MAK HILL Publications Botany Research Journal

Research Article
doi: 10.36478/makbrj.2025.6.9

OPEN ACCESS

Key Words
Population dynamics of aphids, wheat in charsadda, harvesting

Corresponding Author
Madieha Ambreen,
Department of Botany, School of Biology, Minhaj University, Lahore, Pakistan

Received: 25th June 2025
Accepted: 15th July 2025
Published: 30th August 2025

Citation: Madieha Ambreen, Fawad Khan, Abdul Haseeb and Inam Ullah, 2025. Varietal Effect of Wheat on Population Density of Aphids (Aphidoidea) at District Charsadda Khyber Pakhtunkhwa. Bot. Res. J., 18: 6-9, doi: 10.36478/makbrj.2025.6.9

Varietal Effect of Wheat on Population Density of Aphids (Aphidoidea) at District Charsadda Khyber Pakhtunkhwa

[1]Madieha Ambreen, [2]Fawad Khan, [3]Abdul Haseeb and [4]Inam Ullah

[1]Department of Botany, School of Biology, Minhaj University, Lahore, Pakistan
[2]Department of Health Khyber Pakhtunkhwa, Pakistan
[3]Department of Zoology, Hazara University
[4]Department of Entomology Abdul Wali khan University, Mardan KPK

Abstract
To study the population dynamics of aphids on wheat in Charsadda, the present research work was carried out at the research farm of Agricultural Research Station Charsadda during 2023-24. Five wheat varieties i.e. Pirsabaq-13,Pirsabaq-15,Zincol-16,Pakistan-13 and Pirsabaq-21 were tested. The experiment followed randomized complete block design (RCBD) with three replications. Weekly data were recorded on the population densities of aphids and yield data was recorded after harvesting. Results showed that significantly lower aphid population was recorded on wheat variety Pirsabaq-21 (0.15 aphids per leaf) while significantly higher was recorded on variety Pakistan-13 (1.03 aphids per leaf). Comparatively higher mean yield was recorded for Pirsabaq-21 (4257.3 kg per ha) while significantly lower yield was recorded for variety Pakistan-13 (2896.7 kg per ha). Hence, wheat variety Pirsabaq-21 is recommended for sowing in district Charsadda.

INTRODUCTION

Wheat (Triticum aestivum L.) is healthy and efficient basic food. It is the most leading grain crop and staple food for the individuals of Pakistan. More than 35% of the global population consumed wheat as an essential food[1]. Wheat is a major crop with largest area under cultivation in Pakistan and plays a significant role in economic stability of the country. It contributes 1.7% GDP in Pakistan[2]. The total grain production was 24946 thousand tones with yield of 2827 Kg/ha[3]. Low yield of wheat per hectare in Pakistan compared to the other advanced countries is due to several abiotic and biotic factors, such as traditional methods of cultivation, varieties, lack of irrigation facilities, soil fertility and incidence of insect pests and diseases. Although many insect pests attack wheat (Triticum aestivum L.) in Pakistan, severe damage is caused by aphids. The wheat crop is generally infested with aphids during the growth stages when both the adults and nymphs take a heavy toll by sucking cell sap which reduces the vitality of the plants. The infested leaves turn pale, wilt and wear a silky appearance. Some species also have toxins in their saliva and dense infestation may kill young shoots. Rhopalosiphum maidis, Rhopalosiphum padi, Schizaphis graminumand Sitobia avenae are the major aphid species of wheat in Pakistan[4]. The poor yield of wheat crop is mainly attributed to its instability to aphids attack. The aphids are considered as serious pest of wheat crop. They can multiply very rapidly under favourable conditions on leaves, stems and inflorescence. The infestation causes severe distortion of leaves and inflorescence and can significantly decrease the yield through direct feeding. Aphid also transmits the viruses in plant (vector) Rhopalosiphum padi transmits the Barley Yellow Dwarf Virus (BYDV) by direct feeding of the host (Stern *et al,*. 1967). Decline in the yield in wheat crop is attributed to several abiotic factors, traditional methods of cultivation, low yielding varieties, lack of proper irrigation facilities in most of the areas, relatively low level of soil fertility and a higher incidence of insect pests and diseases. Several control methods have been evolved for the control of aphids. These include cultural, physical, mechanical, biological, chemical and host plant resistance. Mostly, the aphid populations are regulating factors. But sometimes, the aphids can be extremely injurious if present in large number and chemicals have to be used for control[5]. The present study was conducted to evaluate the yield losses in different varieties of wheat crops due to the infestation of aphids. The investigation were projected to check the infestation level of aphid's species on different varieties of wheat crops and also their effects on yield.

Objectives:

- To study the population dynamics of wheat aphids.
- To study the effects of aphids on yield.

