



Population, Fluctuation of Aphid on the different Wheat Varieties from Larkana District

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Abstract: The present investigation has been carried on the population fluctuation of aphids on the different wheat varieties i-e TD-1, Benazir, Tj-83, QS-4, NIAamber from larkana district. Triticum aestivum (wheat) is considered very important food crop in Pakistan including Sindh. This crop is attacked by numbers of insect including aphids, which is responsible for reduction of its yield. The occurrence of aphid has been started in the month of January and its peak infestation was observed during mid March when wheat crop was fully grown. During the present study significant large numbers of specimens were collected from the different varieties of wheat. The collected material was sorted out in to two species viz: Rhopalosiphum padi (L.), Schizaphis graminum (Rondani). During this study it was noted that TD-1 was significantly affected by R.padi and S.graminum as compare to other tested varieties. It was observed that aphid reached peak point in mid February on leaves then in the end of February aphids started shifting from leaves to ears and their population start to decline in month of April.

Keywords: Aphids, Wheat Varieties, Larkana.

1. INTRODUCTION

Wheat (Triticum aestivum) is most important crop as being consumed for staple food in the world (Khan et al., 2000). More than 35% of the world growing population takes it as staple food (Khakwani et al., 2012). Gluten is the most important protein found in grains of wheat (Kausar and Shahbaz., 2013), it helps foods maintain their shape, acting as a glue that holds food contents together. The factors which are responsible for low yielding of various wheat varieties includes abiotic factors (Khan et al., 2012), improper system of irrigation, use of fertilizers (Kibe et al., 2006), sowing time (Aheer et al., 1993), weeds (Memon et al., 2013) and insects pests, including aphid (Geza., 2000), the most dominant aphid species are green bug, Schizaphis graminum, Oat aphid, Rhopalosiphum padi, English grain aphid, Sitobion avenae, Russian wheat apid, Diuraphis noxia and rose-grass aphid, Metopolophium dirhodum (Bospuperez and Schotzko., 2000).

In Pakistan, the most common aphid species are S.avenae, R.padi and S.graminum (Shah, et al., 2006). Aphid causes curling of leaves, chlorosis, and distortion of leaves and blocks the growth (Kindler et al., 1995; Akhter and Khaliq, 2003). Aphid can causes 35-40% loss by sucking sap and 20-80% by transmission of fungal and viral diseases (Kiechefer and Gellner, 1992; Rossing et al., 1994). R.padi alone can cause wheat yield losses up to 600Kg/ha (Hallqvist, 1991). Laboratory studies on life of green bug on different wheat varieties were conducted by Buriro et al, (1996). Aphid got status as a pest in Pakistan during 1990, when population of aphids started to increased on wheat

(Aheer et al., 1994). In this study, five different varieties of wheat are selected such as TD-1, Benazir, TJ-83, QS-4, and NIAamber to observe the population of aphids on these varieties at Larkana District. This study will help to assess in controlling and management of aphids as pest of wheat.

2. MATERIAL AND METHOD

The sowing season of wheat in Larkana district starts from mid of November. Five varieties of wheat were selected to observe the population, fluctuation of aphid. A plot of 100m x 100m was selected at Abbasi farm, Deh walleed and Quaid-e-Awam Agriculture research institute Larkana. From this plot on each observation, five sub plots of 4m x 4m were selected. Five wheat varieties namely, TD-1, Benazir, TJ- 83,

