MANAGEMENT OF APHIDS BY AUGMENTATION OF COCCINELLIDS AND *CHRYSOPERLA CARNEA* UNDER FIELD CONDITIONS ON WHEAT

Javaid Iqbal*, Muhammad Ashfaq** and Amjad Ali***
*Adaptive Research Farm, Sheikhupura
**Department of Entomology, University of Agriculture, Faisalabad
***Entomological Research Institute, Faisalabad

The study was conducted to manage the population of aphids on wheat by augmentation of predators (Coccinellids and *C. Carnea*). The release of predators showed significant control of aphids under natural conditions almost at all the post treatment intervals. However, the plots where both predators were released showed significantly minimum population of aphids. The population of predators showed negative and non-significant effect on the population of aphids at most of the post treatment intervals except coccinellids versus aphids at 7 days after first release and aphid versus *C. carnea* at 7 and 15 days after second release, which showed significant and negative correlation. The maximum increased (3.83%) in 1000-grain weight over control was observed in those plots where both predators were released.
Keywords: Management, aphids, augmentation, coccinellids, *Chrysoperla carnea*

INTRODUCTION

Efective control of aphids on wheat can be obtained through biological agent. Coccinellid beetle is common predator with its immature and mature stages, which feed voraciously on aphid. It has a high reproductive potential and long oviposition period (Karpacheva, 1991). Krotova (1994) recorded 17 species of coccinellids as predators of cereal aphid. The high numbers and voracity of coccinelids and synchronous development with pests made them an important predator of cereal aphids. Besides this, *chrysopids,* are also contributed a significant role for the control of aphids (Kannan, 1999).

Nakamuta (1983) in the trumpet creeper field, damage was reduced by 76.4%. Similar results were obtained in the cotton field. Xu (1985) reported that the introduction of the coccinellids in spring crops can effectively suppress aphids below economic threshold without the insecticides. Holland and Thomas (1997) concluded that polyphagous predators cannot present an aphid outbreak late in the season when population increased rapidly.

According to Kannan (1999), natural enemies encountered preying on aphids were chrysopids, coccinellids and syrphids, the first of these being the most important and dominant predators. Messina and Sorenson (2001) reported that lacewings reduced the aphid population on some plants and their effectiveness was 84%.

Schmidt *et al.* (2003) studied cereal aphid population in winter wheat under experimentally reduced densities of flying predators, coccinellid beetles, syrphusfly and gall midges resulted in 70 percent higher than flying predators. Khan (2004) conducted an experiment for the control of aphids in wheat crop through release of *C. carnea* and reported that the plots released with more number of eggs of *C. carnea* resulted in significant decrease in aphid population.

Keeping in view the above facts, the present project was conducted with the objective to manage population of aphids by augmenting Coccinellids and *C. carnea* under field conditions on resistant and susceptible cultivars of wheat.

MATERIALS AND METHODS

The study was conducted in the farmer's field Chak No. 219 RB, Faisalabad, three Km North from Entomological Research Institute, Faisalabad. Two genotypes viz., Iqbal-2000 (a susceptible cultivar) and V-00146 (comparatively resistance cultivar) obtained from a preliminary screening trial including 30 genotypes, were sown on November 22, 2003 each in four fields denoting replications. The distance from one field to another was 90 m. Each field was divided into four divisions denoting treatments. The size of each division in each field was 20-m x 9-m. Same aged-100 coccinellids males and females in 1:1 ratio were released in each replication in both genotypes, twicely at fortnight interval on March 10 and March 25, 2004, respectively. Similarly three cards each containing 1000 eggs of *C. carnea* were hanged at 3-cm below from top of the tiller in selected division of each replication on the same dates mentioned above. The fourth division of each replication of both cultivars was kept as check.

The data regarding the population of aphids, coccinellids (adult + larvae) and *C. carnea* larvae were collected before and 7 days after 1st release, before, 7

days and 15 days after 2nd release. The data on 1000-grain weight were also observed at the harvesting time to determine the role of predators in enhancing yield of wheat. The data were analyzed following RCB Design and means were separated by DMR Test with the help of an IBM Computer using M-Stat Package.

