Egypt. J. Plant Prot. Res. Inst. (2019), 2 (4): 759 - 769

Ministry of Agriculture and Land Reclamation
Agricultural Research Center

Egyptian Journal of Plant Protection Research Institute

www.ejppri.eg.net

PLANT PROTECTION RESEARCH INSTITUTE
PPRI

Impact of aphid infestations and yellow rust infection on some wheat cultivars Egypt

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ARTICLE INFO

Article History

Received: 18 /11 / 2019

Accepted: 29 / 12 /2019

Keywords: Wheat (Puccinia striiformis f. sp. tritici), aphid infestations, adult-plant resistance and yield losses,

Abstract:

This study was carried out to evaluate the susceptibility of six wheat varieties, sids 12, gemmeiza 11, misr 1, misr 2, sakha 94 and giza 171 to infestation with cereal aphids especially the oat bird-cherry aphid, *Rhopalosiphum padi* L., the greenbug aphid, *Schizaphis graminum* (Rondani) and the English grain aphid, *Sitobion avenae* Fabricius (Hemiptera: Aphididae) and the yellow rust disease in grain yield under field conditions at Sakha Agricultural Research Station, Kafr El-Sheikh, Egypt during two growing seasons and successive seasons 2017/2018 and 2018 / 2019. Data showed that the presence of aphids on six varieties was highly concentrated during the period was extended from the first week of January till the end of March during both tested seasons. The highest value was 69.8, 61.9, 73.1 and 30 individuals/ 10 plants on misr 1, sids 12, misr 2 and sakha 94 at 2nd week of March. While, it was reported at the first week of March by 69.7 and 51.8 individuals/ 10 plants on gemmeiza 11 and giza 171, respectively. A significant difference was reported between the tested wheat cultivars.

The field experiment with nirtire of races yellow rust *of Pucciniastrii formis f. sp. tritici* physiologic races as a source of inoculam. Yellow rust infection significantly reduced grain yield of all inoculated cultivars as compared to the protected ones Disease severity was recorded weekly, and area under disease progress curve was estimated and ranged from 41,30 to 558.00 in wheat cultivars Sakha 94 and Sids 12 during season 2017/18 while, 60.00 to 925.00 in wheat cultivars Giza 171 and Sids 12 during season 2018/19. The loss in 1000 kernel weight of the different wheat cultivars was variable according to the varietal response. The 1000 kernel weight of the protected plants of all wheat cultivars were higher than the infected treatment and also significant differents were found between infected and protected wheat cultivars under the study. according yield losses ranged from 10.54 to 30.73 in wheat cultivars sakha 94 and Sids 12 during season 2017/18 7.53, 73.44 wheat cultivars giza 171 and sids 12 during season 2018/19.

Introduction

Wheat crop (*Trirticum aestivum*) is one of the most important strategic cereal crops in Egypt and also in the world. It provides about 20% world food calories and food for nearly 40% of the world's population. The cereal is grown on 23% global cultivated area is for great importance in bread, diet, pharmaceutics and other industries. Wheat is important product of international trade for worldwide market. Many pests attack wheat causing yield damage and leading to great losses in quality and quantity of the wheat crop. The major insect pests in cereal crop were the oat bird-cherry aphid, *Rhopalosiphum padi* L., the greenbug aphid, *Schizaphis graminum* (Rondani) and the English grain aphid, *Sitobion avenae* Fabricius (Hemiptera: Aphididae) in Egypt. The damage caused by cereal aphids is direct through feeding by sucking the plant sap and indirect through the effects of honeydew in combination with fungi, which reduce rate of photosynthesis and available leaf area (Martin and Johnston, 1982; Ryan *et al*., 1987). Wheat yield loss due to cereal aphid infestation was estimated by 7.5 to 18.7% (Tantawi, 1985), up to 23% (El-Heneidy *et al*., 1991) and 17.83% (Abdel-Rahman, 2005).The most important and economic cereal aphid species in Egypt were; R. padi, *S. graminum*, *Rhopalosiphum maidis* (Fitch) and *S. avenae* (El- Heneidy and Adly, 2012).

