grouped for its relative susceptibility to the purple lind borer *Chilo agamemnon* Bles. and rice leaf miner *Hydrellia prosternalis* Deem. according to L.S.D. values.

## **RESULTS AND DISCUSSION**

### **A. Screening relative susceptibility of varieties to rice stem borer *Chilo agamemnon* Bles.**

Rice plant varieties differ in their susceptibility or resistance to the infestation by the rice borer at different stages of their growth. Sakha 101 and Sakha 102 were less susceptible in the tillering stage than in the flowering stage 2.4 and 2.8 to 3.5 and 5.0 with an average of 2.6 and 4.3 in 1997 and 1998, respectively.

Giza 178, Giza 176 and Giza 181 were moderately infested susceptible in the tillering stage. On the other hand, Giza 171, Giza 176 and Giza 178 were moderately susceptible in flowering stage, while Giza 177, Giza 175 and Giza 171 were highly suscep-

tible in tillering stage. It means that some tested varieties were resistant during one stage, but susceptible during another, while others were resistant or susceptible during the two stage, Pathac (1967) stated that, in general, Indica varieties were more susceptible during dead heart than Japonica varieties. Tantawi *et al.*, (1989) added that, percentages of dead hearted plants in rice varieties were lower than as white head. On the other hand, susceptibility of different rice varieties to stem borer *Chilo agamemnon* Bles. and whorl maggot *Hydrellia prosternalis* Deem was independent of each other. Soliman *et al.* (1997) stated that protein increased rice stem borer infestation in most rice entries with positive correlation, while decreased rice leafminer in most rice entries with negative correlation. But, Silica decreased infestation of both with negative correlation.

#### **B. Relationship between different varieties of rice and percentage of damaged leaf area (D.L.A.) caused by rice leafminer (R.L.A.) *Hydrellia prosternalis* Deem**

Statistical analysis of the data derived from the two seasons showed high significant differences between varieties Giza 178, Giza 181 and each of Giza 177 and Giza 171, while only significant differences were shown between Sakha 101, Sakha 102, Giza 175 and Giza 178, 181, 176. On the other hand, differences between Giza 171, Giza 175, Sakha 102 were not significant.

These data were in agreement with the finding of Zaazou *et al.* (1970) in China, Andrea (1975), Tantawi *et al.* (1989) in Egypt. They found that the rice leaf miner infestation was comming on the height of plants was positive, Giza 181 was more susceptible to this pest and Giza 175 was moderate. Ali *et al.* (1997) mentioned that protein increased rice stem borer (RSB) infestation in most entries, while decreased (RLM), rice leafminer, infestation in it, Silica decreased infestation of both (RSB and RLM). Table 1. Japonica entries showed more resistance against (RLM) insects and higher protein content.

Finally, the relationship between D.L.A. and densities of infestation by *Hydrellia prosternalis* Deem was positive and highly significant ( $r = + 0.9548^{**}$ ). On the other hand, the unit effect, regression co-efficient indicate that an increase of infestation by 1% increase the damage of leaf area (DLA) was + 0.25 cm.

Table 1. Relationship between dead leaf area (D.L.A.) and variable densities of infestation of *Hydrellia prosternalis* Deem on different rice varieties.

| Varieties | Dead leaf area (D.L.A.) |       |        |          | Densities of infestation |       |       |       |
|-----------|-------------------------|-------|--------|----------|--------------------------|-------|-------|-------|
|           | 1997                    | 1998  | Total  | Mean     | 1997                     | 1998  | Total | Mean  |
| Giza 177  | 56.66                   | 36.53 | 93.19  | 46.60 a  | 24.72                    | 17.09 | 41.81 | 20.91 |
| Giza 171  | 72.20                   | 37.13 | 109.33 | 54.67 a  | 25.09                    | 17.20 | 42.29 | 21.15 |
| Giza 175  | 73.30                   | 45.31 | 118.61 | 59.31 a  | 28.94                    | 17.24 | 46.18 | 23.09 |
| Sakha 102 | 81.10                   | 51.90 | 133.00 | 66.50 ab | 29.90                    | 18.00 | 47.90 | 23.95 |
| Sakha 101 | 91.30                   | 54.15 | 145.45 | 72.73 ab | 32.09                    | 19.36 | 51.45 | 25.73 |
| Giza 178  | 110.20                  | 61.30 | 171.50 | 85.75 b  | 32.18                    | 20.63 | 52.81 | 26.41 |
| Giza 181  | 114.60                  | 63.55 | 178.15 | 89.08 b  | 35.09                    | 23.36 | 58.45 | 29.23 |
| Giza 176  | 115.30                  | 63.85 | 17.15  | 89.56 b  | 36.18                    | 25.18 | 61.36 | 30.68 |

Mean followed by the same letter are not significantly different ( $P=0.05$  (Cuncan's multiple range test, 1950)).

