Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(6): 2014-2017

Received: 22-09-2017
Accepted: 24-10-2017

Farman Ali Sipio
Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tandojam

Aslam Bukero
Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tandojam

Kamil Kabir Khanzada
Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tandojam

Imran Ali Kumbhar
Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tandojam

Abid Ali Soomro
Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tandojam

Muhammad Irfan Jat
Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tandojam

Riaz Hussain Chandio
Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tandojam

Correspondence
Farman Ali Sipio
Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University Tandojam

Biology of seven spotted beetle, *coccinella septempuntata* (linn.) on different aphid species

Farman Ali Sipio, Aslam Bukero, Kamil Kabir Khanzada, Imran Ali Kumbhar, Abid Ali Soomro, Muhammad Irfan Jat and Riaz Hussain Chandio

Abstract
A laboratory experiment was conducted in the Bio-Control Research laboratory, Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University, Tandojam in 2016. The egg laying capacity (Fecundity) of the female *Coccinella septempunctata* showed that the maximum fecundity was recorded 1241.24±10.25 on mustard aphid, whereas the lowest pre-oviposition period was recorded in female fed on cabbage and mustard aphids. The maximum ovipostion period was observed on cabbage aphid followed by mustard and akk aphids, respectively. The lowest larval cannibalism% was seen 14.0±5.77 on mustard aphid while the highest larval mortality% 20.0±83.0 and 23.0±10 on cabbage and akk aphids. The maximum adult emergence% of *Coccinella septempunctata* on mustard aphid followed by cabbage and akk aphids, respectively. The results of the present research showed that the minimum development period was observed in the 1st, 2nd, 3rd and 4th instar larvae fed with mustard aphid, *Lipaphis erysimi* followed by Cabbage aphid, *Brevcoryne brassicae* and Akk aphid, *Aphis nerii*, respectively. The highest adult male longevity of *Coccinella septempunctata* was seen 69.68±11.25 days on cabbage aphid whereas maximum female longevity was recorded 85.0±8.41 and 91.23±10.81 days of akk and cabbage aphids, respectively. The result further revealed that the adult male and female was lived longer on cabbage aphids There is highly significant difference in the longevity of male and female of different host species ($P<0.05$).

Keywords: Biology, *C. Septempuntata*, Mortality, Longevity, Aphid, Oviposition

Introduction
Insect pests have always been a threat to agriculture productivity in Pakistan, in result the crop productivity per unit area is still far less than the potential exists or when comparison is made with the achievements of advanced agricultural countries of the world. Thus for controlling these harmful insects, different chemicals (pesticides) are applied against different insect pests (Pearson, 2004) [1]. The 7-spotted ladybird beetle, *Coccinella septempunctata L.* is one of the most common predators, which can consume its weight in 40 aphids daily as a mature grub (larva) and as many as 53 aphids daily as an adult. Ladybird beetles have been imported to control outbreaks of aphids and scale insects (Omkar and Srivastava 2002) [2] they have hardened front wings that do not beat up and down they provide lift that helps the lady bug stay in the air. Before it can fly, a lady bug opens its front wings and unfolds its back wings, the front wings swing outwards, and when the back wings are beating fast enough, the lady beetles takes off. The bright colors of ladybird beetles warn enemies that they have a bitter taste, and the spots of each species are arranged in a different pattern (Buczacki, 2002) [3].
The carnivorous characterized by the mandibles having simple or bifid apices and each jaw being armed with a basal tooth. These are most important of all predators (Agarwala and Bardhanroy 1999) [4] they are active in both the larval and the adult condition and have a considerable range of prey, which includes some of the most destructive groups of insects, notably the aphids and the scale insects. 7-spotted ladybird beetles are predaceous on aphids, mealy bugs, sugarcane aleyrodid, citrus psyllid, mites and sorghum stem borer, *Chilo partellus*. The larvae of aphid fly, *Syrphus baleatus* (Degean) are also important predators of aphids. These predators have high potential of predation both in the immature as well as the adult stage (Shepard, 1999) [5].
In the same preview, *C. septempunctata* consumed more aphids than *Brumoides suturalis, Cheilomenes sexmaculata, Menochilus sexmaculatus*. Both young ones (grubs) and adults of

C. septempunctata consume about 40-173 aphids daily (Solangi, 2007a) [6]. There are some Coccinellid beetles that have preference only to consume certain aphid species but others attack many species because of their capacity to survive (Ali and Rizvi 2009) [7].

