RESPONSE OF, *RHOPALOSIPHUM PADI* L. TO SOME BIOTIC, ABIOTIC FACTORS AND PHYTOCHEMICAL COMPONENTS OF FIVE WHEAT VARIETIES

EL-MITWALLY, M. F. [1], F. F. SHALABY[2], M. M. ASSAR [2] and A. M. KHORCHID [1]

1. *Plant Protection Research Institute, ARC, Dokki, Giza, Egypt.*
2. *Plant Protection Department, Faculty of Agriculture, Moshtohor, Benha University, Egypt.*

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Abstract

The infestation levels of bird cherry-oat aphid, *Rhopalosiphum padi* L. wer been studied on five wheat (*Triticum aestivum*) varieties viz., Giza 168, Sides 1, Gemmeiza 7, Gemmeiza 9 and Sakha 93 throughout 2005\06 and 2006\07 growing seasons at the Agricultural Research Institute, Ismailia governorate, Egypt. Recorded relative population densities of *R. padi* were correlated with some abiotic (temperature and relative humidity) and biotic (predators & Parasitoids) factors during both seasons. Sids 1 variety showed highest susceptibility, while Sakha 93 variety was the least susceptible one. Results showed significant differences between the five wheat varieties for *R. padi* population abundance (adults and nymphs) in both seasons. Presence and rates of phytochemical components in leaves of the different wheat varieties were studied.

Key words: *Rhopalosiphum padi*, Infestation, wheat varieties, Parasitoid, predator, Susceptibility, Weather factors.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is the most important strategic cereal crop in Egypt. More than 2.538 million feddans are cultivated in old land, in addition to 526 thousand feddans in new lands. Many pests attack the wheat plants leading to great loss in quality and quantity of the yield. In Egypt, The population needs cereals foods in our consummation over the production of the wheat crop more than 60%.

The bird cherry-oat aphid, *Rhopalosiphum padi* L, may be considered as one of the major insect pests attacking wheat crop in Egypt as in years of outbreak of this aphid, it causes severe damage to plants resulting from direct sap-drainage by aphids feeding. The quick build up of aphids populations is attributed to quick reproduction by parthenogenesis, moderate weather conditions and continuous existence of cereal (geramineous) crops all the year round, (Tantawi *et al.,* 1986). Some commercial bread wheats were screened for resistance against the main cereal aphid species (Ruchira *et al*., 2002). Sekhar and Singh (1999). They reported that the plants are mainly infested with the Indian grain aphid, *Macrosiphum miscanthi* and the bird

cherry oat aphid, *R. padi* in India. *R. padi* infested all above ground plant parts, but was more preponderant on leaves and stem (foliage). Dry matter analysis revealed the presence of free amino acids and sugars in leaves and spikes of varieties (Havlickova, 1996).

Webster and Porter (2000) evaluated the impact of resistance to wheat aphid, *Diuraphis noxia, Metopolophium dirhodum, Sitobion avenae*, and *R. padi*. on some wheats. Abou-Elhagag *et al*. (2001) evaluated the susceptibility of ten wheat varieties to three cereal aphid species (*R. padi, Schizaphis graminum* and *R. maidis*) in Egypt. Akhtar *et al*. (2007) evaluated eleven wheat lines against *Rhopalosiphum padi*. The author stated that three lines were resistant, while the varieties namely Chakwal-97 and V-002467 were susceptible to aphid attack whereas seven lines were moderately resistant. In seedling bulk tests, Akhtar *et al*. (2008) evaluated twenty wheat varieties against *Rhopalosiphum padi* in Pakistan. These varieties were grouped into three categories (i.e resistant, moderately resistant and susceptible). In which, data from seedling bulk tests showed that DN-47 and PR 87 lines of wheat were resistant to aphid as compared to the other varieties. The present experiment was carried out to study out the population abundance of *R. padi* in relation to biotic and abiotic factors and also, to different wheat varieties.

