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Biology of spotted ladybird beetle, *Harmonia octomaculata* (Fabricius) (Coccinellidae: Coleoptera) on Lucerne aphid, *Acyrthosiphon pisum* (Harris) (Aphididae: Hemiptera) under laboratory conditions

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Abstract
Ladybird beetles are important biological control agents for soft bodied insect pests *viz*., aphids, mealybug, scales etc. Augmentation and use of biocontrol agents are important strategies of IPM for any crop. An investigation on the biology of spotted ladybird beetle, *Harmonia octomaculata* (Fabricius) on Lucerne aphid, *Acyrthosiphon pisum* (Harris) was conducted under laboratory conditions. The results revealed that mean incubation period was 3.44 ± 0.50 days. The average hatching percentage was 94.37 ± 2.00 per cent. The first, second, third and fourth instar larva lasted for about 1.38 ± 0.49, 1.86 ± 0.35, 2.60 ± 0.49 and 3.58 ± 0.50 days, respectively. The total larval duration was 9.42 ± 0.95 days. The average pre-pupal and pupal duration were 1.1 ± 0.3 and 4.14 ± 0.57 days, respectively. The adult emergence of *H. octomaculata* was 92.17 ± 2.91 per cent. The sex ratio (Male: Female) was 1:1.39. The pre-oviposition, oviposition and post-oviposition period of *H. octomaculata* was 8.28 ± 1.11, 19.42 ± 1.44 and 7.80 ± 0.93 days, respectively. The fecundity was 396.16 ± 54.57 eggs during her ovipositional period. The male and female adult lived for 28.02 ± 1.48 and 35.50 ± 1.71 days, respectively while average total lifespan of male and female were recorded as 46.14 ± 1.69 and 53.64 ± 1.97 days, respectively.

Keywords: Biology, morphometrics, ladybird beetle, *Harmonia octomaculata* (Fabricius) lucerne aphid, *Acyrthosiphon pisum* (Harris)

Introduction
The aphids are one of the most destructive pests and its distribution is worldwide. Aphids cause damage by sucking the sap from the tender shoots and leaves thus reduce the market value [3]. Lucerne is the most important temperate forage legume crop. The Lucerne aphid *Acyrthiosiphon pisum* (Harris) is a pea aphid infesting the lucerne crop and affect the quality and quantity of crop [9]. Now a day's Integrated Pest Management is suitable pest control techniques as it is ecologically safe and environmental friendly. Biological control is the beneficial action of parasites, pathogen and predators in managing pests and their damage. Bio-control provided by these living organisms, collectively called as "natural enemies," is especially important for reducing the numbers of insect pests and mites. Natural enemies of insect pests play a key role in reducing the levels of pest populations below those causing economic injury. Conservation, augmentation, and classical biological control are tactics for harnessing the benefits of natural enemies. Both natural and applied biological control tactics are important in successful management of pest populations. Among the various bio-agents, predators kill and consumed on several prey species during their lifespan. Biological control is most effective strategies of pest management by using predators and parasitoids thereby it reduce the expensive use of insecticides. Coccinellid beetles are efficient feeders and predate on a wide range of soft bodied insects including aphids, plant hoppers, thrips, jassids, scale insects, mealy bugs and whitefly infesting large number of cultivated crops [11]. In spite of the prosperous biodiversity of lady bird beetles under south Gujarat conditions, work pertaining to biology of *Harmonia octomaculata* (Fabricius) is lacking. To increase the knowledge on this aspect, present investigation was carried out in Navsari with native lady bird beetle species. The study on life history parameters of *H. octomaculata* against *A. pisum* would be useful in proper biological control programme of lucerne aphid.