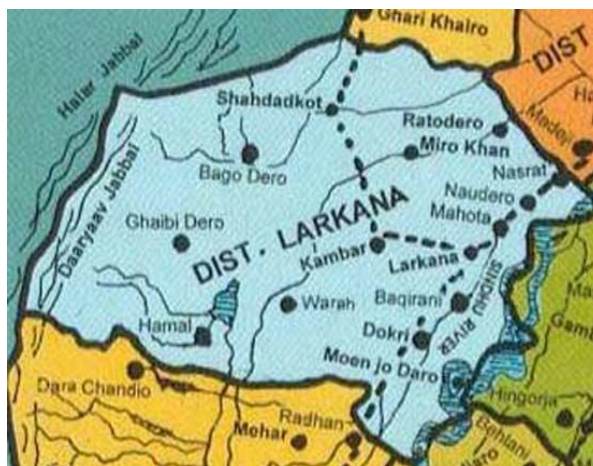


Fig: 1. Map of Larkana District

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QS-4 and NIAamber were observe for aphid population densities in the experiment form. Two stations were selected for study, one station (St.1) is Abbasi farm, located about 1 km of distance from Larkana city (**Fig:1**) and second station (St.2) is Qauid-e-Awam Agriculture Research Institute Larkana, which is about 3 km from Larkana city. At Abbasi farm (St.1),TD-1 and NIAamber were cultivated, where plot of 4×4 meters are measured and named as plot: No.1 and plot: No.5, respectively, selected for study purpose, where as remaining other three varieties Benazir, TJ-83 and QS-4 are cultivated at Qauid-e-Awam Agriculture Research Institute Larkana (St.2) and named as plot No.2, plot No.3, Plot No.4, respectively. Observations on the study site were carried out from January to April 2017, which is a wheat crop season. Observations carried out fortnightly. At each observation five subplots (4m × 4m) selected at random to count healthy and infested plants. Aphid population is counted by taking ten plants from each subplot. This data transformed as number of aphids per plant. Data is taken after one month of the crop cultivation up to crop maturity. All the standard agronomic practices conducted throughout course of experiment. Aphids were collected from five selected varieties of wheat by aspirator, camel hair-brush, net sweeping and by jerking the plant leaf in polythene bags and jars. Specimens were collected from St1. and St.2 and preserved in 70% alcohol. The collected specimens were brought to laboratory for further study. Temperature, humidity and soil ph data for Larkana was recorded by hygrometer, by temperature and humidity meter and also procured from the Meteorological office.

3. RESULT

During this study two species of aphids (*Rhopalosiphum padi* (L.) and *Schizaphis graminum* (R.) were found on wheat varieties at Abbasi form area and Qauid-e-Awam Research Institute area, District Larkana, from the period Jan. 1, 2017 to April 16, 2017.

On January 1, 2017, only *R.padi* was recorded on wheat plants. (**Table-1**) indicates total number of plants and number of plants infested with aphids, on five selected plots with different five wheat varieties. The wheat plants infested as TD1 3.1%, Benazir 2.7%, Tj-83 1.9%, QS-4 2.6% and NIAamber 1.7%, with mean value of infested plant was 2.4. The number of aphids per leaf on TD1 was 0.5, Benazir 0.4, Tj-83 0.2, QS-4, 0.4 and NIAamber 0.1, with mean value of aphids per leaf was 0.3.

On January16, 2017, some increased population of aphids was recorded on wheat varieties. The wheat

plants infested as TD1 4.2%, Benazir 3.0%, Tj-83 2.1%, QS-4 3.2% and NIAamber 2.5%, with mean value of infested plant was 3.0. The number of aphids per leaf on TD1 was 0.7, Benazir 0.5, Tj-83 0.2, QS-4, 0.4 and NIAamber 0.2, with mean value of aphids per leaf was 0.4.

On February1, 2017, more increased population of aphids was recorded. The second species of aphid *S. graminum* also identified and started to infest wheat plants. The wheat plants infested as TD1 5.7%, Benazir 4.3%, Tj-83 3.2%, QS-4, 5.4% and NIAamber 3.7%, with mean value of infested plant was 4.4. The highest rate of infestation of aphid population per leaf of *R.padi* and *S. graminum* is on TD1 (4.3) and lowest infestation rate is on NIAamber (0.8).

On February16, 2017, there was tremendous increase in population of aphids and also plant infestation. The wheat plants infested as TD1 47.3%, Benazir 43.2%, Tj-83 25.2%, QS-4, 34.5% and NIAamber 12.9%, with mean value of infested plant was 32.6. The highest rate of infestation per leaf of *R.padi* and *S.graminum* is on TD1 (22.8) and lowest infestation rate is on NIAamber (3.2). At this stage of growth, ears started appearing and aphids are shifting from leaves to ears. The highest rate of infestation per ear of *R.padi* and *S.graminum* is on TD1 (15.1) and lowest infestation rate is on NIAamber (6.1).

