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ABUNDANCE OF PREDATORS AS AFFECTED BY PLANTING DATES IN WHEAT, (*TRITICUM AESTIVUM* L.) AT MULTAN (PUNJAB, PAKISTAN)

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ABSTRACT

Experiment was conducted to evaluate the impact of planting dates on incidence and abundance of predators. Wheat (cv. Sahar) was sown at the Agricultural Farm in Bahauddin Zakariya University Multan, Pakistan on 5th, 20th November and 5th December 2011 in randomized complete block design with three replicates. Numbers of predators were recorded from 30 ears selected randomly from each treatment. Coccinellids and syrphid flies were the only observed predators. On March 12th 2012, predators were observed first time in all plots of wheat sown on three dates. Transformation of the population data was carried out as it did not follow the assumption of the analysis of variance. Coccinellids and syrphid flies population responded to planting time differently but not in all the sampling dates. No higher abundance was recorded consistently in any sowing date, however on April 03rd 2012 higher populations were recorded on late sown crop for both predators. Population declined in the first week of April for syrphid flies whereas; coccinellid diminished in the second week of April in all three sowing dates.

Keywords: Sowing dates, syrphid flies, coccinellids, wheat

INTRODUCTION

Wheat, *Triticum aestivum* L. provides more proteins and calories than any other cereal and is the daily diet of more than one third of the world humans (Adams *et al*., 2002). In Pakistan, it was cultivated in an area of 8666 thousand hectares and 23.5 million tons yield was recorded in 2011-12 (Anonymous, 2012). The wheat crop is encountered by both biotic and abiotic stresses comprising of drought, temperature, diseases and insect pests (Akhtar *et al*., 2010).

Among insect pests, cereal aphids damage wheat crop throughout the world. In Pakistan, the major wheat aphid species are English grain aphid, *Sitobion avenae* F., corn leaf aphid, *Rhopalosiphum maidis* Fitch., Bird cherry oat aphid, *Rhopalosiphum padi* L. and green bug *Schizaphis graminum* Rond, (Hashmi *et al.*, 1983). They suck sap from leaves and shoots and resulting in shortening of the plant, twisting of leaves and sometimes leaves falling (Akhter and Khaliq, 2003). Aphid cause reduction in crop yield 10-50 % directly and 20-80% indirectly through transmission of viral diseases (Trdan and Milevoj, 1999). Population of aphids has been increasing from 1990s and has got status of pest in Pakistan (Zia *et al*., 1999).

Integrated Pest Management (IPM) utilizes physical, mechanical, cultural, biological, host plant resistance and chemical control. Biological control is the major part of any integrated pest management strategy (Scholler *et al*., 1997). Adults and larvae of ladybird beetle (Coccinellidae), larvae of hover flies (Syrphidae) and lacewing larvae (Chrysopidae) restrict aphid populations effectively (Wratten and Powell, 1991). Coccinellids are outstanding group of predators and 75 species of coccinellids were recorded as predators from Pakistan (Rafi *et al*., 2005). They feed on aphids and scale insects, which are important pests in agro-ecosystems (Inayat *et al.,* 2011). These can inhibit aphids below economic threshold effectively in spring crops and significant aphid control was observed by the predators i.e., Coccinellids and *Chrysoperla carnea* (Stephen) under field conditions in wheat crop (Xu, 1985; Iqbal *et al*., 2008).

The larvae of many species of syrphid flies are predators of destructive aphids (Gilbert, 1981) and these can be efficient predators in grain crops such as wheat, corn and rice

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rice (Lapchin *et al*., 1987), whereas; adults feed on pollen, nectar and aphid honeydew (Cowgill *et al*., 1993). The predatory potential of these predators have been proven excellent under laboratory conditions. The coccinellid beetle, *Coccinella septempunctata* consumed 78.00 aphids whereas; syrphid fly consumed 309.72 aphids per day under laboratory conditions (Sharma and Joshi, 2010; Roshmi and Dutta, 2010).

In cultural control, sowing time of a crop plays a fundamental role in insect pest occurrence, dynamics and infestation (Hossain *et al*., 2009). Early planted wheat crop suffer lower aphid infestation (Acreman and Dixon, 1985). Similarly planting time affects biological control agents. Abundance of *C. septempunctata* was greater on late planted wheat than on early sown crop (Aslam *et al*., 2003). So if the crop is sown later by any reason, then it is benefitted by activities of predators because study has revealed that late sown crop suffered higher aphid infestation (Aheer *et al*., 1993). Young and Teetes (1977) also reported that *C. septempunctata* are most effective to decrease aphid population in the late season. Cropping system and biological control are suitable methods because they secured the environment and beneficial insects. Studies concerning predator dynamics in relation to sowing time are rare in Pakistan especially for wheat crop. Therefore, this study was carried out to determine the impact of planting dates on coccinellids and syrphid flies population in wheat crop.

