PREDATORY EFFICIENCY OF TWO LADY BIRD BEETLES, *COCCINELLA SEPTEMPUNCTATA* AND *PROPYLEA QUTTUORDECIMPUNCTATA* AGAINST WHEAT APHIDS

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ABSTRACT

The studies were carried out in the Bioassay laboratory, Plant Pathology Research Institute, Faisalabad to determine the predatory efficiency of two lady bird beetles, *Coccinella septempunctata* and *Propylea quattuordecimpunctata* against wheat aphid at room temperature of 22 °C to 25 °C. The results recorded indicated that a single larva of *Coccinella septempunctata* consumed significantly more aphids (56.01) per day as compared to single larva of *Propylea quttuordecimpunctata* (32.93) per day. Similarly the adult of *Coccinella septempunctata* was found to be most efficient than the adult of *Propylea quttuordecimpunctata* by consuming 54.48 and 34.51 aphids per day respectively**.** Therefore it is concluded that both larva and adult of *Coccinella septempunctata* have higher rate of predation than *Propylea quattuordecimpunctata*. More over it was also observed that the incubation period was 4 days in both the species while the total life cycle from egg to adult lasted for 28 days in *Coccinella septempunctata* and 26 days in *Propylea quattuordecimpunctata*.

Key words: Lady bird beetles, Aphids, Efficiency

INTRODUCTION

The lady bird beetles, coccinellids have attracted considerable attention as biological control agent, because of its potential to control many soft-bodied insect pests particularly the aphids on which it feeds voraciously in the immature as well as the mature stages. Nevertheless, the effectiveness of coccinelids as aphid predators could be improved by the selection of coccinellid races that are not so restricted by the climatic conditions as the aphids already present. On the other hand, varieties of plants characteristics that would permit more efficient aphid capture by the coccinellids could be selected (Frazer, 1988). Aphids are

minute insects that often legion due to their capacity to proliferate tremendously (Jones & Jones, 1984). They cause serious damage to agricultural crops by sucking cell sap and injecting toxic saliva into plant tissues. They secrete honey dews which facilitates growth of sooty mould which ultimately hinders photosynthesis process of attacked plants (Zia et al., 2010). Becker, 1997 observed that the attack of aphids sometimes results in foliage disfiguring by crippling of shoot and deformation of buds. Fourteen spices of aphids have been recorded attacking weed crop. Among these *Sitobion avenae, Rhopalosiphum maidis, R. padi* and *Metopolophium dirhodum* are common ones (Popov et al., 1988). Shahid, S et al., 2012 recorded three spices of aphid on wheat crop namely, *Sitobion avenae, Schzaphis. graminum* and *Rhopalosiphum padi* in there studies. Aphid is one of the most destructive pest and its distribution is world wide (Begum et al., 1991). The aphids are important sucking pest of various field crops, fruits and vegetables and are commonly called as plant lices. Seven spotted ladybird beetle, *Coccinella septempunctata* Linn feed primarily on aphids and also preys on both adult and immature soft-bodied crop pests (Nunez-perez et al., 1992). The population of aphid has been increasing for the last few years and is attaining the status of an alarming pest in Pakistan. Aphids attack wheat, barley, oat etc. and spread rapidly causing serious injuries and crop losses. Like other sucking insects pests both nymphs and adults suck the sap from plants, particularly from their ears, and thus lower the plant vigor. The lady bird beetle has high reproductive potential and long oviposition period. The successful natural enemies are those which have high reproduction rate, and good searching ability for its host, adaptability in different environmental conditions and synchronization with its host (Buchanan, 1996). The other important hosts of coccinellids include whiteflies, mealy bugs and rice brown plant hopper. The biological control agents being important components of IPM are receiving serious attentions of Entomologist as well as policy makers these days. The biological control is one of the most effective means of achieving insect control (Pedigo, 2004). The biological control with *coccinellids* was contributed greatly and suppressed the pests below economic damage (Hoy and Nguyen, 2000). To protect the plants and environment, biological control of aphids is a good replacement of highly toxic insecticides which is a common practice for its control (Bellows, 2001).

Keeping in view the importance of biological control, the predatory efficiency of two species of lady bird beetles, *Coccinella septempunctata* and *Propylea quattuordecimpunctata* against wheat aphids was determined in the laboratory.