On March 1, 2017, there was a decline in aphid population on leaves. The number of aphid per leaf decreased where as the number of aphids per ear found increased because of availability of sufficient food substances. The wheat plants infested as TD-1 35.5%, Benazir 46.9%, Tj-83 29.6%, QS-4, 38.2% and NIAamber 15.2%, with mean value of infested plant was 33.1. The highest rate of infestation per leaf of *R.padi* and *S. graminum* is on TD-1 (9.2) and lowest infestation rate is on NIAamber (2.9). The highest rate of infestation per ear of *R.padi* and *S.graminum* is on TD-1 (27.1) and lowest infestation rate is on NIAamber (17.1).

On March 16, 2017, highest infested plants were found. The highest rate of infestation per leaf of *R.padi* and *S. graminum* is on TD-1 (17.8) and lowest infestation rate is on NIAamber (8.1). The highest rate of infestation per ear of *R.padi* and *S. graminum* is on TD-1 (74.0) and lowest infestation rate is on NIAamber (20.0). In the month of April aphid population start to decline may be because of fully growth of ear which becomes hard and aphid cannot get its food because their mouth parts are sucking type.

Table: 1. Percentage of infested plants of different wheat varieties during 2017.

Sampling dates and Wheat Varieties	Total No. of plants	No. of infested plants	% of infested plants	Sampling dates and Wheat Varieties	Total No. of plants	No. of infested plants	% of infested Plants
1-Jan-17				1-Mar-17			
Plot-1 (TD-1)	950	30	3.1	Plot-1 (TD-1)	950	510	35.5
Plot-2 (Benazir)	810	22	2.7	Plot-2 (Benazir)	810	380	46.9
Plot-3 (TJ-83)	912	18	1.9	Plot-3 (TJ-83)	912	270	29.6
Plot-4 (QS-4)	940	25	2.6	Plot-4 (QS-4)	940	360	38.2
Plot-5 (NIAamber)	850	15	1.7	Plot-5 (NIAamber)	850	130	15.2
Mean	892	22	2.4	Mean	892	330	33.1
16-Jan-17				16-Mar-17			
Plot-1 (TD-1)	950	40	4.2	Plot-1 (TD-1)	950	550	57.8
Plot-2 (Benazir)	810	25	3	Plot-2 (Benazir)	810	460	56.7
Plot-3 (TJ-83)	912	20	2.1	Plot-3 (TJ-83)	912	310	33.9
Plot-4 (QS-4)	940	31	3.2	Plot-4 (QS-4)	940	440	46.8
Plot-5 (NIAamber)	850	20	2.5	Plot-5 (NIAamber)	850	210	24.7
Mean	892	27.6	3	Mean	892	394	44
1-Feb-17				1-Apr-17			
Plot-1 (TD-1)	950	55	5.7	Plot-1 (TD-1)	950	260	27.3
Plot-2 (Benazir)	810	35	4.3	Plot-2 (Benazir)	810	150	18.5
Plot-3 (TJ-83)	912	30	3.2	Plot-3 (TJ-83)	912	80	8.7
Plot-4 (QS-4)	940	51	5.4	Plot-4 (QS-4)	940	160	17
Plot-5 (NIAamber)	850	32	3.7	Plot-5 (NIAamber)	850	40	4.7
Mean	892	40	4.4	Mean	892	138	15.2
16-Feb-17				16-Apr-17			
Plot-1 (TD-1)	950	450	47.3	Plot-1 (TD-1)	950	0	0
Plot-2 (Benazir)	810	350	43.2	Plot-2 (Benazir)	810	0	0
Plot-3 (TJ-83)	912	230	25.2	Plot-3 (TJ-83)	912	0	0
Plot-4 (QS-4)	940	335	34.5	Plot-4 (QS-4)	940	0	0
Plot-5 (NIAamber)	850	110	12.9	Plot-5 (NIAamber)	850	0	0
Mean	892	295	32.6	Mean	892	0	0