MATERIALS AND METHODS

For studying impact of some biotic and abiotic factors on population of *R. padi* on different varieties of wheat two successive experiments were conducted at the experimental farm of Ismailia Agricultural Research Station during two 2005/ 2006 and 2006 / 2007growing reasons. Five varieties of wheat viz., Giza 168, Sides 1, Gemmeiza 7, Gemmeiza 9 and Sakha 93were sown on November 15th of each year. The experiments were laid out in a randomized complete block design with four replications and plot size was kept at 105 $m^{2.}$ Cultural methods were followed as commonly practices and chemical control was entirely avoided during the growing seasons. For estimating the population density of cereal aphids and their natural enemies, samples of 40 tillers per replicate were randomly collected at weekly intervals starting from the beginning of December 2005 to crop harvesting on 1 April 2006. The tillers were refrigerated until examined within 24 hr. All aphids including mummies (parasite) and predaceous insects per tiller were counted with the aid of binocular microscope. Aphid mummies were placed individually is small plastic tubs and held for parasite emergence. The parasites were identified by specialists at Plant Protection Institute. The recorded counts of beneficial natural enemies were statistically correlated with aphids infestation. The relationship between certain abiotic

factors and the population dynamics of this pest during the two successive seasons 2005\06 and 2006\07 were studied. Daily maximum and minimum temperature and relative humidity were recorded from data of the Central Laboratory of Agricultural Climate, Agricultural Research Centre, Dokki, Giza.

The number of individuals was accumulated for seven days for the whole data of the two seasons in relation to the abiotic and biotic factors.

The relationship between the leaf phytochemical components and infestation levels by *R. padi* was studied on the five wheat varieties through the two growth stages (seedlings and heading stages) during 2005/06-2005/07 seasons. Leaves of each sample were cleaned and washed by water, then quickly dried by placing between two filter papers to remove the excess of water. The fresh weight of leaves was recorded. The leaves were placed in drying oven at 45 ºC for one day. The dry powder of leaves was stored in glass bottles to determine carbohydrates and total protein contents according to the methods of Pregl (1945) and Michel *et al.* (1956). The percentages of the reduced, non-reduced and total sugars were also estimated in the dry powder using the method of Forsee (1938). The phosphorous content was determined according to the method of Troug and Meyer, 1939.

RESULTS AND DISCUSSION

Five wheat varieties (Giza 168, Sides 1, Gemmeiza 7, Gemmeiza 9 and Sakha 93) were evaluated for their susceptibility to infestation by the oat bird-cherry aphid, *Rhopalosiphum padi* L. during two successive seasons 2005\06 and 2006\07.

Data tabulated in Tables (1, 2, 3&4) show that the weekly counts of *R. padi* and aphid parasitoids *Aphidius matricaria* and *Aphidius colemani* and predators, *Paederus alfierii*, *Chrysoperla carnea, Coccinella unedcimpunctata*, *C. septempunctata*, *Cydonia vicina nilotica*, *Cydonia vicina isis* and *Hippodamia variegata* on wheat plants of the two seasons at Ismailia Research Station, Ismailia Governorate during 2006/07 seasons. Presence of aphids, *R. padi* on five varieties was detected throughout the whole period of plant growth from December to April during both seasons. Generally, higher abundance of *R. padi* on all wheat varieties occurred throughout the period between January up to the third week of March during both seasons. The data showed significant differences between all tested wheat varieties in their seasonal mean infestation by *R. padi*. From data in Tables (1&2), plants of Sides 1 variety were the heaviest infested by *R. padi* showing a two seasons overall mean 39.22 individuals\ 10 plants(39.44 and 39 aphid individuals in 2005\06 and 2006\07, respectively), being the most susceptible wheat variety among the tested ones. Gemmeiza 9 came the next (seasonal means, 37.51 and 34.63 individuals, respectively with a mean of 36.07 individuals). On contrary, Sakha

93 variety appeared as the least susceptible showing the lowest aphid numbers with a two seasons mean of 21.11(25.13 and 17.09 individuals, respectively), being the least susceptible variety against *R. padi* infestation. Giza 168 ranked the second after Gemmeiza 9 in susceptible to aphid infestation (26.14 and 19.30 individuals\ 10 plants, in the two seasons respectively), while the 5 th variety (Gemmeiza 7) manifested intermediate position in susceptibility to *R. padi* infestation recording 29.18 individuals\10 plants as two seasons mean (29.15individuals in 2005 \06 season and 29.2 in 2006\07 season ,Tables, 1 & 2). It could be generally observed from Tables (1&2) that the higher population abundance of *R. padi* on wheat plants in Ismailia throughout the period extending from the 2 nd week of February till the2 nd or 3 rd week of March.

