Research Article

Examine the Morphometric and Survival Duration of Life-Emerging Stages of Coccinellidae *Septumpunctata* Lady Bird Beetles (*Coccinellidae: Coleopteran*)

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Abstract | The current research work observes various life growing phases of *Coccinellidae Septempunctata* (*Coccinellidae: Coleoptera*) under laboratory controlled conditions (25±27˚C and 48.29%), at department of Zoology/ Government College University Hyderabad, from February to June 2023. It was noted that eggs of *Coccinellidae; Septempunctata* were tiny bright yellow- crimson, oval, or spindle-shaped, and they are arranged in leaves or stems in batches (clusters) of varying sizes or individually. The average length and width were 0.92±1.12mm, 0.96±1.15mm respectively. 1st, 2nd, 3rd and 4th instar measured, 1.93±0.058mm,4.29±0.28mm, 5.31± 0.2522mm and 7.30± 0.245 in length respectively, and 0.45±0.6mm, 0.57±0.98mm, 1.4±2.25mm and 1.4±2.25mm in width individually. The typical puparia's width and length was measured 3.2 ± 0.04mm & 3.0±3.6mm respectively. The adult ♂: ♀ morph measurements with average length and width of male (3.4 ± 0.01mm and 3.0±3.6mm) and average length and width of female (5.4 ± 0.02mm and 3.25-4.8 mm) respectively, but the average body length of common adult lady bird beetle is 7.6±*12.7 mm [0.3–0.5 in*]. The duration of egg hatching is 3-4 days after emergence with average development period was "4.3±0.81" days. The developmental time of four larval instars (1st, 2nd, 3rd, and 4th) was estimated based on an average duration (after 2 days of the 4th grub becoming inactive and stopping feeding (10-30days) 3.9 ± 0.37, 3.8 ± 0.46, 3.8 ± 0.48, and 4.8 ± 0.80 days respectively.3.12 days (5.2±0.59) was the average growing time for "pre-pupal and pupal," respectively. The adult (♂: ♀) developmental time (22.2 ± 0.11days and 22.2 ± 0.09 days) respectively. The period preceding oviposition was observed to average 4.2 ± 2.0 days, whereas the average time of oviposition was 5.0 ± 10.5 days. Fecundity 200-300 eggs per-day (per cluster 15-25 eggs). Sex ratio ♂: ♀ was 1:2. When adults predation efficiency on different Aphids, *Coccinellidae Septempunctata* were fed *Aphis Myzus Persicae, S. graminum*, *Brevicoryne brassicae*, with number of each aphid species 972-1010 such as longevity extended mature Male 9.0 ± 20.1 days and female 8.4 ± 29.7 days, while immature adults of *Coccinellidae Septempunctata* were fed on same number *Aphis Myzus Persicae* there were significantly different longevity (P<00.5), longevity of males and females averaged 70.2 ± 20.0, and 72.4 ± 20.4 days respectively.

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Introduction

Although *Coccinellidae Septumpunctata* originated in Europe and Asia, it is currently found North American regions (Canada and the United States), India, and the Middle East.The US intentionally imported *C.septempunctata* between 1951 and 1971 to control the amount of crop-damaging aphids. Lady bird beetles are another name for lady bugs. According to Kausar Saeed *et al.* (2016), they are members of the *Coleoptera* order and the *Coccinellidae* family. Most people know the Aphidophagous *Coccinellidae septempunctata L.* as the seven-spotted ladybird beetle. One of its imminent predators is the mustard aphid, "Lipaphis Erysimi" (Kalt.), a significant rape seed and mustard pest. This beetle's status as a naturally occurring bio-control agent of mustard aphid is particularly notable (Mathur, 1983). Lady beetle adults and larvae are mainly known for being aphid predators, sometimes known as plant lice, but they also consume a wide range of other pests, such as mealy bugs, spider mites, Colorado potato beetle eggs, European corn borer larvae, and pollen and plant mildews. The most prevalent ladybird beetle known in "Egypt" is the 7- marked variety, *lady bird beetle.* (Coleoptera: Coccinellidae). It is a significant aphid pillager, eating eggs, young mealy bugs, Jassids, cotton leaf worm larvae, and many other types of aphids (Ibrahim, 1955; Ibrahim, 1948). It is possible to use these predatory beetles for biological control of insects infestations, as both the adult and larval stages consume pests.Such aphids and scale insects, are consumed by both the adult and larval stages of the life cycle. To exploit their potential for biological control in the majority of agricultural systems, ladybird beetle augmentative releases and management methods are seriously emphasized (Ali and Rizvi, 2007). The mustard aphid *L. erysimi's* natural enemies were most abundant (41.97%) *C. septempunctata* species in farmers' fields. Until harvest, all of the crop's natural enemies exhibited an upward trend, although *coccinellids* predominated due to the largest relative abundance of *C.septempunctata*.

