327
Annals
Agric. Sci.,
Ain Shams Univ.,
Cairo, 52(2), 327-340, 2007

EVALUATION OF SPRING BARLEY GENOTYPES TOLERANCE TO DROUGHT STRESS AND APHID INFESTETION

[26]

Hamam[1*] K.A. and A.M.A. Salman[2]
1- Agronomy Dept., Fac. of Agric., Sohag University, Sohag, Egypt
*- e-mail: khalafhamam@yahoo.com
2- Plant protection Dept., Fac. of Agric., Sohag University, Sohag, Egypt

Keywords: Barley; Drought resistance, *Hordeum spontaneum,* Aphid resistance, Sensitivity, *Rhopalosiphum maidis*

ABSTRACT

Thirty four barley genotypes plus two local barley (check) were tested for resistance to drought stress and corn leaf aphid, *Rhopalosiphum maidis* (Fitch.) infestation under field conduction at Sohag governorate during 2004/2005 and 2005/2006 seasons. Results show that, the irrigation intervals significantly affect the population densities of *Rhopalosiphum maidis* and the prolonged of interval of irrigation to four week caused a significant decline in aphid population. The results obtained reveled that the corn leaf aphid, *Rhopalosiphum maidis* (Fitch.) appeared from January then increased gradually to reach its maximum level of abundance during last week of March during both seasons. The genotypes were different in their sensitivity to the infestation with *Rhopalosiphum maidis* and it divided to four groups, the first one was highly resistance, includes (1, 3, 4, 21 23, 34 and Giza 128) and the second group was moderately resistance includes (33 and Giza 127), and the third group was susceptible includes (2, 5 and 6), and the fourth group was highly susceptible includes the remaining barley genotypes. The genotypes (1, 3, 4, 21, 23, 33 34, Giza 127 and Giza128) achieved high yield under normal and regime irrigation with potentiality high resistance to drought stress. The genotypes (4, 7, 13, 15, and 29) give the highest No. of kernels/spike. Genotypes (13, 14, 20, 22 and Giza 128) give the highest number spikes/plant. The highest 1000 kernel weight was obtained by genotypes (3, 8, 26, 30 and Giza 128). Yield was negative and strong correlation with, number of aphid (-0.87** and -0.84**) under normal and drought stress. The correlation between normal irrigation and aphid densities during two seasons was strong and negative (- 0.868**). Strong negative correlation (-0.854**), between drought stress and the aphid densities were detected.

INTRODUCTION

The annual world area of spring barley (*Hordeum vulgar*) covering nearly 53146630 Ha produced about 137105540 tonnes. After Maize, rice and wheat, barley ranks the fourth most important crop plant in the world. As barley is animal feeding, there is an increasing interest in barley-world wide. Barley is the important crop in Egypt covering nearly 56000 Ha, produced 149000 tonnes, respectively **(F.A.O, 2005)**. Present of drought and aphid resistant varieties in the third world countries reduces frequent harvest failures and eliminates grain import. In Egypt most of barley production areas are located in marginal areas where adverse conditions exist such as in rainfed areas, poor soil, saline soils and new reclaimed lands (arid and semiarid lands). Barley could serve

(Received July 31, 2007)
(Accepted October 3, 2007)

as a simple genetic model as it is known to be well-adapted to several biotic and abiotic stresses, especially to water deficit **(Ceccarelli, 1987)**. Also, barley is considered one of the most suitable crops which can be grown over a wide range of climatic and variability **(Ceccarelli 1987 and El-Bawab 1999)**. The final yield was more reduced when drought was imposed at pollination and flowering stages than vegetative or pod filling stages. Plant growth stages, time and duration of the feeding, nutritional status of the host plants, aphid abundance, and environmental factors affect plant responses to aphid infestation **(Macedo *et al* 2003)**. Resistance to aphid in barley has been attributed to either physical factors e.g. thickness of sclerenchyma cells and number of vascular boundless **(El-Serwiy *et al* 1985)**, or surface wax on the leaves and the chemical composition of the leaves **(Tsumuki *et al* 1987)**. **Todd *et al* (1971)** concluded that resistance of barley genotypes to *Schizaphis graminum* might be due to the presence of phenolic and flavonoid compounds in the leaves, while **Jeneja *et al* (1972)** identified benzyl alcohol as possible cause of resistance. In addition, the infestation was inversely proportional to the structural polysaccharide content (cellulose, hemicellu loses and pectins). **Zuniza *et al* (1985)** reported that leaf content of gramine in barley decreased feeding rate, survival rate and reproductive index of individuals of *Schizaphis graminum*. Moreover, the population growth rate of this pest was inversely correlated with gramine content in the leaves of several cultivars. **Weibull (1987)** found that the relative growth rate of *Rhopalosiphum padi* on two cultivars of oats and barley were low when free amino acids content was low and vice versa. **Mornhinweg *et al* (2006)** found that the effect of RWA show highly resistant lines to have either an increase in grain yield or less of a reduction in grain yield than susceptible cultivar, while lines with intermediate resistance fell between the two effect of water interval on the population densities of the corn leaf aphid, *Rhopalosiphum maidis* (fitch.). Barely crops are subjected to the attack by several aphid species, the most serious one is the corn leaf aphid, *Rhopalosiphum maidis* (Fitch.), which is one of the most dominant species in Egypt and other parts of the world. In order to avoid the extensive use of insecticides, the phenomenon of plant resistance to insects, as emphasized by **Painter (1951)** should be chosen as a safe tool for pest management. The aim of this study was to evaluation barley genotypes to drought and aphid infestation tolerance.

MATERIALS AND METHODS

The present study was carried out during the two growing seasons of 2004/2005 and 2005/2006 at the Experimental Farm of Faculty of Agriculture, Sohag University. Thirty six genotypes were grown in two experiments with four replicates distributed in a randomized complete block design. Thirty six genotypes evaluated under water regimes and aphid tolerance as shown in **Table (1)**, seeds were sown of 20 November during both seasons. Each genotype was sown in plot was 10.5 m^2 in size. The seeds were planted in drills (150 g) for each plot. The first experiment (normal treatment) was irrigated 8 times (once every two weeks) after planting irrigation; while in the second experiment (stress) was irrigated 4 times (once every four weeks) after planting irrigation as stress treatment. The recommended cultural practices of barley production were applied throughout the growing season and no pesticides treatments were applied. The data were recorded: on plot basis for each genotype and each replicate to measure the following traits: - (1) Days to heading: number of days from planting to 50% of plants protruded heads from the flag leaf sheath. (2) Number of spikes / plant: Tillers with fertile spikes; (3) Number of kernels / spike: Average number of kernels measured in a 5 spikes sample. (4) 1000-kernel weight (gm): It was obtained as the weight of 1000-kernel, which were chosen randomly; (5) Yield: it was determined as the weight of grains of each experimental plot. (6) Number of aphid: Average number of aphid / ten tillers sample. For each variety which randomly chosen at 3-4 days intervals were counted. The barley genotypes were divided into groups according to their sensitivity and resistance to the infestations with aphids as described by **Chiang and Talekar (1980)**. The insect numbers less than $\overline{X} - 2Sd$ were considered to be highly resistant (HR), between $\overline{X} - 1Sd$ to $\overline{X} - 2Sd$ were moderately resistant (MR); between $\overline{X}$ and $\overline{X} + 2Sd$ were susceptible (S) and more than $\overline{X} + 2Sd$ were highly susceptible (HS), ($Sd = \delta^2 / n - 1$, $\overline{X} = (\overline{X}_1 + \overline{X}_2 + \overline{X}_3 + ... / n)$. The data of season 2004/2005 – 2005/2006 was subjected to statistical analysis performed by the SAS software **(SAS Institute 1999)**.