Table: 2. Aphid population on different wheat varieties during 2017

Wheat Varieties						
Sampling Dates	TD-1 Leaf/ear	NIAamber Leaf/ear	TJ-83 Leaf/ear	QS-4 Leaf/ear	Benazir Leaf/ear	Mean Leaf/ear
January						
1/1/2017	0.5/0	0.1/0	0.2/0	0.4/0	0.4/0	0.3/0
16/1/2017	0.7/0	0.2/0	0.2/0	0.4/0	0.5/0	0.4/0
February						
1/2/2017	4.3/0	0.8/0	1.1/0	2.8/0	3.0/0	2.4/0
16/2/2017	22.8/15.1	3.2/6.1	11.4/6.4	15.9/12.5	17.8/12.8	15.6/10.5
March						
1/3/2017	9.2/27.1	2.9/17.1	3.8/18.1	7.1/25.2	5.8/20.2	5.7/21.5
16/3/2017	17.8/74.0	8.1/20.0	9.4/21.0	15.8/45.0	15.8/48.0	13.3/47.6
April						
1/4/2017	10.1/30.5	2.1/5.6	4.2/7.2	7.2/20.5	8.2/15.0	6.3/15.8
16/4/2017	0/0	0/0	0/0	0/0	0/0	0/0
Mean	9.34/20.9	2.61/6.9	4.2/7.5	7.0/14.7	7.3/13.7	

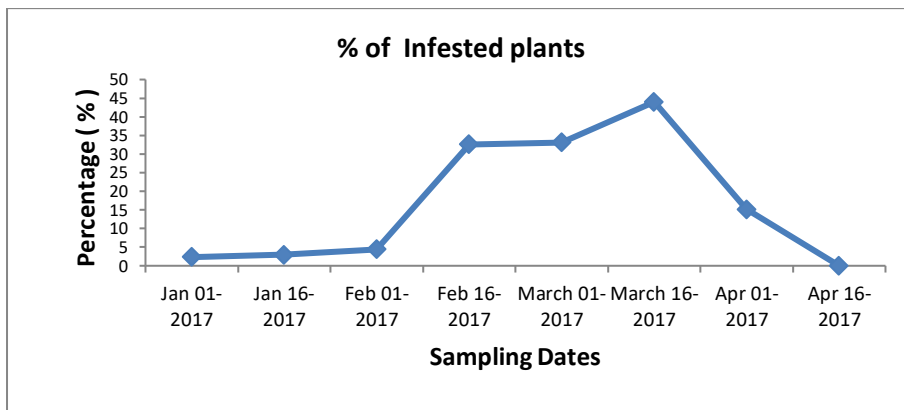


Fig: 2. Percentage of infested wheat plants during 2017.

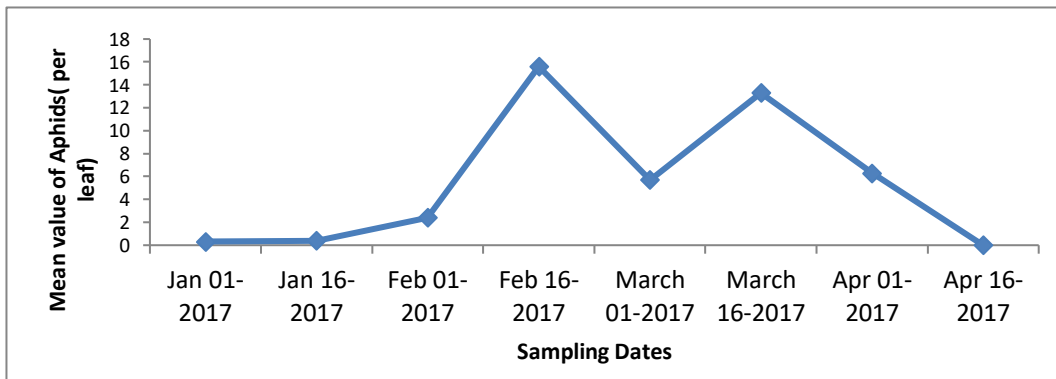


Fig: 3. Mean value of Aphids on per leaf of different wheat varieties during 2017.

