VARIETAL RESISTANCE : FIFLD EVALUATION AND SCREENING OF CERTAIN RICE MATERIALS AGAINST THE RICE LEAF MINER, *HYDRELLIA PROSTERNALIS* DEEM. AND ROLE OF SOME FACTORS IN PLANT RELATIVE RESISTANCE

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Abstract

This investigation was carried out on forty one commercial rice varieties and promising lines to evaluate their relative resistance and select some against rice leaf miner; *Hydrellia prosternalis* Deem., and role of some factors in this resistance . It proved that :

- Entries ; Giza 172, LR 25571-31-1, GZ 3766-38-1-2, GZ 4127-2-1-3, ,GZ 4255-6-1 and GZ 4294-10-2 were relatively the most resistant (least preferred) entries to rice leaf miner infestation showing 0.13,0.14,0.15,0.16 and 0.19 % , respectively, as damaged leaf area (DLA%) which is the most accurate parameter for the miner damage. On the other hand, Giza 180, Giza 181, GZ 4255-6-3, Giza 171, Giza 175, GZ 4386-34-3 and Yabani 15 were relatively the most susceptible (Most preferred) entries showing 0.41, 0.47, 0.51, 0.52, 0.56, 0.58 and 0.62%, respectively. As based on the percentage of the infested leaves (IL %), as the most common and easiest parameter, GZ 4127-2-1-3, GZ4294-9-4 AND GZ 4255-9-1 entries were relatively the most resistant (least preferred) showing 18, 18.6 and 19.1%, respectively, as compared to Giza 171 of 33.6%. As based on the number of mines/leaf, GZ 3766-38-1-1 and GZ 4249-4-9 entries were the most resistant showing 0.29 and 0.33, while Giza 171 of 1.09 was the most susceptible one. Using the damaged area/leaf as a parameter, GZ 4294-10-2 was the most resistant entry showing 2.63 mm compared to Yabani 15 of 9.63 mm/leaf .

When overall resistance or susceptibility indices (ORSI); as a collective measure for all used parameters was calculated, GZ 4127-2-13, Todorpkiwase, GZ 4255-6-1, GZ 3766-38-1-1 and GZ 4294-9-4 were highly resistant entries as compared with Giza 176 the most common variety in Egypt.

The behaviour of some entries differed as sowing date differed. Most entries sown on the recommended date (mid May) suffered less damage than those sown on the late date.

Rice entries may differ in their susceptibility to the infestation by the rice leaf miner at different stages of the rice plant growth. In gernerал, entries reaction to infestation at both stages was found to be independent of each other; most of the tested rice entries were more susceptible during the tillering stage than heading stage.

In most entries, the percentage of infestation was affected by the leaf area. There was a positive relationship between them.

Entries of japonica or indica source (exotic) were less infested with the rice stem borer than the commerical (local) varieties.

In general, plant type, sowing date, growth stage, and leaf area play effective role in the relative resistance of rice plant against rice leaf miner infestation.

INTRODUCTION

Rice is the most important food crop of almost the entire population in Egypt, and about one million feddans are yearly grown allover the country.

Out of about forty insects found in rice field, the rice leaf miner, Hydrellia prosternalis Deeming is one of the most serious on rice plant .

Varietal resistance is one of the most important tool in integrated pest management (IPM) system that aims at depressing the infestation under the economic level. Field evaluation of plant resistance is one of the three bases (field, laboratory biological and chemical evaluation) that varietal resistance is established on. Field evaluation for the relative susceptibility of rice entries through entomology program is useful to the plant breeder. It helps in selecting and producing more resistant materials that can be used in developing less susceptible and higher yielding rice varieties.

This investigation aims at evaluation of forty one of the currently recommended varieties and these considered promising for their relative resistance against the rice leaf miner infestation and hence, selecting and presenting more resistant rice materials to the breeder. These resistant varieties are one of the most effective and safe items in IPM system for insect control far from insecticides and their dangerous effects. In addition, it aims at studying the effect of source of plant material, area of plant leaf, sowing date and plant growth stage on the relative plant resistance.

MATERIALS AND METHODS

To evaluate the relative susceptibility of forty one different commercial rice varieties (Giza varieties) and promising lines to infestation of the rice leaf miner *Hydrellia prosternalis* Demm., two field experiments were carried out at Agric. Res. St., Sakha, Kafr El-Sheikh Governorate, through 1995 rice season at two different sowing dates. One experiment at the recommended date (15 May) and the other at late date (15 June). For each experiment, the rice seedlings were transplanted 30 days after sowing. The experimental design was complete randomized block, five lines (5 meters length) with 4 replicates for each entry. The whole experimental field received the recommended agronomic practices. Plants were exposed to natural infestation in the field, with no insecticide application .

Samples of 50 leaves were randomly selected from each entry in two different plant stages; tillering and heading (40 and 60 days after transplanting), respectively. The percentage of infested leaves and severity of infestation as an average number of mines/leaf, damaged area (mm) / leaf and damaged leaf area % were calculated. These four used parameters differed according to their ease and accuracy. They were previously mentioned in order from the easiest and least accurate to the most difficult and most accurated parameter. The overall resistance or susceptibility indices (ORSI) of different entries was calculated for each entry, as related to the check entry (Giza 176 as the most common variety), according to Tantawi *et al.* (1989). Also, the average of plant-leaf area for each rice entry was measured. The needed statistical analysis was done .

RESULTS AND DISCUSSION

Results of the relative susceptibility of different entries to the rice leaf miner, Hydrellia prosternalis Deem. infestation are shown in Tables (1 and 7).

Table 1 showed the relative plant resistance as measured by the percentage of infested leaves (IL %), which is the most common and easiest, but least accurate parameter. The average of the two date damage ranged from 18.0 to 33.6% with the average of 24.7%. Most of the tested materials differed considerably from one another in their susceptibility to the rice leaf miner. Among the tested entries, GZ 4127-2-1-3, GZ 4294-9-4, GZ 4255-9-1 and IR 40 were relatively the most resistant entries showing 18.0, 18.6, 19.1 and 19.2% infested leaves, while Giza

Table 1. Percentage of infestation (IL %) as a parameter for evaluating rice entries planted at two different dates against the leaf miner *H.prosternalis* damage at two growth stages.