Table 1. Brief description of the pedigree and origin of the thirty six barley genotypes

Entry No.	Entry name	Origin	Description		
			Heading	yield	Tall
1	Sca 03-2	Germany	early	high	Short
2	Sca 034-2	Germany	early	high	Moderate
3	Sca 045-2	Germany	early	high	High
4	Sca 056-1	Germany	moderately	high	Moderate
5	Sca 067-2	Germany	early	moderately	Short
6	Sca 078-2	Germany	moderately	moderately	Moderate
7	Sca 089-1	Germany	late	moderately	Short
8	Sca 96-1	Germany	moderately	low	Moderate
9	Sca 100-1	Germany	moderately	low	Short
10	Sca 111-2	Germany	late	low	Short
11	Sca 122-1	Germany	late	moderately	Short
12	Sca 126-2	Germany	early	low	Moderate
13	Sca 135-2	Germany	late	low	Moderate
14	Sca 146-1	Germany	early	moderately	High
15	Sca 158-1	Germany	moderately	moderately	High
16	Sca 167-1	Germany	late	moderately	High
17	Sca 178-1	Germany	late	moderately	High
18	Sca 189-2	Germany	moderately	moderately	Moderate
19	Sca 195-1	Germany	moderately	high	Moderate
20	Sca 200-2	Germany	early	low	Moderate
21	Sca 213-2	Germany	early	high	Moderate
22	Sca 226-1	Germany	moderately	moderately	High
23	Sca 233-1	Germany	moderately	high	Short
24	Sca 246-1	Germany	moderately	low	Moderate
25	Sca 258-1	Germany	moderately	low	High
26	Sca 268-1	Germany	late	moderately	Moderate
27	Sca 279-1	Germany	moderately	moderately	Moderate
28	Sca 288-1	Germany	late	low	Moderate
29	Sca 295-1	Germany	early	moderately	High
30	Sca 300-1	Germany	moderately	moderately	Moderate
31	Sca 311-1	Germany	moderately	moderately	Short
32	Sca 313-2	Germany	late	low	High
33	Sca 323-1	Germany	moderately	high	High
34	Sca 334-1	Germany	early	high	High
35	Giza 127	Egypt	moderately	high	Short
36	Giza 128	Egypt	late	high	Short

RESULTS AND DISCUSSION

The analysis of variance: The analysis of variance of all traits was studied and the combined analysis of variance between water regimes (D), genotypes (G) and years (Y) were highly significant for all traits. The interaction between (D) and (G) were yielded highly significant differences for all traits. Result found that the analysis of variance between years (Y) and replications (R) were not significant for all traits **(Table 2).**

Duration to heading in days: Data in **Table (3)** show that the duration to heading in the different barley genotypes under normal irrigation ranged from 88.3 to 122.5 with average 106.4 days during the first season (2004/ 2005) and from 89.5 to 123.8 with average 107.1 days in the second season under the same condition of irrigation, while the duration to heading under regime irrigation in the first season (2004/ 2005) ranged from 84.8 to 102.5 with average 97.4 days, as compared from 84.8 to 112.5 with average 98.1 days under regime irrigation in the second season. In early barley genotypes No.1, 2, 4, 5, 12, 29 and 34 the average of durations to heading in both seasons were 98.3, 96.3. 91.8, 86.8, 95.8 and 96.7 days, compared to109, 108.3, 112.8, 113.4 and 109 days in the late genotypes were No. 7, 13, 16, 17 and 32, respectively. The average for two seasons under normal irrigation and drought regimes were 106.75 days and 97.75 days respectively. The difference between the two means was 9 days, decrease 9 days of March month was decrease 585 aphids in the early genotypes under irrigation regime. The early genotypes harboured a less number of Aphids under irrigation regime, because of the unsuitable leaves to aphid feeding, for this reasons selection early genotypes help to aphid tolerance. Our data are in agreement with **Ahmed *et al* (2000)** has reported the mean heading dates over two years from 27.3 to 55.8 days. Heading date did not contribute to the environment, seasonal rainfall and the ratio of rainfall to evapotranspiration made large contributions to the environmental effect **(Teulat *et al* 2002).**

Number of spikes/plant: Result in **Table (3)** shows that the number of spikes / plant under normal irrigation in first the season (2004/ 2005) ranged from 7.3 to 15.4 spikes, and 7.1 - 15.1 spikes (2005/2006). Result showed that the range of number of spikes / plant under regime irrigation in first season (2004/ 2005) ranged from 6.3 to 11.3 spikes, and 6.0 to 12.1 spikes / plant in (2005/2006) under the same condition of drought stress. The genotypes No. 11, 13, 14, 20, 22 and Giza 128 give the highest number of spikes / plant 11, 12.2, 11.1, 11, 11.2 and 11.6 spikes respectively. On other hand the least number of spikes / plant were obtained by genotypes No.17, 18, 21, 26, 29 and Giza 127 in both seasons with mean of 6.7, 8.2, 7.8, 7.2, 7.2 and 8.2 spikes respectively. This study demonstrated that drought stress was lead to decreased number of spikes / plant. These results are in agreement with **(Fischer, 1984)** who noticed when growth resources are limited by stress, the size of plant organs such as leaves and spikes are reduced and **Kuroli (1983)** who recorded that the damage of *Rhopalosiphum padi* caused significant yield losses in wheat due to reduction in number of grain / ear and grain mass.

Number of kernels/spike: Data in **Table (4)** indicated that number of kernels / spike under normal irrigation in first season (2004/ 2005) ranged from 25 to 38.5 kernels and 25 to 38 kernels in (2005/2006) under the same irrigation condition. While under regime irrigation in first season (2004/ 2005) number of kernels / spike, ranged from 19.3 to 31.8 kernels. Compared with 20 to 30.5 kernels in the second season (2005/2006). The highest number of kernels / spike were achieved 30.5, 31.4, 31.2, 30.9 and 32.9 kernels in genotypes No. 4, 7. 13. 15, and 29 in both seasons among all tested genotypes and the lowest number of kernels / spike were 24.6, 24.3, 23.9, 23.7 and 23.3 kernels in genotypes No. 21, 24, 30, 33 and Giza 128, respectively. The irrigation regime lead to decrease number of kernels / spike consequently decreased the yield. Our result is in harmony with the others, kernels are set, cereal grain yields are proportional weight. Thus environmental effects on kernel size merit better understanding as a source of yield variability **(Wiegand and Cuellar 1981).**

1000- kernel weight (gm): The careful examination of data in **Table (4)** indicated that the range of 1000-kernel weight under normal irrigation in first season (2004/ 2005) was 36.3 - 57.2 gm and 34.5 to 57.4 gm for the second season (2005/ 2006), while under irrigation regime (drought stress) weight of 1000- kernel ranged from 32 to 54.2 gm in first season (2004/ 2005) and ranged from 31.3 to 53.5 gm in the second season (2005/ 2006) under the same condition of drought. The highest weight of 1000-kernel in both seasons 51.9, 55.5, 52.0, 53.7 and 54.5 gm were obtained by genotypes No.3, 8, 26, 30, and Giza 128 and