MATERIALS AND METHODS

The experiment was conducted at the Agricultural Farm in Bahauddin Zakariya University Multan, Pakistan during 2011-12. Wheat cultivar, Sahar, was sown on November 05th (designated as early November), November 20th (late November) and December 05th (late December) in 2011. The experimental design was randomized complete block design (RCBD) with three replications. The total experimental area was 90m^2 and area for each sowing date was 30m^2. Each replication was of 10m^2 and distance between the replication was 1m. The wheat seeds were sown by broadcast method on recommended seed rate. Standard agronomic practices were applied uniformly on each treatment. Fertilizers i.e., urea and single super phosphate (SSP) were applied at 120 and 100 kg/ha, respectively. Whole SSP and one third of the urea were applied at time of sowing. The remaining urea was applied in two splits i.e., with first and second irrigation, respectively.

The data were recorded on weekly basis started from March 12th to April 03rd, 2012. The 30 wheat ears were selected randomly on each sampling date and examined visually without detaching from wheat plants for two aphid predators i.e., coccinellids (larvae and adults) and syrphid flies (only larvae). Their population was recorded.

Predator counts were square root transformed before analysis of variance as it did not follow the assumption of analysis of variance (ANOVA). Then data of coccinellids and syrphid flies populations were analyzed for ANOVA of each sampling date. Differences in means were further separated by the least significant difference (LSD) test at 5% level of significance (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Impact of sowing dates on coccinellid populations

Among species of predators, coccinellids and syrphid flies were dominant but *Chrysoperla carnea* (Stephen) were too low to be sampled. The beetles were seven spotted (*C. septempunctata*) and eleven spotted (*C. undecimpunctata*) while several species of syrphid flies were observed. Numbers of the both predator groups were pooled for each sampling date. Results revealed that coccinellid populations responded planting time in different manner i.e., no higher abundance was recorded consistently in any sowing date. On early November sowing (first sowing date) peak coccinellid populations (1.11) were recorded on March 12th, 2012 and after this population declined from March 19th to 26th but again increased (1.07) on April 03rd, 2012. On late November sowing (second sowing date) lower population (0.56) was observed on March 12th, 2012 and then slight increase was observed from March 19th to April 03rd (1.03 to 1.16). While on early December sowing (third sowing date) sharp increased in population was observed from March 19th, 2012 and highest numbers (1.35) were recorded on April 3rd, 2012 as compared to first two sowing dates (Fig. 1).

Mean number of coccinellid beetles were found significantly different in three sowing dates. Statistically higher populations were observed in early November (F=6.89, P=0.05, LSD=0.43) on March 12th, in late November on March 19th (F= 9.62, P=0.03, LSD=0.34) and late December (F= 13.40, P=0.02, LSD=0.15) on April 03rd, 2012, respectively. Non significant populations in plots of other sowing dates on above said sampling dates were recorded except those mentioned for higher populations (Fig. 1).

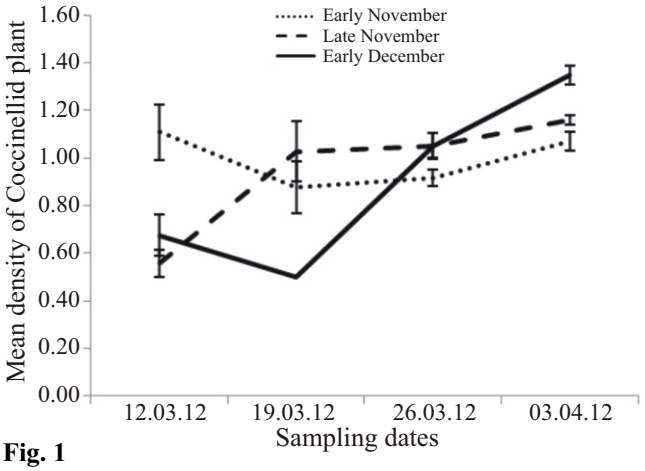

Fig. 1

Mean density of Coccinellids per plant recorded on wheat, *Triticum aestivum,* planted on 5th, 20th November and 5th December 2011 at Multan.

