Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(1): 839-842

Received: 22-11-2016
Accepted: 23-12-2016

Huma Shereen
Department of Entomology, Pir Mehr Ali Shah-Arid Agriculture University Rawalpindi, Pakistan

Khadija Javed
Department of Entomology, Pir Mehr Ali Shah-Arid Agriculture University Rawalpindi, Pakistan

Humayun Javed
Department of Entomology, Pir Mehr Ali Shah-Arid Agriculture University Rawalpindi, Pakistan

Ata ul Mohsin
Department of Entomology, Pir Mehr Ali Shah-Arid Agriculture University Rawalpindi, Pakistan

Muhammad Rehan Aslam
Department of Entomology, Pir Mehr Ali Shah-Arid Agriculture University Rawalpindi, Pakistan

Tayyib Ahmad
Department of Entomology, Pir Mehr Ali Shah-Arid Agriculture University Rawalpindi, Pakistan

Kashif Hussain
Department of Entomology, Pir Mehr Ali Shah-Arid Agriculture University Rawalpindi, Pakistan

Ajmal Khan Kassi
Department of Entomology, Pir Mehr Ali Shah-Arid Agriculture University Rawalpindi, Pakistan

Correspondence
Humayun Javed
Department of Entomology, Pir Mehr Ali Shah-Arid Agriculture University Rawalpindi, Pakistan

Interaction of selected wheat genotypes towards aphids and their natural enemies in Pothwar region

Huma Shereen, Khadija Javed, Humayun Javed, Ata ul Mohsin, Muhammad Rehan Aslam, Tayyib Ahmad, Kashif Hussain and Ajmal Khan Kassi

Abstract
The present study was conducted to investigate the population distribution pattern of aphids and their natural enemies under the response of different wheat varieties at Research Farm of PMAS Arid Agriculture University, Rawalpindi during 2008. Data regarding to winged, wingless and nymph aphid population present on leaves, spike and stem of wheat varieties were recorded. The population of winged, wingless and nymph of aphids were maximum on INQALAB-91 variety with 3.00, 6.69 and 7.97 per leaf and minimum on GA-2000 variety with 2.667, 6.282 and 7.333 per leaf. The predators Coccinelid Beetle, Syrphid fly and Aphid Mummies abundance were maximum on INQALAB-91 variety with 2.154, 1.154 and 3.692. The winged, wingless and nymph aphids population on spikes of wheat were recorded minimum on GA-2000 variety and abundance of predators were maximum on INQALAB-91 variety. The winged, wingless and nymph aphids minimum population were observed on stem of wheat variety GA-2000 with 1.385, 7.564 and 7.436 per stem respectively. The predator aphid mummies were recorded maximum on INQALAB-91 variety with 3.282 while minimum were observed on GA-2000 variety with 2.615. It was also evident from these findings that Ga-2000 proved the comparatively resistant variety with minimum aphids population.

Keywords: Wheat, Aphids Population, Natural Enemies, Predators and Parasitoids

1. Introduction
Wheat (*Triticum aestivum*) is the most important staple food of the people of Pakistan and mainstay of our economy. It constitutes about 80% of total intake of wheat [1]. Wheat belongs to the family Gramineae. It provides more protein than any other cereal [2]. Wheat grain contains about 12% protein and 2% lipids [3]. It contributes 12.1% to the value added in agriculture and 2.9% to Gross Domestic Production [4]. Wheat is severely attacked by wheat aphids, which affect the produce adversely [5]. Aphid population has been increasing for the last few years on wheat crop and attaining the status of pest in Pakistan [6]. Aphids (Homoptera: Aphididae) commonly known as plant lice, black fly and green fly are pests of considerable economic importance throughout the world from arctic to the tropics [7]. They cause direct damage by sucking cell sap resulting in leaf curling, wilting, twisting or causing necrosis. They are directly involved in transmission of plant viruses and indirectly by depositing honey dew that reduce photosynthetic activity and induce sooty mold production and premature leaf senescence [8].
Large populations of natural enemies are the basis for natural pest control [9]. Natural enemies play a significant role in suppressing the aphid population below economic threshold level. Natural enemies including Coccinellid beetle, Syrphid flies, Chrysopids, Hymenopterous parasitoids and Entomophagus fungi are considered to be responsible for preventing the cereal aphid's outbreaks in Europe [10]. Aphidiphagous hoverfly, *Episyrphus balteatus* is a voracious obligate predator of aphids and important in the control of aphid numbers in field crops [11]. The number of lady beetles that develop in a field depends on environmental conditions and the size of the aphid population [12]. *Chrysoperla carnea* is most beneficial and prolific obligate predator found on many field crops including wheat to limit the abundance of aphids [13]. Parasitoids are the most important biological control agents [14]. Parasitoids represent an important element in the aphid's environment. The aphid parasitoids larvae are internal feeders of tissues and adults are free living [15].
A large number of pesticides, weedicides and insecticides are being used that causes reduction in the number of natural enemies, secondary pest resurgence, insecticide resistance etc.

