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SCREENING OF BARLEY GENOTYPES FOR APHID RESISTANCE

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Abstract

Laboratory screening of local and exotic barley genotypes revealed 2 resistant and 3 moderately resistant genotypes out of 50 entries. Field screening of the same material revealed 4 resistant genotypes at Giza and 6 at Mallawi. Out of 62 Local Barley Crossing Block breeding lines grown at Giza, 3 entries exhibited high resistance, while from 72 ICARDA CB, 2 entries were free of aphids. The level of infestation with aphids at Giza in 1994-95 growing season was moderate to high.

INTRODUCTION

Aphids attack barley at critical stages of plant growth and if the level of infestation is high, as in some seasons, detrimental effect on yield is therefore expected. In order to avoid the use of hazardous insecticides, the phenomenon of plant resistance to insects, as emphasized by Painter (1951), has been chosen as a safe tool for pest control. For this reason, local and exotic barley material were screened in the laboratory, and under natural conditions of the field in two ecologically different regions of Egypt.

MATERIALS AND METHODS

1. Laboratory Screening: (Standard method)

A colony of the corn aphid, *Rhopalosiphum maidis* (fitch) was raised in the laboratory on the local barley variety Giza 121, grown in 12-m plastic pots, under nearly constant conditions of temperature (22±2°C), relative humidity (65±5% RH) and illumination (14/10 light/dark cycle).

The tested barley genotypes were grown in groups of 5 seedling per pot, with 4 replicates. Three days after seedling emergence, 5 viviparous female aphids were

introduced into each pot at the rate of one female per seedling, which were covered by a lantern glass with muslin top for confining the aphids and their progeny inside each pot. Six days after initial infestation, the total number of aphids per at was counted. The criterion for resistance was based on the average daily reproduction rate of the female aphids, as not exceeding one nymph per female per day i.e. 30 aphids per 5 females per six days. Barley genotypes harboring 40 aphids/5 females/6 days were considered moderately resistant.

2. Field Screening

Barley genotypes (94-95 breeding material) were evaluated for their levels of resistance to aphids infestation at Giza and Mallawi representing two ecologically different regions.

Two criteria for evaluation were measured:

i. Level of infestation of plants with aphids was estimated according to a scale of 5 scores:

1 = 0-25; 2=26-50; 3=51-100; 4=101-500, and 5 = more than 500 aphids/plant.

ii. Percentage of infested plants per plot.

Barley genotypes harboring the least numbers of aphids (score 1) and lowest percentage of infested plants per plot (10% or less) were considered resistant.

RESULTS AND DISCUSSION

1. *Laboratory screening*

Screening of 50 local and exotic barley material during 1994-95 growing season revealed 2 resistant and 3 moderately resistant genotypes as shown in Table 1.

From Table 1, it is clear that the newly released barley cultivar Giza 126 adapted to drought stress in the rainfed areas of Egypt, possesses moderate resistance to aphids. This confirms the results obtained in the previous season, 1993-94.

2. Field Screening

Under field conidtions of Mallawi, 6 entries out of 50 genotypes tested showed resistance to aphid build-up as shown in Table 2. At Giza however, 4 genotypes harboured very few aphid colonies as presented in Table 3. Aphid populations in the two areas were moderate to high during 1994-95 season.

Table 1. Resistance levels of laboratory screended barley genotypes to R.maidis, 1994-95.

Entry No	Name/Pedigree	No. aphids/5 females/ 6 days
Resistant genotypes		
5	Pld 10342//Cr. 115/Por/3/Bahtim9/4/Ds/Pro/5/WI2291/6/Badia ICB86-0545-OAP-3KSR-1kSR-OGZ-OKSR	25.0
27	Quinn/Rihane//Quinn/Lignee 640 ICB83-1134-OAP-OAP-OAP-9AP-OAP	28.0
Moderately resistant genotypes		
4	Giza126	38.0
13	MD ATL/CM5S-3W-B/6/MD ATL/CM-B-4-2-1-B-B/5/Ccr/Por// Tb/3/Pro/4/DL75 ICB85-0587-5AP-2AP-2TR-5AP-OTR-OAP	36.5
19	Api/CM67//Mona/3/DI//Asse/CM65-1W-B/4/Assala-02 ICB85-0225-2AP-3AP-OTR-1AP-OTR-OAP	33.0

Two groups of barley breeding lines were also screened for resistance to aphids; these are CB local (62 entries) and BCB (72 genotypes). From the first group 3 entries were resistant (Table 4) and from the second group 10 entries harboured very few aphids.

Several authors dealt with screening barley genotypes for aphid resistance. Hormchong and Wood (1963) suggested that gene-pair responsible for Schizaphis *graminum* resistance in barley was apparently different from the pair that impact resistance to *R.maidis*. Webster and Starks (1984) stated that great resistance in an Rstrain of barley to S.graminum occurred when antibiosis, non-preference and tolerance were considered together.

Resistance to aphids in barley has been attributed to either physical factors e.g. thickness of schlerenchyma cells and number of vascular bundles (El-Serwiy et al., 1985), or surface wax on the leaves (Tsumuki et al., 1987); or to the chemical composition of the leaves as has been discussed by some authors. Todd et al., (1971) concluded that resistance of barley genotypes to *S.gramimum* might be due to the presence of phenolic and flavonoid compounds in the leaves, while Juneja et al. (1972) identified benzyl alcohol as possible cause of resistance.