Because insects have numerous developmental stages and mortality rates and it can vary from one to the next, the life table is a particularly useful tool for studying insects. It generates summary information such as life expectancy and makes it easier to analyse insect population mortality. Holometabolous insects, *C.septempunctatae* go through four stages in their life cycle: "egg, larva, pupa, and adult" (Pervez, 2004). There is a inconsistency in the published data, with a lot of information on predation, growth, and fecundity and little information on mating behavior, age-specific fecundity, life tables, etc. Which are serious pests of the crops, they prefer especially soft bodied nymph of aphids. An adult ladybird beetle can consume aphids equivalent to its own weight, and a single larva is capable of consuming up to 50 aphids per day.

Members of the subfamily species Fabaceas and *Epilaechninae* are phytophagous and certain species are agricultural crop pests (Dieke, 1947; Li *et al.*, 2020). They like aphid nymphs with particularly delicate bodies for eating. In addition to meal bugs, they favour tiny insects like mites and white flies. Anwarullah (1966) stated that the average adult red spider may consume 2, 23, 29 red spider eggs, larvae, and adult mites, respectively. An adult alone may consume up to 5,000 aphids in its complete life time. In contrast a female beetle consume up to 300 aphids before laying eggs (Dixon, 2000). These lovely insects are renowned for their naturally occurring aphid bio control chemicals (Mathur, 1983). According to Kausar Saeed *et al.* (2016*)* in winters adults hide themselves in the holes of tree or any possible hiding place. The Fauna *Coccinellids hibernate* separately in small groups under the leaves. Aphids that feed on commercially significant plants, such rose, wheat, and brassica, might be suitable food sources for *C.septempunctata* that is mass reared.

The amount of prey affects the size of the clutch and the rate of female fertility (Anthony and Guo, 1993). This has a major impact on all larval instars' intake of aphids. For instance, as aphid density rises, *C.septempunctata* larvae consume considerably more *L.erysimi* (Solangi *et al.*, 2007). The most intriguing aspect of the biology of these insects, *Coccinellidae* beetles, is their seasonal migration and mass aggression. In the winter, these creatures battle for hibernation in well-heated forest clearings, which serve as their most advantageous hiding places. Aggression for the sack of hibernation is carried out in a designated area. Globally, people have observed this phenomenon. As holometabolous insects, lady bird battles go through 4 phases in their life cycle: "egg, larva, pupa, and adult". Four larval instars and three molting phases have been observed in lady bugs (Pervez, 2004). Twenty aphid species from the four subfamilies *Aphidinae, Calaptidinae, Chaitophorinae*,

and *Lachininae* are consumed by this auxiliary (Halima *et al*., 2010), It is thought to be among the most common aphidophagous insects (Saharaoui *et al*., 2001). Due to this lady bird beetles are very beneficial in plummeting pest population. "There is an imbalance in the material that has been published, with lots of data on predation, growth, and fecundity and little data on mating behavior, age-specific fecundity, life tables, etc. Considering that our study's objectives were to produce Aphidophagous ladybird beetles in a lab to determine some of their characteristics and to provide preventative measures to increase the amount of these dangerous species' suppression by this auxiliary. Aphids may have an impact on a number of *C.septempunctata* traits, according to earlier research (Blackman, 1967; Ohashi *et al*., 2003; Obrycki, 2018). The authors of a recently published study showed that *C. septempunctata's* life table parameters were superior to those of three aphid species, which included Aphis *Craccivora Koch, Hemiptera: Aphididae, L. erysimi*, and *M. persicae*. They also concluded that M. persicae is the ideal prey for this predatory beetle (Farooq *et al*., 2018). The present investigation is an extension of earlier research. As hosts of *C. Septempunctata*, we evaluated the relative fitness of four aphid species: *Sitobion avenae Fabricius* (Hemiptera: Aphididae), *Rhopalosiphum padi Linnaeus (Hemiptera: Aphididae),* and *Schizophris graminum Rondani (Hemiptera: Aphididae).*

Furthermore, we looked into how each prey species affected the juveniles' and adults' reproductive patterns. Producing enormous amounts of the 7-spotted ladybird, (*Coccinella septempunctata L*.,) was the aim of this investigation. By lowering the quantity of insecticides used to combat a range of insect pests in an attempt to prevent environmental pollution. We also looked into how each prey species affected the juvenile and adult reproductive patterns. An age-stage two-sex life table was created to include details on the traits of *C. Septempunctata's* growth, reproduction, and survival in a laboratory environment where it was fed on a variety of host species. The present study aims to shed light on whether *C. Septempunctata* may be mass-produced and used as a potential bio-control agent for pest management.