Materials and Methods

Studies on the biology of spotted ladybird beetle, *H. octomaculata* was carried out in PG Research Laboratory, Department of Agricultural Entomology, N.M.C.A., N.A.U., Navsari (Gujarat) at 30.41 ± 3.18% temperature and 42.80 ± 7.64 per cent relative humidity during January 2018 to April 2018. The culture of host insect *viz*., lucerne aphid, *A. pisum* and the predatory spotted ladybird beetle, *H. octomaculata* was collected from the lucerne fields at Forage Research Scheme, N.A.U., Navsari and brought to PG Research Laboratory to study on the biology of spotted ladybird beetle. Collected beetles were kept in plastic jars (15 x 10 cm) and reared on *A. pisum*. A cotton swab soaked in water and a cotton swab dipped 10 per cent honey solution was placed in the plastic jar to maintain the required humidity and for adult feeding, respectively. The top of the plastic jar was covered with muslin cloth fitted with the help of rubber bands. Lucerne leaves were also provided to facilitate egg laying and to maintain natural condition. The eggs of spotted ladybird beetle laid were transferred individually with the help of moist fine camel hair brush and placed in separate plastic vials (6 x 4 cm) individually for further rearing. Morphometric measurements such as length and breadth of egg, larva (all four instars), pre-pupa, pupa, male and female were recorded by using thirty individuals of laboratory culture under dissecting stereo-trinocular microscope. The incubation period and hatching percentage of the eggs were recorded. Number of larval instars and duration was also determined on the basis of casted-off larval exuviae. The duration of pre-pupal and pupal period was recorded. Newly emerged fifty adults of *H. octomaculata* were placed individually in plastic vials and provided with *A. pisum* to record the observations on longevity of males and females separately. A set of 25 adults of *H. octomaculata* were kept individually in plastic vials to record the fecundity, pre-oviposition, oviposition, post-oviposition period of females and sex-ratio (male: female) from laboratory culture. Eggs laid by each mated female were counted separately on daily basis during the morning hours and total number of eggs laid during entire lifespan of adult was considered as its fecundity.

Result and discussion

The results of biology of the spotted ladybird beetle, *H. octomaculata* when reared on lucerne aphid, *A. pisum* is presented in Table 1 and 2 along with Plate-1.

Eggs

The spotted ladybird beetle, *H. octomaculata* female laid eggs singly or in cluster of 21 to 52 eggs on inner side of lid, on side wall of plastic jar or vials, both surface of leaf, sometimes on the dead aphid body and also on the muslin cloth. Eggs were yellowish in colour, oval shaped with smooth chorion and free from reticulations. The one end of the egg was firmly attached to the substratum. The eggs were turned to blackish in colour with the development and became completely black before hatching. The eggs split open at the apical portion and the grubs wriggled out at the time of hatching. The neonate grubs remained on egg case for some time and then moved towards prey for feeding. The data on measurement of length and breadth of eggs are presented in Table-1 revealed that the length of eggs ranged from 1.25 to 1.37 mm (Av. 1.31 ± 0.04 mm), whereas the breadth varied from 0.48 to 0.59 mm (Av. 0.56 ± 0.03 mm). The present findings are in close agreement with Patel and Shinde [6] who reported that the length of *Propylea sp*. varied from 1.27 to 1.56 mm (Av. 1.43 ± 0.06 mm) and breadth varied from 0.45 to 0.61 mm (Av. 0.53 ± 0.04 mm) when fed on *A. pisum*.

Incubation period

The incubation period of *H. octomaculata* was calculated based on the duration between the date of egg laying and date of egg hatching. The data presented in Table-2 showed that the incubation period of *H. octomaculata* varied from 3 to 4 days with an average of 3.44 ± 0.50 days. Manpoog *et al*. [4] reported that incubation period of *C. septempunctata* was 3.5 ± 0.5 days when fed on mustard aphid, *L. erysimi* which is similar to the present findings.

Hatching percentage

The hatching percentage was the number of neonate larva hatched out from the total number of eggs kept when fed on lucerne aphid. The hatching percentage of eggs of *H. octomaculata* ranged from 91.18 to 97.87 per cent with an average of 94.37 ± 2.00 per cent (Table-2). According to Priyadarshani *et al*. [7] hatchability of *M. sexmaculatus* ranged from 84 to 88 per cent with an average of 85.86 per cent when reared on *A. craccivora*. The slight variation in hatching percentage might be due to prevailing weather condition, difference in the prey species and predator used for the present investigation.

