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LABORATORY SCREENING BARLEY GENOTYPE SEEDLINGS FOR APHID RESISTANCE IN EGYPT

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Abstract

The level of resistance of 50 barley breeding lines seedlings were tested to three aphid species *Rhopalosiphum padi* (L.), *Rhopalosiphum maidis* (Fitch) and *Schizaphis graminum* (Rond.) (Homoptera: Aphididae) under laboratory conditions. The present work showed that all tested genotypes were subject for infestation with the three aphid species, but at different population levels. The criterion for resistance was based on the average daily reproduction rate of the female aphids to be more or less. Only 8 genotypes were considered resistant to *R. maidis* and 3 to *R padi*. However, 7 genotypes were considered moderately resistant to *R maidis* and 3 to *R. padi*. All genotypes were found to be susceptible to *S. graminum*.

INTRODUCTION

Cereal crops in Egypt are subject for infestation with several aphid species, the dominant ones are *Rhopalosiphum padi* (L.), *Rhopalosiphum maidis* (Fitch) and *Schizaphis graminum* (Rond.) (Homoptera: Aphididae), (El-Hariry, 1979 and Tantawi 1985). However, survey studies revealed that *R. maidis* was the dominant species of aphid (Noaman *et al.*, 1992).

Many authors reported the effect of different varieties or breading lines of barley on the resistance to some aphids (Hormchong and Wood 1963; Pandey *et al.*, 1981; Webster and Starks 1984).

In an attempt to apply the principle of plant resistance to insects as a tool in integrated pest management programs, an experiment was conducted to reveal any resistance to aphid build-up in 50 barley breeding lines.

The present study included screening 50 barley-breading lines to evaluate their levels of resistance to the three main aphids infesting barley under laboratory conditions.

MATERIALS AND METHODS

A standard colony was established separately for each species of the three tested aphid species (i.e. *R. maidis, R. padi* and *S. graminum*) in the laboratory on barley, *Hordeum vulgare* L. variety Giza 121. Cultured plants were grown in plastic pots with cylindrical glass cages placed over them to exclude extraneous insects and to confine the aphids. The tops of the cages were covered with glue-on special muslin cloth to allow air exchange.

The colonies were maintained under laboratory conditions of 22±1 C and photoperiod 10: 14(L:D).

Fifty breeding lines and cultivars of barley, kindly supplied by Barley Department, Agriculture Research Center, were tested for their levels of susceptibility to infestation with three cereal aphids under constant conditions in the laboratory. This experiment aimed at revealing any levels of resistance to aphid build-up. A list of barley genotypes is included in Table 1.

Five seeds for each breading line were planted in plastic pot. When the seedlings were 3 cm high, five newly emerged females were placed on the seedlings and covered with the glass cage and maintained at the previous conditions. After 6 days, all aphids (adults and nymphs) were counted. This experiment was repeated 5 times for each breading line for each aphid species.

An assumption was made (according to Bishara *et.al.*, 1997) that if the mean daily rate were less than one aphid per day, i.e. 30 aphids per 5 females per 6 days, that would indicate the presence of resistance in the plants of that genotype.

Similarly, when the mean daily rate ranges between 1.0 and 1.3 aphids per day, i.e. between 30 and 39 individuals per females per 6 days, the genotypes could be considered moderately resistant.

RESULTS AND DISCUSSION

The maximum number of aphids produced by 5 females of *R. maidis* in 6 days was 133.8 ± 3.87 in case of genotype No. 7, Table 2. The mean daily rate was 4.46

aphids per day.

By applying the reistance criterion, 8 entries could be considered resistant to *R. maidis* being genotypes Nos. 48, 37, 47, 38, 46, 50, 39 and 18, Table 2.

Six genotypes fall in moderately resistant category, being Nos.: 49, 13, 21, 45, 44 and 40, Table 2. The fecundity of *R. maidis* differed significantly on the 50 tested barley genotypes.

Few barley entries inhibited progeny production in *R. padi*; those being genotypes Nos. 45, 47, and 28, Table 3. Another three entries proved moderately resistant (less than 40 individuals/ 5-females/ 6 days); those are genotypes Nos. 44, 39 and 22. Differences between genotypes tested were significant.

On the other hand, none of the barley material experimented exhibited any level of resistance to *S. graminum* Table, 4. However, all the genotypes differed significantly at 0.05 level.

Several authors dealt with screening barley genotypes for aphid resistance and attributed resistance in barley to either chemical or physical factors.