Table 2. Analysis of variance of six traits for 36 genotypes for drought tolerance

Trait		Year (Y)	(Y)*Rep.	Drought stress (D)	Genotypes (G)	D*G	Error
	DF.	1	6	1	35	35	497
Heading	MS	70.84**	0.31	11574.17**	451.45**	207.62**	0.335
No. of spikes /plant	MS	6.87**	0.02	670.59**	27.75**	14.93**	0.182
No. of kernel / spike	MS	19.14**	0.59	6090.5**	83.96**	54.77**	1.79
1000-kernel weight	MS	41.17**	0.23	2330.47**	418.01**	23.59**	1.04
Yield	MS	0.46**	0.047	476.7**	105.02**	5.87**	0.065
No. of aphid	MS	4755.25**	254.53	1351309.38**	425455.89**	5199.61**	349.46

*, ** Significant at 0.05 and 0.01 levels, respectively

Table 3. Mean performance of days to heading and number of spikes per plant for 36 spring barley under water regimes treatments during two seasons

	Days to heading					Number of spikes per plant				
	2004/2005		2005/2006		Mean	2004/2005		2005/2006		Mean
	N	S	N	S		N	S	N	S	
1	103.5	92.5	104.5	92.8	98.3	10.3	7.3	10.1	7.1	8.7
2	103.3	88.3	104.3	89.3	96.3	10.3	9.4	11.2	9.1	10.0
3	105.3	93.5	105.5	94.5	99.7	15.4	7.3	14.4	6.5	10.9
4	103.3	101.8	104.5	102.8	103.1	10.7	8.4	10.1	8.2	9.3
5	94.5	88.5	94.8	89.5	91.8	11.2	10.3	11.0	8.2	10.2
6	103.3	97.5	103.5	98.5	100.7	9.6	8.4	9.3	8.9	9.0
7	115.5	101.5	116.5	102.5	109.0	9.1	8.6	9.1	9.0	9.0
8	105.5	102.5	105.3	104.3	104.4	10.4	9.3	9.1	9.0	9.4
9	104.5	94.5	105.5	94.5	99.8	9.7	8.8	9.2	6.1	8.4
10	119.0	91.5	120.5	92.5	105.9	10.0	8.3	11.1	10.2	9.9
11	117.3	93.3	118.3	93.5	105.6	11.4	9.3	12.1	11.1	11.0
12	88.3	84.8	89.5	84.8	86.8	10.4	8.4	9.7	8.1	9.1
13	122.5	93.5	123.8	93.5	108.3	12.4	11.4	13.2	12.1	12.2
14	103.5	94.5	104.5	94.8	99.3	13.8	8.7	14.1	8.1	11.1
15	103.5	101.5	104.5	102.5	103.0	15.3	6.4	15.1	6.1	10.7
16	113.8	111.5	113.5	112.5	112.8	11.4	8.7	11.1	8.1	9.8
17	114.5	111.5	115.3	112.3	113.4	7.3	6.4	7.1	6.1	6.7
18	108.5	100.3	108.5	101.3	104.6	10.4	6.3	10.1	6.0	8.2
19	104.3	98.8	104.5	99.8	101.8	9.3	8.3	9.1	8.0	8.7
20	104.5	92.5	105.5	93.5	99.0	11.5	11.1	11.3	10.0	11.0
21	102.5	96.3	102.3	97.5	99.6	8.4	7.4	8.2	7.4	7.8
22	102.3	97.5	103.3	97.5	100.1	12.3	10.4	12.0	10.1	11.2
23	103.3	96.5	104.3	97.5	100.4	11.5	10.4	11.0	9.4	10.6
24	103.5	96.5	104.5	96.5	100.3	10.4	7.5	11.2	7.2	9.1
25	104.5	103.5	105.5	103.5	104.3	10.3	9.0	9.3	9.1	9.4
26	107.8	104.5	108.8	105.0	106.5	8.4	6.3	8.1	6.1	7.2
27	105.3	94.8	105.8	94.5	100.1	11.3	7.3	9.0	7.0	8.7
28	114.8	95.5	115.5	96.5	105.6	11.0	7.3	11.1	7.0	9.1
29	96.5	94.5	96.5	95.5	95.8	8.5	6.3	8.1	6.0	7.2
30	108.3	97.5	109.3	98.5	103.4	10.5	8.3	10.1	8.1	9.2
31	107.5	97.5	107.5	98.5	102.8	9.7	7.6	9.1	7.1	8.4
32	113.3	104.3	113.3	105.3	109.0	8.6	7.6	9.1	8.1	8.3
33	105.0	98.5	106.0	99.5	102.3	11.3	10.3	11.0	10.1	10.7
34	97.3	95.5	97.3	96.8	96.7	9.3	7.3	8.8	8.1	8.4
35	107.5	102.5	108.5	102.5	105.3	8.4	8.0	8.3	8.0	8.2
36	113.5	97.8	114.5	98.8	106.1	12.3	11.2	12.0	11.1	11.6
Mean	106.4	97.4	107.1	98.1	102.3	10.6	8.4	10.4	8.2	9.4
LSD	0.05			0.01			0.05		0.01	
Genotypes	0.4			0.53			0.4		0.53	

N = Normal irrigation S = Stress irrigation

Table 4. Mean performance of number of kernels / spike and 1000 kernel weight for 36 spring barley under water regimes treatments during two seasons