The farmers spray toxic chemicals (pesticides) on cotton, vegetables, oilseeds and fruit crops in order to avoid the pest infestation. Due to the intensive and indiscriminate use of many pesticides poison, people suffer from many diseases, and some of these are chronic for human beings. Use of pesticides has resulted in the environmental pollution on large scale. Besides contaminating food and food products, pesticides have been accumulating in the soil, air and water to a critical stage. This calls for a safe and cheap control method. This can only be achieved by the practice of Integrated Pest Management (IPM); a pest control management which ensures environmental safety (Solangi, 2007b) [8]. Biological control agents (Coccinellids) consist of an important constituent of many incorporated pest management programs but many synthetic pesticides affect them negatively. To avoid such harmful effects, there is a need to use the natural enemies (Sarwar and Saqib 2010) [9].

Cotton aphid is one of the most injurious insect pests which suck the cell sap and hence is one of the crop yield limiting factors they affect the general vigor of plant by secreting honey dew which encourages sooty mould development that disturbs the normal physiology of the leaves (Bellows 2001) [10]. 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. It is not surprising that pests often develop resistance to these chemicals (Henn and Weinzieral 19990) [11] sometimes Coccinellids larvae are not killed by systemic insecticides that are injurious to predators they are tolerant to many insecticides which is an advantage over other predators. It is the most important beneficial insect of cotton pests, with its immature and mature stages as voracious feeder of all the aphids (Saharia, 1982) [12].

Materials and Methods

Place of work: The experiment was conducted under laboratory conditions, during 2015-2016, Department of Entomology, Faculty of Crop Protection, Sindh Agriculture University, TandoJam. The stock culture of *Chrysoperla carnea* and *Sitotroga cerellela* were obtained from N.I.A laboratory.

Experimental Design: The adult lady beetle was collected from different crops and reared on natural hosts under laboratory for stock culture. Natural diets like mustard aphid, Akk aphid and cabbage aphid were collected from respective host plants. The natural diets (aphids) were provided to the beetle. There were three treatments including $T_{1=}$ *Aphis nerii*, $T_{2=}$ *Lipaphis erysimi* and T_3= *Bervicoryne brassicae.* Each treatment was replicated five times. The experimental design was Complete Randomized Design (CRD). The temperature was maintained between 26±2 ˚C.

Data collection: After hatching from eggs the grubs were shifted in new petridishes for experiments. Each grubs were fed by aphid species as diets. The developmental period of each grub instars, pupal percent emergence and sex ratio were recorded. The newly emerging the adults were fed by the same diets. The fecundity, egg incubation, hatching percent, mortality and longevity was recorded similarly.

Statistical Analysis: The collected data were subjected to statistical analysis and statistical differences existed between data sets (P<0.05), Fisher's Least Significant Differences (LSD) was being used to separate the differing means.

