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Population of Aphid (*Schizaphis graminum* R.) on Different Varieties/Lines of Wheat (*Triticum aestivum* L.)

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ABSTRACT

The population of aphid (*Schizaphis graminum* R.) was studied on twelve varieties/lines of wheat (*Triticum aestivum*) viz., Inqalab-91, Iqbal-2000, MH-97, BWP-97, PND-1, Punjab-96, 2333, 2210, 2486, 2045, 2049 and 2460, during 2001-02 at Multan, Pakistan. Aphid population appeared on all varieties/lines on 19th January and increased gradually up to 19th February, 2002. Thereafter the aphid population increased exponentially and reached its peak on 16th March, 2002 on all the varieties / lines. A sudden decline in the aphid population was recorded after 23rd March, 2002 and was totally eliminated on 6th April, 2002. Mean aphid population/ five tillers of a wheat plant during the whole season was lowest on Inqalab-91 (6.90) followed in ascending order by Punjab-96 (7.90 aphids), BWP-97 (8.80 aphids), MH-97 (9.50 aphids), 2049 (10.60 aphids), Iqbal-2000 (12.20 aphids), 2460 (14.50 aphids), 2045 (14.70 aphids), 2486 (17.00 aphids), 2210 (19.90 aphids), 2333 (20.40 aphids) and PND-1 (21.80 aphids). Inqalab-91 was the most resistant and PND-1 was the most susceptible varieties among twelve tested varieties/lines.

Key Words: Aphid; *Schizaphis graminum*; Population; Wheat; *Triticum aestivum* L.

INTRODUCTION

Many pests, including wheat armyworm (*Mythimna separata*), wheat weevil (*Tanymecus indicus*), white ants (*Microtermes obesi*) and aphids, attack wheat (Atwal & Dhaliwal, 1998). Wheat aphids severely damage the wheat crop in Pakistan (Mohyuddin, 1981; Hamid, 1983), especially *Schizaphis graminum* R., *Sitobion avenae* F., *Rhopalosiphum madis* F. and *Rhopalosiphum bufiabdominah* S. (Hashmi *et al*., 1983). The aphid population affects the produce adversely (Wratten & Redhead, 1976; Girma *et al.*, 1993) by causing 35-40% yield losses directly (Kiechefer & Gellner, 1992) and 20-80% yield losses indirectly by transmitting viral and fungal diseases (Marzochi & Nicoli, 1991; Rossing *et al.*, 1994; Trdan & Mileroj, 1999).

Aphid (*Schizaphis graminum* R.) is a serious pest having a wide host range of at least 60 plant species including wheat, barley, sorghum and corn (Kindler *et al.*, 1984; Bowling *et al*., 1998). It sucks the sap and injects the toxin into the plant and interferes with the grain formation (Kannan, 1999). The abundance of aphid adversely affects the nitrogen and protein contents, weight of 1000 grains, number of grains per ear (Ciepiela, 1993) and results in decrease in carbon assimilation rate, transpiration and total chlorophyll (Ryan *et al*., 1987) and reduction in plant biomass (Holmes *et al.*, 1991).

The incidence of aphids has been reported to be significantly different on different cultivars of wheat (Hinz & Daeber, 1976; Castro, 1980; Aheer *et al*., 1993; Ciepiela, 1993; Parvez & Ali, 1999; Ahmad & Nasir, 2001). It also depends on the crop stages (Dyadechko & Ruban, 1975; Rios & Conde, 1986; Kieckhefer & Gellner, 1988; Kieckhefer & Kantack, 1988; Robe *et al*., 1989; Rustamani *et al*., 1999) because their pre-reproductive, reproductive and post-reproductive periods and fecundity are significantly affected by crop varieties (Saikia *et al*., 1989).

The present work was conducted to study the population of the aphid (*Schizaphis graminum* R.) on different varieties/ lines of wheat.

MATERIALS AND METHODS

The study was conducted at Agricultural Farm of the University College of Agriculture, Bahauddin Zakaryia University, Multan, Pakistan during the year 2001-2002. Twelve varieties / lines of wheat viz. Inqalab-91, Iqbal-2000, MH-97, BWP-97, PND-1, Punjab-96, 2333, 2210, 2486, 2045, 2049 and 2460 were sown on 25 November, 2001. Plot size was 4.0 X 0.90 m. There were four lines in each plot at a distance of 22.5 cm. The distance between plots was 50.0 cm. The treatments were replicated four times in a Randomized Complete Block Design. Nitrogen @ 160 kg ha^{-1} and Phosphorus @ 115 kg ha^{-1} were applied. The crop was irrigated five times during the season.