Materials and Methods

Rearing culture of C. Septempunctata

The adult Septempunctata (seven-spotted) ladybird beetle specimens were collected from alpha alpha plant samples between the beginning of February and the end of June. The samples were collected from the Hyderabad region's fields, which are located at 25.367 °N latitude and 68.367 °E longitude, using insect nets and manual picking methods. During the field survey, which was conducted by direct observation of the foliage between 6:00 a.m. and 5:00 p.m., very active behavior and the high capacity of lady bird beetles dispersion were observed. Both adult and immature *C. Septempunctata* were moved to 40 x 42 x 40 cm cages in the Zoology Department of Government College University Hyderabad. Supplied with matched aphid species nymphs from previously established aphid cultures and maintained for 16–8 hours (L: D) in a laboratory setting at 25±27°C and 48.29% relative humidity. Fifty eggs from the above-maintained cultures were cultured in petri dishes kept at the previously specified laboratory conditions in order to analyses the life cycle of *Septempunctata* (seven spotted). Every 12 hours, the eggs were checked on. The developing larvae were first fed on the first and second instars of several prey species after being individually placed into different petri dishes. The first and second instars of the prey species were fed to the emerging larvae after they were individually moved to different petri plates. Aphids in their third and fourth in stars were fed to the larval instars that followed. Until they pupated, the larvae were observed every twelve hours. Immature aphids were continuously supplied to the first-instar larvae and emerging adults. All specimens of ladybird beetles were carefully collected and put on plastic jars and cover them with mosquito net and taken them into the laboratory for their biology. According to shape paper were installed in the breeding box to increase the egg laying area in addition pieces of stem and leaves of alfalfa plant were placed into the breeding box to increase the life span of aphid population which involve different stages of development and due to egg hiding habit that have been noted in lady bugs. Following a 24-hour period of mating, adult male-female pairs were moved to different petri dishes for longevity research, and the gravid females were observed until their deaths in terms of oviposition, longevity, and reproductive length. Every person's survival and fecundity (the quantity of eggs they produced) were tracked every day until they passed away. The TWOSEX-MS Chart program was used to assess the developmental time, fecundity, adult pre-oviposition period (APOP), and total pre-oviposition period (TPOP) based on the two-sex age-stage replications. Life expectancy

and the age-specific survival rate were computed. The initial C. septempunctata populations (generated from 50 eggs) were likely to last for two months in order to quantify the overall population increase on several aphid species. The eggs and pupae were taken out of the culture after one cohort was raised. The pups were transferred to 80 mm by 20 mm Petri dishes. In contrast, the eggs were kept in an incubator with comparable laboratory settings on tissue paper that had been drenched in water. The culture of rearing of is followed by *C.septempunctata* (seven spotted) (Ali and Rizvi, 2010; Xiao *et al*., 2016; Chi and Liu, 1985).

Collection of aphids

For the bio control experiment, cast-off pests in conservatories described to be suitable prey for *Coccinella Septempunctata. C.septempunctata* was reared on *Aphis Myzus Persicae, S. graminum*, *Brevicoryne brassicae*. Aphids were gathered from various agricultural fields, including vegetable crops belonging to the Solanaceae, Chenopodiaceous, Compositae, *Brassicaceae*, and Cucurbitaceous families, in the vicinity of Hyderabad [25.367 °N latitude and 68.367 °E longitude], in order to cultivate a sufficient number of aphids. In the laboratory at the Zoology Department of Government College University Hyderabad, they were housed in 400ml plastic jars and moved to 40 42 40cm plastic cages for mass culture. They were fed mustard corn and lucerne leaves that were kept on solid 1% on fresh leaves of Triticum aestivum agar solution in the bottom of petri dishes (80 mm to 40 mm) that were covered with mesh net and overturned. *Coccinellidae Septempunctata* females were taken out of the culture and allowed to mate with males in Petri dishes (80 mm-10 mm) covered with muslin cloth in order to produce cohorts of desired larval instars. We employed a 16 L: 8D light regime and a temperature of 23.5 °C. We also employed *Rhodobium porosum* (sanderson), a pest species that isn't considered a good prey species, for the consuming trial. These aphids were raised similarly, but fed on the leaves of lucerne, brassica and maize. Using a tiny camel hair brush, the neonates were transferred to several cages with new wheat leaves after hatching. The cultures' relative humidity and temperature were kept at 70–5% and 24–1°C, respectively. Since none of the species or specimens gathered were endangered, the government did not seek specific approval for the field collection (Gupta *et al*., 2012, Blackman, 1965).

