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SCREENING BEST ADOPTED WHEAT LINES AGAINST APHID (*SCHIZAPHIS GRAMINUM* RONDANI) POPULATION

Saba Tabasum, Ijaz Rasool Noorka, *Muhammad Afzal and Amjed Ali

University College of Agriculture, University of Sargodha, Pakistan

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***Corresponding Author**:
Muhammad Afzal
Email: mafzal@uos.edu.pk

ABSTRACT

The study was conducted at the University College of Agriculture, University of Sargodha during 2009-2010 on four wheat genotypes to check the aphid attack on different sowing dates. Aphid population a serious threat was observed and counted on four wheat genotypes to check the attack on different dates. It was observed that Aphid population was maximum on February 24, then a decline behavior was observed up to March 8. Again on March 8 up to March 17 a slump in aphid population was recorded. According to sampling results, Inqalab-91 remained least attacked genotype. Population of both predators synchronized with aphid population with the highest synchronization during the end of February. The wheat cultivar V- 02192 should be considered in IPM program to minimize the infestation with aphids. This study revealed that late sown crop showed abundant while very low quantity in timely sown crop. Early sown crop was least effected by aphid attack, which signified that wheat crop can set aside by modifying sowing dates. It was concluded that at Sargodha vicinity aphid attack may be minimized significantly by planting wheat in end of November month.

Keywords: Aphid, population, screening, sowing dates, wheat

INTRODUCTION

Wheat has a prime and pride of place in our agricultural system. Due to high contents of nutrition and versatile nature of plant, it attained a staple food status. Under the changing set of climatic conditions and conventional farming, our crops yields are minimized due to environmental stresses like drought, heat, salinity and diseases. Most of stresses are now under the control or scientists are trying to control them (Aheer *et al*., 2008; Wains *et al*., 2008). Although wheat plant was attacked by many insect pest in Pakistan, however aphid was known as the highest damaging agent (Khan *et al*., 2011) by the action of infecting significantly (Ahmed and Nasir, 2001). It has a long range of almost 60 plant species like wheat, sorghum and corn (Kindler *et al*., 1984; Bowling *et al*., 1998). The wheat yield losses are reported as dual damage. By the action of cell sap sucking the wheat is effected 35 to 40%, while 20 to 80% by injecting viral, fungal and other factious diseases (Aslam *et al*., 2005). Ciepiela (1993) reported that the aphid population affects the nitrogen and protein contents by lowering the yield and yielding contributing traits, while it was further added by Ryan *et al*. (1987) and Holmes *et al*., (1991) the abdunce attack of aphid results in less chlorophyll and plant transpiration activity (Ahmad and Nasir, 2001).

It was noted with serious concern that since a decade Pakistani wheat is under the threat of heavy infestation of cereal aphids (Mohyuddin, 1981; Hamid, 1983). In Pakistan limited work has been reported on population dynamics of wheat aphids (Aheer *et al.*, 1998). However Hashmi *et al*. (1983) found four types *Sitobion avenae*, *Schizaphis graminum, Rhopalosiphum padi and Rhopalosiphum maidis* of aphid species, which have grave damaging effect on wheat crop. Natural methods are employed to check these insect pests and to play a strong role among crop growth by interaction of biological organism and environmental factors. In the present study, we investigated the attractiveness of aphids and coccinellid predators towards the tested wheat cultivars to select the most resistant cultivar against aphid infestations. The present studies were designed to check the aphid population on certain wheat genotypes with the aim to screen and select the best adopted wheat genotypes for future breeding needs.

MATERIALS AND METHODS

The present research study was conducted at the research

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area of the University College of Agriculture, University of Sargodha, Pakistan during 2009-2010. Wheat varieties Inqalab-91, Lasani-2002, V-02192, Bhakkar-2002, were sown on October 24 designated as (early), on November 24 designated as (timely) and on December 24 designated as (late) (Table 1). The wheat crop was planted using a range of seed rate 115, 175 and 210kg/ha for early, timely and late crop respectively. Hundred plants from each treatment were selected for statistical analysis. Sampling was done regularly on each plot with respect to sowing dates. The samples of aphids from the nearby tagged plants were collected and preserved in 75% alcohol in glass vials for identification. Predatory Syrphid fly and Coccinellid beetle larvae were collected by the same procedure as in case of aphids.