Yellow rust (*Puccinia striiformis f. sp. tritici)* is one of the wheat rusts that cause severe losses throughout the world. Losses of 50-70% have often been reported under field conditions. The actual amount of loss caused by rust can range from slight to complete destruction of the crop. Grain from infected crops is shrivelled and light in weight, and therefore has reduced quality (Stubbs *et al*., 1986 and Zadoks, 1961). Epidemics occur when environmental conditions during the growing season are favourable (Leonard and Szabo, 2005).

Varietal resistance to stem rust has generally provided adequate protection without the need for fungicides. Wheat stem rust caused by the fungus *Puccinia graminis f. sp. tritici* is a heterocious obligate biotroph with a macrocyclie lifecycle feating five distinct spore stages. The full stem rust lifecycle begins with an infected plant, with elongated blister like pustules (uredinia) full of losses browinshred uredinia spores found on the leaf sheaths, awns, glumes, stem tissue and leaves (Singh *et al*., 2008). As the growing season progresses and the infected plant matures, the uredinia convert into telia and teliospores are black in color, and give forth the name black rust (Leonard and Szabo, 2005). The infected plant attack all of the above ground parts of the wheat plant and causes losses by reducing grain yield and affecting grain quality (El-Daoudi *et al*., 1996). The infection plant usually produces fewer tillers, set fewer seeds per head and the kernals are smaller in size and weight. For this reason, wheat genotypes have been discarded due their susceptibility for the disease (Singh *et al.,* 2002). Many other main factors i.e. virulent, pathotypes, susceptible genotype are involved in disease incidence and development in any wheat growing area of Egypt (Abd El- Badeea, 2015). The appearance of virulent and aggressive pathotypes of the causal organism is one of the most dangerous factors in the occurrence of any disease epidemic. Breeding for adult plant resistance is still the most economic and desirable mothed for controlling the disease. Therefore, the present study was conducted to evaluate the susceptibility of six wheat varieties, sids 12, gemmeiza 11, misr 1, misr 2, sakha 94 and giza 171 to infestation with cereal aphids especially the oat bird-cherry aphid, *R. padi*, the greenbug aphid, *S. graminum* and the English grain aphid, *S. avenae* and the yellow rust disease in grain yield under field conditions at Sakha Agricultural Research Station, Kafr El-Sheikh, Egypt during two growing seasons during two successive seasons 2017/2018 and 2018 / 2019 .

Materials and methods

The seeds of the wheat cultivars were provided by Wheat Res. The experimental area was about 1050 m^2. This area was divided into 18 plots. The experimental plots were arranged in randomized complete block design with three replicates for each variety. Samples of 10 wheat tillers were randomly chosen from each variety. Numbers of aphids/tiller were recorded and percentages of its infestation were calculated under a binocular stereomicroscope in the same day of the inspection. Direct inspection of wheat tellers were used to study the abundance and distribution of cereal aphids. The total number of aphid individuals (adults and nymphs) were counted and recorded during the two studied seasons. The individuals of aphids were recorded according to El-Heneidy and Adly (2012).

Weekly means of maximum and minimum temperature (ºC) and maximum & minimum of relative humidity (R.H.%) were obtained from the Central Laboratory for Agriculture Climate, and then recorded to correlate with the mean number of aphids and thrips in the three studied planting dates in both studied seasons. The differences between mean number of aphids were analyzed by using SAS program computer (SAS Institute, 2003) The experimental plots received the standard cultivation practices of that area and mechanical control was applied to remove weeds..