No.	Entries	% of infested leaves (IL %)								
		Recommend sowing date (15 May)			Late sowing date (15 June)			Average of two dates		
		T	H	Mean	T	H	Mean	T	H	Mean
1	Giza -171	13.3a-d	24.1a	18.7	72.0gh	25.0a-e	48.5	42.7	24. 6	33.6
2	Giza -172	8.4 b-h	5.1fgh	6.8	55.0ag	22.0b-e	38.5	31.7	13.6	22.7
3	Giza -175	17.3 a	21.1ab	19.2	56.0a-h	14.0de	35.0	36.7	17.6	27.1
4	Giza -176	15.2 ab	16.1a-d	15.7	65.0d-h	34.0abc	49.5	40.1	25.1	32.6
5	Giza -181	8.0 c-h	12.0c-g	10.0	69.0fgh	16.0de	42.5	38.5	14.0	26.3
6	GZ-1368-S-5-4	6.0 e-h	17.0abc	11.5	62.0c-h	34.0abc	48.0	34.0	25.5	29.8
7	GZ-4120-205-2	11.0a-f	8.0d-h	9.5	63c-h	15de	39.0	37.0	11.5	24.3
8	IR-25571-31-1	10.0b-g	7.1e-h	8.6	53a-g	27.0a-e	40.0	31.5	17.1	24.3
9	GZ-4565-S-10	17.1 a	12.4c-g	14.8	65.0d-h	22b-e	43.5	41.1	17.2	29.2
10	GZ-4255-6-1	3.0h	6.0fgh	4.5	54a-g	19.0cde	36.5	28.5	12.5	20.2
11	GZ-4255-6-2	7.0d-h	9.0c-h	8.0	57a-h	23.0a-e	40.0	32.0	16.0	24.0
12	GZ-4255-6-3	7.0d-h	12.0c-g	9.5	49.0a-g	23.0a-e	36.0	28.0	17.5	22.8
13	GZ-4255-6-4	6.0e-h	3.0h	4.5	54a-g	28.0a-e	41.0	30.0	15.5	22.8
14	IR -28	9.0b-h	15.0b-e	12.0	48.0a-g	12.0e	30.0	28.5	13.5	21.0
15	GZ-3766-38-1-1	11.1a-f	7.0e-h	9.1	46.0a-f	21.0b-e	33.5	28.6	14.0	21.3
16	GZ-3766-38-1-2	14.0abc	9.0c-h	11.5	47.0a-g	35.0abc	41.0	30.5	22.0	26.3
17	GZ-4565-S-6	10.0b-g	11.0c-h	10.5	61.0b-h	31.0a-d	46.0	35.5	21.0	28.3
18	GZ-4071-16-2-1	14.1abc	7.2e-h	10.7	35.0a	26.0a-e	30.5	24.6	16.6	20.6
19	GZ-4255-3-1	8.0c-h	16.0a-d	12.0	62.0c-h	24.0a-e	43.0	35.0	20.0	27.5
20	GZ-4255-8-1	3.0h	9.1c-h	6.1	51.0a-g	20.0cde	35.5	27.0	14.6	20.8
21	GZ-4255-8-2	10.0b-g	15.1b-e	12.6	52.0a-g	23.0a-e	37.5	31.0	19.1	25.1
22	GZ-4255-9-1	12.0a-e	12.0c-h	11.1	40.0a-d	14de	27.0	26.0	12. 1	19.1
23	GZ-4256-1-1	5.0fgh	12.0c-g	8.5	45.0a-f	18.0cde	31.5	25.0	15.0	20.0
24	GZ-4386-34-3	14.0abc	17.5abc	15.8	51.0a-g	36.0abc	43.5	32.5	26.8	29.7
25	GZ-4122-23-4-2	10.1b-g	17.0abc	13.6	48.0a-g	38.0ab	43.0	29.1	27.5	28.3
26	GZ-4127-2-1-3	9.0b-h	7.0e-h	8.0	40.0a-d	16.0de	28.0	24.5	11.5	18.0
27	GZ-4294-9-4	10.2b-g	6.0fgh	8.1	36.0ab	22.0a-e	29.0	23.1	14.0	18,6
28	GZ-4294-10-2	11.1a-f	7.3e-h	9.2	39.0abc	24.0a-e	31.5	25.1	15.7	20.4
29	GZ-4294-10-4	11.0a-f	6.0fgh	8.5	47.0a-g	18.0cde	32.5	29.0	12.0	20.5
30	GZ-4294-10-5	7.1d-h	13.6b-f	10.4	41.0a-e	26.0a-e	33.5	24.1	19.8	22.0
31	GZ-4256-7-4-7	10.3b-g	11.0c-h	10.7	48.0a-g	28.0a-e	38.0	29.2	19.5	24.4
32	Kagahikari	3.1h	4.0gh	3.6	55.0a-g	40.0a	47.5	29.1	22.0	25.6
33	TKY-1024	7.1d-h	15.0b-e	11.1	51.0a-g	31.0a-d	41.0	29.1	23.0	26.1
34	Zhong Hoa-3	13.2a-d	3.0h	8.1	53.0a-g	31.0a-d	42.0	33.1	17.0	25.1
35	Todorokiwase	5.0fgh	9.1c-h	7.1	56.0a-h	18.0cde	37.0	30.5	13.6	22.1
36	Giza-159	14.0abc	9.0c-h	11.5	66.0e-h	21.0b-e	43.5	40.0	15.0	27.5
37	Giza-180	7.1d-h	13.0b-g	10.1	69.0fgh	36.0abc	52.5	38.1	24.5	31.3
38	IR-40	4.0gh	17.6abc	10.9	44.0a-f	11.0e	27.5	24.0	14.0	19.2
39	Toride-1	12.0a-e	9.0c-h	10.5	56.0a-h	26.0a-e	41.0	34.0	17.0	25.8
40	Telle Hamsa	3.0h	5.1fgh	4.1	68.0fgh	21.0b-e	44.5	35.5	13.1	24.3
41	Yabani-15	12.0a-e	17.2abc	14.6	80.0h	23.0a-e	51.5	46.0	20.1	33.1
	Mean	9.5	11.0	10.3	53.9	24.2	39.1	31.7	17.6	24.7

* Values followed by a common letter are not significantly different at 5% level by DMRT.
T : Tillering stage investigation; H: Heading stage investigation.

171, Yabani 15, Giza 176 and Giza 180 were the most susceptible showing 33.6, 33.1, 32.6 and 31.3%.

As for the plant stage effect, at the tillering stage, the average percentage of the infested leaves for the two sowing dates ranged from 23.1 to 46.0% with an average of 31.7%, while it ranged from 11.0 to 24.2% with the average of 17.6% at the heading stage. Susceptibility of the tested materials were found independent of each other. Israel (1967) stated that factors responsible for resistance to damage resulting from two stages of the plant may be independent. Plant stage and the structure of the plant which differs at different stages is a factor of a chain of factors involving diverse aspects of insect-host relationship .

Rice plants sown on 15 June (late date) received obviously higher leaf miner infestation than those sown on 15 May (recommended date). Percentages of infested leaves for rice entries planted at the recommended sowing date ranged from 3.6 to 19.2% with an average of 10.3%, while those planted at the late date ranged from 27.0 to 52.5% with an average of 39.1%. This result was confirmed by Isa *et al.*, (1979) who found that rice sown during April and early May is less liable to infestation by Hydrellia prosternalis than that sown in late May or early June. Most entries behaved differently as the plant stage differed. Kagahikari and Telle Hamsa changed from relatively resistant at the recommended sowing date to relatively susceptible at the late one. While Giza 181 and Yabani 15 remained relatively susceptible at both sowing dates. This may due to the growth index of entry, climatic conditions and/or the fluctuation of the insect .

