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Investigations on varietal resistance of wheat against *Schizaphis graminum* (rond). under field conditions

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Abstract

Wheat (*Triticum aestivum*) is an important cereal crop which is being grown in Pakistan. The wheat crop has also many pests which damage the yield and quality of grains and are responsible for great reduction in yields. There are many species of insects which can cause damage to crop, but Aphid are known to be more dangerously damaging pests of wheat crop. To investigate the varietal resistance of wheat against *Schizaphis graminum* under field conditions, an experiment was conducted at the research field of Lasbela, University of Agriculture, water and Marine sciences, Uthal Baluchistan, Pakistan during 2017- 2018. Five commercial wheat varieties were sown on November 2017 in a randomized complete block design with four replications in 9.8×4.6 m size plot having 10 rows, respectively. The sowing of wheat seeds was done on ridges. Observations on the infestation of wheat aphids were recorded at weekly interval. For this purpose, five plants from each replication were randomly selected. During the study we observed that aphids attack started in last two weeks of December, increased during January and March, peaked on 26th January, and then declined afterwards till complete disappearance in April. The overall mean number of aphids per plant was higher on wheat variety Shalkot (3.76±0.29/aphids per plant), which was followed by Azri (2.17±0.22aphids per plant), Sarsabz (2.68±0.19 aphids per plant), Nymber (1.43±0.16), Tajawaan (1.17±0.15 aphids per plant). However, Upcoming wheat variety Shalkot found to have susceptibility to *Schizaphis graminum*, this variety was more infested by wheat aphid than rest of the varieties. Tajawaan was found to be relatively less infested with insect population of 1.17±0.15/plant, which can be assumed as relatively resistance to *Schizaphis graminum*. The results for population of *Schizaphis graminum* in all Five varieties showed statistically highly significant difference (F= 62.41 P = 0.0000).

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Introduction

Wheat (*Triticum aestivum*) is an important cereal crop which is being grown in Pakistan. Also famous locally with names Kanak (Sindhi) and Gandum (Urdu) in the Pakistan. It is cultivated during rabi cropping season after cultivation of summer crops cotton and rice. According the report of Pakistan agriculture research council (PARC 1989), wheat is consumed by more than 70 % of the human population. This cereal is grown on 23 % of global cultivated area and is of the great importance in bread, diet, pharmaceutic and other industries, and also important product of international trade on worldwide market. (Istvan, 2006). It was grown on 8414 million hectares producing 21749 million tons of grain with a yield of 2585 kg per hectare (MINFAL, 2008-2009) that country consumes 120 kg of wheat per capita per year. All Provinces of Pakistan have been cultivating wheat, therefore country's name has been found in list of top 10 wheat producing states of the globe, but still there is problem to complete the grain requirement of increasing population of the country. The wheat crop has also many pests which damage the yield and quality of grains and are responsible for great reduction in yields. There are many species of insects which can cause damage to crop, but Aphid are known to be more dangerously damaging pests of wheat crop (Schowalter, 2016). Three species of aphids viz., oat aphid (*Rhopalosiphum padi*), English grain aphid (*Sitobion avenae*) and Green bug aphid (*Diuraphis noxia* M.) were reported on wheat crop in Pakistan (Irshad, 2001). Aphid outbreak during early growing stages of wheat is very alarming. It damages the crop by sucking the cell sap from leaves, stem and kernels. Honey dew secreted by the aphid encourages black sooty mould development that leads to 20- 80% damage by covering the leaves and interrupted the process of photosynthesis (Aslam *et al.*, 2005). Wheat aphid is one of the major pests of winter wheat and has posed a significant threat to winter wheat production (Zhang *et al.*, 2016). The experiment was conducted to investigate and monitor population of wheat Aphid on various wheat cultivars/varieties to examine the most resistant variety against wheat

aphids.