The impact of yellow rust infection on grain yield of six Egyptian wheat cultivars, sids 12, gemmeiza 11, misr 1 , misr 2, sakha 94 and giza 171 (Table, 1) bread wheat cultivars used in the study. The effect of yellow rust infection on grain yield 1000 kernel weight was determined in an experiment for two years (2017/2018-2018/2019). The main treatments were infected and protected plots. All plants were surrounded by a susceptible disease spreader (Morocco and *Triticum spelta saharinsis*). In addition, the plants under the study were inoculated with a mixture of yellow rust races at booting stage; To provide and maintain the rust inoculated by injection method twice in a week during the growing season, whereas, the other treatments were protected by the effective fungicide Tilt 25% EC 5EC(CE)-1-(2,4- Propiconazole)1-4,4-dimethyl 1-2-(1,2,4-triazol-1-y1) Pent -1-en -3-0L) at the rate of 75cm /300 litter water per Fadden at the early dough stage. The nursey was sown fifteen day after the regular sowing data (the first haff of December) to expose the plants to suitable environments of rust incidence, and development, all cultivar practise recommended in the commercial filed i.e. fertilization irrigation and other managent. Data on rust incidence were scored as response and severely infection to gather every week from rust appearance to final rust severity along with the stage of plant growth for each plot using the modified cobs scale (Paterson *et al*., 1948) and the infection response scale described in (Roelfs *et al*., 1992). The area under disease progress curve (AUDPC) was calculated for each variety according to the equation adopted by (Pandey *et al*., 1989). At 1000 kernel weight were determined for each cultivar. Yield loss was estimated as the difference among the protected and infected plots using simple equation adopted by (Calpouzos *et al*., 1976)

Loss (%) = $1 - y_d/y_h \times 100$

Where: y_d = yield of diseases plants.

Y_h = yield of healthy plants.

All data obtained were statistically analyzed for each season individually was used to compare yield components according to (Snedecor, 1957). Correlation coefficient was also used to detect the relationship between yield losses and area under disease progresses curve (AUDPC).

Table (1): Name, pedigree and year of release of six Egyptian wheat cultivars.

No.	Cultivar	Pedigree	Year of release
1	Sids 12	BUC//7C/ALD/5/MAYA74/ON//1160.147/3/BB/GLL/4/CHAT"S"/6/MAYA/VUL//CMH74A.630/4*SX SD7096-4SD-1SD-1SD-0SD	2007
2	Gemmeiza 11	BOW"S"/KVZ"S"//7C/SER182/3/GIZA168/SAKHA61 GM5820-3GM-1GM-2GM-0GM	2011
3	Misr 1	OASIS/SKAUZ//4*BCN/3/2*PASTOR CMSS00Y01881T -050M-030Y-030M-030WGY-33M-0Y-0S	2011
4	Misr 2	SKAUZ/BAV92 CMSS96M03611S-1M-010SY-010M-010SY-8M-0Y-0S	2011
5	Sakha 94	OPATA/RAYON//KAUZCMBW90Y3180-0TOPM-3Y-010M-010M-010Y-10M-015Y-0Y-0AP-0S	2004
6	Giza 171	SAKHA 93 / GEMMEIZA 9 S.6-1GZ-4GZ-1GZ-2GZ-0S	2013

Results and discussion

1. Susceptibility of some wheat varieties to infestation by certain aphids:

This study was carried out in (Sakha Research Station), to evaluate the susceptibility of six wheat varieties (Sids 12, gemmeiza 11, misr 1, misr 2, sakha 94 and giza 171) to infestation with certain cereal aphids especially the oat bird-cherry aphid, *R. padi*, the greenbug aphid, *S. graminum* and English grain aphid, *S. avenae*.

1.1.During 2017/ 2018 season:

Data tabulated in Tables (2) showed that the population fluctuation of aphid individuals (*R. padi*, *S. graminum* and *S. avenae*) / 10 plants at Sakha Research Station during 2017/ 2018 season as indicated by weekly aphid counts throughout the whole period of wheat plant growth. Presence of aphids on six varieties was detected throughout most of the whole period of plant growth that extended from the second week of December, 2017 until the late week of March, 2018.

The infestation started from the 2 nd week of December with few aphid numbers on sids 12 when the plants were still in the seedling stage. Presence of aphids on wheat plants continued up to the end of March. The highest peak of aphids' abundance was always detected during the third inspection and the second week of March on all cultivars with average numbers 42.7, 82.5, 51.7, 62.8, 35 and 36.0 individuals/10 plants of misr 1, sids 12, misr 2, gemmeiza 11, sakha 94 and giza 171, respectively (Table, 1).