therefore, the present research was planned to know the responses of aphids and their natural enemies at different growth stages of wheat crop and their identification under such conditions.

2. Materials and Methods

Present studies were conducted to study the responses of aphids and their natural enemies on wheat crop at University Research Farm Koont, during 2008. Four wheat varieties GA-2000, Uqaab-2000, Ufaq-2000 and Inqlab-91 were sown in Randomized Completely Block Design (RCBD) with three replications. The plot size was 4 x 3 m with plant to plant and row to row distance 1℃m and 3℃m were maintained respectively. All recommended agronomic practices were strictly followed throughout the growing season of the crop uniformly for all the tests plots.

2.1 Sampling method

Two wheat plants were selected randomly from each plot and marked by plastic bags. Visual count method was used to record the population of aphids and their natural enemies. Data were recorded on weekly basis from the marked plants.

2.2 Data recorded

Collection of data was started at the beginning of aphid's immigration and continued at weekly intervals until the collapse of their population. Nymphs, alates and apterous adults of aphids and their natural enemies were counted from the stem, leaves and spikes of the selected plant. The insect pests population was recorded on above ground parts of the plant. Nymphs, alates and apterous adults of aphids and their natural enemies were counted from the stems, leaves and spikes of the selected plants by direct observation. Population recorded before spike formation and after spike formation was included in vegetative growth stage and reproductive growth stage of the plant respectively. Meteorological data (Temperature ℃) Relative humidity (%) and Rainfall (mm)) were recorded from Regional Agro-Meteorological center, PMAS Arid Agriculture University, Rawalpindi and correlated with population of aphids and their natural enemies.

Rate of predation was determined by following formula:

$$\text{Rate of predation} = \frac{\text{Total number of predators}}{\text{Total number of pest}} \times 100$$

Rate of parasitism was determined by following formula:

$$\text{Rate of parasitism} = \frac{\text{Total number of mummies}}{\text{Total number of pest}} \times 100$$

2.3 Statistical analysis

The data were analyzed by using the statistical package for social studies (SPSS). Descriptive statistical (mean, standard deviation, standard error, sum) and ANOVA models were used for logical conclusions on the basis of these results. For graphical representation of the results MS. Excel program was used.

3. Results

3.1 Aphids Present on Leaves of Different Wheat Varieties

The data regarding population of winged aphids on leaves of different wheat varieties were recorded and their Analysis of variance was also calculated. The results revealed that variety INQALAB-91 had maximum number of winged aphids with 3.000 per leaf and significantly different from others. Least was recorded on GA-2000 and comparatively resistant cultivar with 2.67 per leaf. It is evident from these findings that, more number of wingless aphids were recorded on INQALAB-2000 that was susceptible cultivar and statistically different from others with 6.69 per leaf. Least population was observed on GA-2000 (6.28) wingless aphids per leaf. The results showed that minimum nymphs population were observed on GA-2000 which was the comparatively resistant cultivar with 7.33 nymphs per leaf. The highest population was recorded on INQALAB-2000 with 7.97 nymphs per leaf in (Table no. 1).

3.2 Predator of Aphids Present on Different Varieties of Wheat

The data regarding population of predator such as Coccinellid beetle on leaves of different wheat varieties on different dates of observations were recorded. And their Analysis of variance was also calculated. The results exposed that maximum beetles population were observed on INQALAB-2000 that was susceptible cultivar and significantly different from others with 2.15 beetles per aphid. It was also evident from these findings that GA-2000 was the comparatively resistant cultivar with least coccinelid beetles 1.59 per leaf. The results showed that least number of syrphid flies was recorded on GA-2000 that was comparatively resistant cultivar with an average population of 0.72 flies per leaf. More number of population of this fly was observed on INQALAB-2000 with 1.15 flies per leaf. The results revealed that INQALAB-2000 had maximum aphid mummies, a moderate susceptible cultivar and significantly different from the others with 3.69 per leaf. Minimum aphid mummies were recorded on GA-2000 a comparatively resistant cultivar with 2.78 per leaf in (Table no. 1).