Results and Discussion

The results are summarized in Table-1 which showed that maximum egg laying capacity (fecundity) of female adult was recorded 1241.24±10.25 on mustard aphids whereas minimum were on akk and cabbage aphids' species, respectively. Our results are generally agreed with (Rauf *et al.,* 2008) [13], who recorded fecundity% ages of females were (124.5, 251.5) and 293.2 eggs per female, respectively. Whereas adult (male and female) developmental time, female fecundity percentage was significantly different from each other at 3 different constant temperatures. Highest female and male predatory was recorded (3262.9) and 2571.7 aphids at 25±1°C while lowest was (2276.8) and 1890.6 aphids, almost. On the other hand, the investigation of (Shukla and Jadhay) [14], found mean fecundity of *C. transversalis* on mustard aphid *L. erysimi* were 377.36±28.96 eggs per female. The correlation was seen by (Ashraf *et al*., 2010) [15] between food consumption and egg production, so egg laying capacity of seven spotted beetle is affected by the different type of diet. Seven spotted beetle consumed highly significant (*L. erysimi*) 32.2 aphids per day as compared to other aphid species respectively. The results further suggested that the highest egg hatching% age in female fed on mustard aphid was seen 85.21±5.77 similarly; the lowest egg mortality% was seen 14.79±3.21 fed on mustard aphid. However, the maximum adult emergence of *C. Septempunctata* male was recorded 31.41±6.23% on cabbage aphid whereas; highest female emergence was noted 60.59±6.23% on mustard aphid followed by 56.60±4.21 and 51.77±4.51% on cabbage and akk aphid species. The results of (Henn and WeinzIeral 1990) [11] are in conformity with ours that average consumption of aphids per *C. septempunctata* adult male and female was 77.8±5.15, and aphids were consumed by the one larva during 1st, 2nd, 3rd and 4th instars, respectively. One single female can lay eggs (177.0±23.03) during whole entire life. In that order, emergence percentage% in male and female adults was obtained 36.6±2.98 and 56.6±4.21, Male to female sex ratio was indicated 1:1.5.

Furthermore! The highest pupation% age was recorded 86.0±5.77 on mustard aphid, similarly, the lowest larval cannibalism% was seen 14.0±5.77 on mustard aphid while the highest larval mortality% 20.0±83.0 and 23.0±10 on cabbage and akk aphids, respectively. There was a highly significant difference in pupation and larval mortality% (P<0.05). Similarly, findings of (Aslam *et al*.,) [16], determined that the larvae of the predator fed with dried aphid were suffered with maximum mortality (dx), apparent mortality (Sx), and essential mortality (IM) in larval and pupal stage. The adults emerged from the pupae also produces weaker egg, maximum of them were failed to hatch. The highest apparent mortality (100qx) was obtained in whole life stages of the predator on dried and lowest on fresh aphids. The present investigation may be supportive in the identification of an efficient predator for its utilization as one of the important and eco-friendly tools for the management of aphid pests in IPM.

During study we steered successions of experiments and difference was observed between rates of larval periods (Table-2) it is shown minimum development period was recorded 2.67±0.67 days in the 1st and 2nd instar larvae, fed with mustard aphid respectively. Furthermore, the results

indicated that the highest developmental period of 3rd and 4th instar larvae of *C. septempunctata* was seen 5.20±0.66 days on cabbage aphid. According to above results it was noted that the maximum larval developmental period was lasted on cabbage aphid followed by mustard and akk aphids. Previous studies of (Shukla and Jadhay) [14], examined the average biology of *C. transversalis* were shown that adult male and female periods were 1.40±0.26, days, whereas on *L. erysimi* these periods were 2.70±0.76, days, respectively.

Present studies are examined highest adult male and female longevity of *C. septempunctata* was seen 91.23±10.81 on *Breycorine brassicae* aphids. The predator passed through 4 larval instars completing its average duration in (2.27, followed by 1.81, 2.25, and 3.06 days, in that order. The total number of larval period was recorded 9.39 days with a range of 8.2-10.5 degree days. While the pupal period lasted period for 4.7 days with arrange 4.0-4.9 days. On an average male adult longevity was obtained 36.91 days with a range of 33-47 days, (Rana and Kakker 2000) [17]. But according to (Ashraf *et al.*, 2010) [15] the artificial diet showed more longevity 41.6 days on plain water, and also it was also observed in the study that female lived longer than male on mustard, akk and cabbage aphids. in the same way, (kianpour *et al.*, 2011) [18] observed convinced life history of demographic attributes of *C. sepempunctata* which were shown the larval period was highest recorded (12.17±1.25 days) when feed an irregular diet for two days aphid and also two day's mite. Endurance rates of ladybird beetles were absolutely related to an increasing ratio of aphids in their diets.