To record the observations, twelve random spots were selected from the middle two lines in each plot. Number of aphid was counted weekly on five tillers per plant from each spot. The observations were recorded weekly from January, 2002 to crop harvesting on 25 April, 2002. The data were subjected to Analysis of Variance and Least Significance

Difference test (LSD) at P=0.05 was calculated to separate the treatment means using the software Mstat-C.

RESULTS AND DISCUSSION

Aphid infestation started in the third week of January, peaked on 16th March and almost diminished on 6th April on all wheat varieties / lines (Table I). Seasonal mean aphid population / five tillers was significantly different on all tested varieties / lines. The highest population was recorded on PND-1 and 2333, which had non-significant difference in population between each other. The minimum and non-significantly different population among each other was recorded on BWP-97, Punjab-96 and Inqalab-91. The data indicated that the mean aphid population / five tillers on different wheat varieties / line varied with the passage of time. On 19th January, maximum mean number of aphid was found on BWP-97 followed by 2333, which had higher population as compared to that on other varieties / lines. The population was lowest and non-significantly different between each other on 2045, Iqbal-2000 and 2210. On 26 January, there was a gradual growth of the aphid population on most of the verities / lines. The highest population was recorded on MH-97, while the population on 2210, BWP-97 and 2249 was non-significantly different and lower than MH-97. The population on PND-1, 2480, Punjab-96, Inqalab-91, 2333, 2445 and 2460 was non-significantly different among each other, and lower than that on 2210, BWP-97 and 2249. The minimum population was recorded on Iqbal-2000.

On 2nd February, the maximum population was recorded on MH-97 followed by 2460. The minimum population was recorded on 2333, 2045, Inqalab-91 and Iqbal-2000 having non-significant difference among them in aphid population. On 9th February, the maximum population was recorded on Punjab-96, MH-97 and 2333, which had non-significantly different number of aphids / five tillers between them. The population was minimum, and non-significantly different among them, on 2049, 2045, BWP-97, Iqbal-2000, PND-1, 2210, 2460, Inqalab-91 and 2486. On 19th and 23rd February, the population was non-significantly different on all varieties/lines. On 2nd March, the maximum population was recorded on Iqbal-2000 followed by 2445, 2486 and 2210 in descending order having significant difference among them in aphid population. The minimum population was recorded on BWP-97. On 9th March, PND-1 had maximum population followed by 2445 and 2486, which had non-significant difference between each other in population. The population on Punjab-96 was higher than that on Inqalab-91, which has minimum population. On 16th March, the peak population was recorded on all the varieties / lines. The maximum population was recorded on 2333 followed by 2210, PND-1 and 2486 in descending order. The minimum population was recorded on MH-97. On 23rd March, a sharp decline in population was observed. The maximum population was recorded on PND-1 followed by BWP-97, 2333 and MH-97 in descending order. The population on 2210 and 2460 was non-significantly different between each other and lower than that on MH-97 but higher than that on 2486, Punjab-96 and 2045, which had non-significantly different population among them. The minimum population was recorded on Inqalab-91. On 30th March, the aphid population declined to a very low level. The maximum population was recorded on 2460. The minimum population was recorded on PND-1, 2333, 2210, Inqalab-91, 2049, 2486, MH-97, 2045, BWP-97, Iqbal-2000 and Punjab-96, which had non-significant difference in population among them. After 30th March, the aphid population almost diminished on all the wheat varieties/lines.

The aphid population increased gradually from 19th January to 19th February, 2002 and remained low, because wheat was producing tillers in its early stage and aphid does not reproduce rapidly on the early growth stages of wheat (Kieckhefer & Gellner, 1998; Ahmad & Nasir, 2001). This may be due to the low quality of food (sap) available in the early stages of the wheat. Changes in quality and quantity of the food occur with life of the plant and its growth stages, which ultimately affect the survival, longevity, distribution, reproduction and speed of development of insects (Yazdani

Table I. Comparison of the mean aphid population per five tillars on wheat varieties/lines during 2002-2003.