3.3 Aphids Present on Spike of Different Wheat Varieties

The data regarding population of winged aphids on the spike of different wheat varieties on different dates of observations along with their Analysis of variance were also calculated. It is evident from these findings that more number of winged aphids were recorded on INQALAB-2000 and statistically different from other cultivars with 2.20 per leaf. The results also showed that low number of winged aphids was observed on GA-2000 with 1.89 per leaf. The results showed that GA.2000 was the comparatively resistant and significantly different from other cultivars with 2.76 wingless aphids per leaf. Maximum population of wingless aphids was recorded on INQALAB-2000 with 3.25 per leaf. The results revealed that least number of nymphs (3.28) was recorded on GA-2000 and significantly different from others. The highest number of nymphs was observed on INQALAB-2000 with 4.97 nymphs per leaf in (Table no. 2).

3.4 Predator of Aphids Present on Different Varieties of Wheat

The data regarding population of predator such as Coccinellid beetle on the leaves different wheat varieties on different dates of observations along with Analysis of variance were recorded. Maximum number of coccinelid beetle was observed on INQALAB-2000, susceptible cultivar and statistically different from others with an average of 1.53 per leaf. Minimum population was recorded on GA-2000 and comparatively resistant cultivar with 1.15 beetles per leaf. The results exposed that highest number of syrphid flies were observed on INQALAB-2000 and significantly different from the other cultivars with 1.74 per leaf. The least population was

recorded on GA-2000 a moderate susceptible cultivar with 1.59 per leaf. The results showed that INQALAB-2000 had maximum number of aphid mummies and susceptible cultivar with 1.94 per leaf. It was also evident from these findings that minimum population was on GA-2000 and the comparatively resistant cultivar with 1.69 aphid mummies per leaf in (Table no. 2).

3.5 Aphids Present on Stem of Different Wheat Varieties

The data regarding population of winged aphids on stem of different wheat varieties on different dates of observations were observed. And Analysis of variance was also calculated. The results showed that INQALAB-2000 had maximum population and significantly different from other cultivars with 1.74 per stem. Minimum number of winged aphids were recorded on GA-2000 and comparatively resistant cultivar with 1.38 per stem. The results revealed that least number of wingless aphids was observed on GA-2000 (7.56) and statistically different from other cultivars. The highest population was recorded on INQALAB-2000 and moderate susceptible cultivar with 8.46 wingless aphids per stem. The findings showed that more number of nymphs was recorded on INQALAB-2000 with 8.61 per stem. It was also evident from these results that lowest population was observed on GA-2000 (7.43) and significantly different from others in (Table no. 3).

3.6 Predator of Aphids on stem

The data regarding population of predators such as aphid mummies on the stem of different wheat varieties on different dates of observations along with Analysis of variance were also calculated. The results revealed that maximum population was recorded on INQLAB-2000 with 3.28 per stem and statistically different from other cultivars. The GA-2000 had minimum aphid mummies i.e. 2.61 per stem and comparatively resistant cultivar among them in (Table no. 3).