MATERIALS AND METHODS

The studies were conducted in the bioassay laboratory of Plant Pathology Research Institute, Faisalabad. For the studies, the adults and larvae of *Coccinella septempunctata* and *Propylea quattuordecimpunctata* were collected from wheat crop area of AARI, Faisalabad, in the month of February and March. The adult and larva were kept singly in small plastic cup with lid so that the adult and larva may not escape. Wheat panicles with counted no of aphids were provided to them as food daily to raise a uniform culture of both the species and to run a blank experiment to observe the predatory potential. After the formation of adult stage, five pairs of adults of each specie were kept in separate Petri dishes with filter paper at the bottom for oviposition and placed in the laboratory at room temperature varied from 22 °C to 25 °C. The wheat panicles with aphid on them were provided as food. The eggs laid by the female of each specie were collected and placed in other separate dishes. To determine the predatory efficiency of larva of seven spotted lady bird beetle, *Coccinella septempunctata* and fourteen spotted lady bird beetle, *Propylea quattuordecimpunctata*, the newly hatched larva of both the species was placed singly in small plastic cups covered with lid. The experiment was conducted according to RBD with five replications. A counted number of aphids on wheat panicles were offered to them daily and substituted each day with new panicles having more number of aphids than the previous day. The unconsumed / alive aphids were counted from old panicles. This practice continued up to pupal formation stage. Afterwards, the adults so emerged from pupae were also provided with counted number of aphids on wheat panicles daily and substituted each day with new panicles having more number of aphids than the previous day. The alive/ unconsumed aphids were counted from the old panicles to observe the predatory potential of adults of both the species. During the experimentation, the duration of egg hatching, each larval instar, total larval period and duration of adult of *Coccinella septempunctata* and *Propylea quattuordecimpunctata* was also recorded.

RESULTS AND DISCUSSIONS

The data presented in (Table 1) revealed that a single larva of *Coccinella septempunctata* has significantly higher rate of predation consuming 56.01 mean wheat aphids per day as compared to *Propylea quattuordecimpunctata* larva consuming less aphids (32.93) per day. The consumption of aphid increased with increase in larval instars of both the species and reached maximum in 4th instar. These results are in conformity with Debarij and Singh (1989) but they used *Coccinella transfersalis* against *Aphis cracivora* instead of *Coccinella septempunctata* against *Macrosiphum granarium*. Similarly Chowdhury et al. (2008) also reported that the total number of bean aphids consumed by each larva of *Micraspis discolor* during its total larval development period were 38 to 58 aphids with an average of 48.68 + 2.04 aphids during their entire larval period. The adult of *Coccinella septempunctata* consumed significantly more number of aphids (54.48) per day than the adult of *Propylea quattuordecimpunctata* which consumed only 34.51 aphids per day. Moreover, the incubation period, duration of 1st, 2nd, 3rd, 4th larval instars, pupal period, adult duration and total developmental period from egg to adult stag of *Coccinella septempunctata* and *Propylea quattuordecimpunctata* were also determined and found to be 4 & 4, 2 & 2.5, 2 & 2.5, 3 & 3, 5 & 4, 6 & 4, 6 & 6 and 28 & 26 days respectively in both the lady bird beetles (Table 2 & Figure 1). These results are in conformity with Muzammil et al. (2008) who reported that incubation period in seven spotted lady bird beetle *C. septempunctata Linn* was 4.3 + 0.81 days and mean duration of 1st, 2nd, 3rd and 4th larval instars were 2.00, 2.00, 3.00 and 5.00 days respectively and pupal period was 6.00 days. Debaraj and Singh (1990) reported that the pupal stage may last from 3-12 days depending upon availability of food and temperature, while the present studies also showed that the pupal period was 6 & 4 days in both the species.

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Table 1: Predatory efficiency of lady bird beetles against wheat aphids

Code. #	Treatment	Stage	Mean duration(day)	Mean aphid consumed per day
T1	LB (7 spotted)	Larva	12.00	56.01 a
T2	LB (14 spotted)	Larva	12.00	32.93 d
T3	LB (7 spotted)	Adult	6.00	54.48 b
T4	LB (14 spotted)	Adult	5.00	34.51 c
T5	Check	All the aphids remained alive during the period of studies, neither increased nor decreased.		
	LSD Value at 5% level			**0.766**

Table 2: Duration of different stages of two lady bird beetles, *Coccinella septempunctata* and *Propylea quattuordecimpunctata.*

Sr. #	Stage of insect	Mean duration (days) of different stages of	
		Coccinella septempunctata	***Propylea quattuordecimpunctata***
1	Egg	4.00	4.00
2	1st Instar	2.00	2.50
3	2nd Instar	2.00	2.50
4	3rd Instar	3.00	3.00
5	4th Instar	5.00	4.00
6	Pupa	6.00	4.00
7	Adult	6.00	6.00
8	Total duration	28.00	26.00

Figure 1. Mean duration of different stages of *Coccinella Septempunctata and Propylea quattuordecimpunctata*