	Number of kernels / spike					1000-kernel weight (gm)				
	2004/2005		2005/2006		Mean	2004/2005		2005/2006		Mean
	N	S	N	S		N	S	N	S	
1	34.5	27.3	30.3	22.5	28.6	53.1	39.5	51.8	38.3	45.6
2	29.5	27.3	29.0	24.0	27.4	54.3	47.3	54.3	45.7	50.4
3	32.5	28.5	36.8	22.5	30.1	55.9	47.3	57.4	47.0	51.9
4	33.5	31.8	32.0	24.8	30.5	54.2	49.5	53.0	47.5	51.0
5	29.0	27.5	28.0	26.5	27.8	45.2	44.2	45.9	44.1	44.9
6	29.0	26.5	30.0	25.5	27.8	40.2	38.4	46.1	37.3	40.5
7	37.0	29.5	36.0	23.3	31.4	42.7	38.2	42.0	37.2	40.0
8	30.0	27.3	28.5	25.5	27.8	57.2	54.2	57.0	53.5	55.5
9	29.0	25.8	32.0	29.8	29.1	46.9	44.0	48.5	42.9	45.6
10	33.5	26.5	35.0	24.0	29.8	48.2	44.0	47.8	42.1	45.5
11	27.8	25.8	30.0	24.3	26.9	52.3	50.1	51.0	48.2	50.4
12	30.5	27.5	29.5	25.0	28.1	48.2	43.2	46.8	42.0	45.1
13	32.5	27.8	34.0	30.5	31.2	46.1	36.1	45.2	38.3	41.4
14	28.8	26.8	30.0	27.0	28.1	43.1	37.2	43.9	35.9	40.0
15	36.5	24.8	37.5	25.0	30.9	50.2	47.2	49.0	45.1	47.9
16	35.0	27.5	34.0	22.0	29.6	36.3	32.0	34.5	31.3	33.5
17	29.5	26.5	30.3	23.0	27.3	49.1	47.5	48.6	46.5	47.9
18	33.5	28.8	33.0	25.0	30.1	50.0	46.0	49.0	44.7	47.4
19	26.5	24.5	25.0	24.3	25.1	49.2	47.4	48.0	45.4	47.5
20	35.3	24.3	35.0	24.3	29.7	45.1	42.2	46.4	41.5	43.8
21	25.0	23.5	25.3	24.5	24.6	44.1	41.3	45.5	40.9	42.9
22	29.0	23.5	30.5	25.0	27.0	43.1	39.1	42.1	38.4	40.7
23	35.5	21.5	35.3	21.3	28.4	43.2	41.1	42.0	39.3	41.4
24	28.3	20.5	28.0	20.5	24.3	41.1	39.1	40.0	38.4	39.6
25	34.5	21.5	34.3	21.5	27.9	42.1	40.1	42.4	39.0	40.9
26	28.5	26.5	28.5	25.8	27.3	53.3	51.3	52.5	50.9	52.0
27	33.5	23.5	33.5	23.3	28.4	41.2	40.0	43.3	38.9	40.9
28	29.5	25.5	30.5	27.5	28.3	42.1	38.2	41.7	37.5	39.9
29	38.5	27.5	38.0	27.5	32.9	45.5	43.7	45.6	42.5	44.3
30	25.5	22.3	25.8	22.3	23.9	56.5	50.4	57.0	51.0	53.7
31	32.5	22.5	33.0	23.0	27.8	50.1	46.8	48.9	46.2	48.0
32	34.0	24.5	33.8	24.0	29.1	44.1	42.4	43.5	41.3	42.8
33	25.0	21.8	25.5	22.5	23.7	48.6	46.7	47.5	45.5	47.1
34	34.5	23.3	34.0	24.5	29.0	39.4	37.2	38.4	36.0	37.7
35	29.8	21.0	30.8	22.0	25.9	44.1	40.0	44.0	40.0	42.0
36	26.5	19.3	27.3	20.0	23.3	55.1	54.0	55.5	53.3	54.5
Mean	31.2	25.3	31.4	24.3	28.0	47.2	43.5	47.1	42.6	45.1
LSD	0.05		0.01			0.05		0.01		
Genotypes	0.93		0 1.22			0.71		0.93		

the lowest weight were obtained by genotypes No.7, 14, 16, 24, 28 and 34 with mean of 40.0, 40.0, 33.5, 39.6, 39.9 and 37.7 gm respectively. The results obtained demonstrate that drought stress lead to decrease number of kernel / spike and weight of kernel. These result are in agreement with (**Fokar *et al* 1998**) found reduction in grain weight / ear, kernel number, and single kernel weight under stress.

Yield: Data presented in **Table (5)** clearly appeared during the first season (2004/2005) under normal irrigation that barley genotypes No. 34, 3, 21, 33, 23, 1 and 4 give the highest grain yield with an average 12.7, 12.6, 12.4, 11.9, 11.5, 11.3 and 11.2 ardab/ fed. respectively. The genotypes No. Giza 127, Giza 128, 19, 18, 6 and 7 give moderately grain yield under the same condition with an average 10.9, 10.9, 9.7, 9.5, 9.2 and 9.2 ardab /fed. respectively. Under drought stress during the first season (2004/2005) that barley genotypes No. 34, 33 and 23 give the highest grain yield with an averages 11.8, 11.1 and 11.1 ardab/fed. respectively and the barley genotypes No 3, 1, 21, 4, Giza 127 and Giza 128 give moderately grain yield with an averages 10.5, 10.3, 10, 10, 9.1 and 9.1 ardab/fed. respectively. In the second season (2005/2006) under normal irrigation the genotypes No. 34, 33, 23, 3, 21 and 1 give the highest grain yield with an averages 12.5, 12.1, 12.5, 12, 12.2 and 11.6 ardab/ fed. respectively, the genotypes No. 4, Giza 127,Giza 128, 19 and 6 give moderately grain yield under the same irrigation system with an averages 10.8, 10.9, 10.6, 9.6 and 9.1 ardab/ fed. respectively. During the second season (2005/2006) the same trend of grain yield were obtained almost for all tested barley genotypes under drought stress. It could be concluded that the population density of Aphid and grain yield of barley were highly affected by irrigation regime. The tolerance to drought stress and Aphid infestation were found be differ in barley genotypes. The average grain yield 8.2 and 8.1 ardab / fed. were obtained under normal irrigation during 2004/ 2005 and 2005/2006, as compared respectively, 6.4 and 6.3 ardab/fed. during 2004/2005 and 2005 /2006 under drought stress, respectively. Resistant and susceptible cultivars were selected by regressing individual cultivar yields **Matin *et al* (1989). Robinson, (1993)** showed decrease grain yield and spike number even in resistant genotypes but less so for resistant than for susceptible genotypes. **Archer and Bynum (1992)** reported that there were 0.46 and 0.48% yield losses for each 1% increase in damaged and infested tillers, respectively, at the pre-heading growth stage. The economic injury level for the spring infestations was 0.9 aphid / seven plants at seven tiller growth stage in Kansas (**Girma *et al* 1993**). **Archer *et al* (1998)** reported that the yield losses were ≈1% and 0.67% / infested or damaged tiller at two tiller growth stage in Montana and Washington, respectively. **Archer *et al* (1998)** reported that the yield losses were 0.5% per infested or damaged winter wheat tillers at the growth stages 31 in Colorado. Winter wheat yield loss due to Russian wheat aphid infestation was 37% in the Canadian Prairies (**Butts *et al* 1997**). Cumulative economic losses from Russian wheat aphid infestation in wheat and barley in the US have been estimated at nearly $1 billion since 1987 (**Webster *et al* 2000**). Reflectance changes in response to biotic and abiotic stressors have been largely documented, however, natural Russian wheat aphid infestations and damage to field crops (**Pe˜nuelas *et al* 1995; Raikes and Burpee 1998**).

Effect of normal irrigation on the population densities of the corn leaf aphid, *Rhopalosiphum maidis* (fitch.). Data presented in **Table (6)** show clearly that leaf corn aphid, Rhopalosiphum *maidis* appeared on the barley genotypes during January in relatively low number, then increased gradually with relatively high number during February and reached its maximum level of abundance during March in both seasons. The aphid numbers (167. 72, 472.18 and 1125.24 per 10 tillers during January, February and March (2004/2005) seasons, respectively, while the numbers were 153.42, 490.74 and 1100.81 during January, February and March (2005/ 2006) seasons. The foregoing results indicate that the population density of aphid during second season was markedly lower than that of the first season. High population densities of aphids during first season (2004/2005) are probably due to climatic conditions particular temperature (**Table 6a**). It is clear that the maximum number of the *Rhopalosiphum maidis* occurred in March during both seasons, this may be attributed to the barley genotypes which during this month are in the suitable developmental stage for feeding of this aphid (anthesis growth stage), also the weather factors prevailing in Sohag during the month are within the preferred range for their multiplication. Obtained results are in agreement with **Salem (2003)** who found that the greenbug, *Schizaphis graminum* infestation by adult was initiated on wheat as soon as seedling emergence and adult attained the highest numbers during a period extended from 2 nd week