Table 2 showed the relative plant resistance as measured by the average number of mines/leaf (M/L). The general average of mines was highest for Giza 171 and Yabani 15 (1.09 and 0.9, respectively),but lowest for GZ 3766-38-1-1 and GZ 4294-9-4 (0.29 and 0.33, respectively). Statistical analysis showed significant differences among the number of mines/leaf of the tested entries

Entries sown at the late date suffered severer damage (0.88) than those sown on the recommended (0.19). Telle Hamsa proved resistant when sown at the recommended date, but susceptible at the late one. Kagahikari changed from resistant to moderately. Suscptibility of other entries did not change by sowing date (Giza 171 as susceptible and GZ 3766-38-1-1 as resistant) .

Resistance to rice leaf miner at tillering and heading stages of rice plant growth was independent of each other. The average numbers of mines at tillering stage

Table 2. Severity of infestation (Av. no-mines/leaf) as a parameter for evaluating rice entries, planted at two different dates, against the rice leaf miner *H.prosternalis* damage at two growth stag-

No.	Entries	% of infested leaves (IL %)								
		Recommend sowing date (15 May)			Late sowing date (15 June)			Average of two dates		
		T	H	Mean	T	H	Mean	T	H	Mean
1	Giza -171	0.20a-f	0.40a	0.30	2.50abc	1.24a	1.87	1.35	0.82	1.09
2	Giza -172	0.18a-f	0.07c	0.13	1.52a-g	0.31bcd	0.92	0.85	0.19	0.53
3	Giza -175	0.19a-f	0.39ab	0.29	1.32b-g	0.25cd	0.79	0.76	0.32	0.54
4	Giza -176	0.39abc	0.30abc	0.35	1.88a-g	0.49bcd	1.19	1.14	0.40	0.77
5	Giza -181	0.14a-f	0.34abc	0.24	2.0a-f	0.37bcd	1.19	1.07	0.36	0.72
6	GZ-1368-S-5-4	0.12ef	0.28abc	0.20	1.80a-g	0.94ab	1.37	0.96	0.61	0.79
7	GZ-4120-205-2	0.23a-f	0.15abc	0.19	1.41c-g	0.18cd	0.80	0.82	0.17	0.50
8	IR-25571-31-1	0.22a-f	0.11abc	0.17	1.24a-g	0.39bcd	0.82	0.73	0.25	0.50
9	GZ-4565-S-10	0.41a	0.24abc	0.33	1.53d-g	0.28cd	0.90	0.97	0.26	0.62
10	GZ-4255-6-1	0.05f	0.15abc	0.10	1.11a-g	0.48bcd	0.80	0.58	0.32	0.45
11	GZ-4255-6-2	0.17b-f	0.17abc	0.17	1.39d-g	0.47bcd	0.93	0.78	0.32	0.55
12	GZ-4255-6-3	0.13ef	0.29abc	0.21	1.10b-g	0.57bcd	0.84	0.62	0.43	0.52
13	GZ-4255-6-4	0.08ef	0.09c	0.09	1.29d-g	0.52bcd	0.91	0.69	0.31	0.50
14	IR -28	0.15def	0.28abc	0.22	0.92fg	0.53bcd	0.73	0.54	0.41	0.48
15	GZ-3766-38-1-1	0.08ef	0.09c	0.09	0.71fg	0.27cd	0.49	0.40	0.18	0.29
16	GZ-3766-38-1-2	0.30a-e	0.22abc	0.26	0.72a-g	0.56bcd	0.64	0.51	0.39	0.45
17	GZ-4565-S-6	0.15def	0.18abc	0.17	1.72g	0.50bcd	1.11	0.94	0.34	0.64
18	GZ-4071-16-2-1	0.24a-f	0.10bc	0.17	0.61a-d	0.51bcd	0.56	0.43	0.31	0.37
19	GZ-4255-3-1	0.39abc	0.31abc	0.35	2.21d-g	0.44bcd	1.33	1.30	0.38	0.84
20	GZ-4255-8-1	0.06f	0.14abc	0.10	0.97d-g	0.27cd	0.62	0.52	0.21	0.36
21	GZ-4255-8-2	0.13ef	0.32abc	0.23	1.10efg	0.43bcd	0.77	0.62	0.38	0.50
22	GZ-4255-9-1	0.17a-f	0.21abc	0.19	0.79d-g	0.26cd	0.53	0.48	0.24	0.36
23	GZ-4256-1-1	0.08ef	0.21abc	0.15	1.02c-g	0.37bcd	0.70	0.55	0.29	0.43
24	GZ-4386-34-3	0.40ab	0.33abc	0.37	1.21efg	0.79abc	1.00	0.81	0.56	0.69
25	GZ-4122-23-4-2	0.14e-f	0.32abc	0.23	0.86efg	0.59bcd	0.73	0.50	0.46	0.48
26	GZ-4127-2-1-3	0.16c-f	0.14abc	0.15	0.75efg	0.30bcd	0.53	0.46	0.22	0.34
27	GZ-4294-9-4	0.15def	0.09c	0.12	0.79fg	0.28cd	0.54	0.47	0.19	0.33
28	GZ-4294-10-2	0.18a-f	0.16abc	0.17	0.73c-g	0.26cd	0.50	0.46	0.21	0.34
29	GZ-4294-10-4	0.16c-f	0.08c	0.12	1.18d-g	0.23cd	0.71	0.67	0.16	0.42
30	GZ-4294-10-5	0.10ef	0.18abc	0.14	1.04d-g	0.36bcd	0.70	0.57	0.27	0.42
31	GZ-4256-7-4-7	0.14ef	0.23abc	0.19	1.20d-g	0.65a-b	0.93	0.67	0.44	0.56
32	Kagahikari	0.04f	0.07c	0.06	0.95d-g	0.65a-d	0.80	0.50	0.36	0.43
33	TKY-1024	0.22a-f	0.29abc	0.26	1.08b-g	0.44bcd	0.76	0.65	0.37	0.51
34	Zhong Hoa-3	0.23a-f	0.06c	0.15	0.93a-g	0.48bcd	0.71	0.58	0.27	0.43
35	Todorokiwase	0.05f	0.20abc	0.13	1.26a-e	0.20cd	0.73	0.66	0.20	0.43
36	Giza-159	0.30a-e	0.12abc	0.21	1.65d-g	0.31bcd	0.98	0.98	0.22	0.60
37	Giza-180	0.13ef	0.29abc	0.21	2.08a-g	0.74abc	1.41	1.11	0.52	0.81
38	IR-40	0.06f	0.27abc	0.17	0.97a-g	0.13d	0.55	0.52	0.20	0.36
39	Toride-1	0.14def	0.13abc	0.14	1.53a-g	0.37bcd	0.95	0.84	0.25	0.55
40	Telle Hamsa	0.05f	0.11abc	0.08	1.79a-g	0.29bcd	1.04	0.92	0.20	0.56
41	Yabani-15	0.16c-f	0.35abc	0.27	2.70a	0.37bcd	1.54	1.43	0.36	0.91
	Mean	0.17	0.21	0.19	1.31	0.44	0.88	0.74	0.33	0.54

* Values followed by a common letter are not significantly different at 5% level by DMRT.
T : Tillering stage investigation; H: Heading stage investigation.

was 0.17, but was 0.21 at heading, as entries sown in the recommended date, while they were 1.31 and 0.44 at both stages, respectively, in the late date entries. Zhou (1988) stated that population fluctuations of the pests were related to the growth period and development stage of the rice , and it is suggested that measures should be taken to adjust growth stage of rice to reduce populations of the pest.