Another chemical causing resistance to cereal aphids in barley was the existence of gramine in the leaves (Salas, 1991). For this reason, biochemical investigations seem essential in the future plan of work in order to identify resistance factors in the breeding material available.

Table 2. Rate of infestation with aphids (R.I) and percentage infested barley plants per plot at Mallawi, 1994-95.

Entry No.	Name/Pedigree	R.I.	% infested plants/plot
5	Pld 10342//Cr. 115/Por/3/Bahtim9/4/Ds/Pro/5/WI2291/6/Badia ICB86-0545-OAP-3KSR-1KSR-OGZ-OKSR	1	0
6	Pld 10342//Cr. 115/Por/3/Bahtim9/4/Ds/Pro/5/WI2291/6/Badia ICB86-0545-OAP-3KSR-2KSR-OGZ-OKSR	1	0
14	Arar/Lignee 527 ICB85-0625-6AP-OAP-18APH-OAP	1	2
19	Api/CM67//Mona/3/DI//Assc/Cm67-1W-B/4/Assala-02 ICB85-0225-2AP-3AP-OTR-1AP-OTR-OAP	1	2
43	Nigrate/5/WI2198/4/Attiki//Avt/Toil/3/82/Vt (Scl.2.2) ICB86-0329-OAP	1	5
47	M 88-598	1	5

Table 3. Rate of infestation with aphids (R.I) and percentage infested barley plants per plot at Giza (50 entries), 1994-95.

Entry No.	Name/Pedigree	R.I.	% infested plants/plot
1	Giza 123	1	10
2	Giza 124	1	10
4	Giza 126	1	10
27	Quinn/Rihane//Quinn/Lignee 640 ICB83-1134-OAP-OAP-9AP-OAP	1	10

Table 4. Rate of infestation with aphids (R.I) and percentage infested barley plants per plot at Giza (CB, 62 entries), 1994-95.

Entry No.	Name/Pedigree	R.I.	% infested plants/plot
14	Arish 2	1	0
15	Mahally El-Goura	1	5
24	DL 534	1	5

Table 5. Rate of infestation with aphids (R.I) and percentage infested barley plants per plot at Giza (BCB, 72 entries), 1994-95.

Entry No.	Name/Pedigree	R.I.	% infested plants/plot
1	Arar/19-3//WI2291 ICB86-0579-OAP-8AP-1APH-OTR-OAP-2AP-OTR-OAP	1	0
25	H.Spont20-4/Arar 28/2/OP/ZY//Alger/Union, 385-2-2 ICB87-0703-OAP	1	0
19	Api/CM67//DL71/3/Row 906-73/4/3309/5/Mari/Coho// 847-Proctor/Emir ICB84-0952-2AP-5AP-OTR-3AP-OTR-OAP	1	2
3	11012-2/Impala//Birence/3/Arabi Abiad/4/5604/1025/5/ SB73358-B-104-16-1-3//ER//Apm ICB90-0308-1AP-OTR-OAP	1	5
6	Arar/PI 386540 ICB84-1739-2AP-OAP-3APH-OAP	1	5
17	Harmal-02//WI2291/bgs ICB83-1554-1AP-1AP-6AP-OAP	1	5
18	Hd/Aths//Pyo/DL70/3/Apm/5106/4/Mona/Ben//Cam ICB84-0692-2AP-1AP-001TR-1AP-OTR	1	5
27	Arar//2762/Bc-2L-2Y ICB83-0687-7AP-OTR-OAP-4AP-1APH-OAP	1	5
31	Orge 905/Cr. 289-53-2 ICB82-1451-8AP-OAP-9AP-OTR	1	2
33	Quinn/Rihane//Quinn/Aths ICB83-1135-OAP-OAP-OAP-34AP-OAP	1	5

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غربلة بعض التراكيب الوراثية من الشعير للمقاومة لحشرة المن

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أختبرت ١١٤ سلالة من سلالات الشعير المحلية والمستوردة معمليا وحقليا خلال موسم ١٩٩٤ / ٩٥ بمعمل أختبار المن بالجيزة ومحطتى البحوث الزراعية بكل من الجيزة وملوى وذلك بهدف أنتخاب أصناف وسلالات مقاومة لحشرة المن وكانت أهم النتائج:

- أظهرت الأختبارات المعملية لعدد ٥٠ سلالة وجود عدد ٢ سلالة مقاومة و ٣ سلالة متوسطة المقاومة للمن.
- أظهرت الأختبارات الحقلية وجود عدد ٤ سلالات مقاومة للمن فى الجيزة وعدد ٦ سلالات مقاومة للمن فى ملوى.
- أوضحت نتائج تقييم ٦٢ سلالة محلية بالجيزة وجود ٣ سلالات عالية المقاومة لحشرة المن، بينما ظهر من نتائج تقييم عدد ٧٢ سلالة مستوردة من منظمة الإيكاردا أن سلالتين فقط كانتا خالية من الأصابة بحشرة المن.
- متوسط الإصابة بحشرة المن فى محطة بحوث الجيزة لموسم ١٩٩٤ / ٩٥ كانت متوسطة الى عالى ة.