From data in Table (2), it could be stated that the highest general infestation rate by aphids occurred on sids 12 with seasonal mean numbers of 27.14 individuals/10 plants. Whereas, misr 2, gemmeiza 11 and misr 1 had medium aphid infestation with seasonal mean counts of 21.26, 21.91 and 16.13 individuals/10 plants, while lowest general infestation rate by aphids occurred on giza 171 and sakha 94 with seasonal mean numbers of 12.80 and 11.72, respectively. there were significant difference between the tested cultivars.

Table (2): Weekly mean counts of *Rhopalosiphum padi*, *Schizaphis graminum* and *Sitobion avenae* / 10 wheat plants on different wheat varieties during 2017/ 2018 wheat season in Agricultural Sakha Research Station,

inspection weeks	Wheat cultivars						Climatic factors		
	Misr 1	Sids 12	Misr 2	Gemmeiza 11	Sakha 94	Giza 171	Max. Temp.	Min. Temp	Average RH
Dec., 2nd 2017	0	0.5	0	0	0	0	19.75	11.50	70.63
3rd	0.3	0.1	0	0.6	0.3	0.4	20.83	11.50	62.67
4th	0.9	0.9	1.2	0.8	0.7	0.9	20.22	11.11	65.22
Jan., 1st 2018	3.3	6.3	4.7	2.5	0.4	0.5	18.43	11.00	44.71
2nd	4.4	10.2	8.6	6.9	1.4	1.7	19.88	11.13	64.13
3rd	6.5	18	12.3	13.5	2.9	3.9	18.00	9.50	50.67
4th	8.7	24.6	14.5	10	11.5	13	15.50	7.70	68.00
Feb., 1st	18.8	28.8	25.9	17.9	15.6	15.5	20.29	10.57	59.71
2nd	30.3	28.6	17.3	24	13	14.6	22.13	11.63	48.25
3rd	42.3	47.1	30	42.2	23	25.4	27.00	16.67	51.17
4th	25.2	54.8	28.9	36.9	26	28.7	25.38	14.38	52.50
Mach., 1st	40.9	47.2	38	61	25	26.4	26.43	16.14	49.14
2nd	42.7	82.5	51.7	62.8	35	36	27.88	16.88	39.88
3rd	14.5	59.3	61.5	42.7	18	21	24.33	14.83	51.33
4th	3.1	1.8	24.3	6.9	3	4	26.20	16.00	44.40
Mean ±SE	16.13 ab 4.17	27.38 6.64	21.26 ab 4.82	21.91 ab 5.65	11.72 b 2.99	12.80 b 3.16			
F value	1.61								
LSD	13.371								

1.2. During 2018/ 2019 season:

Data tabulated in Table (3) showed the aphid incidence on the tested wheat varieties during 2018/2019 season as indicated by weekly inspections throughout the experimental period. Presence of aphids on six varieties was concentrated during period which extended from the fourth week of Jan. 2019 till the third week of Mar. 2019 (Table, 3). The highest value was 69.8, 61.9, 73.1 and 30 individuals/ 10 plants on misr 1, sids 12, misr 2 and sakha 94 at 2nd week of Mach. While, it was reported at the first week of March by 69.7 and 51.8 individuals/ 10 plants on gemmeiza 11 and giza 171, respectively.

Similarly, Abou-Elhagag *et al*. (2001) in Egypt evaluated the susceptibility of ten wheat cultivars to cereal aphids (*R. padi, S. graminum* and *R. maidis*) infestation. sids 9, sids 7, sids 5 and gemmeiza 1 showed the lowest population of *R. padi* and *R. maidis*, while sids 5, sids 7 and sids 9 were the least preferred cultivars by *S. graminum*. Sids 9, sids 7 and sids 5, aside from obtaining the highest yields, were the least susceptible to infestation by all cereal aphids studied. Saleem *et al.* (2009) fund that aphid infestation started during the last week of Dec., remained low during January with a peak in the 1 st week of March. Wains *et al.* (2010) revolved that a peak of aphids population was recorded during the beginning of the third week of March. Khan *et al*. (2011) in Pakistan recoded that the recorded that the 4th of February was found to be very favorable for aphids in wheat fields. Barbec *et al*. (2014) in

Pakistan stated aphids' population grow quickly and increased at the last period wheat plants. Ullah *et al*. (2014) showed that aphids attack wheat plants started in the 1st week of January and increased with the vegetative growth of plants and reached at peak level in the 3rd week of March.