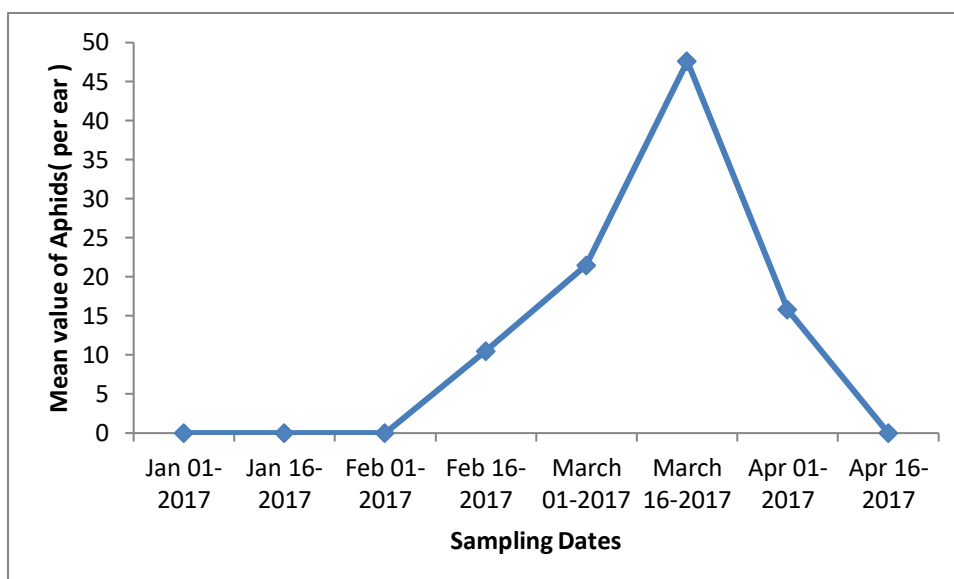


Fig. 4. Mean value of Aphids on per ear of different wheat varieties during 2017.

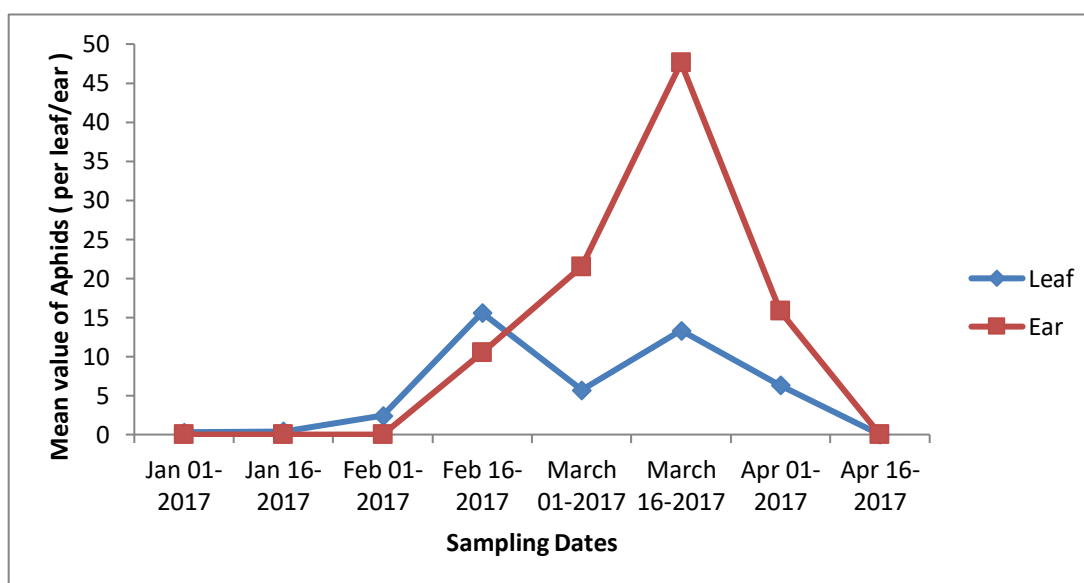


Fig. 5. Comparison of mean value of Aphids on per leaf and ear of different wheat varieties during 2017.