Consumption experiment

To avoid cannibalism, beetles were feed aphids and small insects on regular basis (*Aphis fabae Scopoli*, 1763) harvested from field. Each pair was placed on a plastic jar and monitored to calculate average matting length once matting was complete and eggs have been laid males were returned to the breeding container whereas females remind on the plastic jars. Breeding containers and plastic jars were cleaned and dried daily to prevent the production of molds due to excess moisture. Complete process of breeding were carried out under laboratory conditions. Every day, the lowest, highest, average temperatures and the humidity were noted. Each female's eggs were extracted and placed individually on a petri plate, labelled with the date of laying and the quantity of eggs laid. Later, the hatching date and the quantity of hatched eggs were noted. The first instar larvae were collected with a soft brush after the eggs had hatched, placed individually on petri dishes, and covered with mosquito net. The larvae were fed aphids every day (roughly 20 for the first two instars and about 100 for the last instars), and it was noted if there was any moulting that would indicate a change in larval stage and the emergence of newly adult coccinellidae coleopterans.

Bio-control experiment

Female ladybirds were individually moved to Petri plates (80 mm to 35 mm) filled with corn, mustard, and alfalfa leaves after being enclosed from the pupae. There, they were given free access to the target aphid species at a temperature of 23.5 to 1°C. By doing this, we accustomed them to eating aphids, which would stop them from spreading right away when they were put onto the experiment's aphid-infested plants. Only virgins aged between 2 and 17 days, with a body length of roughly 6 mm (the mean size), and devoid of elytra tissue were utilised in order to reduce phenotypic variance.

Nine cages (2.65 × 0.75 × 1.25 m) with a solid bottom and fine mesh net were used for the experiments. They were housed in a greenhouse with minimum temperatures of 22.5°C during the day and 21.5°C at night. On the bottom of each cage, a single mustard that was 65 to 80 cm tall and out of contact with the cage was positioned. Each plant had at least six leaves infested with 20–65 aphids of one of the aphid species.

After settling and reproducing for one to three days,

aphids were counted. The plants were subsequently assigned at random to one of three ladybird treatments, where a single beetle was perched atop the plant's lowest leaf. Its whereabouts (on/off the plant) was tracked at eleven different times during the day for the next 48 hours. After that, it was taken out of the cage, and the number of aphids still on the plants was tallied. Every therapy was repeated twelve times for *M.persicae.*

Statistical analysis

Time zero by the final aphid count 48 hours after ladybird release. We used SPSS 15.0's non-parametric statistics and an ANOVA for each aphid species independently. (Chi *et al.*, 2013). In order to examine the location of the ladybird beetles in the bio-control experiment, we fitted a GLM using a binomial error distribution for every time point and ladybird morph as a component. In order to identify the effects of ladybird morph, we next eliminated the factor from the model and used a Chi-square test on the residual deviances to compare the reduced model with the original. A beetle's absence was considered a missing value for that particular time period. To examine how treatments affected the number of aphids in the bio-control experiment, we employed an Analysis of Variance (ANOVA) on aphid population increase. Aphid population growth was determined by dividing the starting aphid count at

Results and Discussion

Four of the most prevalent aphids *(R. padi, R. maidis, S. avenae, and S. graminum*) were used to monitor the life cycle of *C.septempunctata*. Morphometric traits of the eggs, larvae, and pupae were noted, as well as developmental time. In addition to this, the life stages and developmental time of *C.septempunctata* on feeding diet were observed in several Aphids under laboratory-controlled settings (temperature 26±31°C, humidity 55–65%).

The female of *C.septempunctata* produces clusters of eggs (five to thirty eggs per cluster), and the four larval stars (first, second, third, and fourth instars) differ not only in size and colour but also in the prominence of their antennae and labial palps. The larvae have elongated bodies and bumpy exoskeletons, which are characteristics that set *C. Septempunctata* lady bird beetles apart.

Eggs: Before hatching, the bright yellow eggs of *C. Septempunctata* turned dark yellow. The eggs have a spindle shape, with both ends slightly rounded and extended oval or cigar-shaped. Clusters of *Septempunctata* eggs were placed on plants that were frequently close to their food. Like the majority of ladybird beetle species, *C.septempunctata* fixes its eggs at one end so that they are upright (Figure 2b).