Table 5. Relationship between yield and aphid infestation of 36 spring barley genotypes under normal and stress irrigation system during two seasons

	Yield (ardab/fed)					Number of aphid				
	2004/2005		2005/2006		Mean	2004/2005		2005/2006		Mean
	N	S	N	S		N	S	N	S	
1	11.3	10.3	11.6	10.9	11.2	233.0	180.0	243.5	183.8	210.1
2	8.9	5.3	9.4	5.1	7.2	611.0	587.0	593.8	524.0	578.9
3	12.6	10.5	12.0	10.8	11.5	255.0	222.0	288.0	239.0	251.0
4	11.2	10.0	10.8	10.0	10.5	344.0	235.0	321.5	223.8	281.1
5	7.3	5.6	7.2	5.3	6.4	582.0	532.0	624.0	526.8	566.2
6	9.2	7.9	9.1	7.9	8.5	633.0	541.0	635.3	531.5	585.2
7	9.2	3.6	9.1	3.3	6.3	643.0	598.0	648.0	562.0	612.8
8	6.4	3.1	6.4	3.0	4.7	651.0	542.8	644.0	561.0	599.7
9	5.7	3.2	5.8	2.1	4.2	720.8	609.8	724.8	602.0	664.3
10	5.6	4.8	5.1	4.7	5.0	713.8	601.8	727.8	604.0	661.8
11	8.1	7.4	8.2	7.3	7.7	719.0	607.8	727.0	602.8	664.1
12	5.6	5.0	5.5	4.9	5.3	731.8	613.0	726.3	600.8	667.9
13	5.6	4.7	5.8	4.4	5.1	732.0	595.0	726.5	586.0	659.9
14	6.3	4.8	6.1	4.9	5.5	733.0	592.0	726.0	585.5	659.1
15	6.0	5.5	5.9	5.3	5.7	733.5	587.0	725.5	587.0	658.3
16	7.3	5.3	7.1	5.2	6.2	728.5	583.0	730.8	568.0	652.6
17	8.2	5.8	8.1	5.8	7.0	727.0	580.0	721.5	564.3	648.2
18	9.5	5.7	9.4	5.6	7.5	707.0	563.0	715.5	566.0	637.9
19	9.7	8.9	9.6	8.7	9.2	693.0	531.0	596.0	512.8	583.2
20	5.9	4.8	6.0	5.0	5.4	712.0	582.0	698.0	569.0	640.3
21	12.4	10.0	12.2	10.0	11.2	311.0	251.8	338.0	280.5	295.3
22	6.8	6.0	6.9	5.7	6.4	714.0	580.0	702.0	567.3	640.8
23	11.5	11.1	12.5	11.2	11.6	232.0	200.5	243.0	203.8	219.8
24	6.6	3.1	6.6	3.1	4.9	675.0	564.8	636.0	542.0	604.4
25	4.4	2.2	4.3	2.0	3.2	674.0	551.5	662.8	554.0	610.6
26	6.2	5.1	6.1	5.0	5.6	671.8	571.0	648.5	558.0	612.3
27	6.9	5.1	6.8	5.0	6.0	675.0	631.8	659.0	607.0	643.2
28	5.9	4.8	6.3	4.8	5.4	689.0	576.8	673.0	566.0	626.2
29	7.8	5.2	7.8	5.1	6.5	681.0	551.0	654.0	555.8	610.4
30	7.9	7.2	7.8	7.1	7.5	697.3	575.0	670.8	582.8	631.4
31	6.5	5.1	6.1	5.0	5.7	664.8	536.8	640.8	548.8	597.8
32	5.6	1.6	5.5	1.6	3.6	660.0	557.8	654.8	591.0	615.9
33	11.9	11.1	12.1	11.2	11.6	336.8	274.8	342.8	282.3	309.1
34	12.7	11.8	12.5	12.0	12.3	227.3	184.3	234.3	178.0	205.9
35	10.9	9.1	10.9	9.1	10.0	352.8	307.0	323.3	294.3	319.3
36	10.9	9.1	10.6	9.2	10.0	313.0	244.0	311.3	257.5	281.4
Mean	8.2	6.4	8.1	6.3	7.3	588.3	490.0	581.6	485.2	536.3
LSD		0.05		0.01			0.05		0.01	
Genotypes		0.18		0.23			12.98		17.1	

Table 6. Susceptibility of barley genotypes irrigated at two weeks interval to *Rhopalosiphum maidis* infestation during growing sessions 2004/2005 and 2005/2006

Lines	No. *Rhopalosiphum maidis* / 10 tillers 2004/2005					No. *Rhopalosiphum maidis* / 10 tillers 2005/2006					Total over two seasons	Sensitivity
	Jan.	Feb.	Mar.	Total	Mean	Jan	Feb	Mar	Total	Mean		
1	124	201	374	699	233.0	116	250	365	731	243.7	715	HR
2	196	576	1062	1834	611.0	169	452	1160.4	1781.4	593.8	1807.7	(S)
3	123	239	403	765	255.0	114.05	281	469	864.05	288.0	814.5	HR
4	116	301	615	1032	344.0	140.55	302	522	964.55	321.5	998.3	HR
5	180	490	1076	1746	582.0	124.3	518	1230	1872.3	624.1	1809 2	(S)
6	187	534	1179	1900	633.0	138.15	560	1208	1906.15	635.4	1903.1	(S)
7	148	509	1273	1930	643.0	169	569	1206	1944	648.0	1937	HS
8	151	570	1232	1953	651.0	169.3	508.04	1255	1932.34	644.1	1942.7	HS
9	160	536	1467	2163	720.8	174.8	636.04	1363.7	2174.54	724.8	2168.8	HS
10	173	559	1409.4	2141.4	713.8	170	534	1479.4	2183.4	727.8	2162.4	HS
11	180	568	1409	2157	719.0	164	600	1417	2181	727.0	2169	HS
12	190	588	1418	2196	731.8	170	599	1410	2179	726.3	2187.5	HS
13	196	580	1420	2196	732.0	178	598	1404	2180	726.7	2188	HS
14	190	592	1417	2199	733.0	174	588	1416	2178	726.0	2188.5	HS
15	194	588.6	1418	2200.6	733.5	173	589	1415	2177	725.7	2188.8	HS
16	194	584	1408	2186	728.5	171	570	1452	2193	731.0	2189.5	HS
17	199	579	1403	2181	727.0	176	570	1419	2165	721.7	2173	HS
18	192	583	1346	2121	707.0	160	585	1401.8	2146.8	715.6	2133.9	HS
19	182	550	1347	2079	693.0	160	528	1100	1788	596.0	1933.5	HS
20	188	569	1379	2136	712.0	171	597	1326	2094	698.0	2115	HS
21	130	280	523	933	311.0	120	269	625	1014	338.0	973.5	HR
22	186	569	1388	2143	714.0	169	570	1367	2106	702.0	2124.5	HS
23	101	206	389	696	232.0	103	229	397	729	243.0	712.5	HR
24	180	490	1355	2025	675.0	166.85	546	1195.27	1908.12	636.0	1966.6	HS
25	190	500	1333	2023	674.0	156	567.3	1265	1988.3	662.8	2005.7	HS
26	195	503	1318	2016	671.8	189	569	1187.6	1945.6	648.5	1980.8	HS
27	187	489	1350	2026	675.0	184	598.4	1194.73	1977.13	659.0	2001.6	HS
28	198	516	1353	2067	689.0	174	582	1263	2019	673.0	2043	HS
29	192	502	1349	2043	681.0	164	589	1209	1962	654.0	2002.5	HS
30	198	590	1304	2092	697.3	162	581.3	1269	2012.3	670.8	2052.2	HS
31	185	502	1307.3	1994.3	664.8	160	552	1210.3	1922.3	640.8	1958.3	HS
32	198	509	1273	1980	660.0	161	580.3	1223	1964.3	654.8	1972.2	HS
33	106	305	600	1011	336.8	96.2	300.3	632.04	1028.54	342 8	1019.8	MR
34	101	209	373	683	227.3	100	215	388	703	234.3	693	HR
35	117	306	636	1059	352.8	119	256	595	970	323.3	1014.5	MR
36	111	226	602	939	313.0	117	228	589	934	311.3	936.5	HR
Mean	167.72	472.18	1125.24	1765.1	588.3	153.42	490.74	1100.81	1744.98	581.7	1755.06	