Aphid infestation started in the mid of January mostly on leaves. At this time humidity was 62% and temperature ranged from 20.0°C to 7.2 °C maximum and minimum respectively (Table. 3). In the mid of February, the population of aphid start to increase slowly, while a slight fluctuation in temperature and relative humidity was also recorded. Sharp increase of aphid population in 1st week of March was recorded which remained till mid of March. At this time 41% relative humidity, 32°C maximum temperatures

and 14.5°C minimum temperatures were recorded. After wards, aphid population started declining in the end of March.

Temperature increased in the mid of April, ,maximum temperature 42.8°C and minimum temperature 24.4 °C and relative humidity 29% was recorded at this time aphid population dropped down while at the end of April no count of aphid were observed in the field.

Table 3. Effects of abiotic factors on aphid population during 2017.

Date of Sampling	Temperature °c		Soil Temperature °c	Humidity %
	Max.	Min.		
Jan 01-2017	19 °c	7.0 °c	16.0 °c	62%
Jan 16-2017	20 °c	7.2 °c	15.0 °c	57%
Feb 01-2017	24.2 °c	8.5 °c	20.0 °c	46%
Feb 16-2017	27.2 °c	10.6 °c	21.5 °c	53.00%
March 01-2017	32.6 °c	15.0 °c	23.5 °c	41.30%
March 16-2017	34 °c	17.0 °c	24 °c	45.00%
Apr 01-2017	42.8 °c	22.0 °c	30 °c	31.00%
Apr 16-2017	42.0 °c	24.1 °c	31 °c	29%

4. DISCUSSION

Wheat crop in larkana district is one of the most important crops and plays very important role in the economy of local peoples. This crop is attacked by aphid. Aphid commonly known as plant lice, it is serious pest of many crops.

Aphid severely damages the wheat in Pakistan (Mohyuddin, 1981; Hamid, 1983). The aphid starts to attack in the first week of January and gradually increased by the growth of wheat crop. Aphids do not reproduce rapidly on the early growth stages of wheat (Kieckhefer and Gellner, 1992; Ahmed and Nasir, 2001). It was observed that in early growing stages of wheat, aphids found in low numbers because it may be due to the low quality of food (sap). Aphid increased their population as plant grows (Yazdani and Agarwal, 1997).

During this study, peak mean population of aphid was observed 22.8/leaf in the month of February (**Fig.2**) and 74.0/ear in the month of March (**Fig. 3 and 5**). The peak population of aphid was observed in the month of March and the same peak population of aphid was observed by many other researchers (Farooq and Nisar, 2001; Shuhail, *et al.*, 2001; Aslam, *et al.*, 2004; Muhammad, *et al.*, 2005; Aheer, *et al.*, 2006). It was observed that because of rapid reproduction, aphid population start to increase from mid of February to mid of March, during this time period wheat was in milk stage which provides good and surplus quantity of food (sap) in the ears (Dyadechko and Ruban, 1975; Keickhefer *et al.*, 1994; Kieckhefer and Gellner, 1992; Rustamani, *et al.*, 1999). At the end of March and beginning of April, the population of aphids went down and eliminated completely on all varieties of wheat. These results are similar to those reported earlier (Pervez and Ali, 1999; Keickhefer, *et al.*, 1994; Ahmed and Nasir, 2001). Our results are similar with other researchers, Bambhro, (2002) and Aslam, *et al.* (2005),

reported that aphids breed rapidly due to cold weather and reached at the highest population in the end of February to mid of March. (Aheer *et al.*, 2007) and Wains *et al.*, 2008), found that the highest peak of aphids was in March. The decline of aphid population might be due to crop maturity, grain hardness, unavailability of sap due to senescence of the crop and high temperature.

Abiotic factors (**Table. 3**) shows great influence on the aphid population fluctuation on wheat (Aheer *et al.*, 2007). Low temperature and high humidity support the aphid growth on wheat.

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