Table 1. Effect of abiotic factors on the population dynamics of the oat bird-cherry aphid, *Rhopalosiphum padi*/10 wheat plants on five wheat varieties during 2005-06 season at Agricultural Research Station, Ismailia Governorate.

Weeks of inspection	Wheat varieties					Temp.		R.H.%	
	Giza168	Sides1	Gemmeiza7	Gemmeiza9	Sakha93	Max.	Min.	Max.	Min.
Dec.,1st2005	0.00	0.00	0.00	0.00	0.00	20.5	9.0	85.0	38.0
Dec., 2nd	0.00	0.00	0.00	0.00	0.00	21.0	12.5	85.0	39.0
Dec., 3rd	0.00	4.75	0.75	0.00	1.25	21.0	12.5	85.0	39.0
Dec., 4th	6.50	13.25	2.75	15.50	1.50	21.0	6.5	86.0	33.0
Jan., 1st	16.25	24.75	10.50	21.75	0.75	23.0	11.0	87.0	42.0
Jan., 2nd	7.50	32.50	3.50	6.25	6.50	20.0	8.5	85.0	33.0
Jan., 3rd	15.75	12.25	17.25	18.50	18.50	20.5	10.0	83.0	38.0
Jan., 4th	24.50	25.50	23.25	34.25	22.00	21.0	9.0	75.0	21.0
Feb., 1st	20.25	36.75	31.75	61.25	15.50	16.5	10.0	83.0	28.0
Feb., 2nd	38.75	78.50	50.00	71.50	25.75	23.0	5.0	86.0	16.0
Feb., 3rd	52.25	53.75	55.75	109.75	46.50	22.0	10.3	84.0	28.0
Feb., 4th	89.75	104.50	100.25	65.50	77.00	25.0	15.5	59.0	16.0
March., 1st	37.50	85.50	48.50	145.75	115.50	30.0	15.0	66.0	17.0
March., 2nd	113.25	123.75	120.25	76.50	51.75	25.0	16.5	86.0	47.0
March., 3rd	19.50	43.50	19.75	9.25	37.75	21.0	8.2	85.0	22.0
March., 4th	2.75	24.75	8.50	2.00	4.50	22.5	11.7	84.0	33.0
April, 1st	0.00	6.50	2.75	0.00	2.50	21.5	14.0	75.0	22.0
Total	444.50	670.50	495.50	637.75	427.25	-	-	-	-
Mean	26.14d	39.44a	29.15c	37.51b	25.13d	-	-	-	-
LSD	1.377								
F value	227.9								

The same letter in the same row is non-significant relationship

Table 2. Effect of abiotic factors on the population dynamics of the oat bird-cherry aphid, *Rhopalosiphum padi* / 10 wheat plants on five wheat varieties during 2006/07 season at Agricultural Research Station of Ismailia Governorate.