MATERIALS AND METHODS

Experimental Layout: The research trial was carried Charsadda, Khyber Pakhtunkhwa, Pakistan during the year 2023-24. Seed of different wheat varieties i.e. Zincol-16, Pirsabaq-21, Pirsabaq-15, Pirsabaq-13 and Pakistan-13 were acquired from their respective breeders/research institutes. There were five treatments and each treatment were replicated three (3) times in Randomized Complete Block Design (RCBD)[6-12]. The distance between row to row was kept at 0.3 m, while the distance between plant to plant was kept at 0.10 m. Each plot consists of 06 rows, 05 m long having total area of 9 m^2. The treatments and replications were separated from one another by a non-cropped area of 0.8 m and 1.0 m, respectively. The agronomic practices were carried out uniformly containing hoeing, irrigation, weeding and ploughing etc throughout the cropping season.

Data Collection: The population density of aphids per plant was recorded at weekly intervals once the insect infestation started. Five plants per treatment were randomly selected and population of aphids was recorded on three leaves i.e., one each from top, middle and bottom of canopy of the plant in the field.

Yield Per Treatment: Once the crop is harvested yield per plot was recorded after threshing of each plot separately and then converted to kg/ha.

Statistical Analysis: The collected data will be subjected to statistical analysis through Statistical software of Statistic 8.1 and for Least Significant Difference (LSD) test at 5% level of significance was used to mean differences (Steel and Torrie., 1980).

RESULTS AND DISCUSSIONS

Aphid Infestation: The results in (table 1) revealed that mean density of A. gossypii leaf-1 varied significantly on different wheat varieties[13-20]. Overall mean density of A. gossypii leaf-1 was significantly higher on Pakistan-13 (1.03 leaf-1), followed by Zincol-16 (0.73 leaf-1), Pirsabaq-15 (0.54 leaf-1), Pirsabaq-13 (0.35 leaf-1) while significantly lower on Pirsabaq-21 (0.15 leaf-1). It is also evident from the results that the aphid infestation was initially lower (Week-1 i.e. 0.50 leaf-1) which gradually increases till the middle of crop (Week-3 i.e.0.78 leaf-1) and again decreases gradually till the end (Week-5 i.e. 0.45 leaf-1) which might be

due to the crop maturity resulting in less availability of food for the aphids.

Table 1: Mean Density of A. Gossypii Leaf-1on Five Different Wheat Varieties at Charsadda During 2023-24

Varieties	Mean density of A. gossypii leaf-1on					
	Week 1	Week 2	Week 3	Week 4	Week 5	Overall Mean
Zincol-16	0.69	0.74	0.90	0.70	0.63	**0.73 b**
Pirsabaq-21	0.11	0.16	0.28	0.12	0.09	**0.15 e**
Pirsabaq-15	0.52	0.54	0.68	0.52	0.44	**0.54 c**
Pirsabaq-13	0.30	0.33	0.47	0.38	0.25	**0.35 d**
Pakistan-13	0.87	0.96	1.57	0.93	0.83	**1.03 a**
Overall Mean	**0.50 bc**	**0.55 b**	**0.78 a**	**0.53 b**	**0.45 c**	

Means within last column followed by different letters are significantly different at 5% level of significance (LSD test).
LSD for Varieties=0.0513
CV=12.47
LSD for Weeks=0.0513

Yield: Mean yield of five wheat varieties during the cropping season 2023-24 are given in (Table 2). In the present study higher mean yield was recorded for variety Pirsabaq-21 (4257.3 kg/ha) while significantly lower yield was recorded for variety Pakistan-13 (2896.7 kg/ha).

Table 2: Mean Yield of Five Different Wheat Varieties at ARS Charsadda During 2023-24

Varieties	Overall Mean (kg/ha)
Zincol-16	4097.3 a
Pirsabaq-21	4257.3 a
Pirsabaq-15	3666.7 b
Pirsabaq-13	3740.0 b
Pakistan-13	2896.7 c

Means within last column followed by different letters are significantly different at 5% level of significance (LSD test).
LSD for Varieties=293.84
CV=CV 4.18

CONCLUSION AND RECOMMENDATION

It is concluded from the experiment that variety Pirsabaq-21 has significantly lower aphid per leaf and also has the highest yield among five wheat varieties under study hence it is recommended for cultivation in district Charsadda.