First instar larva

The newly emerged larva came out through the circular opening from eggs; afterward larvae were remain present on egg shell for a while and then moved actively in search of food. First instar larva was dark grey in colour covered with spine like structure all over the larval body with shining dark head capsule and legs. The legs were comparatively longer and articulated with oval shaped body.

The measurements on length of *H. octomaculata* first instar larva ranged from 1.75 to 2.08 mm with an average of 1.92 ± 0.08 mm, while breadth varied from 0.64 to 0.77 mm with an average of 0.69 ± 0.30 mm (Table-1). The present investigations are corroborated with Patel and Shinde [6] who reported that the length of first instar larva of *Propylea sp*. was 1.91 ± 0.07 mm, while breadth was 0.73 ± 0.09 mm when reared on *A. pisum*.

The duration of first instar larva varied from 1 to 2 days with a mean duration of 1.38 ± 0.49 days (Table-2). More or less similar observations were reported by Patel and Shinde [6] noticed that the duration of first instar of *Propylea sp*. lasted for 1.64 ± 0.48 days when fed on lucerne aphid, *A. pisum*.

Second instar larva

The freshly moulted second instar larva was shining black in colour with yellowish colour head capsule and later turned to dark brown to black in colour, body covered with spiny structure all over the body and black legs. The development of two orange coloured patches was observed on darso-lateral side of first abdominal segment. The larva was ventrally flat and slightly convex dorsally, abdominal segments were broader at thoracic region and tapering towards posterior end.

The result presented in Table-1 indicated that length of second instar larva varied from 3.90 to 4.65 mm (Av. 4.18 ± 0.21 mm) while breadth varied from 1.02 to 1.38 mm (Av. 1.20 ± 0.09 mm). Patel and Shinde [6] reported that the length of second instar larva of *Propylea sp*. was 3.44 ± 0.19 mm, while breadth varied was 1.12 ± 0.07 mm when reared on

lucerne aphid, *A. pisum*. The present investigations are in tally with above findings.

Data presented in Table-2 exhibited that duration of second instar larva varied from 1 to 2 days with an average of 1.86 ± 0.35 days. According to Patel and Shinde [6] duration of *Propylea sp*. was 2.28 ± 0.45 days when reared on lucerne aphid, *A. pisum*; 3.2 ± 0.42 days for *C. transversalis* on cabbage aphid, *B. brassicae* (Rajan *et al*.) [8]. The discrepancy in present findings with the above workers might be due to prevailing weather conditions existing in a particular locality, different prey and predator species used during the course of investigations.

Third instar larva

The third instar larva of *H. octomaculata* was similar in general appearance to second instar larva except larger in size. In third instar larva, spiny structures were little larger than in second instar. The freshly moulted third instar larva was dark grey to black in colour with orange coloured patches. These patches were more intensified on darso-lateral side of first abdominal segment and abdominal segments were broader at thoracic region and tapering towards posterior end.

The measurement on larval length and breadth are presented in Table-1 and data indicated that the length of third instar larva varied from 5.35 to 6.31 mm with an average of 6.06 ± 0.23 mm, while breadth varied from 2.01 to 3.00 mm with an average of 2.19 ± 0.18 mm. The above findings are in support with Chakraborty and Korat [2] who reported that the length and breadth of *C. transvarsalis* third instar larva were 5.72 ± 0.02 and 1.47 ± 0.02 mm, respectively when fed on black aphid, *A. gossipii*.

It is clearly seen from Table-2 that the duration of third instar larva varied from 2 to 3 days with an average of 2.60 ± 0.49 days. The present results are disagree with the findings of Manpoog *et al*. [4] who found that the duration of third instar of *C. septempunctata* was 6.5 ± 0.5 days when fed on mustard aphid, *L. erysimi*. The disagreement of the present finding with past worker might be due to change in the predator and prey species used during the investigation and ambient temperature and adopted methodology for execution of experiment.