Weeks of inspection	Wheat varieties					Temp.		R.H.%	
	Giza168	Sides1	Gemeiz	Gemeiza	Sakha9	Max	Min.	Max.	Min.
Dec., 1st	0.00	0.00	0.00	0.00	0.00	27.0	13.7	83.0	18.0
Dec., 2nd	0.00	1.25	0.00	0.00	0.00	24.0	12.0	83.0	56.0
Dec., 3rd	0.50	0.75	1.75	0.75	1.50	20.0	10.0	83.0	19.0
Dec., 4th	1.50	2.25	3.50	2.50	3.75	17.0	7.5	84.0	44.0
Jan., 1st	2.75	10.50	5.75	4.50	4.50	22.0	8.8	84.0	39.0
Jan., 2nd	11.75	16.25	11.25	12.25	2.75	19.0	8.0	83.0	36.0
Jan., 3rd	20.75	28.75	31.25	36.75	11.75	18.5	7.0	83.0	37.0
Jan., 4th	13.50	39.50	24.50	26.00	20.75	17.0	5.5	83.0	42.0
Feb., 1st	26.25	48.25	45.75	31.75	25.50	20.3	6.5	83.0	36.0
Feb., 2nd	30.75	42.75	35.50	36.50	17.25	19.2	10.5	72.0	28.0
Feb., 3rd	49.50	57.75	53.75	65.50	31.00	16.0	9.0	83.0	45.0
Feb., 4th	28.25	91.00	35.25	49.75	33.50	20.5	11.0	82.0	44.0
March., 1st	36.50	81.50	47.50	78.25	49.50	23.5	10.5	84.0	35.0
March., 2nd	57.50	110.7	75.50	97.50	29.00	23.0	9.0	84.0	31.0
March., 3rd	29.25	125.0	95.25	115.75	47.50	30.5	14.0	81.0	18.0
March., 4th	16.75	6.50	25.75	27.50	12.25	19.0	11.2	83.0	43.0
April, 1st	2.75	0.00	4.00	3.50	0.00	21.0	11.0	83.0	36.0
Total	328.25	663.0	496.25	588.25	290.50	-	-	-	-
Mean	19.30D	39.00	29.20C	34.63B	17.09E	-	-	-	-
LSD	1.4174								
F value	446.04								

As respect to the parasitoids & predators known as natural enemies of aphids, those were expressed as means of total counts of larvae, nymphs and adults which were detected weekly throughout the plant growth period during both seasons 2005\06 & 2006\07. The presence of parasitoids &predators was detected at the periods from the third week of December till third week of March during the two successive seasons. In spite of the low weekly mean counts of natural enemies, Statistical analysis showed significant differences between all seasonal mean counts of parasitoids and predators on all tested varieties in the two seasons (Tables 3, 4). By comparing the two seasons' means, plants of Sakha 93 wheat variety hardboard the highest population density of parasitoids showing 1.08 (1.06 and 1.10 individuals \ 10 plants in 2005\06 and 2006\07 wheat season, respectively), followed by Side`s 1 (0.88: 0.19 and 1.57 individuals) and Giza 168 (0.83 as a two seasons mean, 0.66 and 0.99 individuals, respectively).while, on contrary, Gemmeiza 7 variety harbored the lowest population abundance of parasitoid adults (0.61, 0.37 and 0.85 individuals), followed by Gemmeiza 9 which showed 0.2 1 and 1.21 individuals as means of the two season, respectively (mean 0.71) (Tables, 3 & 4).

As regard to counts of predators (different stages) counted on wheat plants, data in Tables,(3 & 4) indicated that Sides 1 variety harbored the highest population abundance of insect predators showing the two seasons mean of 1.76 (1.69 in

2005\06 and 1.82 in 2006\07) individuals\ 10 plants. That was followed by Gemmeiza7 (0.37 and 1.56 individuals in the two seasons resp.). On contrary, Giza 168 harbored the lowest population abundance of predators (0.49 and 0.19), Sakha 93 (0.36, 0.31 and 0.40 in the two seasons resp.), and Gemmeiza 9 which harbored 0.48 individual as mean of two seasons, 0.47 and 0.49 individual, respectively (Tables, 3 & 4).

The data in (Tables, 3 & 4) show that the period of higher abundance of parasitic and predaceous insects, which are known to survive on aphids, extended from the 2nd or 3rd week of January up to the 1st or 2nd week of March in both years. This period, actually, coincided with the period of higher abundance of *R. padi* on wheat plants (Table, 1&2). This observation confirms that the presence of these beneficial natural enemies on wheat plants was dependent upon the presence of their natural host (or prey), i.e. aphids on these plants.

Table 3. Population dynamics of natural enemies (parasitoids and predators) associated with *R. padi*/10 wheat plants on five wheat varieties during 2005/06 season at Ismailia Agricultural Research Station.