4. Discussion

In this study four varieties of wheat namely GA-2000, UFAQ-2000, UQAB-2000 and INQALAB-91 were studied for the population density of aphids and their natural enemies at weekly interval throughout the season during 2008. The population mass of aphids along with their natural enemies were recorded on the basis of their population pattern per leaf/spike or stem on different randomly selected wheat varieties. There were significant variations in the population distribution pattern of aphids and their natural enemies among the treatments and as well as in the time interval. These results can be compared with various scientists' works for the assessment of interaction between aphids and their natural enemies towards the different wheat crop germplasms. The results of the present research revealed that GA-2000 showed comparatively resistance while the INQALAB-91 variety proved moderately susceptible towards the behavior between aphids and their natural enemies. UFAQ-2000 and UQAB-2000 varieties exposed in-between susceptibility. These results are in agreement to [16] who reported that *Rhopalosiphum padi* with other aphid species reduced 50% grain weight per ear in winter wheat. Both nymphs and adults reduced the yield by infesting the leaves and stems of wheat crop. The present findings are somewhat similar to [17] they investigate that natural enemies play their significant role in reducing the aphid population and estimated that one lady bird beetle can consume up to 200 aphids in one day. Both the larvae and adults of the lady bird beetles are perocious predators on aphids. Similar results were reported by [18] they studied a model, that presence of coccinellids caused a reduction in aphid population ranges from 40 to 60%. The present research is in conformity to [19] who reported the aphid and their natural enemies in wheat field. They found *Rhopalosiphum padi* a dominant species, *Rhopalosiphum maidis, Schizaphis graminum, Sitobion avenae and Diuraphis noxia* on wheat. Among the natural enemies *Coccinlla undecimumpuntate, Diaeretiella rape* and *Aphidus sp*. were recorded as dominant predator and parasite respectively. The present study is in agreement with those of [20] they made an evaluation of the influence of aphidophagous syrphid larva on cereal aphids in winter wheat. The peak density of aphid populations was significantly dependent on aphid abundance at the time syrphid larvae became active, a fact indicating the high predation potential of the beneficial. The present results confirm by the findings of [21] stated that natural enemies can keep aphids under control; cool dry weather in the spring often allows aphids to reproduce rapidly whereas their natural enemies reproduce slowly. Beneficial insects that attack aphids reproduce slowly at temperatures below 65°F, whereas aphids can rapidly increase when temperatures exceed 50°F.

Table 1: Comparison of mean values for the data regarding Aphids population and their predator on leaf of wheat during 2008.

Varieties	Aphids on Leaf			Predator		
	Winged Aphids per leaf	Wingless Aphids per leaf	Nymphs per leaf	Coccinelid Beetle per aphid	Syrphid fly per aphid	Aphid Mummies per aphid
GA-2000	2.667 a	6.282 a	7.333 a	1.590 a	0.7179 a	2.769 a
UFAQ-2000	2.923 A	6.410 a	7.513 a	2.128 a	0.9231 a	3.308 a
UQAB-2000	2.744 a	6.872 a	7.051 a	1.923 a	1.026 a	3.436 a
INQALAB-91	3.000 a	6.692 a	7.974 a	2.154 a	1.154 a	3.692 a
LSD	1.389	1.574	1.423	1.453	1.233	1.438
Analysis	F3, 155 =61.26 p<0.0000**	F3, 155 =108.98 p<0.0000**	F3,155=7.57 p<0.000**	F3, 155 =3.2912 p<0.0000**	F3,155=2.28 p<0.0000 ns	F3,155=7.49 p<0.0000**

Mean sharing similar letters are not significant different by DMR Test at p=0.05

Table 2: Comparison of mean values for the data regarding Aphids population and their predator on spike of wheat during 2008.

Aphids on Spike			Predator		
Winged Aphids per spike	Wingless Aphids per spike	Nymphs per spike	Coccinelid Beetle per aphid	Syrphid fly per aphid	Aphid Mummies per aphid
1.897 a	2.769 a	3.282 a	1.154 a	1.590 a	1.692 a
2.026 a	2.897 a	3.692 a	1.333 a	1.667 a	1.846 a
2.103 a	2.769 a	3.744 a	1.205 a	1.718 a	1.897 a
2.205 a	3.256 a	4.974 a	1.538 a	1.744 a	1.949 a

1.284	1.057	1.005	1.163	1.146	1.210
F3, 155 = 1.04 p<0.0000**	F3,155 =4.85 p<0.0000**	F3,155 = 54.04 p<0.0000**	F3,155= 2.22 p<0.0000**	F3,155 =0.36 p<0.0000**	F3,155 =0.86 p<0.0000**

Mean sharing similar letters are not significant different by DMR Test at p=0.05

Table 3: Comparison of mean values for the data regarding Aphids population and their predator on stem of wheat during 2008.

Varieties	Aphids on Stem			PREDATOR
	Winged Aphids per stem	Wingless Aphids per stem	Nymphs per stem	Aphid Mummies per aphid
GA-2000	1.385 a	7.564 a	7.436 a	2.615 a
UFAQ-2000	1.692 a	7.949 a	7.923 a	3.077 a
UQAB-2000	1.46 a	8.179 a	8.103 a	2.872 a
INQALAB-91	1.744 a	8.462 a	8.615 a	3.282 a
LSD	1.060	1.438	1.251	1.164
Analysis	F3, 155 = 2.77 p<0.0000**	F3,155 =7.13 p<0.0000**	F3,155 = 15.51 p<0.0000**	F3,155 = 5.41 p<0.0000**

Mean sharing similar letters are not significant different by DMR Test at p=0.05

5. Conclusion

According to the present research Ga-2000 wheat variety is comparatively resistant among all others varieties with lowest Aphids population density. According to predators predation are also satisfactory because there is a good interaction between aphids and their natural enemies on the selected variety. On the basis of this research Ga-2000 wheat variety has been recommended for the cultivation in Pothwar region.