Fourth instar larva

The freshly moulted fourth instar larva was larger in size than third instar. Colour changed from deep black to dull black before pre pupation. A series of orange spots were developed on first and fourth abdominal segments and abdominal segments were broader at thoracic region and tapering towards posterior end.

The data presented in Table-2 revealed that the length of fourth instar larva varied from 8.04 to 9.98 mm with an average of 9.37 ± 0.41 mm, while the breadth varied from 2.17 to 3.40 mm with an average of 2.89 ± 0.38 mm (Table-1). The present findings are in agreement with the finding of Chakraborty and Korat [2] who reported that the length and breadth of fourth instar larva of *C. transvarsalis* were 9.48 ± 0.06 and 2.49 ± 0.01 mm, respectively when fed on black aphid, *A. gossypii*.

The results pertaining to larval duration of fourth instar is presented in Table-2 indicated that the fourth instar larval period varied from 3 to 4 days with an average of 3.58 ± 0.50 days. The present finding are dissimilar with Manpoog *et al*. [4] who found that the duration of fourth instar *C. septempunctata* was 8.5 ± 1.0 days when fed on mustard aphid, *L. erysimi*. The difference in larval duration of fourth instar might be due to ambient temperature, change in predator and prey species and adopted methodology during present investigation.

The total larval developmental period of *H. octomaculata* varied from 8 to 11 days with a mean duration of 9.42 ± 0.95 days when reared on *A. pisum* (Table-2). The present findings are strongly disagree with the results of Manpoog *et al*. (2016) who found that the total larval period of *C. septempunctata* grub was 26.00 ± 3.00 days when fed on mustard aphid, *L. erysimi*. The total developmental period of *C. septempunctata* was 16.66 ± 0.66 days when fed on *A. fabae* (Ali *et al.*) [1]. However, Rajan *et al*. [8] revealed that the total grub period was completed within 15.1 ± 0.74 days for *C. transversalis* on cabbage aphid, *B. brassicae*. The discrepancy in total larval duration might be due to difference in prey and predator species, environmental factors like temperature, relative humidity and adopted methodology during the present investigation.

Pre-pupal stage

The full grown fourth instar larvae stop the feeding and became sluggish with swollen body and searching for a suitable site for pupation. The larva attached its posterior abdominal segment with walls of plastic vials or on leaf surface and the shape of pre-pupa was transformed into 'C' shape and becomes pupal stage within a short period of time. The pre-pupa was similar to the fourth instar and several orange coloured patches were seen on larval body.

Data presented in Table-1 indicated that the pre-pupal length of *H. octomaculata* varied from 5.75 to 6.89 mm (Av. 6.48 ± 0.17 mm), while breadth ranged from 3.00 to 3.28 mm (Av. 3.19 ± 0.05 mm).

The duration of pre-pupal period was recorded when fourth instar grub stop the feeding to the period when it was completely transformed in to pupal stage. It is clearly seen from Table-2 that the duration of pre-pupal stage varied from 1 to 2 days (Av. 1.10 ± 0.30 days). The present findings are in conformity with the findings of Patel and Shinde [6] who reported that the pre-pupal duration of *Propylea sp*. was 1.10 ± 0.30 days when reared on lucerne aphid, *A. pisum*.

Pupa

Freshly formed pupa was shining yellow in colour and later on turned to pale orange yellow. Fully developed pupa was yellowish orange in colour. There were symmetrical black spots on each segment. Pupa was formed on walls or lower surface of the plastic vials or sometimes even on lid of the plastic vials. When pupa was disturbed, only anterior body region was moved and posterior end attached itself to a substratum. Female pupa of *H. octomaculata* was comparatively larger in size than male pupa.

Looking to the data presented in the Table-1 indicated that pupa was measured about 5.20 to 6.12 mm in length (Av. 5.58 ± 0.30 mm) and 3.07 to 4.05 mm in breadth (Av. 3.50 ± 0.26 mm).