Weeks of inspection	Natural enemies on wheat varieties										Temp.		R.H.%	
	Giza 168		Sides 1		Gemmiza		Gemmiza		Sakha 93		Max.	Min	Max	Min
	Par.	Pre	Par	Pre	Par	Pre	Par.	Pre	Par.	Pr				
Dec., 1st	0.00	0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.00	0.	20.5	9.0	85	38
Dec., 2nd	0.00	0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.00	0.	21.0	12.	85	39
Dec., 3rd	0.00	0.2	0.2	0.0	0.0	0.0	0.00	0.2	0.25	0.	21.0	12.	85	39
Dec., 4th	0.25	0.2	0.5	0.2	0.2	0.0	0.25	0.0	0.00	0.	21.0	6.5	86	33
Jan., 1st	0.25	0.7	0.2	0.5	0.2	0.2	0.00	0.2	0.25	0.	23.0	11.	87	42
Jan., 2nd	0.50	0.2	0.2	0.7	0.5	0.5	0.25	0.2	0.50	0.	20.0	8.5	85	33
Jan., 3rd	0.75	0.5	0.5	1.5	0.2	0.7	0.25	0.2	1.00	0.	20.5	10.	83	38
Jan., 4th	1.00	0.7	0.2	4.5	0.5	1.2	0.50	0.5	2.25	1.	21.0	9.0	75	21
Feb., 1st	1.00	1.0	0.2	4.7	0.7	0.7	0.25	0.7	3.00	0.	16.5	10.	83	28
Feb., 2nd	0.75	0.5	0.0	4.0	1.0	0.5	0.50	0.5	3.50	0.	23.0	5.0	86	16
Feb., 3rd	1.50	1.0	0.5	3.7	0.7	0.7	0.75	1.2	2.50	1.	22.0	10.	84	28
Feb., 4th	2.00	1.2	0.2	2.7	0.7	0.5	0.25	1.5	1.75	0.	25.0	15.	59	16
March,	1.75	1.0	0.2	2.5	0.7	0.2	0.25	1.0	1.50	0.	30.0	15.	66	17
March,	0.50	0.5	0.0	1.5	0.2	0.2	0.25	0.7	0.75	0.	25.0	16.	86	47
March,	0.25	0.2	0.0	1.2	0.2	0.5	0.00	0.5	0.50	0.	21.0	8.2	85	22
March,	0.00	0.0	0.0	0.7	0.0	0.0	0.00	0.2	0.25	0.	22.5	11.	84	33
April, 1st	0.00	0.0	0.0	0.0	0.0	0.0	0.00	0.0	0.00	0.	21.5	14.	75	22
Total	11.2	8.2	3.2	28.	6.2	6.2	3.50	8.0	18.0	5.	-			
Mean	0.66 B	0.49	0.19	1.69	0.37	0.37	0.21 D	0.47	1.06 A	0.3	- -			
F value	Par.	240.59												
	Pred	129.44												
LSD	Par.	0.0746												
	Pred	0.1598												

Counts followed by the same letter in the same row is non-significant relationship * Par. = Parasitoids and ** Pred. = Predators

Table 4. Population abundance of natural enemies (parasitoids and predators) associated with *R.padi*/10 wheat plants on five wheat varieties during 2006/07 season at Ismailia Agricultural Research Station