Table 3 showed the relative plant resistance as measured by damaged area per leaf (DA/L). The average of the two dates ranged from 2.63 mm to 9.93 for GZ4294-10-2 and Yabani 15, respectively with an average of 5.14% .
GZ 4294-10-2, GZ 4294-9-4 and GZ 4294-10-5 showed the least damaged area values (2.63,2.94 and 3.02), but Yabani 15, Giza 181 and Giza 171 showed the highest (9.93, 8.08 and 7.77), respectively . There were significant differences in dama ged area per leaf among the evaluated entries.

Entries sown at the late date averaged more infestation (8.44) than those sown at the recomended date (1.84). Bishara (1966) mentioned that delay in sowing date increased rice leaf miner infestation. The relative susceptibility of most entries changed as sowing date changed . GZ 4386-34-3 was the most infested one as sown early (4.48) , while became relatively less at the late date (7.63), while GZ 4255-6-4 was less infested as sown early (0.53) than late (10.04). These results may be due to the broods of the insect which prevail late in the season and for the presence of favourable stage . Therefore , the early maturing entry could escape from the heavy attack by this pest at the end of the season .

At the tillering stage, the average of damaged area per leaf for the two dates was higher (7.77) than that at the heading (2.51). The data is corresponded with the findings of Bishara (1966) who stated that rice leaf miner infestation was less in the older plants than the younger ones.

Table 4 showed the relative plant resistance as measured by the percentage of damaged leaf area (DLA%) which is the most accurate but most difficut parameter for evaluating rice entries against rice leaf miner. Data indicated that Giza 172, IR 25571-31-1, GZ 3766-38-1-2, GZ 41277-2-1-3, GZ 4255-6-1 and GZ 4294-10-2 were relatively the most resistant entries to rice leaf miner as they averaged 0.13, 0.14, 0.15, 0.16 and 0.19% damaged leaf area, respectively. On the other hand, Giza 180, Giza 181, GZ 4255-6-3, Giza 171, Giza 175 GZ 4386-34-3 and Yabani 15 were relatively the most susceptible entries showing the averages 0.41, 0.47, 0.51, 0.52, 0.56, 0.58 and 0.61 % damaged area, respectively. The remaining en-

Table 3. Damaged area/leaf (DA/L) as a parameter for evaluating rice entries planted at two different dates, against the rice leaf miner, *H.prosternalis* damage at two growth stages .

No.	Entries	Damaged area (mm2) / leaf at :								
		Recommend sowing date (15 May)			Late sowing date (15 June)			Average of two dates		
		T	H	Mean	T	H	Mean	T	H	Mean
1	Giza -171	3.00bcd	4.06a-e	3.53	21.79a-d	2.20c-f	12.00	12.40	3.13	7.77
2	Giza -172	1.80b-h	0.83hij	1.32	14.26c-f	2.28b-f	8.27	8.03	1.56	4.80
3	Giza -175	1.68b-h	4.25a-d	2.97	16.84b-f	1.73def	9.29	9.26	2.99	6.13
4	Giza -176	3.13bc	3.70a-c	3.42	17.97b-f	3.56b-f	10.77	10.55	3.63	7.10
5	Giza -181	1.35b-h	4.47abc	2.91	24.56abc	1.91def	13.24	12.96	3.19	8.08
6	GZ-1368-S-5-4	0.56e-h	2.31b-j	1.48	19.86a-f	3.85a-f	11.85	10.26	3.08	6.67
7	GZ-4120-205-2	2.53b-g	0.58hij	1.56	10.80c-f	1.19ef	6.00	6.67	0.89	3.78
8	IR-25571-31-1	1.73b-h	1.72c-i	1.73	16.81b-f	3.23b-f	10.02	9.27	2.48	5.88
9	GZ-4565-S-10	3.09bc	0.42j	1.76	10.65c-f	1.94def	6.30	6.87	1.18	4.03
10	GZ-4255-6-1	0.85c-h	0.89g-j	0.87	15.60b-f	3.03b-f	9.32	8.23	1.96	5.10
11	GZ-4255-6-2	1.63b-h	1.57e-j	1.60	21.12a-e	5.62a-d	13.37	11.38	3.59	7.48
12	GZ-4255-6-3	1.37e-h	1.91cj	1.64	12.63c-f	5.92abc	9.28	7.00	3.92	5.46
13	GZ-4255-6-4	0.59b-f	0.46j	0.53	15.77b-f	4.30a-f	10.04	8.18	2.38	5.29
14	IR -28	2.80b-f	2.90a-j	2.85	8.79def	3.10b-f	5.95	5.80	3.00	4.40
15	GZ-3766-38-1-1	1.13b-f	1.21cj	1.17	7.89def	2.05c-f	4.97	4.51	1.63	3.07
16	GZ-3766-38-1-2	2.37b-h	1.49e-j	2.27	6.79ef	3.51b-f	5.15	4.58	2.84	3.71
17	GZ-4565-S-6	1.65b-h	2.17cj	1.57	13.91ef	3.28b-f	8.60	7.78	2.39	5.09
18	GZ-4071-16-2-1	2.06b-h	0.77hij	1.42	6.11f	2.44b-f	4.28	4.09	0.61	2.85
19	GZ-4255-3-1	1.40b-h	3.11a-j	2.26	20.53a-f	4.11a-f	12.32	10.97	3.61	7.29
20	GZ-4255-8-1	0.50fgh	1.15f-j	0.83	15.43b-f	3.53b-f	4.48	7.97	2.34	5.16
21	GZ-4255-8-2	0.67dh	4.04a-e	2.36	17.25b-f	3.57b-f	10.41	8.96	3.81	6.39
22	GZ-4255-9-1	1.99b-h	3.36a-h	2.68	12.50c-f	1.61ef	7.06	7.25	2.49	4.87
23	GZ-4256-1-1	1.0c-h1	1.51c-j	1.26	12.35c-f	2.28b-f	7.32	6.68	1.90	4.29
24	GZ-4386-34-3	5.22a	3.73a-f	4.48	11.83c-f	3.42b-f	7.63	8.53	3.58	6.06
25	GZ-4122-23-4-2	0.99c-h	4.41a-d	2.70	7.73def	4.25a-f	6.11	4.36	4.45	4.41
26	GZ-4127-2-1-3	1.30b-h	1.07f-j	1.19	8.52def	1.72def	5.12	4.91	1.40	3.16
27	GZ-4294-9-4	1.88b-h	0.49ij	1.19	7.81def	1.55ef	4.68	4.85	1.02	2.94
28	GZ-4294-10-2	1.37b-h	1.90cj	1.64	5.96f	1.27ef	3.62	3.67	1.59	2.63
29	GZ-4294-10-4	1.83b-h	0.86hij	1.35	11.66c-f	1.41ef	6.54	6.75	1.14	3.95
30	GZ-4294-10-5	1.76b-h	1.60d-j	1.68	7.44def	1.26ef	4.35	4.60	1.43	3.02
31	GZ-4256-7-4-7	3.43b-h	3.49e-h	3.46	13.76c-f	4.49a-f	9.08	8.55	3.99	6.27
32	Kagahikari	0.18ab	0.55hij	0.37	9.36def	7.51a	8.44	4.77	4.03	4.41
33	TKY-1024	0.73h	1.93ci	1.33	10.03c-f	2.73b-f	6.38	5.38	2.33	3.86
34	Zhong Hoa-3	3.44dh	0.83hij	2.14	8.43def	3.02b-f	5.73	5.94	1.93	3.94
35	Todorokiwase	0.19ab	0.76hij	0.48	10.24c-f	1.28ef	5.76	5.22	1.02	3.12
36	Giza-159	2.84gh	0.50ij	1.67	16.58b-f	2.88b-f	9.73	9.71	1.69	5.70
37	Giza-180	1.00b-f	2.24cj	1.62	20.06a-f	6.19ab	13.13	10.53	4.22	7.38
38	IR-40	0.54c-h	2.93a-j	1.74	11.84c-f	0.74f	6.29	6.19	1.84	4.02
39	Toride-1	1.66dh	1.08f-j	1.37	15.82b-f	2.58b-f	9.20	8.74	1.82	5.29
40	Telle Hamsa	0.65e-h	0.77hij	0.71	20.83a-e	2.68b-f	11.85	10.74	1.82	6.28
41	Yabani-15	1.60b-h	3.33a-i	2.47	29.38ab	5.40a-d	17.39	15.49	4.37	9.93
	Mean	1.7	1.98	1.84	13.83	3.04	8.44	7.77	2.51	5.14