REFERENCES

1. Agricultural Statistics of Pakistan. 2019-2020. Government of Pakistan, Ministry of Food and Agriculture (Economic Wing) Islamabad. 3-4.
2. Akhtar, N., A Iqbal, H.I. Javed, J. Khan, M. Riaz, W.A. Gillani, T. Mahmood, A. Rasool. and T. Yasmin. 2013. Evaluation of recommended wheat varieties for resistance against Schizaphisgraminum (Rondani)(Aphididae: Homoptera) under laboratory conditions. Pak. J. Agric. Res. 26 (4): 321-327.
3. Arshad, M., Ullah, M. I., Murtaza, G., Javed, M. And Ahmad, M. H. (2016). Responses of different wheat genotypes against aphid (Schizaphisgraminum R.) and its natural enemies. Journal of Entomology and Zoology Studies, 4, 445-447. Bommarco, R., S.O. Firle and B. Ekbom. 2007. Outbreak suppression by predators depends on spatial distribution of prey. J. of Ecol. Model. 201(2): 163-170.
4. Economic Survey of Pakistan. 2019-2020. Government of Pakistan, Finance Division, Economic Adviser's Wing, Islamabad.
5. Frank, J.M. and S.M. Sorenson. 2001. Effectiveness of lacewing larvae in reducing Russian wheat aphid populations on susceptible and resistant wheat. J. Biolo. Cont. 21(1): 19-26.
6. Gillian, F. 2005. Factors to consider in using Bio-control agents for aphids.11. Predators:
7. Haider SS, Hassan MW, Jamil M. Comparison of wheat varieties (Triticum aestivum L.) for aphid (Homoptera: Aphididae) infestation in relation to physico-morphic traits sown under semi arid climatic conditions. MAYFEB J Agric Sci. 2017;3:42-51
8. Haenke, S. Scheid, B. Schaefer, M. Tschamtke, T. Thies and Carsten. 2009. Increasing syrphid fly diversity and density in sown flower strips within simple vs. complex landscapes. J of applied Ecol.46(5): 1106-1114.
9. Hafeez. F, M. Abbas, K. Zia, S. Ali, M. Farooq, M. Arshad, A. Iftikhar, M. J. Saleem, A. T. K. Zuan, Y. Li.
10. O. Nasif, S. A. Alharbi, M. Wainwright, M. J. Ansari.2021.Prevalence and management of aphids (Hemiptera: Aphididae) in different wheat genotypes and their impact on yield and related traits. PLoS ONE 16(10).
11. Hatchett AH, Starks KJ, Webster JA (1987) Insect and mites pest of wheat: In Wheat and wheat improvement (E.G. Heyne Edition) Madison, Wisconsin, USA.
12. Khan. A. M, A. A. Khan, M. Afzal and M. S. Iqbal.(2012) Wheat Crop Yield Losses Caused by the Aphids Infestation. J Biofertil Biopestici 3:122
13. Khakwani, A. A., Dennett, M. D., Munir, M. And Abid, M. (2012). Growth and yield response of wheat varieties to water stress at booting and anthesis stages of development. Pakistan Journal of Botany, 44(3), 879-886.
14. Mirik, M., J. Ansley, J. Michels and N. Elliott. 2009. Grain and vegetative biomass reduction by the Russian wheat aphid in winter wheat. J. of Southwestern Entomologist 34(2): 131-139.
15. Rafi, M.A., Irshad, M. and Inayatullah, M., 2005. Predatory ladybird beetles of Pakistan. National Insect Museum and Insect Pest Informatics, IPM Programme. Rohani Press, Islamabad, Pakistan. 105 pp.

16. Rafi, M.A., M. Irshad and M. Inayatullah. 2005. Predatory ladybird beetles of Pakistan. National insect museum and insect pest informatics, IPM Programme, NARC and NWFP Agric. Univ. Pesh. Pak. 1-5:38, 39-40.
17. Rana, Z.A., M.A. Shahzad, M. Saleem, A. and J. Salim. 2007. Sowing date effect on incidence of aphids and coccinellids in wheat. J. of Agric. Res., 2009. 47(2): 171-177.
18. Razmjou., J., P. Mohamadi, A. Golizadeh, and, M.H. and B. Naseri. (2012). Resistance of Wheat Lines to Rhopalosiphumpadi (Hemiptera: Aphididae) Under Laboratory Conditions. J. Econ. Entomol. 2(105): 592-597.
19. Triplehorn, C.A. and N.F. Johnson. 2005. Borrer and Delong's introduction to the study of insects. 7th Edition. Thomson Book/cole 10 Davis Drive Belmont, Ca 94002 USA. 433-434, 477, 728-729.
20. Ullah. F, H. Gul, F. Said, A. Ali, K. Tariq, M. Zaman and D. Song.Population dynamics of wheat aphids Rhopalosiphum padi(Linnaeus) and Sitobion avenae (Fabricius) at District Mardan, Khyber Pakhtunkhwa Pakistan. Pure and Applied Biology 9(1):27-35.