6. References

1. Balouch UK. Irshad M. Post-harvest research on food grain in Pakistan. A review, Pak. Agri. Cou. 1986; 45.
2. Khan H, Ayaz M, Hussain I, Khan Z, Khattak MK. Effect of sowing methods and seed rates on grain yield and yield components of wheat variety PAK-81. Pak. J. Bio. Sci. 2000; 3(7):1177-1179.
3. Belitz HD Grosch W. Food chemistry. Springer, Berlin, 1999.
4. Govt. of Pakistan. Economic Survey, 2000 - 2001. Govt. of Pakistan. Economic adviser's wing, Finance Division, Islamabad, 2001.
5. Hamid S. Natural balance of graminicolous aphids in Pakistan. Survey of population, Agronomy. 1983; 3(7):665-673.
6. Zia MA, Aheer GM, Mumtaz MK, Ahmed JK. Field screening of sixteen advanced lines of wheat for resistance to aphids (Homoptera: Aphididae). Pak. Entomol. 1999; 21:95-97.
7. Blackman RL, Eastop VF. Aphids on the World's crops: An Identification and information guide. John Willey and Sons, Chichester, England. 1984, 474.
8. Naeem M. Response of aphids and their natural enemies to a Silvoarable Agro-forestry Enviornment. Ph. D. Thesis unpublished. Leeds, Univ., Leeds, England, 1996, 272.
9. Schmidt MH, Laure A. Purtauf T, Thies C, Schaefer M, Tscharntke T. Relative importance of predators and parasitoids of cereal aphid control. Proc. Biol. Sci. 2003; 270(1527):1905-1909.
10. Serafi EHA, Salam AHA, Bakey NFA. Effect of four aphid species on certain biological characteristics and life table parameters of *Chrysoperla carneae*, *Chrysoperla septumpunctatan* (Neuroptera: Chrysopidae) under laboratory condition. Pak. J. Biol. Sci. 2000; 3(2):239-245.
11. Stechman DH. Cereal aphids Aphidophaga associated in hedges and field can habitate interaction contributed. Pest management Ecology of Aphidophaga 2nd symposium. 1984; 35:173-278.
12. Knutson A, Boring BP, Michels GJ. Biological control of aphid population and their natural enemies. Texas Agri. Exp. Stat. Texas A and M University, 1997.
13. Serafi EHA, Salam AHA, Bakey NFA. Effect of four aphid species on certain biological characteristics and life table parameters of *Chrysoperla carneae*, *Chrysoperla septumpunctatan* (Neuroptera: Chrysopidae) under laboratory condition. Pak. J. Biol. Sci. 2000; 3(2):239-245.
14. Stray P. Aphid parasites of Czechoslovakia. Dr. W. Junk, (Ed) Pub., Czechoslovakia, 1996, 242.
15. Gair R, Jenkins JEE, Lester E. Wheat pest, In cereal pest and diseases (fourth Ed.). Fuming Press Ltd. U. K. 1987; 268:32-65.
16. Kuroli G, Nemeth I. Aphid species occurring on winter wheat, their damage and results of control experiment. Nevenyvedelem. 1987; 23(9):385-394.
17. McBride K, Glogoza PA. Aphid management in small grains, Corn and Sorghum. NDUS extension service, North Dakota State Univ. Agric. and Applied Science, 1993, E-493.
18. Sikirvin DJ, Perry JN, Harrington R. The effect of climate change aphid- Coccinellid interaction. Global Change Biology. 1997; 3(1):1.
19. Heniedy AH, Attia AA. Evaluation of the parasitoids and predators associated with aphids in wheat field Egypt. Bulletin of the Entomological Society of Egypt. 1998; 17:137-147.
20. Tenhumberg B, Poehling HM. Syrphids as natural enemies of cereal aphids in Germany: Aspects of their biology and efficacy in different years and regions. Agric. Ecosystem. Environ. 1995; 52(1):39-43.
21. Joanne W. Scout Small Grains for Aphids, University of Delaware Cooperative Extension. 2008.