Table 1
Statistical differences between the different wheat cultivars in the mean number of aphids/tiller (Tukey's tests α 0.05).

Wheat cultivar	Mean number of aphids/tillers
Inqlab-91	0.36 ± 0.01c
Lasani-2002	0.38 ± 0.01c
V-02192	0.58 ± 0.01b
Bhakar-2002	0.96 ± 0.01a

RESULTS AND DISCUSSION

Evaluation of early, timely and late planting wheat

The observation recorded revealed that the mean aphid population significantly decreased from (19.1 aphids/ plant) in case of late sown crop, while it remained (7.19 and 4.08 aphids/plant) in the case of early and timely sown crop respectively. During the month of February particularly on mid month there was minimum aphid appearance. On treatment 1(early sown) first aphid was seen on 9th of January (Fig.1). It takes momentum on March 13 and than it starts decline which reached to end on 1st week of April. In the same way in treatment 2 (timely sown) the first appearance of aphid was observed on 19th January (Fig. 2), which was at top on 24th February. This trend was lowered on 8th March which goes to an end on 3rd week of April (Fig. 3). In treatment 3, (late sown) highest aphid population was recorded on 4th week of March. It was also observed that there was 2.90 and 3.52 times higher aphid population on late sowing wheat crop in contrast with early and timely sown crop. During this experiment weather condition was found encouraging for the pest development. The temperature fluctuation ranged from 19.5 to 36.2 C^{o} at the moment of when experiment was conducted. The similar results were revealed by Abou-Elhagag and Abdel-Hafez (1998). Bhambhro (2002) also reported similar results that cold weather support aphid breeding behavior. During this experiment peak population was observed during the month of March on 13th, 17th and 30th respectively. The experiment results are in line with the findings of Elmali (1998), who depicted that aphid population was increased three times higher during the late sowing. Another researcher Manna (2000) also reported that aphid population has three swarming peak times during cold weather conditions of mid January, Mid February and start of March.

It was concluded by this study that the decline in aphid concentration during end of March and 3rd week of April was mainly due to rise in temperature tending ripening of wheat crop and attack of aphid predator Syrphid fly and Coccinellid beetle (Table 2). Similarly Zou *et al*. (1998) reported that *Coccinella undecimpunctata* prime role in tumbling aphid intensity.

Performance of wheat varieties

The mean number of aphids/tiller significantly differed among the four wheat cultivars (df = 3, 1; F = 350.47; P < 0.001). The highest number of aphids per tiller (0.92 ± 0.02) was recorded on V-02192 cultivar, whereas the lowest one (0.36 ± 0.01) was recorded on Inqalab-91 cultivar (Table 1).

Table 2
Statistical differences between the different wheat cultivars in the mean number of predators/sweep (Tukey's tests α 0.05).

Wheat cultivar	Mean number of Coccinellids/sweep	Mean number of Syrphid fly/sweep
Inqlab-91	0.74 ± 0.03	0.65 ± 0.03c
Lasani-2002	1.94 ± 0.03	1.86 ± 0.03a
V-02192	0.75 ± 0.05	0.60 ± 0.05c
Bhakar-2002	0.93 ± 0.01	0.89 ± 0.01b

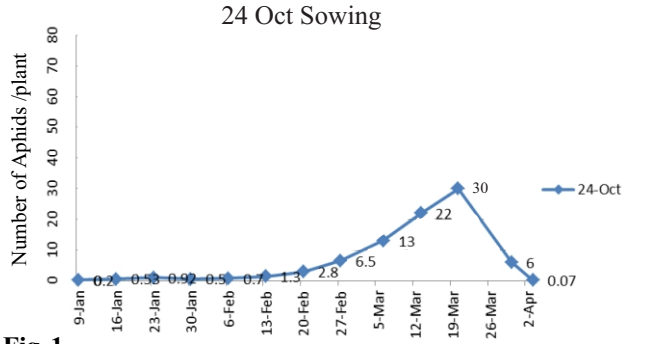

Fig. 1
Aphid population on wheat sown on 24th October, 2009 at Sargodha.