$\overline{X} = 1755.06$ Sd = 88.30

HR = Highly resistance MR = Moderate resistance

LR = Low resistance S = Susceptible

HS = Highly susceptible

Table 6a. Maximum and minimum temperature degree over two seasons for Sohag governorate

		November	December	January	February	Mars	April	May
2004/2005	Maximum	27.6	22.1	20.1	22.4	25.7	32.5	34.4
	minimum	11.5	6.6	5.4	7.5	9.2	14.4	19.0
2005/2006	Maximum	25.9	23.4	21.5	23.5	26.6	30.1	34.9
	minimum	10.0	9.0	6.8	8.9	11.0	14.6	19.1
Mean	Maximum	26.75	22.75	20.8	22.95	26.15	31.3	34.65
	minimum	10.75	7.8	6.1	8.2	10.1	14.5	19.05

of February to the end of March in both seasons. The highest number of nymphs was 504.2 and 158.77 nymphs / tiller for the 1st and 2nd seasons, respectively.

Data also in **Table (6)** indicated that the population density, of *Rhopalosiphum maidis* in the first season (2004/ 2005) ranged from 683.0 to 2200.6 aphid /10 tillers. On the other hand, ranged from 703.0 to 2193.0 aphid /10 tillers at the second season (2005/2006). The genotypes No. 9, 10, 11, 12, 13, 14, 15, 16, 17, 18 and 22 harboured the highest aphid population in both seasons among all tested barley genotypes, followed by 20, 25, 26, 27, 28, 29, 30 and 32 throughout two seasons. On other hand, the genotypes No. 1, 3, 21, 23, 33, 34, Giza 127 and Giza 128, harboured the least number of the corn leaf aphid in both seasons. The reaming tested barley genotypes were infested moderately in both seasons. Data in **Table (5)** in the first season appears that the genotypes No. 1, 3, 4, 21, 23, 33, 34 and Giza 128 harboured the least number of aphid, *Rhopalosiphum maidis* with average, 233, 255, 344, 311, 232, 336.8, 227.3 and 313, individual / 10 tillers, meanwhile the genotypes No. 9, 10, 11, 12, 13, 14, 15, 16, 17, 20 and 22 received the highest number of aphids, with an average 720.8, 713.8, 719, 731.8, 732, 733, 733.5, 728.5, 727, 712 and 714, respectively. The remaining barley genotypes are considered moderately infestation. In the second season (2005/2006) the same trend were observed according to **Chiang and Talkar (1980).** The 34 barley genotypes plus two varieties Giza 127 and Giza 128 as local (check) can be divided into four groups of sensitivity **(Table 6)**. The first one includes the genotypes No. 1, 3, 4, 21, 23, 34, and Giza 128, this group was highly resistant (HR) to *Rhopalosiphum maidis* infestation, the second group was moderately resistant (MR) include two genotypes 33 and Giza 127. While the third group was susceptible (S) include 2, 5, 6 and the fourth group was highly susceptible (HS) included genotypes No. 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 24, 25, 26, 27, 28, 29, 30, 31 and 32. Several authors, however, dealt with screening barley genotypes for aphid resistance.

Effect of Drought stress on the population densities of the corn leaf aphid, *Rhopalosiphum maidis* (fitch.) on spring barley genotypes: Data presented in **Table (5)** show significant effect of irrigation interval on the population density of *Rhopalosiphum maidis*. Obtained results indicated that the low numbers of *Rhopalosiphum maidis* were recorded when the barley genotypes supplied by irrigation regime for 4 weeks intervals with an average 490.0 and 485.2 individuals / 10 tillers for *Rhopalosiphum maidis* during the two seasons, 2004 /2005 and 2005 /2006 respectively. As compared to 588.3 and 581.6 individuals for *Rhopalosiphum maidis* / ten tillers during 2004 /2005 and 2005/2006 seasons respectively in the normal irrigation. Results show that, the population densities of *Rhopalosiphum maidis* was highly affected by irrigation intervals. The current results are in agreement with those obtained by many authors, **Minoranskii (1972)**, stated that the short irrigation intervals followed by increasing population densities of *Aphis feba* and *Pegomia mixta*, **Abou Said and Draz (1989)** mentioned that sugar beet plants were heavily infested when irrigated at intervals; **Watson *et al* (1992)** and **Helaly *et al* (1994)**, found that prolonged of interval of irrigation in cotton to 20 days caused a significant decline in insect numbers. **Ali *et al* (1996)** found that insect populations were affected by different furrow – irrigation system and **Abou Aiana *et al* (1997)** found that sunflower plants irrigated every week harboured the highest population of *Aphis Spp*., *Bemisia tabaci* (Genn.) and *Empoasca spp.* Compared with the plants, which irrigated every two and three weeks. **Slman (2002)** found that prolonging of irrigation interval from 15 to 21, 28 or 35 days caused a decline in aphid population of *Rhopalosiphum padi* and *Schizaphis graminum*.

The simple Pearson's correlation presented in **Table (7)**. There are three levels of correlation <0.2 was weak, from >0.2 to <0.5 was moderate, and more than >0.5 was strong **(Hamam 2004)**. **Yield** was negative and strong correlated with number of aphids (-0.87** and – 0.84**) under normal irrigation and drought stress respectively. Also, due to negative correlations, it is necessary to select plants that have little aphids and high yield. Correlations were weak and moderate for **number of kernel / spike** with 1000-kernel weight (-0.28** and – 0.011), yield (- 0.16** and - 0.21**) and number of aphid (0.073 and 27**). **Heading** was resulted weak and moderate correlation with No. of spikes /plant, (0.076 and 0.27**) and No. of aphid (0.22** and 0.013). Relative reduction of No. of aphid due to drought was a promising trait to improve drought tolerance indirectly. The remaining correlations between other different traits were weak. The correlation between **normal irrigation** (two weeks) and aphid densities during two seasons was strong and negative (-0.868**). Strong negative correlation (-0.854**), between **drought stress** (four weeks) and the aphid densities were detected. The results obtained are in agreement with this obtained by **Pillen *et al* (2003)** and **Kuroli (1983)** who found that the level of yield loss was correlated with aphid numbers and the period of damage.