Materials and methods

The study was carried out during the year 2017 -2018. The experiment was conducted to find out the most resistance variety of wheat against wheat aphids at the experimental fields of the Lasbela University of Agriculture, water and Marine sciences, uthal Baluchistan, Pakistan. Five commercial wheat varieties namely viz., Nymber, Sarsabz, Azri, Shalkot, Tajawaan were sown on November 2017 in a randomized complete block design with four replications. The plot size was 9.8×4.6 m having 10 rows and with row-to-row (12 cm), and plant-to-plant distance of (7 cm), respectively. The sowing of wheat seeds was done on ridges and first two irrigations were given frequently after emergence of seed. Normal agronomic practices were carried out throughout the growing season of the crop and no practices were sprayed in and around experimental field. The observations on the infestation of wheat aphids were recorded at weekly interval. For this purpose, five plants from each replication were randomly selected. The observation was recorded at morning hours (9-10 am) and ultimate care was taken to examine the population of insect pests. The observations were started in the end of December, 2017 to third week of May, 2018. The analysis of variance were statistically analyzed by Software Statistic 8.1 shown in table 2.

Results and discussion

During the study we observed the population of *Schizaphis graminum* was recorded and compared on five varieties i.e., Nymber, Sarsabz, Azri, Shalkot, Tajawaan. The resistance of varieties to pest was measured on the basis of their population buildup throughout the growing season of wheat. Wheat aphid (*Schizaphis graminum*) is a serious insect pest of wheat. This pest has been found a significant damaging the wheat immature and mature stage up to the final before harvest stage. Results shown (Table 1) indicated that the highly statistically difference ($F = 62.41$, $P \leq 0.0000$) in population of *Schizaphis graminum* on different wheat varieties.

However, the population of *S. graminum* was found relatively greater (3.76 ± 0.29 /plant) on wheat variety (Shalkot), followed by Sarsabz (2.68 ± 0.19), Arzi (2.17 ± 0.22) and Tajawaan (1.17 ± 0.15) on wheat varieties. Commercial wheat variety Nymber was found to be relatively less infested with *S. graminum*. Which can be assumed as relatively resistance to *S*

graminum. However, upcoming wheat variety Shalkot found to have susceptibility to *S. graminum* this variety was more infested by wheat aphid than rest of the varieties. The ANOVA results for population of *S. graminum* showed that highly significant ($F = 24.78$ $P = 0.0000$) on various observation dates.

Table 1. Mean population of wheat aphids on different wheat varieties.

Date	Nymber	Sarsabz	Azri	Shalkot	Tajawaan	Total mean
23/12/17	1.25 ± 0.29	2.51 ± 0.28	2.35 ± 0.84	3.33 ± 0.44	0.9 ± 0.26	2.06 ± 0.44
30/12/17	1.45 ± 0.27	2.35 ± 0.33	2.25 ± 0.56	3.9 ± 0.55	1.85 ± 0.27	2.36 ± 0.41
6/1/18	1.7 ± 0.42	2.45 ± 0.32	1.95 ± 0.54	3.15 ± 0.57	1.7 ± 0.41	2.19 ± 0.27
11/1/18	0.7 ± 0.20	1.45 ± 0.26	1.45 ± 0.30	2.3 ± 0.36	0.4 ± 0.13	1.26 ± 0.33
20/1/18	1.15 ± 0.25	2.4 ± 0.34	1.75 ± 0.40	4.15 ± 0.28	0.85 ± 0.25	2.06 ± 0.58
26/1/18	2.65 ± 0.49	4.35 ± 0.44	3.15 ± 0.70	5.25 ± 0.48	2.25 ± 0.50	3.53 ± 0.55
1/2/18	0.7 ± 0.20	2.1 ± 0.38	1.4 ± 0.30	3.4 ± 0.22	0.8 ± 0.40	1.68 ± 0.49
8/2/18	2.5 ± 0.71	4.3 ± 0.78	4.8 ± 1.79	5.85 ± 1.34	1.05 ± 0.35	3.7 ± 0.85
12/2/18	1.5 ± 0.32	2.7 ± 0.37	1.6 ± 0.61	3.65 ± 0.42	1.75 ± 0.40	2.24 ± 0.41
18/2/18	0.8 ± 0.18	1.8 ± 0.40	1.85 ± 0.53	2.95 ± 0.46	0.55 ± 0.13	1.59 ± 0.42
22/2/18	1.1 ± 0.29	2.45 ± 0.46	1.05 ± 0.18	2.65 ± 0.35	0.6 ± 0.18	1.57 ± 0.41
28/2/18	2.1 ± 0.75	2.9 ± 0.25	2.5 ± 0.64	4.3 ± 0.60	1.95 ± 0.31	2.75 ± 0.42
5/3/18	2.15 ± 0.74	2.65 ± 0.82	2.2 ± 0.61	5.95 ± 1.21	1.45 ± 0.24	2.88 ± 0.79
11/3/18	1.45 ± 0.32	3.35 ± 0.63	3.05 ± 0.69	4.45 ± 0.93	1.65 ± 0.36	2.79 ± 0.55
18/3/18	0.5 ± 0.17	2.95 ± 0.36	1.65 ± 0.34	2.15 ± 0.37	0.4 ± 0.11	1.53 ± 0.48
23/3/18	1.3 ± 0.23	2.25 ± 0.27	1.85 ± 0.25	2.8 ± 0.13	0.65 ± 0.13	1.77 ± 0.37
2/4/18	0	0	0	0	0	0
9/4/18	0	0	0	0	0	0
14/4/18	0	0	0	0	0	0
Total mean	1.43 ± 0.16	2.68 ± 0.19	2.17 ± 0.22	3.76 ± 0.29	1.17 ± 0.15	