In present work further results revealed in (Table 1-2) that lowest egg hatching period were recorded 3.0±0.58 days, whereas the maximum pre-pupal and pupal period was recorded 2.67±0.33 and 4.33±0.66 days, fed on aphids, respectively. These results are also investigated by (Takahashi 1993) [13] egg incubation period of *C. septempunctata* was (5.12, 3.62) and 3.20 days with 75.6%, followed by 82.0% and 71.2% hatchability. The above findings are noted by (Khursheed and Hodek 2006) [20] total pre-pupal 16±1.73 days and pupal-period, 7.5±0.87 days, when a comparison was made, between larval instars, it was also observed that older larvae consume more number of aphids/day.

Table 1: Biology of *Coccinella Septempunctata* reared on different aphid species

Biology	*Lipaphis erysimii*	*Aphis nerii*	*Breycorine brassicae*
Fecundity per female	1241.24±10.25	819.01±9.61	1025.26±15.66
Pre-oviposition period	6.00±00.5	9.00±0.58	7.00±0.58
Oviposition period	59.00±9.21	62.0±8.41	72.0±11.54
Post-oviposition period	10.00±0.88	14.02±1.23	12.00±0.88
Egg Incubation period	3.00±0.58	4.67±0.88	5.61±0.58
Hatching% (n=40)	85.21±5.77	73.00±1.53	7.00±0.58
Mortality% (n=40)	14.79±3.21	27.00±2.13	30.00±5.77
Pupation/Larval cannibalism	53.33±3.33	9.25±1.65	6.45±0.25
Pupation%(n=40)	50.00±5.77	30.00±8.16	50.00±0.33
Larval cannibalism%(n-40)	50.00±5.77	30.00±10	13.33±3.33
Adult emergence rate% Male	36.41±3.41	38.40±2.21	39.23±6.23
Female	63.59±6.23	61.60±4.51	60.77±4.21

Table 2: Developmental period of *Coccinella septempunctata* on different aphid species

Development Period (days)			
Life stage	***Lipaphis erysimii***	***Aphis nerii***	***Breycorine brassicae***
1st instar	2.67±0.67ab	3.33±0.33ab	3.66±0.33a
2nd instar	3.45±0.33b	4.21±0.33b	4.56±0.66a
3rd instar	4.61±0.67a	5.21±0.33b	6.21±0.33ab
4th instar	3.82±0.33b	4.92±0.66ab	5.20±0.66ab
Total larval duration	14.55±1.34b	17.67±2.13a	19.63±1.46ab
Pre Pupal Period	2.67±0.33b	2.33±0.33b	2.33±0.333b
Pupal period	2.33±0.33b	4.33±0.66a	3.81±0.33b
Adult Logivity Male	49.00±14.05	67.00±9.86	69.68±11.25
Female	75.00±10.51	85.00±8.41	91.23±10.81

Conclusions

It is concluded that the *L. erysimi* are most suitable for mass rearing of *C. septempunctata* for production of bio-control agents. This could be augmented in horticulture for the suppression of insect pests as well as field crops.

Acknowledgment

We are cordially thanks to Dr. Aslam Bukero Department of Entomology, Sindh Agriculture University Tandojam for his kind guidelines and his support during the research work.