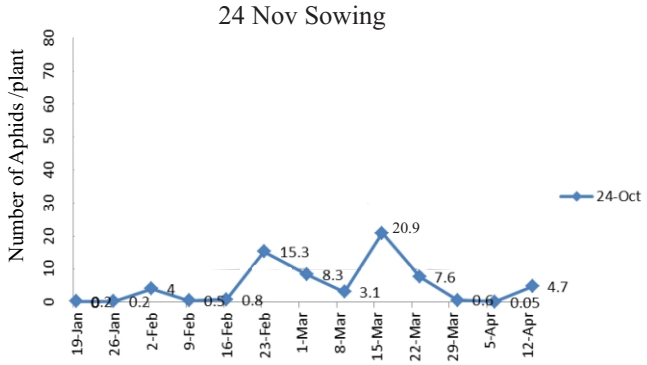

Fig. 2
Aphid population on wheat sown on 24th November, 2009 at Sargodha.

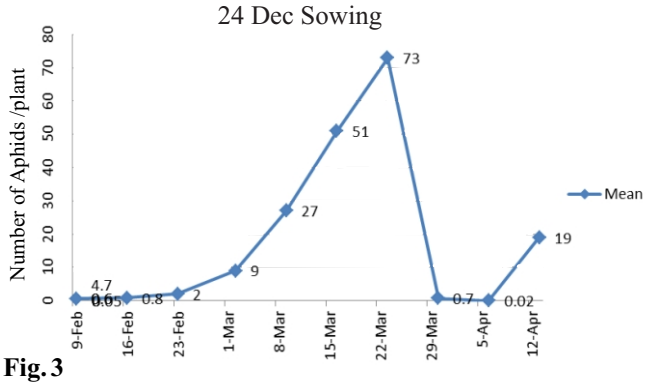

Fig. 3
Aphid population on wheat sown on 24th December, 2009 at Sargodha.

The mean number of *Coccinellids* (all species combined) and Syrphid fly significantly differed among the four wheat cultivars (df = 3; F = 268.80; P < 0.001) and (df = 3; F = 256.80; P < 0.001).The highest number of *Coccinellids* and Syrphid fly per sweep per each strike (1.94 ± 0.01) and (1.86 ± 0.01) was gotten from Lasani-2002 cultivar (Table 2). Mean numbers of aphids and predators recorded from different wheat cultivar are given in Fig. 2. Two peaks of predators were recorded, the first peak (the highest one) was recorded at the end of February and the second one in mid March (Fig. 3). There was significant synchronization between aphid and predator populations (Pearson's correlation = 0.30; Fig. 3).

The current results revealed that there were significant differences with respect to the number of aphids and their associated predators among the four wheat cultivars. Number of aphids per tiller was high in V-02192 cultivar and low in Inqalab-91. Thus, V-02192 proves to be more susceptible and Inqalab-91 as resistant one. Variations in the density of aphid populations among the different cultivars has already been reported by several researchers like Bosque and Schotzko (2000); Ahmed and Nasir (2001); Aslam *et al*. (2005) and Khan *et al*. (2011).

Population of both predators synchronized with aphid population with the highest synchronization during the end of February. This implies that aphid population increased or decreased the predators and fluctuated with the same trend. This is an important attribute in the natural enemies, which could regulate the pest population. The wheat cultivar V-02192 should be considered in IPM program to minimize the infestation with aphids.

It is therefore recommended that in Sargodha wheat should be planted as early as possible to tackle the onset of aphid population.

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