Table (3): Weekly mean counts of *Rhopalosiphum padi*, *Schizaphis graminum* and *Sitobion avenae* / 10 wheat plants on different wheat varieties during 2018/ 2019 wheat season in Agricultural Sakha Research Station.

inspection dates	Wheat cultivars						Climatic factors		
	Misr 1	Sids 12	Misr 2	Gemmeiza 11	Sakha 94	Giza 171	Max. Temp	Min. Temp	Average RH
Dec., 2nd 2018	0	0	0	0	0	1.6	19.63	12.38	56.25
3rd	0.1	1.5	0.4	0	0	0.2	18.50	10.67	54.83
4th	3.2	5.9	2.4	5.7	0	0.8	17.11	10.44	53.33
Jan., 1st 2019	5.6	13.5	5.2	8	0	0.5	17.86	9.00	52.86
2nd	2.5	12.3	0.6	4.4	0.4	1.2	17.50	9.13	53.38
3rd	7.5	7.6	7	10.3	1.9	9	19.43	9.71	69.57
4th	13	18.5	13.7	19.2	8.5	14.3	18.33	11.00	52.67
Feb., 1st	12.8	24.3	14.2	33.2	12.6	10.6	19.57	9.00	60.86
2nd	23.7	35.7	28.1	40.3	10	17.7	19.50	12.00	55.88
3rd	46	32.7	49.4	44.5	20	27.6	17.00	8.33	61.00
4th	45.5	47.9	45.7	46	21	35.3	23.43	11.71	62.57
Mach., 1st	30.2	56.7	25.9	69.7	20	51.8	22.14	13.71	63.14
2nd	69.8	61.9	73.1	67.7	30	29.5	23.38	15.13	45.63
3rd	25.3	44	31	31.5	13	18.4	23.00	14.43	51.00
4th	0	9.5	5.9	0.7	0	0.3	26.11	15.78	50.33
Mean ±SE	19.01 ab 5.43	24.80 a 5.28	20.17 ab 5.65	25.41 a 6.23	9.16 b 2.57	14.59 4.04			
	1.53 14.106								

2.Effect of yellow rust infection on 1000 kernel weight and its components of six Egyptian wheat genotypes.

Effect of yellow rust severity on 1000 kernel weight and its components of six Egypt wheat genotypes i.e. sids 12, gemmeiza 11, misr 1, misr 2, sakha 94 and giza 171 was estimated under field condition at Sakha Agricultural Research Station for two growing seasons (2017/2018-2018/2019).The reaction of wheat cultivars to yellow rust at adult plant stage under field condition were recorded on the treatment plants, whill the fungicide protected plants remained almost free from yellow rust during the two growing seasons of this study. The 1000 kernel weight due to yellow rust infection was estimated in the tested wheat cultivars, which showed different disease severity. However, the wheat cultivars which showed high yellow rust disease severity exhibited maximum values of AUDPC and 1000 kernel weight. while the wheat cultivars which showed low disease severity exhibited minimum values of AUDPC and 1000 kernel weight the six tested wheat cultivars reacted differentially to yellow rust infection during the two growing seasons of the study indicated that the Yellow rust epidemic (FRS%) in 2018/19 was more severe than that in the other one growing seasons (2017/2018).

2.1.The first growing season 2017-2018:

Data presented in Table (4) revealed that yellow rust severity was higher on the high level of susceptible wheat cultivars i.e. sids 12 (56.67%), gemmeiza 11 (53.33%), misr 1(36.67%) and misr 2 (26.67%) for the infected treatment. On the other hand the rust severity was lower on the low level of susceptible wheat cultivars i.e. sakha 94 (2.47%) and giza 171 (6.67%) for the infected treatments.