Table 2. The changes in the infestation levels of dead heart (D.H.) plants and white head (W.H.) for certain rice varieties tested to the rice stem bore *Chilo agamemnon* Bles. (El Serw, 1997 and 1998 seasons) Domietta Governorate.

| Rice varieties | Plant type  | D.H. |      |      | W.H. |      |      |
|----------------|-------------|------|------|------|------|------|------|
|                |             | 1997 | 1998 | Mean | 1997 | 1998 | Mean |
| Giza 171       | Japonica    | 6.7  | 5.8  | 6.0  | 6.3  | 6.1  | 6.2  |
| Giza 175       | Indian      | 6.7  | 5.1  | 5.9  | 9.8  | 8.6  | 9.2  |
| Giza 176       | Japonica    | 4.1  | 3.9  | 4.0  | 6.3  | 6.1  | 6.2  |
| Giza 177       | Japonica    | 5.2  | 4.9  | 5.1  | 8.6  | 7.3  | 8.0  |
| Giza 178       | Japo., Ind. | 3.9  | 3.4  | 3.7  | 6.7  | 5.9  | 6.3  |
| Giza 181       | Indian      | 5.6  | 4.0  | 4.8  | 8.9  | 7.1  | 8.0  |
| Sakha 101      | Japonica    | 2.4  | 2.8  | 2.6  | 3.5  | 5.0  | 4.3  |
| Sakha 102      | Japonica    | 3.2  | 2.0  | 2.6  | 5.1  | 4.1  | 4.6  |

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حساسية الأصناف المختلفة للارز للإصابة بكل من ثاقبة ساق الارز  
*CHILO AGAMEMNON BLES.* وصانعة الأنفاق *HYDRELLIA*  
*PROSTERNALIS DEEM* فى أوراق الأرز فى مصر

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زرعت الأصناف الثمانية المختبرة حوالى منتصف مايو وشتلت بعد ٣٥ يوماً وذلك بمحطة  
البحوث الزراعية بالسرو (محافظة دمياط) لدراسة رد فعلها للإصابة بحشرتى

١- ثاقبة الساق *Chilo agagemnon Bles*

أ- وجد أيضاً فروق معنوية بين الأصناف المختبرة فيما تختص بقابليتها للإصابة أو المقاومة بثاقبة  
ساق الأرز.

ب- لوحظ أن القابلية للإصابة بثاقبة الساق تختلف حسب مرحلة نمو نبات الأرز نفسه حيث أن  
بعض الأصناف تكون قابلة للإصابة خلال مرحلة النمو الأخضر إلا أنها تكون مقاومة خلال مرحلة  
التزهير أو العكس.

ج- أظهرت الأصناف اليابانية أكثر مقاومة للإصابة فى حين ان الأصناف الهندية كانت أكثرها  
قابلية للإصابة بثاقبة الساق وبالتالي فإن احلال بعض أهم هذه الأصناف مستقبلاً يعتبر خطوة  
هامية فى طريق المقاومة المتكاملة لهاتين الأفتين.

٢- صانعة الأنفاق فى الأوراق *Hydrellia prosternalis Deem*

أمكن تقسيم الأصناف إلى ثلاث مجموعات من حيث درجة قابليتها النسبية للإصابة

المجموعة الأولى : اقل الأصناف قابلية للإصابة  
المجموعة الثانية : أصناف متوسطة الإصابة  
المجموعة الثالثة : أصناف شديدة القابلية للإصابة

وقد كان الارتباط موجب وعالى المعنوية حيث كانت  $r = +0.9548$  \*\* حيث متوسط درجة  
الإصابة ونسبة التلف فى الأوراق المعرضة للإصابة بصانعة الأنفاق وبقياس درجة الانحدار وجد أنه  
بزيادة درجة الإصابة ١٪ أدى الى زيادة نسبة التلف فى الأوراق الى حوالى ٠.٢٥ سم.