The duration between formations of pupa to the emergence of adult beetle was recorded as pupal period. Data pertaining to pupal period is presented in Table-2 revealed that the duration of pupal stage ranged from 3 to 5 days with an average of 4.14 ± 0.57 days. The present findings are more or less in concurrence with the findings of Patel and Shinde [6] who reported that the pupal period of *Propylea sp*. was 4.90 ± 0.76 days when reared on lucerne aphid, *A. pisum*.

Adults

The newly emerged adults were soft, yellowish in colour without any markings, later on adults developed yellowish orange in colour with black patches on pronotum and elytra. Further, adults stayed for few hours on the pupal cases thereon body hardened and turned yellowish orange in appearance. The male beetle was small, oval, convex dorsally and flat ventrally. The pronotum was yellowish orange in colour with 'M' shaped black patches or sometimes without black patches. Further, yellowish orange coloured elytra had two to four black spots or sometimes without black spots on each proximal end while the large black spots on each distal end of the elytra. Female was similar to male in external appearance except larger in size and last abdominal segment of female was pointed for egg laying whereas it was roundish in adult male.

The measurements of adult length and breadth of *H. octomaculata* are presented in Table-1 revealed that the length of female varied from 6.20 to 6.88 mm (Av. 6.65 ± 0.20 mm) and breadth varied from 4.80 to 5.25 mm (Av. 5.00 ± 0.11 mm). The length of male varied from 5.22 to 6.20 mm (Av. 5.69 ± 0.29) and breadth varied from 4.12 to 4.55 mm (Av. 4.22 ± 0.13). The data indicated that the female were relatively larger in size than males.

Data presented in Table-2 indicated that the adult emergence varied from 82.61 to 95.45 per cent with an average of 92.17 ± 2.91 per cent. The present finding is more or less in conformity with findings of Patel and Shinde [6] who reported that the per cent adult emergence varied from 80.00 to 91.67 per cent with an average of 86.81 ± 3.10 per cent. The data presented on adult longevity of *H. octomaculata* in Table-2 indicated that male survived for 25 to 31 days with a mean of 28.02 ± 1.48 days while that of female lasted for 32 to 40 days with a mean of 35.50 ± 1.71 days. The overall data showed that female adults lived longer than male.

Sex ratio

To study the sex ratio counted numbers of pupae were kept in different plastic vials. The emerged male and female adults were differentiated based on sex and also with their morphological characters. The sex ratio was worked out from laboratory reared culture during the study period. The results depicted in Table-2 indicated that, out of 498 adults emerged from laboratory culture, 211 were males and 287 were females which implies that the preponderance of female adult. The sex ratio of male: female was varied from 1:1.14 to 1:1.80 with an average of 1:1.39. Patel and Shinde [6] reported that the sex ratio for *Propylea sp*. was 1:1.40 when reared on lucerne aphid, *A. pisum*. The findings of past workers are in agreement with the present findings.

Pre-oviposition, Oviposition and Post oviposition period

Pre-oviposition period

The time period from emergence of adult from pupae to the starting of egg laying was considered as pre-oviposition period. It can be seen from Table-2 that the pre-oviposition period varied from 7 to 11 days with an average of 8.28 ± 1.11 days. Patel and Shinde [6] reported that the pre-oviposition period of *Propylea sp*. was 8.01 ± 0.89 days when reared on lucerne aphid, *A. pisum*.

Oviposition period

The frequent mating was observed during oviposition period. A male ladybird approaches to female, stay for few seconds, legs and antennae were moved and mounted on the posterior end of the female. During mounting process, the female remain motionless and sometimes female refused to mate. Thereafter, male holds the female elytra with his middle legs, bent the tip of his abdomen downwards and inserted the aedaegus into the female genitalia and made copulatory attempt succesful. During mating, the female occasionally moved by carrying the male on her back to find a suitable substratum and preyed on *A. pisum*. After successful mating, female moved randomly and cleaned mouthparts and antennae with her forelegs. More or less similar observation was made by Omkar and Pervez [5]. Further, the female oviposit on inner side of the plastic vials or both surface of leaf and also on muslin cloth.