Conclusion, it could be concluded that the genotypes No.33 and Giza 127 can be used as a source of *Rhopalosiphum maidis* resistance and that the genotypes Giza 127 and Giza 128 can be used as a source of drought resistance in the plant breeding program. Also the genotypes No. 1, 3, 4, 21 23, 34 and Giza 128 proved highly aphid resistance under Upper Egypt condition, while genotypes No. 1, 3, 4, 21 23, 33 and 34 proved highly drought resistance upper south Egypt. Generally, the information obtained in the present study could be helpful in management of drought stress and aphid infestation in barley field and in barley breeding programs aimed to develop drought and aphid resistant cultivars.

Table 7. Pearson's correlation coefficients (r) between six studied traits under normal irrigation and drought stress

		Heading	No. of spikes /plant	No. of kernel / spike	1000-kernel weight	Yield	No. of aphid
Heading	N						
	S						
No. of spikes /plant	N	0.076					
	S	- 0.25**					
No. of kernel / spike	N	0.062	0.13*				
	S	- 0.17**	- 0.14*				
1000-kernel weight	N	0.044	0.12*	- 0.28**			
	S	0.029	- 0.021	- 0.011			
Yield	N	- 0.16**	- 0.073	- 0.16**	0.14*		
	S	- 0.088	- 0.064	- 0.21**	0.103		
No. of aphid	N	0.22**	0.022	0.073	- 0.13*	- 0.87**	
	S	0.013	- 0.047	0.27**	- 0.054	- 0.84**	

N = normal irrigation, S = stress irrigation
*, ** Significant at 0.05 and 0.01 levels, respectively

REFERENCES

Abou Aiana, R.A.; M.B. Abo Salem and K.A.A. Draz (1997). Effect of irrigation depth and interval on population densities of some piercing and sucking pests on sunflower plants. **J. Agric. Sci. Mansoura Univ., 22(8): 2737 – 2743.**

Abou Said, A.M. and K.A.A. Draz (1989). The effect of irrigation intervals in two sugar beet varieties on the population densities of the major prevalling pests at Kafer El – Sheikh area. **Proc. Third Conf. of Pests Dis. of Veg - Fruits in Egypt and Arab Countries. Ismailia, Egypt, pp. 231- 236.**

Ahmed, T.; A. Tsujimoto; A. Hisashi; and T. Sasakuma (2000). Identification of RFLP markers linked with heading date and its heterosis in Hexaploid wheat. **Euphytica 116: 111-119.**

Ali, S.A.; H.M. Abou Zeid and A.M. Hamid (1996). Effect of different furrow irrigation systems on cotton productivity, water use efficiency and some insects populations. **J. Agric. Sci. Mansoura, Univ., Egypt, 21(1): 69 – 77.**

Archer, T.L. and E.D. Bynum (1992). Economic injury level for the Russian wheat aphid (*Homoptera: Aphididae*) on dryland winter wheat. **J. Econ. Entomol. 85: 987–992.**

Archer, T.L.; F.B. Peairs; K.S. Pike; G.D. Johnson and M. Kroening (1998). Economic injury levels for the Russian wheat aphid (*Homoptera: Aphididae*) on winter wheat in several climate zones. **J. Econ. Entomol. 91: 741–747.**

Butts, R.A.; J.B. Thomas; O. Lukow and B.D. Hill (1997). Effect of fall infestations of Russian wheat aphid (*Homoptera: Aphididea*) on winter wheat yield and quality on the Canadian Prairies. **J. Econ. Entomol. 94: 1005–1009.**

Ceccarelli, S. (1987). yield potential and drought tolerance of segregation populations of barley in contrasting environments. **Euphtytica 36: 265-273.**

Chiang, H.S. and N.S. Talekar (1980). Identification of sources of resistance to the Bean fly and two other agromyzid flies in soybean and Mungbean. **J. Econ. Entomol., 73 : 197 – 199.**

El Bawab, A.M.O. (1999). Yield stability of some newly released barley cultivars in Egypt. **Egypt. J. Apppl. Sci. 14(3):128 – 136.**

El-Serwiy, S.; H.S. El-Haidari; I.A. Razoki and A.S. Raggab (1985). Susceptibility of different barley strains and varieties to aphids in the middle of iraq. **J. Agric. Water Pes., 4: SP : 710.**

F.A.O. (2005). The FAOSTAT ProdSTAT Production Quantity of Barley. Available at: (http://faostat.fao.org/site/291/default.aspx) 22.07.2007: at 23:30

Fischer, R.A. (1984). Physiological limitations to producing wheat in semi-tropical and tropical environments and possible selection criteria. In wheat for more tropical environments. **Proc. Int.Symp., Mexico City. 24-28 September. 1984. CIMMYT, Mexico City, pp. 209-230.**

Fokar, M.; A. Blum and H.T. Nguyen (1998). Heat tolerance in spring wheat. II. Grain filling. **Euphytica 104: 9-15.**

Girma, M.; G.E. Wilde and T.L. Harvey (1993). Russian wheat aphid (*Homoptera: Aphididae*) affects yield and quality of wheat. **J. Econ. Entomol. 86: 594–601.**

Hamam, K.A. (2004). Improving Crop Varieties of Spring Barley for Drought and Heat Tolerance with AB-QTLanalysis. pp. 55-58. Ph.D. Thesis, Fac of Agric., Bonn Uni., Germany.

Helaly, M.M.; S.S.M. Hassanein; E.M. Metwally; W.M.H. Desukey and H.M.H. Al-Shannaf (1994). Effect of certain agricultural practices on the population density of some cotton pests **Zagazig, J. Agric. Res. 21(6) : 1817- 1828.**

Jeneja, P.S.; R.K. Gholson; R.L. Burton and K.J. starks (1972). The chemical basis for green bug resistance in small grains. Benzylul alcohol as possible resistance factor. **Ann. Ent. Soc. Am., 65: 961 – 964.**

Kuroli, G. (1983). Damage by oat aphids (*Rhopalosiphum padi* (L.) in cereals. zeitshrift Fur Angewandte **Entomologie, 96: 463 – 469.**

Macedo, T.B.; L.G. Higley; X. Ni and S.S. Quisenberry (2003). Light activation of Russian wheat aphid-elicited physiological responses to susceptible wheat. **J. Econ. Entomol. 96: 194–201.**

Matin, M.A.; J.H. Brown and H. Ferguson (1989). Potential, Relative Water Content, and Diffusive Resistance as Screening Techniques for Drought Resistance in Barley Agronomy **Journal AGJOAT 81 (1): 100-105.**

Minoranskii, V.A. (1972). The effect of irrigation on Bee flea in the north Caucasus steppezne. **Revue d'Ent. de l'URSS. 11(5): 67-74.**

Mornhinweg, D.W.; D.E. Obert; D.M. Wesenberg; C.A. Erickson and D.R. Porter (2006). Registration of Seven Winter Feed Barley Germplasms Resistant to Russian Wheat Aphid. **Crop Sci 46:1826-1827.**

Painter, R.H. (1951). Insect Resistance in Crop Plants. pp. 351-358. The Macmillan Co., New York.