In current study, highest coccinellid populations were recorded on late sown crop (early December) at the end of March and beginning of April. Aslam *et al*. (2003) reported that *C. septempunctata* population was higher on late planted wheat and peak population was observed at the end of March. Young and Teetes (1977) narrated that *C. septempunctata* was truly effective to lower aphid population in the late season. The results are also in accordance with the results of Saleem

et al. (2009) who reported that the peak abundance (0.75) of Coccinellids were observed in the 4th week of March and declined (0.1) in the 1st week of April in KPK province of Pakistan. Similarly Abou-Elhagag and Abdel-Hafez (1998) investigated that in wheat, *C. septempunctata* peak abundance was higher from March to April.

Impact of sowing dates on syrphid flies populations

In early November planted wheat (first sowing date) peak syrphid flies populations (1.26) were recorded on March 19th, 2012 whereas; in late November (second sowing date) peak abundance (1.26) were recorded on March 26th, 2012. Negligible differences were observed in populations (1.08-0.97) of syrphids in early December sown wheat (third sowing date) in all the sampling dates (Fig. 2).

On March 12th, 2012 (F=16.52, P=0.01, LSD=0.22) higher populations of syrphids were recorded on early December sowing (third sowing date) and on March 26th, 2012 (F=7.01, P=0.04, LSD=0.13), higher populations were recorded on late November sowing (second sowing date). In all sowing dates, mean number of syrphids were found non significant on March 19th and April 03rd, 2012 (Fig. 2).

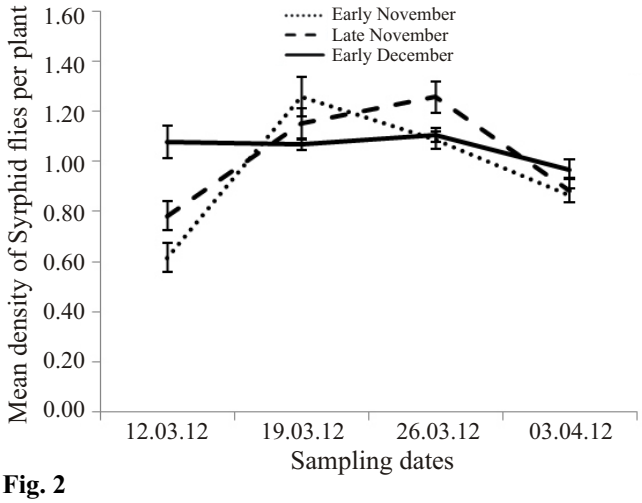

Fig. 2

Mean density of Syrphid flies per plant recorded on wheat, *Triticum aestivum* planted on 5th, 20th November and 5th December 2011 at Multan.

Peak syrphid flies populations (1.26 and 1.26) were recorded in early November (second sowing date) and late November on March 19th and 26th, respectively. Saleem *et al*. (2009) presented increase in populations and the observed peak population of syrphids (1.35) in the 3rd week of March and that decreased gradually (0.45 to 0.15) in the 4th week of March and 1st week of April, respectively on wheat. Similarly Ali *et al*. (2012) proved that the peak population of syrphid larvae (0.47/tiller) was recorded on March 21st, 2009 on wheat whereas Hassan *et al*. (2004) recorded peak population of syrphid fly on March13th, 2004 in other parts of Pakistan.

The reason of high abundance of syrphid flies and coccinellids in the month of March is due to very high aphid occurrence on wheat crop. The irregular peak abundance of predators on different sowing dates may be due to the fact that on early planted wheat, lower aphid population was observed compared to late planted crop.

Syrphid flies and coccinellids were completely diminished in the 2nd week of April. This might be due to rise in temperature, reduction in aphid population and crop maturity. Aheer *et al*. (2001) found negative correlation of *C. septempunctata* population with temperature.

In present study, it was found that coccinellid and syrphid fly populations were significantly different in three sowing times on three and two sampling dates respectively, whereas; no significant differences were observed in remaining dates. Not higher abundance was recorded consistently in any sowing dates. On April 03rd, 2012 higher population were recorded on late sown crop for both predators. Abundance of arthropods is affected by various abiotic and biotic factors (Aheer *et al*., 2001). Therefore, further research should be directed to determine the effect of planting time for predators abundance on different varieties at different locations over the seasons as in present study predators were recorded for a season.

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