The period between laying the eggs to the ceasing of the egg laying was considered as oviposition period. Looking to the data presented in Table-2 indicated that oviposition period varied from 18 to 24 days with an average of 19.42 ± 1.44 days. Patel and Shinde [6] reported that the oviposition period of *Propylea sp*. was 21.04 ± 1.76 days when reared on lucerne aphid, *A. pisum*. The variation in oviposition period of *H. octomaculata* might be due to different predatory coccinellid and host insects used in their experiment, prevailing weather conditions in a particular locality.

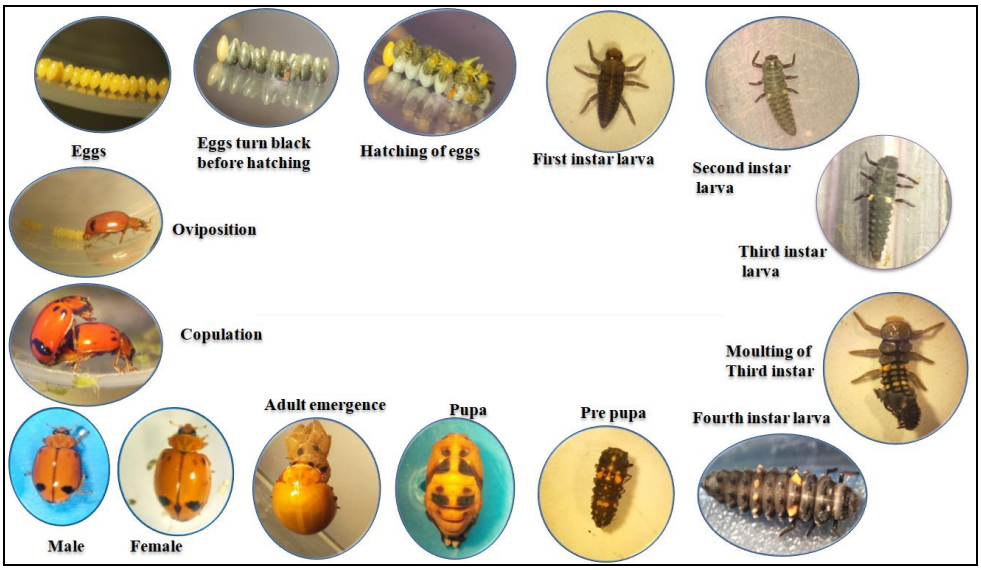

Plate 1: Various life stages of *H. octomaculata* under laboratory condition

Post-oviposition period

Post oviposition period of female was recorded as period between date of female ceased egg laying to the death of the female adult. The data presented in Table-2 revealed that the post oviposition period lasted for 6 to 9 days with a mean duration of 7.80 ± 0.93 days. Patel and Shinde [6] reported that the post oviposition period of *Propylea sp*. was 6.30 ± 1.34 days when reared on lucerne aphid, *A. pisum*. The findings of above worker are more or less in conformity with the present investigations.

Table 1: Morphometrics of different life stages of *H. octomaculata* on *A. pisum*

Stage	Length (mm)			Breadth (mm)		
	Min	Max	Av. ± S.D.	Min	Max	Av. ± S.D.
Eggs	1.25	1.37	1.31 ± 0.04	0.48	0.59	0.56 ±0.03
Larva						
I instar	1.75	2.08	1.92 ± 0.08	0.64	0.77	0.69 ± 0.30
II instar	3.90	4.65	4.18 ± 0.21	1.02	1.38	1.20 ± 0.09
III instar	5.35	6.31	6.06 ± 0.23	2.01	3.00	2.19 ± 0.18
IV instar	8.04	9.98	9.37 ± 0.41	2.17	3.40	2.89 ± 0.38
Pre-pupa and pupa						
Pre pupa	5.75	6.89	6.48 ± 0.17	3.00	3.28	3.19 ± 0.05
Pupa	5.20	6.12	5.58 ± 0.30	3.07	4.05	3.50 ± 0.26
Adult						
Male	5.22	6.20	5.69 ± 0.29	4.12	4.55	4.22 ± 0.13
Female	6.20	6.88	6.65 ± 0.20	4.80	5.25	5.00 ± 0.11