* Values followed by a common letter are not significantly different at 5% level by DMRT.
T : Tillering stage investigation; H: Heading stage investigation.

Table 4. Percentage of damaged leaf area (DLA %) as a parameter for evaluating rice entries planted at two different dates against the rice leaf miner *H.prosternalis* damage at two growth stages.

No.	Entries	% of damaged leaf area (DLA) at : Recommend sowing date (15 May)			Late sowing date (15 June)			Average of two dates		
		T	H	Mean	T	H	Mean	T	H	Mean
1	Giza -171	0.18	0.25	0.22	1.50	0.13	0.82	0.84	0.19	0.52
2	Giza -172	0.10	0.04	0.07	0.23	0.12	0.18	0.17	0.08	0.13
3	Giza -175	0.11	0.28	0.20	1.71	0.12	0.92	0.91	0.20	0.56
4	Giza -176	0.17	0.19	0.18	0.59	0.19	0.39	0.38	0.19	0.29
5	Giza -181	0.07	0.18	0.13	1.51	0.08	0.80	0.79	0.13	0.47
6	GZ-1368-5-5-4	0.04	0.11	0.08	0.59	0.44	0.52	0.32	0.28	0.30
7	GZ-4120-205-2	0.21	0.07	0.14	1.03	0.10	0.57	0.62	0.09	0.36
8	IR-25571-31-1	0.06	0.01	0.04	0.35	0.12	0.24	0.21	0.07	0.14
9	GZ-4565-5-10	0.18	0.10	0.14	0.46	0.11	0.29	0.32	0.11	0.22
10	GZ-4255-6-1	0.04	0.04	0.04	0.40	0.13	0.27	0.22	0.09	0.16
11	GZ-4255-6-2	0.08	0.08	0.08	1.12	0.28	0.70	0.60	0.18	0.39
12	GZ-4255-6-3	0.07	0.10	0.09	1.53	0.30	0.92	0.80	0.20	0.51
13	GZ-4255-6-4	0.03	0.02	0.03	0.83	0.19	0.51	0.43	0.11	0.27
14	IR -28	0.12	0.13	0.13	0.46	0.13	0.30	0.29	0.13	0.22
15	GZ-3766-38-1-1	0.07	0.08	0.08	0.49	0.14	0.32	0.28	0.11	0.20
16	GZ-3766-38-1-2	0.13	0.12	0.13	0.14	0.19	0.17	0.14	0.16	0.15
17	GZ-4565-5-6	0.08	0.07	0.08	0.69	0.16	0.43	0.39	0.12	0.26
18	GZ-4071-16-2-1	0.17	0.06	0.12	0.49	0.20	0.35	0.33	0.13	0.24
19	GZ-4255-3-1	0.13	0.14	0.14	0.93	0.19	0.56	0.53	0.17	0.35
20	GZ-4255-8-1	0.03	0.06	0.05	0.78	0.18	0.48	0.41	0.12	0.27
21	GZ-4255-8-2	0.04	0.21	0.13	0.93	0.19	0.56	0.49	0.20	0.35
22	GZ-4255-9-1	0.10	0.17	0.14	0.61	0.09	0.35	0.36	0.13	0.25
23	GZ-4256-1-1	0.05	0.08	0.07	0.58	0.11	0.35	0.32	0.10	0.21
24	GZ-4386-34-3	0.49	0.36	0.43	1.12	0.32	0.72	0.81	0.34	0.58
25	GZ-4122-23-4-2	0.07	0.31	0.19	0.54	0.31	0.43	0.31	0.31	0.31
26	GZ-4127-2-1-3	0.06	0.05	0.06	0.40	0.08	0.24	0.23	0.07	0.15
27	GZ-4294-9-4	0.14	0.04	0.09	0.56	0.12	0.34	0.35	0.08	0.22
28	GZ-4294-10-2	0.13	0.10	0.12	0.42	0.09	0.26	0.28	0.10	0.19
29	GZ-4294-10-4	0.16	0.08	0.12	1.05	0.13	0.59	0.61	0.11	0.36
30	GZ-4294-10-5	0.10	0.13	0.12	0.56	0.10	0.33	0.33	0.12	0.23
31	GZ-4256-7-4-7	0.15	0.03	0.10	0.56	0.19	0.38	0.63	0.12	0.24
32	Kagahikari	0.01	0.04	0.03	0.64	0.51	0.57	0.33	0.28	0.30
33	TKY-1024	0.04	0.11	0.08	0.57	0.16	0.37	0.31	0.14	0.23
34	Zhong Hoa-3	0.21	0.05	0.13	0.50	0.18	0.34	0.36	0.12	0.24
35	Todorokiwase	0.01	0.06	0.04	0.75	0.10	0.43	0.38	0.08	0.24
36	Giza-159	0.13	0.02	0.08	0.74	0.13	0.44	0.44	0.08	0.26
37	Giza-180	0.05	0.12	0.09	1.09	0.34	0.72	0.57	0.23	0.41
38	IR-40	0.03	0.17	0.10	0.66	0.04	0.35	0.35	0.11	0.23
39	Toride-1	0.07	0.04	0.06	0.64	0.11	0.38	0.36	0.08	0.21
40	Telle Hamsa	0.02	0.03	0.03	0.81	0.11	0.46	0.42	0.07	0.25
41	Yabani-15	0.10	0.30	0.15	1.83	0.28	1.06	0.97	024	0.61
	Mean	1.10	0.11	0.11	0.77	0.18	0.48	0.44	0.15	0.30