Data in Table (4) revealed that AUDPC run in parallel line with disease severity. the values of AUDPC that found in the high level of susceptible wheat cultivars were sids 12 (558.00), gemmeiza 11 (520.00), misr 1 (308.00) and misr 2 (248.00) for the infected treatments. On the other hand, the values of AUDPC were lower in the low level of susceptible wheat cultivars i.e. Sakha 94 (41.30) and giza 171 (142.00) for the in infected treatments. In general, data presented in Table (4) showed that the increasing in 1000 kernel weight losses (%) with the increasing of yellow rust severity (%) and AUDPC values were clearly noticed in all the tested wheat cultivars. The thousand kernel weight (gm) of the healthy plants (protected treatment) of all wheat cultivars was higher than that of the infected ones. The loss% of the thousand kernel weight (gm) ranged from 13.32% to 30.73% The cultivars sids 12, gemmeiza 11, misr 1 and misr 2 gave the highest values of losses% of the on thousand kernel weigh (gm.) (30.73, 21. 82, 14.95 and 13.32%), respectively, followed by sakha 94 (10.54%) and giza 171 (12.55%) (Table, 4)

Table (4): Effect of yellow rust infection on grain yield 1000 kernel wheat of six wheat cultivars under field conditions at Sakha Agriculture Research Station in 2017/2018 growing season.

Cultivar	Rust induce		Mean grain 1000kernelweight(gm.)		
	a FRS.	b AUDPC.	Infected	Protected	Losses (%)
Sids 12	56,67	558,00	32,60	47,06	30,73
Gemmeiza 11	53.33	520,00	38,70	49,50	21,82
Misr 1	36,67	308.00	40,90	48.09	14.95
Misr 2	26,67	248,00	39,88	46.01	13.32
Sakha 94	2,47	41,30	41,60	46,50	10.54
Giza 171	6,67	142,00	42,50	48,60	12.55

a- (FRS). Final rust Severity. b- (AUDPC). Area under disease progress curve

2.2.The second growing season 2018-2019:

Data presented in Table (5) revealed that the yellow rust severity in the second growing season (2018-2019) was higher in all the tested wheat cultivars than that in the first growing one (2017-2018) which was relatively low. The rust severity (%) was higher on the high level of susceptible wheat cultivars Sids 12 (83.33%), Gemmeiza 11 (76.67), Misr 1 (56.67%) and Misr 2 (43.33%) for the infected treatments. On the other hand, the cultivars Sakha 94 and Giza 171 exhibited lower values of yellow rust severity % (4.33 and 2.67%) respectively for the infected treatments.

The same trend was found in case of area under disease progress curve AUDPC. It was found to be higher in all cultivars compared with the previously season. However, the values of AUDPC were as following sids 12 (925.00), gemmeiza 11 (865.00), misr 1 (534.00) and misr 2 (400.00) for infected treatments, respectively. Whereas, in the low level of susceptible wheat cultivars, the values of AUDPC were recorded in sakha 94 (208.00) and giza 171 (60.00) for the same treatments. In general, data in Table (5) show that the increasing in thousand kernel weigh losses% with the increasing of yellow rust severity (%) and AUDPC values, were clearly noticed in all the tested wheat cultivars. Thousand kernel weights (gm.) of the healthy plants (protected treatment) of all wheat cultivars were higher than that of infected ones. The loss% of the 1000 kernel weigh (gm.) ranged from 15.61 % to 73.44%. The cultivars sids 12, gemmeiza 11, misr 1 and misr 2 gave the highest values of loss % of the thousand kernel weight (gm.) (73.44, 69.35, 18.20 and 15.61%) respectively. followed by sakha 94.1(11.94%) and giza 171 (7.53%).

Table (5): Effect of yellow rust infection on grain yield 1000 kernel wheat of six wheat cultivars under field conditions at Sakha Agriculture Research Station in 2018/2019 growing season.