Weeks of inspection	Natural enemies on wheat varieties										Temp.		R.H.%	
	Giza 168		Sides 1		Gemmeiza 7		Gemmeiza 9		Sakha 93		Max	Min	Max.	Min.
	Par.	Pred.	Par.	Pred.	Par.	Pred.	Par.	Pred.	Par.	Pred.				
Dec., 1st 2006	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.0	13.7	83.0	18.0
Dec., 2nd	0.00	0.00	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	24.0	12.0	83.0	56.0
Dec., 3rd	0.00	0.00	0.25	0.25	0.25	0.25	0.00	0.00	0.25	0.00	20.0	10.0	83.0	19.0
Dec., 4th	0.25	0.00	0.75	0.50	0.25	1.00	0.25	0.00	0.25	0.25	17.0	7.5	84.0	44.0
Jan., 1st 2007	0.50	0.50	1.50	0.75	0.50	1.25	0.50	0.00	0.50	0.00	22.0	8.8	84.0	39.0
Jan., 2nd	0.25	0.25	2.75	1.25	0.75	1.50	1.00	0.25	1.00	0.25	19.0	8.0	83.0	36.0
Jan., 3rd	1.00	0.25	3.50	1.50	1.25	2.25	1.25	0.25	1.75	0.50	18.5	7.0	83.0	37.0
Jan., 4th	1.00	0.25	3.75	3.00	1.50	2.50	1.75	0.50	2.25	1.00	17.0	5.5	83.0	42.0
Feb., 1st	1.50	0.00	4.00	4.50	1.00	2.25	2.00	1.00	3.00	1.25	20.3	6.5	83.0	36.0
Feb., 2nd	2.00	0.25	2.75	5.50	1.25	2.00	2.25	0.75	1.50	1.00	19.2	10.5	72.0	28.0
Feb., 3rd	3.00	0.25	2.257	4.50	1.00	2.00	2.00	1.50	1.75	0.75	16.0	9.0	83.0	45.0
Feb., 4th	2.75	0.00	1.75	3.25	2.50	3.25	1.50	1.25	2.75	0.50	20.5	11.0	82.0	44.0
March, 1st	1.75	0.75	1.50	2.75	2.00	3.50	1.00	1.00	1.75	0.50	23.5	10.5	84.0	35.0
March, 2nd	1.25	0.50	1.00	2.00	1.75	2.75	2.75	0.75	1.00	0.50	23.0	9.0	84.0	31.0
March, 3rd	0.75	0.25	0.50	0.75	0.25	1.75	2.00	0.50	0.75	0.25	30.5	14.0	81.0	18.0
March, 4th	0.50	0.00	0.25	0.25	0.00	0.25	1.75	0.25	0.25	0.00	19.0	11.2	83.0	43.0
April, 1st	0.25	0.00	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	21.0	11.0	83.0	36.0
Total	16.75	3.25	26.60	31.01	14.51	26.57	20.58	8.25	18.75	6.75	-	-	-	-
Mean	0.99 cd	0.19 C	1.57 a	1.82 A	0.85d	1.56 A	1.21b	0.49B	1.10 bc	0.40 BC	-	-	-	-
F value	Par.*	17.64												
	Pred.**	77.24												
LSD	Par.	0.2061												
	Pred.	0.2661												

Correlation coefficient between each of weather conditions & population abundance of natural enemies with population abundance of *R. padi*

As regard to correlation coefficient between a biotic and biotic factors during 2005/06 season with the *R. padi* population these was significant positive correlation with max. temperature in all five wheat varieties during the first season (Table 5). The correlation coefficient ranged between -0.27-0.47 with max. temperature. With min. temperature, the data showed that correlation coefficient values significantly positive with the *R. padi* numbers. r, values ranged from 0.51-0.77. With RH%, the *R.padi* numbers, negative correlated with max. RH% (r values) ranged between -0.11 &-0.51. In case of min. RH%, results showed the different relations with *R. padi* numbers. There was negative correlation (r) = -0.41& -0.43 in case of Sides 1 and Gemmeiza 9, respectively (Table 5), but the significantly positive correlation was showed in case of Giza 168 , Gemmiza 7 and Sakha 93. The simple correlation coefficient showed that significantly negative relationship between the *R. padi* numbers and parasitoids except in Sides1 & Gemmeiza 7, r values were significantly positive (0.71 – 0.70, respectively). In case of predators, the significant positive correlation ranged from 0.59-0.68 was reported with *R. padi* numbers (Table 5). Data revealed the significant positive correlation with max. & min. temperature during the second season (Table 6). Also, the same relationship was recorded with max. RH % during the second season but insignificant in case of Gemmeiza 9, with min. RH %. The non significant positive correlation values ranged from 0.38 – 0.45, in Sides1, Gemmieza 7& Gemmieza 9 but significant relation in case of Giza 168 & Sakha 93 during 2006/07 season. Table (6) showed the highly significant positive relationship with both parasitoids and predators during 2006/07 season.

Table 5. Correlation coefficient values of each of a biotic and biotic factors with population abundance of *Rhopalosiphum padi* on five wheat varieties during 2005/2006 seasons.