Table 2: Life cycle of *H. octomaculata* on Lucerne aphid, *A. pisum* under laboratory condition

Sr. No.	Particulars	No. observed	Period (Days)		
			Min.	Max.	Av. ± S.D.
1	Incubation period (Days)	50	3	4	3.44 ± 0.50
2	Hatching percentage	984	91.18	97.87	94.37 ± 2.00
3	**Larval period (Days)**				
	I instar	50	1	2	1.38 ± 0.49
	II instar	50	1	2	1.86 ± 0.35
	III instar	50	2	3	2.60 ± 0.49
	IV instar	50	3	4	3.58 ± 0.50
	Total larval period (Days)	200	8	11	9.42 ± 0.95
4	Pre-pupal (Days)	50	1	2	1.10 ± 0.30
5	Pupal period (Days)	50	3	5	4.14 ± 0.57
6	Pre-oviposition period (Days)	50	7	11	8.28 ± 1.11
7	Oviposition period (Days)	50	18	24	19.42 ± 1.44
8	Post-oviposition period (Days)	50	6	9	7.8 ± 0.93
9	Adult emergence (%)	25	82.61	95.45	92.17 ± 2.91
10	Sex ratio (Male: Female)	25	1: 1.14	1: 1.80	1: 1.39
11	**Adult longevity (Days)**				
	Male	50	25	31	28.02 ± 1.48
	Female	50	32	40	35.50 ± 1.71
12	Total life cycle (Days)				
	Male	50	42	49	46.14 ± 1.69
	Female	50	49	57	53.64 ± 1.97
13	Fecundity (Nos.)	25	314	530	396.16 ± 54.57

Fecundity

The result obtained on the egg laying capacity of gravid female is presented in Table-2 indicated that the fecundity of gravid female ranged from 314 to 530 eggs with an average of 396.16 ± 54.57 eggs. The result pertaining to fecundity of *H. octomaculata* is more or less similar to Shinde [10] who noted that fecundity of *C. sexmaculata* was 325.65 ± 53.89 eggs when reared on *L. erysimi*.

Total life cycle

The total life span of *H. octomaculata* is presented in the Table-2. The total life cycle of male varied from 42 to 49 days with an average of 46.14 ± 1.69 days while the female lifespan varied from 49 to 57 days with a mean of 53.64 ± 1.97 days. Patel and Shinde [6] reported that the total life cycle of male and female of *Propylea sp*. was 44.58 ± 3.59 and 46.42 ± 4.64 days, respectively when reared on lucerne aphid, *A. pisum*. The difference in entire lifespan might be due to the different predator and prey species and due to the variation in the host nutrition.

Conclusion

The results concluded that the spotted ladybird beetle, *H. octomaculata*, a holometabolous insect that exhibited complete metamorphosis and passed through egg, four larval instars, pre-pupa, pupa and adult stages. The mean incubation period was 3.44 ± 0.50 days. The average hatching percentage was 94.37 ± 2.00 per cent. The total larval duration was 9.42 ± 0.95 days. The average pre-pupal and pupal duration were 1.1 ± 0.3 and 4.14 ± 0.57 days, respectively. The adult emergence of *H. octomaculata* was 92.17 ± 2.91 per cent. The sex ratio (Male: Female) was 1:1.39. The fecundity was 396.16 ± 54.57 eggs during her 19.42 ± 1.44 days ovipositional period. The male and female adult lived for

28.02 ± 1.48 and 35.50 ± 1.71 days, respectively while average total lifespan of male and female were recorded as 46.14 ± 1.69 and 53.64 ± 1.97 days, respectively. Hence the predator, *H. octomaculata* posses a good biological attributes. Therefore the knowledge on biology of predatory insects plays a critical role in mass rearing and utilization in sucking pest management programme.

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