Cultivar	Rust induce		Mean grain 1000kernel weight(gm.)		
	a FRS.	b AUDPC.	Infected	Protected	Losses (%)
Sids 12	**83,33**	**925,00**	**12.66**	**47.66**	**73,44**
Gemmeiza 11	**76,67**	**865,00**	**15.03**	**49,03**	**69.35**
Misr 1	**56,67**	**534,00**	**39,55**	**48.35**	**18.20**
Misr 2	**43,33**	**400.00**	**38,70**	**45.86**	**15,61**
Sakha 94	**4,33**	**208,00**	**40.20**	**45.65**	**11,94**
Giza 171	**2,67**	**60,00**	**45.30**	**48.99**	**7,53**

a- (FRS). Final rust Severity. **b- (AUDPC). Area under disease progress curve**

Yellow rust, is considered as the most destructive disease of wheat. The losses may reach 100% on susceptible wheat cultivars when conditions favorable for disease (Singh *et al*., 2002). Stem rust can cause great damage to susceptible wheat crops over a broad number of geographical regions worldwide. A healthy crop before harvest can be destroyed by stem rust fungu , if sufficient inoculums arrives from infected fields . The nutrient flow in the plant is interrupted at a severe infection on the stems leading to shriveling of spikes and grain. Besides that, infected stems are weakened and therefore, prone to loding , leading to farther loss of grain (Roelfs *et al*., 1992 and Leonard and Szabo, 2005).

The effect of yellow rust infection on 1000 kernel weight of wheat genotypes i.e. Sids 12, Gemmeiza 11, Misr 1, Misr 2, Sakha 94 and Giza 171 were estimated under field conditions at Sakha Agricultures Research Stations for two successive growing seasons (2017/18-2018/19). Result obtained revealed that of 1000 kernel – weight was affected by yellow rust infection, and the differences between protected and infected wheat genotypes due to the difference in the level of disease severity of yellow rust. It was noticed that over the growing seasons, the tested wheat cultivars showed different disease severity, however the wheat cultivars which showed high yellow rust disease severity exhibited maximum values of area under diseases progress curve (AUDPC) and 1000 kernel weight, while the wheat cultivars which showed low disease severity exhibited minimum values of area under diseases progress curve (AUDPC).and 1000 kernel weight. However, the tested wheat cultivars showed highly significant difference in Thousand kernel weight of the different cultivars was clearly affected by yellow rust infection particularly at high disease incidence (infected plants). Generally, 1000 kernel weight was decreased (loss increased) as the severity of stem rust increased. However. the percentages of loss in 1000 kernel weight differed significantly among the tested cultivars. The wheat cultivars sakha 94 and giza 171 revealed the lowest level of 1000 kernel weight loss. Whereas, the wheat cultivars sids 12, gemmeiza 11, misr 1 and misr 2 showed the highest loss in 1000 kernel weight in two growing seasons. Moreover the reduction in 1000 kernel weight was parallel to stem rust severity in all seasons. The among of the protected plants of the tested wheat cultivars was chemically controlled expected, this is because of this character is quantitatively and genetically controlled. On the other hand it is affected not only by the disease infection but also by further factors (Mousa, 2001). Boulot (2007) & Boulot *et al*. (2014) reported that the Egyptian wheat cultivars sids 1 exhibited the lowest of loss (%) in both grain weight and 1000 kernel weight in comparison with sids 9 and sakha 69 which they exhibited the highest loss (%) at the three locations of the study. Abdel-Malik (2011) reported that yield loss was correlated strongly with area under diseases progress curve (AUDPC). Which means that high level of partial resistance is needed to prevent significant yield loss. Also, Abdel Badeea (2011 & 2015) reported that infection with stem rust can severely reduce grain yield on susceptible cultivars and correlation was found between yield losses with disease severity and area under disease progress curve AUDPC). Therefore growing slow rusting cultivars will reduced the loss in grain yield. (Singh *et al*., 2013 and El-Sayed *et al.* , 2011).

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