Varietys	a biotic (weather) factors								Biotic factors			
	Temp.				R.H. %				Parasitoids		Predators	
	Max.		Min.		Max.		Min.					
	r	P	r	P	r	P	r	P	r	P	r	P
Giza 168	0.46	N	0.51	*	-0.11	N	0.36	*	-0.65	**	0.61	**
Sides 1	0.38	N	0.63	**	-0.30	N	-0.41	N	0.71	**	0.59	**
Gemmeiza 7	0.47	N	0.52	*	-0.17	N	0.40	N	0.70	**	0.65	**
Gemmeiza 9	0.27	N	0.62	**	-0.41	N	-0.43	N	-0.85	***	0.67	**
Sakha 93	0.46	N	0.77	***	-0.51	N	0.69	*	-0.87	***	0.68	**

Correlation coefficient "r" Probability "P" N = nonsignificant

Table 6. Correlation coefficient values of weather factors and natural enemies with population abundance of *R. padi* on five wheat varieties during 2006/2007

Varietys	a biotic (weather) factors								Biotic factors			
	Temp.				R.H. %				Parasitoids		Predators	
	Max.		Min.		Max.		Min.					
	r	P	r	P	r	P	r	P	r	P	r	P
Giza 168	0.78	***	0.68	**	0.54	*	0.66	**	0.81	***	0.91	***
Sides 1	0.63	**	0.71	***	0.49	*	0.44	NS	0.89	***	0.76	***
Gemiza 7	0.58	*	0.70	***	0.52	*	0.45	NS	0.84	***	0.65	**
Gemiza 9	0.58	*	0.69	**	0.42	NS	0.38	NS	0.84	***	0.68	***
Sakha 93	0.72	***	0.49	*	0.54	*	0.52	*	0.81	***	0.77	***

*= mild significant **= mediate significant ***= highl significant

The infestation of aphids, *R. padi* was extensively represented in the heading stage than the seedling stage according to the representing of phytochemical components of wheat leaves. According to simple statistical analysis, the correlation coefficient between aphid numbers and nitrogen content in wheat leaves (r) was positive in seedling but negative in heeding, the increase of aphid numbers with increase of nitrogen content. The correlation coefficient was 0.11 with nitrogen and aphids. While, the correlation coefficient was negative with protein, phosphorus, reduced and non-reduced sugar and potassium content, the increase of these contents decrease the aphids numbers (Table 7, 8)

Table 7. Relationship between phytochemical components of five wheat varieties and mean numbers rates of aphids

Aphids		Pest count	Protein mg/gm	Nitrogen mg/gm	Phosphorus mg/gm	Sugar mg/gm			Potassium mg/gm
						Soluble	Reduced	Non-reduced	
Sakha93	S	3.50	23.93	3.83	0.39	2.22	0.54	1.20	0.42
	H	23.81	24.18	4.45	0.56	2.48	0.99	2.18	0.51
Giza168	S	4.25	22.86	3.74	0.25	1.94	0.51	1.09	0.38
	H	28.37	23.75	4.27	0.51	2.41	0.87	2.05	0.53
Gemmiza7	S	4.75	21.85	3.62	0.21	1.70	0.49	1.02	0.40
	H	36.31	23.04	4.11	0.48	2.38	0.82	1.89	0.49
Gemmiza9	S	12.19	20.78	3.47	0.15	1.63	0.45	0.82	0.31
	H	39.50	22.17	4.05	0.42	2.21	0.75	1.76	0.47
Sides1	S	8.31	20.01	3.18	0.09	1.45	0.41	0.64	0.37
	H	47.37	21.99	4.01	0.31	1.89	0.70	0.154	0.45

S= Seedling H= Heading

Table 8. The correlation coefficient between aphid numbers and phytochemical components of wheat leaves (r).