T : Tillering stage investigation; H: Heading stage investigation.

tries can be considered as moderately susceptible (0.20 to 0.39%). Isa *et al.*, (1979) reported that tested entries could be arranged into different levels of susceptibility.

Entries sown on the recommended date exhibited less infestation (0.11 % DLA) than themselves on the late one (0.48 %) and ranged from 0.03 to 0.43% at the recommended date and from 0.17 to 1.06% at the late one . The data are in agreement with the findings of Isa (1987) who mentioned that sowing date is very effective in rice infestation with rice leaf miner. It may be important to refer to Akinsola (1990) who mentioned that control measures as well as an integrated approach towards management based essentially on adjusting planting dates.

Resistance to rice leaf miner at tillering and heading stages of rice plant growth was found independed of each other in most entries. Some entries were susceptible during the tillering stage but resistant during the heading, while others showed the opposite. Some others behaved similarly at the two stages. Giza 172, IR 25571-31-1, GZ 4255-6-1 and GZ 4127-2-1-3 were more susceptible at tillering stage (0.17, 0.21, 0.22 and 0.23%) than at heading (0.08, 0.07, 0.09 and 0.07%), respectively. GZ 3766-38-1-2 was the only one which received less infestation at tillering (0.14%) than at heading stage (0.16%). GZ 4122-23-4-2 showed similar percentages of damaged area (0.31%) at the two stages. These results are in agreement with Uthamasamy and Karuppuchamy (1992) who stated that infestation with the whorl maggot (rice leaf miner) differed according to the variety and its age.

Some tested entries changed their behaviour as sowing date changed. At the recommended date, GZ 4255-6-4, Kagahikari and Telle Hamsa were the least infested entries (0.03% for all), while Giza 172 and GZ 3766-38-1-2 were the least infested ones at the late date (0.18 and 0.17 %), respectively. While GZ 4386-34-3 was the most infested entry at the recommended date (0.43 %), Yabani 15 was the most infested at the late one (1.06 %).

Table 5 showed the relative plant resistance as measured by the overall resistance or susceptibility indices (ORSI) as a collective measure for all used parameters. GZ 4368-34-3 (1.31), Giza 171 (1.22) and Yabani 15 (1.15) were more susceptible than the check (Giza 176; 1.00), while Giza 180 (0.99) and Giza 175 (0.97) were almost equal to it . GZ 4127-2-1-3 (0.46), Todorokiwase (0.48), GZ 4255-6-1 (0.51), GZ 3766-38-1-1 (0.51) and GZ 4294-9-4 (0.51) were the most resistant

Table 5. Overall resistance or susceptbility indices (ORSI) of tested entries for rice leaf miner *H.prosternalis* damage at two sowing dates and growth stages.

No.	Entries	ORSI at :								
		Recommend sowing date (15 May)			Late sowing date (15 June)			Average of two dates		
		T	H	Mean	T	H	Mean	T	H	Mean
1	Giza -171	0.85	1.31	1.08	1.55	1.15	1.35	1.20	1.23	1.22
2	Giza -172	0.55	0.25	0.40	0.71	0.64	0.68	0.63	0.47	0.54
3	Giza -175	0.71	1.31	1.01	1.35	0.51	0.93	1.03	0.91	0.97
4	Giza -176	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
5	Giza -181	0.43	1.01	0.72	1.51	0.55	1.03	0.98	0.78	0.88
6	GZ-1368-S-5-4	0.29	0.80	0.55	1.01	1.52	1.27	0.65	1.16	0.91
7	GZ-4120-205-2	0.84	0.38	0.61	1.02	0.42	0.72	0.93	0.40	0.67
8	IR-25571-31-1	0.53	0.33	0.44	0.75	0.78	0.77	0.64	0.56	0.61
9	GZ-4565-S-10	1.06	0.55	0.81	0.80	0.58	0.69	0.93	0.57	0.75
10	GZ-4255-6-1	0.21	0.29	0.25	0.74	0.77	0.76	0.48	0.53	0.51
11	GZ-4255-6-2	0.47	0.49	0.48	1.18	1.17	1.18	0.83	0.83	0.83
12	GZ-4255-6-3	0.41	0.69	0.55	1.16	1.27	1.22	0.79	0.98	0.89
13	GZ-4255-6-4	0.24	0.18	0.21	0.95	1.02	0.99	0.60	0.60	0.60
14	IR -28	0.63	0.83	0.73	0.63	0.75	0.69	0.63	0.79	0.71
15	GZ-3766-38-1-1	0.43	0.37	0.40	0.59	0.62	0.61	0.51	0.50	0.51
16	GZ-3766-38-1-2	0.80	0.63	0.72	0.43	1.04	0.74	0.62	0.83	0.73
17	GZ-4565-S-6	0.51	0.51	0.51	0.95	0.92	0.94	0.73	0.72	0.73
18	GZ-4071-16-2-1	0.80	0.33	0.57	0.51	0.89	0.70	0.66	0.61	0.64
19	GZ-4255-3-1	0.69	0.90	0.80	1.21	0.94	1.08	0.95	0.92	0.94
20	GZ-4255-8-1	0.17	0.42	0.30	0.87	0.77	0.82	0.52	0.60	0.56
21	GZ-4255-8-2	0.36	1.05	0.71	0.98	0.89	0.94	0.67	0.97	0.83
22	GZ-4255-9-1	0.62	0.78	0.70	0.69	0.47	0.58	0.66	0.63	0.64
23	GZ-4256-1-1	0.29	0.54	0.42	0.73	0.63	0.68	0.51	0.59	0.55
24	GZ-4386-34-3	1.63	1.27	1.45	1.00	1.33	1.17	1.32	1.30	1.31
25	GZ-4122-23-4-2	0.44	1.24	0.84	0.64	1.30	0.97	0.54	1.27	0.91
26	GZ-4127-2-1-3	0.44	0.36	0.40	0.54	0.50	0.52	0.49	0.43	0.46
27	GZ-4294-9-4	0.62	0.25	0.44	0.59	0.57	0.58	0.61	0.41	0.51
28	GZ-4294-10-2	0.60	0.51	0.56	0.51	0.52	0.52	0.56	0.52	0.56
29	GZ-4294-10-4	0.66	0.32	0.49	0.95	0.52	0.74	0.81	0.42	0.62
30	GZ-4294-10-5	0.47	0.64	0.56	0.64	0.59	0.62	0.56	0.62	0.59
31	GZ-4256-7-4-7	0.76	0.66	0.71	0.77	1.10	0.94	0.77	0.88	0.83
32	Kagahikari	0.11	0.21	0.16	0.74	1.83	1.29	0.44	1.02	0.73
33	TKY-1024	0.38	0.75	0.57	0.72	0.86	0.80	0.55	0.81	0.68
34	Zhong Hoa-3	0.95	0.22	0.59	0.66	0.92	0.79	0.81	0.57	0.69
35	Todorokiwase	0.15	0.44	0.30	0.84	0.46	0.65	0.50	0.45	0.48
36	Giza-159	0.84	0.30	0.57	1.02	0.69	0.86	0.93	0.50	0.72
37	Giza-180	0.35	0.76	0.56	1.29	1.53	1.41	0.82	1.15	0.99
38	IR-40	0.19	0.92	0.56	0.75	0.25	0.50	0.47	0.59	0.53
39	Toride-1	0.52	0.37	0.45	0.91	0.71	0.81	0.72	0.54	0.63
40	Telle Hamsa	0.17	0.27	0.22	1.13	0.65	0.89	0.65	0.46	0.56
41	Yabani-15	0.58	1.05	0.82	1.85	1.11	1.48	1.22	1.08	1.15
	Mean	0.55	0.63	0.59	0.90	0.86	0.88	0.73	0.75	0.74