Todd *et al.*(1971) concluded that resistance of barley genotypes might be due to the presence of phenolic and flavonide compounds in the leave, while Juneja *et al.* (1972) identified benzyl alcohol as possible cause. Free amino acid concentration in barley and high proportion of the asparagine fraction containing glutamic acid appeared also to be associated with resistance (Weibull, 1987). The existance of gramine in the leaves is another chemical component causing resistance in barley to cereal aphids (Salas, 1991).

As to the physical factors, El-Serwiy *et al.* (1985) reported that most susceptible strains posses thinner layer of schlerenchyma cells and larger number of vascular bundles. Honek (1985) suggested that the mean leaf area showed good predictor of maximum aphid abundance. Degree of resistance was positively related to the amount of surface wax on the leaves and also depended on wax composition (Tsumuki *et al.*; 1987). For this reason, biochemical investigations seem essential in the future studies.

Table 1. Barley genotypes tested for their level of susceptibility to aphid reproduction under laboratory conditions.

No.	Name/ Pedigree
1.	Giza 121.
2.	Giza 123.
3.	Giza124.
4.	Giza 125.
5.	Aths // Hrr / Nopal ICB 85- 1233-2Ap-OAP.
6.	Quinn / Rihane // Quinn / Aths ICB83-1135-OAP-OAP-OAP-35AP- OAP.
7.	Rihane / Badia ICB82-0902-OAP-OAP-OAP-10AP-OAP.
8.	Quinn / Rihane /Quinn Lignee 640 ICB83-1134-OAP-OAP-OAP-9AP-OAP.
9.	Avt / Aths // Aths ICB85-1021-1AP-OAP.
10.	ID / CM67 / Asse / Nacta /4/ Zoop // Mcu 3021-5D/ Ben /3/BCO. Mr//Ds/ Apro ICB84-0070-1AP-2AP-OTR-3AP-OTR.
11.	M64-76 / Bon // Jo / York /3// M5 / Galt // As64 /4/ Hj34-80 / Astrix /5/ CN42 / C1 ICB- 1498- 1AP- 4AP- 1AP- OTR.
12.	MD ATL / CM5S- 1w-b // lignee 527 ICB84- 0411- 1AP- 5AP- 2AP-OTR.
13.	BCO. mr / Avt // Cel/3/ line 257- 14/ 4/ Rihane'S'- 5 ICB84- 0688-1AP-2AP- 001 TR- 4AP- OTR.
14.	BCO. Mr/ Avt // Cel/3/ line 257- 14/4/ Rihane'S'- 5 ICB84- 0688- 1AP-3AP- OTR- 4AP- OTR.
15.	Badia /5/ Cr. 115/ Pro // BC /3/ Apri/ CM67 /4/ Giza 120 ICB84- 1072- 3AP-4AP- OTR- 3AP-OTR.
16.	Mari / Aths*2 // CC 89 CYB- 3528- DD- 3AP- 3AP- 3AP- 0TR.
17.	Mr 25-84 / Altiki // BKF Magueione 1604 ICB84- 0053- 1AP- 3AP- 4AP - OTR- 4AP- OTR.
18.	MD ATL / CM- B-4-2-1-B-B /5/ Bal 16/ Mzq /3/ M67- 18 / M14 //DS / Apro /4/ iris ICB84- 0629- 2AP- 2AP-4AP- OTR.
19.	MD ALT / CM5s- 1w-b/ Lignee 527 ICB84- 0411- 1AP-5AP-3AP-OTR.
20.	Assala –04.
21.	Rihane // Bc /Coho ICB83-1488- 2AP-OAP- 1AP- 1APH- OAP.
22.	80-5013 /5/ Cr. 115 /Pro // BC /3/ Apri/ CM67 /4/ Giza 120 ICB85- 1696-OAP.
23.	Lignee 527/ NK 1272 ICB84- 0323- 8AP- OAP- 8AP- 1APH- OAP.
24.	Rihane-01 / Harmal-01 ICB84- 0003- 11AP- OAP- 22APH- OAP.
25.	Rihane-01 / Harmal-01 ICB84- 0003- 11AP- OAP- 29APH- OAP.
26.	Deir Alla 106 / Strain 205 / Rihane- 13.
27.	ICB85- 0669- OAP- 7APH- OAP.
28.	Vg/ Julia // ZY /3/ CM67/ Apro // Sv02109/ Mari ICB84-1320- 4AP- OAP-14APH- OAP.
29.	Lignee 527 / As45 ICB81- 2527- 8L- OAP- OAP.
30.	Mari / Arth*2 // M –Aatt- 73- 337- 1 CYB- 3574- OAP- 10AP- OTR.
31.	C63 / Rihane- 05 ICB83- 1637- 1AP-OAP.
32.	Gx /3/ Api / CM67 // Choya ICB80- 1009- 3AP- 1AP-OAP- OAP.