VARIETIES /	Sampling Date											Mean
LINES	19/1	26/1	2/2	9/2	19/2	23/2	2/3	9/3	16/3	23/3	30/3	
Inqalab-91	0.21bcd	0.35bc	0.13c	0.56b	0.56	4.63	5.33de	16.90d	43.27de	3.42e	0.04b	6.85d
Iqbal-2000	0.10d	0.02c	0.06c	0.33b	1.81 n.s.	12.98 n.s.	31.69a	36.33bcd	46.31de	4.31de	0.27b	12.20bcd
MH-97	0.13cd	1.06a	1.13a	1.50a	1.71	12.27	5.44de	35.25bcd	26.83e	19.21abcd	0.10b	9.52cd
BWP-97	0.54a	0.46b	0.40bc	0.31b	0.23	2.15	3.94e	23.90bcd	34.52de	30.42ab	0.13b	8.18d
PND-1	0.15cd	0.42bc	0.29bc	0.44b	0.29	10.13	16.40abcde	82.12a	96.83abc	32.87a	0.00b	21.84a
Punjab-96	0.17cd	0.36bc	0.61abc	1.50b	2.86	3.54	12.75cde	19.52cd	35.19de	10.42cde	0.38b	7.93d
2333	0.42ab	0.31bc	0.19c	1.46a	2.79	3.42	19.32abcde	34.00bcd	139.40a	23.00abc	0.02b	21.21a
2210	0.06d	0.46b	0.27bc	0.46b	0.73	3.11	20.13abcd	54.19abcd	121.80ab	17.33bcde	0.04b	19.64ab
2486	0.17cd	0.42bc	0.63abc	0.58b	2.62	9.31	22.81abc	58.44ab	76.85bcd	15.09cde	0.06b	18.14abc
2045	0.10d	0.15bc	0.15c	0.31b	2.69	6.88	30.33ab	59.92ab	53.21cde	7.87cde	0.13b	14.70abcd
2049	0.36abc	0.44b	0.27bc	0.15b	1.25	5.75	17.90abcde	28.9bcd	55.98cde	5.69de	0.06b	10.61cd
2460	0.21bcd	0.06bc	0.9ab	0.48b	2.88	9.73	15.83bcde	49.33abcd	62.67cde	16.13bcde	1.08a	14.48abcd

n.s. = non-significantly different.

* Means followed by the same letters are non-significantly different (LSD; P=0.05).

& Agarwal, 1997).

After 19th February, when wheat was in milk stage, the aphid population increased exponentially and reached its peak on 16th March. Our results confirm the results of earlier workers (Rios & Conde, 1986), who observed peak aphid population at milk stage, i.e. during the third week of March. Aphid reproduces rapidly and increases its population at heading or earing stage (Dyadechko & Ruban, 1975; Keickhefer *et al*., 1994; Keickhefer & Gellner, 1998; Rustamani *et al.,* 1999). This rapid growth in aphid population on all wheat varieties / lines could be due to availability of good quality and surplus quantity of food (sap) present in the ears. Another factor responsible for rapid increase in the aphid population is temperature (Trdan & Mileroj, 1999). Temperature ranging from 7.7 to 25.2 is favourable for aphid growth (Chander, 1996), while the optimum temperature for aphid growth is 23.44°C (Miller & Smith, 1998). The mean maximum temperature at Multan during February was 23.3°C and up to 16th March remained 25.28°C, which is favourable for the rapid aphid growth. It has been reported (Keickhefer & Elliott, 1989) that gross and net reproductive rates of aphids were greatest at low temperature regimes and declined with increase in temperature.

Sudden decline in the aphid population was observed between 16th and 30th March. The aphid population almost diminished on 6th April on all wheat varieties / lines when crop was at dough stage. These results are similar to those reported earlier (Parvez & Ali, 1999; Keickhefer *et al*., 1994; Ahmad & Nasir, 2001). This sudden decline in population might be due to crop maturity, grain hardness, unavailability of sap due to senescence of the crop and high temperature. The mean maximum temperature after 16th March was 31.6°C, which is higher than the favourable temperature for aphid growth. Abou-Elhagag and Abdel-Hafez (1998) found that average daily temperature, natural enemies and relative humidity play most important role in controlling aphid population in wheat field.

The Coccinellid beetles and larvae were observed in the field, though population was not recorded, during the month of March and April. These natural enemies of aphid constantly reduce the aphid population (Rice & Wilde, 1998). Thus, the onset of summer along with higher populations of predators is possibly responsible for sudden elimination of the aphid population on all the varieties**.**

CONCLUSIONS

It is clear from the results of the Present study that aphid, *Scizaphis graminum* R. started infesting wheat in the third week of January. Maximum population was found during second week of March. Aphid population per five tillers was lowest on wheat variety Inqalab-91 and maximum on PND-1. Based on the number of aphid per five tillers it is concluded that variety Inqalab-91 was most resistant and PND-1 was most susceptible among the varieties tested used in the study.

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