References

1. Pearson SA. The Columbia Electronic Encyclopedia, 6th ed. Columbia Univ. Press. Pearson Edu. Pub. Columbia, USA. 2004, 12-124.
2. Omkar S. Srivastava. The reproductive behavior of an aphidophagous lady beetle, *C. septempunctata* (Coleoptera: Coccinellidae). European J of Entomology. 2002; 99:465-470.
3. Buczacki S. The Fauna Britannica Hamlyn, London. J. of Biological Control 2002; 4:93-95.
4. Agarwala BK, Bardhanroy P. Numerical response of lady bird beetles (Coleoptera: Coccinellidae) to aphid prey (Homoptera: Aphididae) in a field bean in North East India. J of Applied Entomology. 1999; 123:401-405.
5. Shepard BM. Insects and their natural enemies associated with vegetables and soybean in Southeast Asia. Quality Printing Co. Orangeburg, South Carolina, U.S.A. 1999,

22-24.
6. Solangi BK. Biological control through natural enemies. Model Farming, Sarhad J. Agriculture. 2007; 23(3).
7. Ali, Rizvi. Record aphids natural enemies' complex of Uttar Pradesh. V. The coccinellids. J Advance Zoological. 2009; 17(1):44-48.
8. Solangi BK. Searching ability and feeding potential of larvae of 7-spotted beetle *Coccinella septempunctata* Linn. Under laboratory and field conditions. Sarhad J. Agriculture. 2007b; 23(3):705-711.
9. Sarwar M, Saqib M. Rearing of Predatory Seven Spotted Ladybird Beetle *Coccinella septempunctata* L. (Coleoptera: Coccinellidae) on Natural and Artificial Diets under Laboratory Conditions. J Pakistan agriculture. 2010; (1):47-51.
10. Bellows TS. The Restoring population balance through natural enemy introductions. Biological Control. 2001; 21:199-205.
11. Henn T, Weinzieral R. Alternatives in insect pest management. Beneficial insects and mites. University of Illinois, Circular. 1990; 1298:24.
12. Saharia D. Field evaluation of granular systemic insecticides on *Lipaphis erysium* and its predator Coccinella. J Research Asian Agriculture. 1982; 2:181-185.
13. Rauf M, Khan J, Rehman A, Gillani, Ali A. Biology and predatory potential of *Coccinella septempunctata* Linn. On *Schizaphis graminum* aphid under controlled conditions. Pakistan J. of Agricultural Research. 2013; 26(2):25-34.
14. Shukla K, Jadhay. Biology and feeding potential of *C. septumpunctata* on mustard aphid, *L. erysimi*. International J Zoology Research. 2014; 2:30-33.
15. Ashraf M, Ishtiaq M, Asif M, Adrees M, Ayub MN, Mehmood T *et al*. Rearing of lady bird beetle (*Coccinella Septempunctata*) to observe its fecundity and longevity on natural and artificial diets. International J. of Biology. 2010; 2(1):165-173.
16. Aslam, Bukero MA, Rustamani AG, Lanjar UA, Memon AW, Solangi MA, Abro *et al*. Life table studies of *Coccinella septempunctata* linneous on natural diets. Science International (Lahore). 2015; 27(3):2263-2266.
17. Rana, J.S. and J. Kakker. Biological studies on 7-spot ladybird beetle, *Coccinella septempunctata* L. with cereal aphid, *Sitobion avenae* (F.) as prey. Cereal Research Communication. 2000; 28(4): 449-454.
18. Kianpour R, Fathipour, Y., Kamali, K. and Omkar, Effects of mixed prey on the development and demographic attributes of a generalist predator, *Coccinella septempunctata* (Coleoptera: Coccinellidae). Bio control Science and Technology. 2011; 21(4):435-447.
19. Takahashi K. Daily behavior of adult *Coccinella septempunctata* (Coleoptera, Coccinellidae). Japanese J. Entomology. 1993; 61(4):839-845.
20. Khursheed P, and Hodek I. The effects of thirteen species of aphids on some life history parameters of the ladybird *Coccinella septempunctata.* Biological Control. 2006; 49(1):21-32.