Pe˜nuelas, J.; I. Filella; P. Lloret; F. Mu˜noz and M. Vilajeliu (1995). Reflectance assessment of mite effects on apple trees. **Int. J. Remote Sens. 16: 2727–2733.**

Pillen, K.; A. Zacharias and J. Léon (2003). Advanced backcross QTL analysis in barley (*Hordeum vulgare* L.). **Theor. Appl. Genet. 107: 340-352.**

Raikes, C. and L.L. Burpee (1998). Use of multispectral radiometry for assessment of Rhizoctonia blight in creeping bentgrass. **Phytopathology 88: 446–449.**

Robinson, J. (1993). (*Diuraphis noxia* (kurdjumov)) productivity of Barley infested with Russian wheat aphid. **J. Agron. Cop Sci. 171: 168 – 175.**

Salem, H.A. (2003). Stages occurrence, natality rate and dispersal ability of *schizaphis graminum* (Rond.) on wheat plants at Giza governorate. **Bull. Fac. Agric., Cairo Univ., 54: 307 – 318.**

SAS Institute (1999). The SAS System for Windows, release 8.00. SAS Institute, Cary, N.C.

Slman, F.A.A. (2002). Influence of some Agricultural practices on the infestation of wheat crop by cereal aphids in upper Egypt. **Assiut J. of Agric. Sci., 33(3): 1- 12.**

Teulat, B.; O. Merah; C. Borries; R. Waugh and D. This (2002). QTLs for grain carbon isotope discrimination in field-grown barley. **Theor. Appl. Genet. 106: 118-126.**

Todd, G.W.; A. Getohan and D.C. Cress (1971). Resistance in barley to the greenhouse, *S graminum.* I- toxicity of phenolic and flavonoid compounds and related substances. **Ann. Ent. Soc. Am., 64: 718 – 722.**

Tsumuki, H.; K. Hanehisa; T. Shirage and K. Kawada (1987). characteristics of barley resistance to cereal aphid 2- Nutritional differences between barley strains. **Nogaku Kenkyu, 61:149-159.**

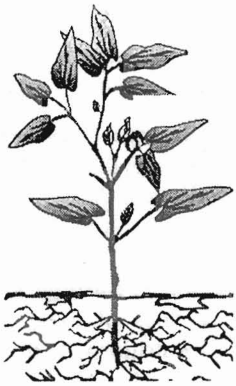
Watson, T.F.; J.C. Silver Tooth; A. Tellez and L. Lastru (1992). Seasonal dynamics of sweet potato whitefly in Arizona. **Southwestern Entomologist Journal, 17(2): 149 – 167.**

Webster, J.; R. Treat; L. Morgan and N. Elliott (2000). Economic Impacts of the Russian Wheat Aphid and Greenbug in the Western United States 1993–1994, 1994–1995, and 1997–1998. U.S. Department of Agriculture. ARS Service Report PSWCRL, Rep. 00-001.

Weibull, J. (1987). Seasonal changes in the free amino acids of oat and barley phloem sap in relation to plant growth stage and growth of *Rhopalosiphum padi.* **Ann. Appl. Biol., 111: 719 – 737.**

Wiegand, C. and J.A. Cuellar (1981). Duration of grain filling and kernel weight of wheat as affected by temperature. **Crop Sci. 21: 95-101.**

Zuniza, G.E.; M.S. Salgadd and L.J. Corcuera (1985). Role of an indole alkaloid in the resistance of barley seedlings to aphids. **Phybochemistry, 24: 945 – 947.**



حوليات العلوم الزراعية
جامعة عين شمس، القاهرة
مجلد(٥٢)، عدد (٢)، ٣٢٧-٣٤٠، ٢٠٠٧

تقييم التراكيب الوراثية للشعير الربيعى لتحمل الجفاف والاصابة بالمن

[٢٦]

خلف على همام[١] - أحمد محمود على سالسان[٢]
١- قسم المحاصيل - كلية الزراعة - جامعة سوهاج - سوهاج - مصر
٢- قسم وقاية النبات - كلية الزراعة - جامعة سوهاج - سوهاج - مصر

أجريت هذة الدراسة لتقييم واختبار اربعة وثلاثون تركيب وراثى من الشعير بالمقارنة بصنفين محليين من الشعير (جيزة ١٢٧ ، جيزة ١٢٨) بالنسبة للمحصول والصفات المحصولية الاخرى وتقييم هذه التراكيب الوراثية من حيث تحملها للاصابة بحشرة من الذرة تحت ظروف الرى الطبيعة فى الحقل ، وتحت ظروف الاجهاد المائى - بمزرعة كلية الزراعة - جامعة سوهاج خلال موسمين دراسيين متتابعين هما ٢٠٠٤/٢٠٠٥ و ٢٠٠٥/٢٠٠٦.

اولا: كما اظهرت النتائج ان قصر الفترة بين مرات الرى الطبيعى كل اسبوعين ادى إلى زيادة معنوية فى عدد الحشرات وان طول الفترة بين مرات الرى تحت ظروف الاجهاد المائى والرى كل اربع اسابيع ادى إلى انخفاض معنوى فى الكثافة العددية لمن الذرة.

ثانيا: أظهرت الدراسة ان نباتات الشعير كانت هدفا للاصابة بمن الذرة اعتبارا من شهر يناير إلى شهر مارس وقد سجل اقصى تعداد للمن خلال شهر مارس وقد تم تقسيم التراكيب الوراثية طبقا لحساسيتها للاصابة بمن الذرة إلى اربع مجموعات :المجموعة الاولى وكانت ذا مقاومة عالية وتشمل التراكيب الوراثية (١ ، ٣ ، ٤ ، ٢١ ، ٣٤ و جيزة ١٢٨) والمجموعة الثانية وكانت ذا مقاومة متوسطة وتشمل التراكيب الوراثية (٣٣ و جيزة ١٢٧) و المجموعة الثالثة وكانت حساسة للاصابة بمن الذرة وشملت التراكيب الوراثية (٢ ، ٥ و٦) اما المجموعة الرابعة فكانت ذا حساسية عالية وشملت بقية التراكيب الوراثية.

ثالثا: أظهرت الدراسة ان التراكيب الوراثية (١ ، ٣ ، ٤ ، ٢١ ، ٢٣، ٣٤ و جيزة ١٢٧، و جيزة ١٢٨) حققت أعلى محصول تحت ظروف الرى الطبيعى وظروف الاجهاد. وكانت التراكيب الوراثية (٣ ، ٨ ، ٢٦ ، ٣٠ ، و جيزة ١٢٨) الاعلى فى وزن ١٠٠٠حبة. وكانت التراكيب الوراثية (١٣ ، ١٤ ، ٢٠ ، ٢٢ ، و جيزة ١٢٨) الاعلى فى عدد السنابل لكل نبات. وكانت التراكيب الوراثية (٤ ، ٧ ، ١٣ ، ١٥ ، و ٢٩) الأعلى فى عدد الحبوب لكل سنبلة.

رابعا: وقد اظهرت النتائج ان محصول الحبوب لهذه التراكيب الوراثية ارتبط ارتباطا قوى سالبا مع الكثافة العددية لمن الذرة (**-٠,٨٧ و **-٠,٨٤) تحت ظروف الرى العادى والجفاف على التوالى. كما اظهرت النتائج انه كان هناك ارتباط قوى سالب ومعنوى بين متوسط الاصابة بالمن وفترات الرى (**- ٠,٨٦٨ و **- ٠,٨٥٤) تحت فترات الرى كل اسبوعين وتحت الجفاف والتى كانت تروى كل اربع اسابيع على التوالى.

تحكيم: أ.د محمد سالم عبد الواحد
أ.د عبد العظيم أحمد إسماعيل