According to overall weekly observations maximum population of wheat aphids was recorded 3.53 ± 0.55 on 26th January, whereas the minimum population of aphid was recorded 1.26 ± 0.33 on 11th January and then declined afterwards till complete disappearance in April. Shuhail *et al.* (2001) reported that wheat aphid's population became zero on in the month of April. Wheat aphid (*S. graminum*) is a serious insect pest of wheat. This pest has been found a significant damaging the wheat immature and mature stage up to the final before harvest stage. Similarly, many authors have reported that Wheat aphid (*S. graminum*), is one of the major pests of Wheat. Zeb

et al. (2015) reported that wheat aphid *Schizaphis graminum* (Rondani), (Hemiptera: Aphididae), causes

Heavy losses to wheat crop by directly sucking the cell sap of the plant, and indirectly, by transmitting viral diseases such as barley yellow dwarf virus. Fifty wheat genotypes against *S. graminum* was conducted. Twelve genotypes were found highly resistant, twelve were moderately resistant while ten were lowly resistant. Ten genotypes were ranked as lowly susceptible, two were moderately susceptible while four genotypes were highly susceptible. Aheer *et al.*

(2006) and Muhammad *et al.* (2005) reported that the peak population aphid's this study provided preliminary information on the resistance/susceptibility status of tested genotypes

against this aphid. Hu *et al.* (2016) aphid, *Sitobion avenae*, is a major pest species of wheat crops; however, certain varieties may have stronger resistance to infestation than others.

Table 2. Analysis of Variance Table for wheat aphid.

Source	DF	SS	MS	F	P
Block	4	34.1	8.526		
Number	18	2051.1	113.952	24.78	0.0000
Treatment	4	1147.9	286.985	62.41	0.0000
number*treatment	72	517.6	7.189	1.56	0.0020
Error	1801	8281.2	4.598		
Total	1899	12032.0			

Grand Mean 1.8900.

This observed difference in the date of peak level and zero population may be due to the difference in the weather factors of different locations. Aheer *et al.* (2007) also confirmed that combination of all abiotic factors contribute a significant role in aphid's population fluctuation on wheat.

Conclusion

It is concluded that the commercially growing wheat variety Tajawaan, was shown resistant against wheat aphids, Nymber was moderately resistant and Shalkot variety was observed highly susceptible for wheat aphids. On the base of present experiment, it is suggested that Tajawaan variety should be cultivated against *Schizaphis graminum*.

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