T : Tillering stage investigation; H: Heading stage investigation.

entries as compared with the check one (1.00).

Table 6 showed the plant resistance as affected by the plant type. As entries were sown at the recommended date, indica entries showed the least infestation as measured by any parameter except DA/L. At the late date (JXI) entries (37.30) were less infested than japonica (39.80), indica (40.70) and commercial ones (40.80) as measured by IL %. Generally, DLA% showed that the exotic entries were more resistant to rice leaf miner than the local ones.

Table 7 showed the general average of damage in all parameters related to a check (Giza 176) as affected by plant leaf area and plant type. Data showed that there was a positive relationship between plant leaf area and the plant susceptibility in most entries. Giza 181 of relatively big leaf area (25.0 cm^2/leaf) showed relatively high infestation; 0.81 IL %, 0.94 mines/leaf, 1.14 mm DA/L and 1.62 DLA%, while GZ 4294-10-4 of relatively low leaf area (11.1 cm^2/l) showed relatively low infestation; 0.63 IL %, 0.55 mines/L, 0.56 mm DA/L and 1.24 DLA%. Therefore, the smaller leaf area, the lower infestation entry. This result was confirmed by Pathak (1964) and Bishara (1966) who reported that the percentage of infestation and the leaf area width in the different varieties were in positive regression at the same.

In general it can be concluded that rice entry, sowing date, growth stage, type of plant and leaf area play an effective role in the relative varietal resistnce of rice plant against the rice leaf rniner infestation.

Table 6. Varietal resistance to rice leaf miner, *H.prosternalis* at different sowing dates and growth stages as affected by plant type.

Index	Sowing date	Japonica (J)			Indica (I)			J x I			Commercial		
		T	H	Ave.	T	H	Ave.	T	H	Ave.	T	H	Ave.
IL%	Recommended	10.60	10.5	10.60	6.70	12.40	9.60	9.30	11.10	10.20	10.70	14.80	12.20
	Late	53.40	26.10	39.80	59.00	22.40	40.70	52.10	22.40	37.30	60.40	21.10	40.80
	Average	32.00	18.30	25.20	32.90	17.40	25.20	30.70	16.80	23.80	35.60	18.00	26.80
M/L	Recommended	0.19	0.19	0.19	0.12	0.24	0.18	0.17	0.21	0.18	0.19	0.27	0.23
	Late	1.27	0.43	0.85	1.53	0.48	1.01	1.17	0.43	0.80	1.56	0.49	1.07
	Average	0.73	0.31	0.52	0.83	0.36	0.60	0.67	0.32	0.50	0.92	0.38	0.65
DA/L	Recommended	1.96	1.78	1.87	1.25	2.48	1.87	1.57	2.08	1.81	2.02	2.88	2.45
	Late	12.00	2.77	3.39	17.54	3.13	10.30	14.57	3.42	9.00	16.89	2.73	9.81
	Average	6.98	2.28	4.63	9.40	2.81	6.11	8.06	2.75	5.41	9.46	2.81	6.13
DLA%	Recommended	0.13	0.12	0.13	0.06	0.09	0.08	0.08	0.10	0.09	0.11	0.15	0.13
	Late	0.72	0.17	0.45	0.78	0.18	0.48	0.76	0.17	0.47	0.94	0.14	0.54
	Average	0.34	0.15	0.29	0.42	0.14	0.28	0.42	0.14	0.28	0.53	0.14	0.34

Japonica entries = 20
J X I = 14
T. = Tillering stage
IL. = Infested leaves
DA/L. = Damaged area (mm2) / leaf

Indica entries = 7
Commercial varieties = 9
H. = Heading stage
M/L. = Number of mines / leaf

Table 7. Relative parameter values to Giza 176 as an average of different sowing dates and growth stages of the rice leaf miner *H.prosternalis* damage as affected by leaf area index and plant type.