RESULTS AND DISCUSSION

Results (Table 1) revealed significant difference among treatments at all the post treatment observations regarding the population of aphids. The plots where both predators were released together showed maximum control of wheat aphids at all the post treatment intervals. These findings are in conformity with those of Xu (1985) who reported that the introduction of Coccinellids in spring crop can effectively suppress aphids below economic threshold without the insecticides. Similar findings are also reported by Kannan (1999).

The results (Table 2) revealed that the release of predators showed significant control of aphids as compared to control treatment. The minimum population of aphids was recorded to be 8.436 per tiller from those plots where both the predators were released and followed by 10.47 and 10.51 per tiller in those plots where coccinellids and *C. carnea* were released separately. Similarly significant increase in the population of predators was also observed in their respective plots as against the control. Furthermore, both predators exerted negative effect on the population of aphids. The correlation between aphids and coccinellids 7 days after first release and the effect of *C. carnea* on the population of aphids 7 and 15 days after second release was significant (Table 3).

Table 1. Means comparison of the data regarding aphids population per tiller in various treatments at different intervals

Treatments	A	B	C	D	E
	Before 1st Release	7 Days After 1st Release	Before 2nd Release	7 Days After 2nd Release	15 Days After 2nd Release
Coccinellids	6.76	12.89 b	16.29 b	13.04 b	3.40 b
C. Carnea	6.35	15.42 a	15.57 b	11.58 c	3.62 b
Coccinellids + *C.carnea*	6.34	11.44 b	12.78 c	9.23 d	2.40 c
Control	6.43	16.84 a	19.90 a	21.66 a	10.98 a

Means sharing similar letters are not significantly different by DMR Test at P = 0.05

Table 2. Means comparison of the data regarding population of aphids and predators per tiller in various treatments on cumulative basis

Treatments	Aphids	Coccinellids	*C.Carnea*
Coccinellids	10.477 b	0.808 a	0.302 b
C.Carnea	10.509 b	0.472 c	0.668 a
Coccinellids + *C.Carnea*	8.436 c	0.717 b	0.638 a
Control	15.161 a	0.483 c	0.288 b

Means sharing similar letters are not significantly different by DMR Test at P=0.05

Table 3. Correlation between aphids population and predators at different releasing intervals on wheat under natural conditions

Releasing Intervals	Aphids vs coccinellids	Aphids *vs C. carnea*
Before Release	-0.144 NS	-0.158 NS
7 Days After 1st Release	-0.384*	-0.130 NS
Before 2nd Release	-0.170 NS	-0.333 NS
7 Days After 2nd Release	-0.243 NS	-0.530**
15 Days After 2nd Release	-0.334 NS	-0.517**
Cumulative effect	-0.075 NS	-0.085 NS

** = Significant at P ≤ 0.01 * = Significant at P ≤ 0.05 NS = Non-significant

Table 4. Means comparison of the data regarding 1000-grain weight (g) in different treatments in selected genotypes of wheat under natural conditions

Treatments	Iqbal-2000	V-00146	Means	Increase over control (%)
Coccinellids	42.24	48.42	45.33 b	0.40
C.Carnea	42.19	48.91	45.55 b	0.89
Coccinellids + *C.Carnea*	43.69	50.06	46.88 a	3.83
Control	42.11	48.19	45.15 b	
Means	42.56 b	48.89 a	-	

Means sharing similar letters are not significantly different by DMR Test at P=0.05

Significant variations were found to exist between genotypes and among treatments regarding 1000-grain weight (Table 4). The maximum weight of 1000-grain was observed to be 46.88-g in those treatments where both predators were released together and differed significantly from other treatments, whereas 45.33 g and 45.55-g 1000-grain weight were observed in those plots where coccinellids and *C. carnea* were released separately and did not show significant difference with control (45.15-g). Furthermore, the plots treated with both predators showed 3.83 percent increase in 1000-grain weight. The resistant genotype (V-00146) showed higher 1000-grain weight (48.89-g) as compared to susceptible genotype (Iqbal-2000) with 42.56-g. The conclusion drawn from the results that wheat resistance and the utilization of biological control agents were proved to be complimentary strategy in an integrated pest management programme against cereal aphids. These findings are not contradicted with those of Messina and Sorenson (2001) and Khan (2004).

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