Table 1 Cont. Barley genotypes tested for their level of susceptibility to aphid reproduction under laboratory conditions.

33.	Lignee 527 / nk 1272 ICB84- 0323- OAP.
34.	NK 1272 / Moroc 9- 75 ICB83- 1273- 3AP- OTR- OAP.
35.	Badia /3/ 4699/ 1485s // 5670/ 5089 N ICB84- 0247- 5AP- OAP.
36.	Sawsan / Lignee 640 ICB81- 0086- 2AP- OAP- OAP.
37.	MRNB 92- 80 / Rigarda.
38.	Lignee 640 / Bgs / Cel.
39.	Antares // 12202 / Attiki /3/ RM1508 / Pro // W12269.
40.	Jerusales a barbes lisses / CI 10836.
41.	Lignee 527/ Sawsan // BC.
42.	Matnan – 02.
43.	Emir / Apm / Hc 1905.
44.	Rihane – 03.
45.	WI2265.
46.	Gloria "s".
47.	Roho / Mazurka.
48.	Giza 117 / Teguila / Arimar – 2763.
49.	Emir / Harmal..
50.	SM 442 / Nackla / PYE's'.

Table 2. Levels of resistance to *R. maidis* in different barley genotypes.

Ser. NO	Number of progeny	Genotype number	Ser. NO	Number of progeny	Genotype number
1	17.6 ± 4.27	48	26	57.8 ± 2.56	12
2	23.8 ± 5.19	37	27	58.2 ± 5.34	32
3	24.8 ± 5.04	47	28	60.4 ± 2.42	3
4	27.4 ± 4.36	38	29	61.0 ± 4.60	17
5	28.0 ± 4.00	46	30	61.8 ± 5.04	27
6	28.8 ± 4.58	50	31	65.4 ± 4.67	25
7	29.6 ± 5.68	39	32	68.4 ± 5.24	33
8	30.0 ± 1.41	18	33	70.6 ± 3.50	1
9	31.8 ± 3.97	49	34	73.6 ± 4.41	4
10	32.2 ± 3.06	13	35	74.2 ± 4.35	5
11	33.4 ± 4.03	21	36	77.2 ± 3.31	6
12	33.4 ± 3.72	45	37	80.4 ± 5.89	9
13	33.6 ± 4.84	44	38	81.0 ± 4.15	2
14	37.8 ± 7.49	40	39	81.2 ± 4.31	35
15	40.6 ± 6.22	31	40	92.4 ± 3.83	23
16	45.4 ± 4.72	16	41	101.6 ± 4.72	29
17	46.0 ± 4.20	28	42	103.0 ± 6.32	19
18	46.0 ± 5.44	36	43	104.2 ± 4.40	43
19	47.6 ± 4.59	10	44	108.4 ± 6.41	26
20	48.0 ± 5.55	22	45	108.6 ± 8.73	42
21	50.2 ± 5.04	20	46	109.6 ± 3.98	30
22	50.8 ± 6.14	41	47	111.0 ± 5.55	14
23	57.4 ± 4.80	8	48	118.0 ± 6.00	15
24	57.4 ± 3.98	34	49	127.4 ± 7.66	24
25	57.8 ± 3.97	11	50	133.8 ± 3.87	7

L.S.D. at 0.05 = 7.0651

Genotype names are listed in Table 1.

Table 3. Levels of resistance to *R. padi* in different barley genotypes.