No.	Entries	Plant characters		Parameter values related to the check (176)			
		Type	LAI (cm)2	IL	Av. no. mines/L	DAL/L	DLA %
1	Giza -171	J	16.6	1.03	1.42	1.09	1.79
2	Giza -172	J	19.4	0.70	0.69	0.68	0.45
3	Giza -175	IJ	14.9	0.83	0.70	0.86	1.93
4	Giza -176	J	18.6	1.00	1.00	1.00	1.00
5	Giza -181	I	25.0	0.81	0.94	1.14	1.62
6	GZ-1368-S-5-4	J	20.1	0.91	1.03	0.95	1.03
7	GZ-4120-205-2	I	11.8	0.75	0.65	0.53	1.24
8	IR-25571-31-1	IJ	27.3	0.75	0.65	0.83	0.48
9	GZ-4565-S-10	IJ	16.8	0.90	0.81	0.57	0.76
10	GZ-4255-6-1	IJ	24.1	0.62	0.58	0.72	0.55
11	GZ-4255-6-2	IJ	20.0	0.74	0.71	1.05	1.34
12	GZ-4255-6-3	I	19.5	0.70	0.68	0.77	1.76
13	GZ-4255-6-4	J	22.8	0.64	0.65	0.75	0.93
14	IR -28	J	23.0	0.64	0.62	0.62	0.76
15	GZ-3766-38-1-1	IJ	14.8	0.81	0.38	0.430.52	0.69
16	GZ-3766-38-1-2	IJ	18.5	0.87	0.58	0.72	0.52
17	GZ-4565-S-6	IJ	20.1	0.63	0.83	0.72	0.90
18	GZ-4071-16-2-1	IJ	12.4	0.84	0.48	0.40	0.83
19	GZ-4255-3-1	IJ	22.1	0.64	1.09	1.03	1.21
20	GZ-4255-8-1	IJ	19.6	0.77	0.47	0.73	0.93
21	GZ-4255-8-2	IJ	18.6	0.59	0.65	0.90	1.21
22	GZ-4255-9-1	J	20.6	0.61	0.47	0.69	0.86
23	GZ-4256-1-1	J	21.3	0.91	0.56	0.60	0.72
24	GZ-4386-34-3	J	10.6	0.87	0.90	0.85	2.00
25	GZ-4122-23-4-2	J	14.4	0.55	0.62	0.62	1.07
26	GZ-4127-2-1-3	J	21.5	0.57	0.44	0.45	0.52
27	GZ-4294-9-4	J	13.1	0.63	0.43	0.41	0.76
28	GZ-4294-10-2	J	14.2	0.63	0.44	0.37	0.66
29	GZ-4294-10-4	IJ	11.1	0.67	0.55	0.56	1.24
30	GZ-4294-10-5	J	12.8	0.75	0.55	0.43	0.79
31	GZ-4256-7-4-7	J	23.1	0.79	0.73	0.88	0.83
32	Kagahikari	J	14.6	0.80	0.56	0.62	1.03
33	TKY-1024	J	17.6	0.77	0.66	0.54	0.79
34	Zhong Hoa-3	J	16.8	0.68	0.56	0.55	0.83
35	Todorokiwase	J	13.6	0.80	0.56	0.44	0.83
36	Giza-159	J	22.6	0.77	0.78	0.80	0.90
37	Giza-180	J	18.5	0.68	1.05	1.04	1.14
38	IR-40	J	17.7	0.84	0.47	0.57	0.79
39	Toride-1	J	24.7	0.96	0.71	0.75	0.72
40	Telle Hamsa	J	25.7	0.59	0.73	0.88	0.86
41	Yabani-15	J	16.7	1.02	1.18	1.40	2.10
	Mean			0.76	0.70	0.72	1.03

LAI = Leaf area index IL = Infested leaves DLA/L = Damaged area/leaf

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المقاومة الصنفية : تقييم حقلى وانتخاب لبعض أصناف وسلالات الأرز ضد صانعة الأنفاق ، ودور بعض العوامل فى المقاومة النسبية للنبات

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أجريت هذه الدراسة الحقلية على ٤١ صنفاً محلياً وسلالة أرز مبشرة لتقييم مقاومتها النسبية (بعدة مقاييس) وانتخاب بعضها ضد صانعة الأنفاق فى الأرز ، وقد دلت النتائج على الآتى:-

- عندما قيمت الأصناف باستخدام نسبة المساحة الورقية التالفة (أدق ولكن أصعب مقياس) : كانت السلالات والأصناف جيزه ١٧٢، أى آر (٢٥٥٧١ - ٣١ - ١) ، جى زد (٣٧٦٦ - ٣٨ - ١ - ٢)، جى زد (٤١٢٧ - ٢ - ١ -٣)، جى زد (٤٢٥٥ - ٦-١)، جى زد (٤٢٩٤ - ١٠ - ٢) أكثر مقاومة (اقل تفضيلا) وبدرجة ٠,١٣ ، ٠,١٤ ، ٠,١٥ ، ٠,١٦ ، ٠,١٩ ، ٠,٢٠٪ بينما جيزة ١٨٠، جيزة ١٨١، جى زد (٤٢٥٥ - ٦ - ٣) ، جيزة ١٧١ ، جيزة ١٧٥، جى زد (٤٣٨٦ - ٣٤ -٣) ، يابانى ١٥ كانت الأعلى إصابة (أكثر تفضيلا) و بدرجة ٠,٤١ ، ٠,٧٤ ، ٠,٥١ ، ٠,٥٢ ، ٠,٥٦ ، ٠,٥٨ ، ٠,٦٢ ٪ على التوالى . وباستخدام نسبة الأوراق المصابة (أشيع وأسهل مقياس) : كان جى زد (٤١٢٧ - ٢ -١ - ٣)، جى زد (٤٢٩٤ - ٩ - ٤)، جى زد (٤٢٥٥ - ٩ - ١) الأكثر مقاومة وبدرجة ١٨ ، ١٨,٦ ، ١٩,١٪ على التوالى ، بينما جيزة ١٧١ كان الأكثر إصابة وبنسبة ٣٣,٦٪. وعندما أستخدم نسبة عدد الأن٤اق فى الورقة : كان جى زد (٣٧٦٦ - ٣٨ - ١ - ١)، جى زد (٤٢٤٩ - ٤ - ٩) هى الأكثر مقاومة وبنسبة ٠,٢٩ ، ٠,٣٣ ، بينما جيزة ١٧١ كان الأقل مقاومة وبدرجة ١,٠٩ . وباستخدام نسبة المساحة التالفة لكل ورقة : كان جى زد (٤٢٩٤ - ١٠ - ٢) هو الأكثر مقاومة وبدرجة ٢,٦٣، بينما يابانى ١٥ كان الأكثر إصابة وبدرجة ٩,٦٣.

وباستخراج المقياس الشامل لكل المقايس السابقة (أورسى) ، وجد أن جى زد (٤١٢٧ - ٢ - ١ - ٣، تودوروكيواز ، جى زد ٤٢٥٥ - ٦ - ١ ، جى زد ٣٧٦٦ - ٣٨ - ١ - ١، جى زد ٤٢٩٤ - ٩ - ٤ هى سلالات عالية المقاومة بالمقارنة بالصنف جيزة ١٧٦ كأشيع الأصناف المحلية.

- اختلفت درجة الإصابة باختلاف ميعاد الزراعة ، فقد أدى الميعاد المبكر إلى الحد من إصابة معظم الأصناف.

- اختلفت درجة الإصابة باختلاف مرحلة النمو النباتية ، فقد كانت معظم الأصناف فى مرحلة التفريع أقل منها فى مرحلة الطرد.

- اختلفت درجة الإصابة باختلاف مصدر الصنف، فقد كانت معظم السلالات اليابانية الأصل أقل اصابة من تلك الهندية أو المحلية.

- اختلفت درجة الإصابة باختلاف متوسط المساحة الورقية ، فمعظم الأصناف ذات المساحة الأكبر كانت هى الاكثر تفضيلا للإصابة بالحشرة.

- وبصفة عامة وجد أن الأصناف والسلالات المختبرة تختلف نسبيا فى درجة مقاومتها وأن المصدر النباتى ، ميعاد الزراعة ، ومرحلة النمو ، ومتوسط المساحة الورقية هى عوامل تلعب دورا هاما فى تحديد هذه الدرجة.