Aphids		Protein mg/gm	Nitrogen mg/gm	Phosphorus mg/gm	Sugar mg/gm			Potassium mg/gm
					Soluble	Reduced	Non-	
seedling	r	-0.787	0.108	-0.722	-0.691	-0.759	-0.767	-0.943
	p	0.114	0.862	0.168	0.1967	0.1364	0.1302	0.0163
heading	r	-0.968	-0.950	-0.970	-0.924	-0.968	-0.855	-0.915
	p	0.0069	0.0132	0.0061	0.0249	0.0069	0.065	0.029

r = Correlation coefficient p= Probability

Abou-Elhagag *et al*. (2001) evaluated the susceptibility of ten wheat varieties to cereal aphids (*Rhopalosiphum padi, Schizaphis graminum* and *R. maidis*) infestation in Egypt. Sides 9, Sides 7, Sides 5 and Gemmeiza 1 showed the lowest population of *R. padi* and *R. maidis*, while Sides 5, Sides 7 and Sides 9 were the least preferred varieties by *S. graminum*. Sides 9, Sides 7 and Sides 5, aside from obtaining the highest yields, were the least susceptible to infestation by all cereal aphids studied. The potential impact of future climate projections on *R. padi* population dynamics, persistence, abundance, dispersal and migration events as well as the interactions between vector, virus, crop and environment have reviewed by Finlay and Luck (2011). Aphids, in particular, are likely to readily respond to climate change given their short generation times, low developmental threshold temperatures and efficient dispersal capabilities (Harrington *et al*., 2007). The relation abundance in *R. padi* population in sexual and asexual lineages is determined by climate, with asexual populations prevalent where winters are mild (Gilabert *et al*., 2009). For apterous *R. padi* mean relative growth rate measured for a range of temperatures on cereals and grasses was found to correlate positively with fecundity (Leather and Dixon, 1984). Aphids specific predators (Coccinellidae, Syripidae, Chrysopidae, Neuroptera, Itonidae, Anthocoridae, Miridae) may be important later in the season by reducing numbers of aphids (Wellings, 1991). The presence of *Aphidius rhopalosiphi* (parasitoid) parasitizing *R. padi* resulted in fewer plants infected with BYDV was reported by Smyrinioudis *et al*., 2001a. On the other hand, levels of free amino acids were decreased in leaves attacked by *R. padi* (Hubert Sytykiewicz *et al*., 2011). The distribution of aphids on the host plant is largely determined by difference in the quantitative-qualitative composition of phloem sap (the same previously author). The quantity and proportion between

these nitrogen compounds in consumed food are main factors for aphids' non-disturbed growth and development (Douglas, 2006). Finally, these studies add other pieces of evidence that climatic, predators, parasitoids and the changes in levels of phytochemical component in wheat leaves may perform important role in the *R. padi* dynamics on the wheat varieties in Egypt.

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أستجابة من الشوفان .L ***Rhopalosiphum padi*** لبعض العوامل الحيوية والغير حيوية و المحتوى الكيميائى لخمسة أصناف من القمح

المتولى فراج المتولى[١] ، فوزى فائق شلبى[٢]،
محمود مصطفى عصر[٢] ، علاء الدين محمد على خورشيد[١]

معهد بحوث وقاية النباتات – مركز البحوث الزراعية – الدقي – جيزة – مصر
كلية الزراعة مشتهر – جامعة بنها – مصر

فى هذة الدراسة تم دراسة مستوى الاصابة بمن الشوفان L *R. padi.* على خمس أصناف من القمح هى جيزة ١٦٨ ، سدس ١، جميزة ٧، جميزة ٩، سخا ٩٣ وذلك خلال موسمى 2005/06 و 2006/07 فى المحطة البحثية بالاسماعيلية – مصر. كذلك تم دراسة العلاقة بين درجات الحرارة العظمى و الصغرى و الرطوبة النسبية العظمى و الصغرى و درجة تاثيرهما على الكثافة العددية لمن الشوفان *R. Padi* على أصناف القمح الخمسة و اظهرت النتائج مدى حساسية هذة الاصناف للاصابة بهذة الافه خلال موسمين الزراعة و اشارت النتائج الى ان الصنف سدس ١ كان اعلى الاصناف حساسية للاصابة بهذا النوع من المن و على العكس من ذلك كان الصنف سخا ٩٣ أقل الاصناف حساسية للاصابة بهذة الافه، كما تم دراسة مدى ارتباط معدلات الاصابة ب *R. padi.* بالمحتوى الكيمائى للاوراق لكل اصناف القمح المختبرة.