Ser. NO	Number of progeny	Genotype number	Ser. NO	Number of progeny	Genotype number
1	15.8 ± 2.79	45	26	67.0 ± 6.07	42
2	28.0 ± 3.41	47	27	68.2 ± 4.31	21
3	28.4 ± 3.88	28	28	68.4 ± 7.03	40
4	34.0 ± 4.47	44	29	71.4 ± 3.26	8
5	36.8 ± 6.37	39	30	73.4 ± 2.93	35
6	38.0 ± 4.69	22	31	75.0 ± 4.52	30
7	41.4 ± 4.50	49	32	77.6 ± 2.50	32
8	42.4 ± 3.56	48	33	80.4 ± 5.24	34
9	46.2 ± 5.19	36	34	82.2 ± 5.81	4
10	47.0 ± 2.83	29	35	83.8 ± 5.31	7
11	48.0 ± 2.83	5	36	84.4 ± 5.68	12
12	53.4 ± 5.61	10	37	88.2 ± 4.87	17
13	54.6 ± 7.09	3	38	88.2 ± 4.17	27
14	55.4 ± 5.12	18	39	89.2 ± 5.81	16
15	56.2 ± 2.99	26	40	90.6 ± 3.72	2
16	56.6 ± 6.59	20	41	91.0 ± 5.83	23
17	58.6 ± 7.45	6	42	93.8 ± 4.96	37
18	59.4 ± 4.22	1	43	95.6 ± 4.76	13
19	59.6 ± 6.83	25	44	97.4 ± 7.34	43
20	60.0 ± 6.13	11	45	104.6 ± 4.96	31
21	60.2 ± 5.04	50	46	105.0 ± 6.60	19
22	60.4 ± 5.99	46	47	115.2 ± 6.31	15
23	63.8 ± 4.92	33	48	117.0 ± 2.45	24
24	67.0 ± 6.03	9	49	123.2 ± 5.11	38
25	67.0 ± 2.10	14	50	129.0 ± 3.10	41

L.S.D. at 0.05 = 7.0044

Genotype names are listed in Table 1.

Table 4. Levels of resistance to *S. graminum* in different barley genotypes.

Ser. NO	Number of progeny	Genotype number	Ser. NO	Number of progeny	Genotype number
1	49.0 ± 4.82	39	26	111.8 ± 4.67	41
2	59.6 ± 5.92	28	27	112.0 ± 3.69	48
3	60.8 ± 4.53	5	28	112.2 ± 4.62	32
4	67.0 ± 5.22	26	29	113.6 ± 6.74	49
5	71.0 ± 4.73	29	30	114.0 ± 3.03	11
6	72.0 ± 4.69	40	31	114.2 ± 4.17	20
7	77.4 ± 4.76	3	32	115.0 ± 6.66	9
8	79.4 ± 3.50	10	33	116.2 ± 4.12	36
9	90.2 ± 7.49	21	34	116.8 ± 5.84	50
10	91.6 ± 7.42	30	35	118.0 ± 4.82	44
11	94.0 ± 6.32	46	36	119.0 ± 5.48	31
12	94.4 ± 4.22	27	37	119.4 ± 5.61	14
13	94.6 ± 5.57	33	38	121.0 ± 3.03	45
14	98.4 ± 4.03	8	39	122.2 ± 5.60	47
15	99.2 ± 7.47	34	40	124.6 ± 4.13	38
16	101.0 ± 4.69	16	41	125.2 ± 5.19	17
17	102.4 ± 6.77	6	42	125.2 ± 5.95	25
18	104.6 ± 5.35	22	43	125.8 ± 6.46	23
19	105.0 ± 4.86	15	44	130.4 ± 6.68	4
20	105.4 ± 5.61	42	45	134.4 ± 5.85	43
21	106.2 ± 6.82	18	46	136.4 ± 8.57	19
22	107.4 ± 6.86	1	47	136.6 ± 5.57	37
23	108.2 ± 7.22	2	48	137.6 ± 5.43	7
24	108.8 ± 6.18	24	49	147.4 ± 5.64	13
25	110.2 ± 7.31	35	50	148.8 ± 3.06	12

L.S.D. at 0.05 = 7.7536

Genotype names are listed in Table 1.

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تقييم معملى لبعض طرز الشعير الجينيه لمدى مقاومتها للإصابة بحشرات المن فى مصر

لوئيس صليب سوريال ، سميرة حنين مترى

معهد بحوث وقاية النبات - مركز البحوث الزراعية - الدقى - الجيزة.

تم اختبار مستويات مقاومة ٥٠ سلالة من الشعير لثلاثة أنواع من المن هي: من الذرة، من الشوفان ومن القمح تحت الظروف المعملية.

وقد أثبتت التجارب أن كل الطرز الجينية المختبرة كانت معرضة للإصابة بالأنواع الثلاثة للمن ولكن بمستويات متفاوتة. وقد اعتمدت صفات المقاومة علي متوسط معدل التناسل اليومي لكل أنثى واحدة ان يكون فرد او اقل.

وقد وجد أن ثماني سلالات فقط تعتبر مقاومة لمن الذرة، وثلاثة لمن الشوفان.

وكذلك اعتبرت سبع سلالات متوسطة المقاومة لمن الذرة وثلاثة لمن الشوفان وكانت كل السلالات حساسة لمن القمح.