The morphometric analysis revealed that the egg's length ranged from 0.2 to 2.0 mm, with a mean of 0.92±1.12 mm, and its width ranged from 0.1 to 0.3, with means of 0.92±1.12 mm and 0.96±1.15 mm, respectively (Table 1). The average incubation period was 4.3±0.81 days, and the egg hatched 3–4 days after emergence (Table 1).

Table 1: *Duration of development, body length and mortality rates of life cycle stages coccinellidae reared on a different Aphids.*

Stage	Length (±SD mm)	Width (±SDmm)	Developmental duration (days)
Egg	0.92±1.12 mm	0.96±1.15mm	4.3 ± 0.81
1st instar larvae	1.93±0.058	0.45 ± 0.6mm	3.9, ± 0. 37
2nd instar larvae	4.29± 0.282	0.57±0.98mm	3.8 ± 0. 46
3rd instar larvae	5.31± 0.252	1.4±2.25mm	3.8 ± 0. 48
4th instar larvae	7.30± 0.245	1.4±2.25mm	4.8 ± 0. 80
Pre-pupae	2.93±0.49m	3.89±0.20mm	1/ half day
Pupa	3.2 ± 0.04	3.0±3.6mm	5.2 ± 0. 59
Adult male	3.4 ± 0.01	3.0±3.6mm	22.2 ± 0. 11
Adult female	5.4 ± 0.02	3.254.8 mm	22.2 ± 0. 09

Larvae (1st, 2nd, 3rd, 4th instars)

The larvae of *C. Septempunctata* go through four instars. The first instar was tiny and translucent when it first appeared, and it remained motionless for roughly twenty-four hours until it turned dark. On the black background, it appears as coloured patches of pale yellow. The first instars show the modest size of the maxillae and mandible, and setae were seen on every portion of the body, but particularly on the dorsolateral part (Figure 2c,) with length 1-2mm (1.93±0.058mm) and width 0.2-0.4mm (0.45 ± 0.6mm) (Table 1).

2nd instar & 3rd instar antenna and Labial palpations became more exposed as the larvae become mature and their morpho measures slightly different (Figure. No 2, d-e). The second instars length 4-5mm (4.29±0.28mm) little bit larger than first instar its abdomen is broad and tapered and width 1-2mm (0.57±0.98mm) (Table 1). The 3rd instars length 6-5mm (5.31± 0.2522mm) and 2-3mm (1.4±2.25mm) (Table No.1). In the 4th instar every 3ree antennal segments were obvious mandible and maxillae are glowing recognized. 4th instars larvae length measured up to 6-7mm (7.30± 0.245) and width 3-4mm (1.4±2.25mm) (Table 1), respectively. According to our findings; the developmental time of four larval instars (1st, 2nd, 3rd, and 4th) have been found with averaging duration (10-30days) 3.9 ± 0. 37, 3.8 ± 0. 46, 3.8 ± 0.48 and 4.8 ± 0.80 days respectively (Table 1)

Pre-Pupae: The mature 4th instar larvae slightly inactive and stop nourishing and remain slothful but metabolically and insensitive to any kind of disturbance. They become shorten in their length and attached with the petri dish at the caudal extremity. These have a crescent form and are light golden in colour, with a slate grey to black exterior that occasionally has orange or white markings (Figure 2f) Pre-pupae were 2-3 mm in size, with an average of 2.93±0.49 m, and 2-4 mm in width, with an average of 3.89±0.20 mm (Table 1). One to half days was the developmental period.

Pupae The pupa's shape was a crescent black marking that linked end to end, and it eventually turned pale orange. Nine segments were visible, while the final larval exuviate obscured the remaining segments. (Figure 2g). The average length and width of puparia was measured 3.2 ± 0.04mm &3.0±3.6mm respectively (Table No.1). The Pupal average developmental time duration lasted 3.12 days (5.2±0.59) respectively (Table 1).

Adult: The adults *C.septempunctata* were emerged from pupae with four to five days in early morning from 7.00 to 10.00 A.M**.** They are usually colored in some combination of black and red, and often have spots on their wing covers. The body of adult beetle is convex, round to oval, its medium size, orange-red elytra (wing coverings), and black markings give it the appearance of a typical ladybird. This species is distinguished by a number of distinctive traits. It can have anything from 0 to 9 black spots, but often it has seven. Two white patches are located on either side above the single area towards the top of the elytra that crosses the two elytra. Each elytra has three points, albeit their locations can change. It is dark on the underside. On the final portion of their bodies, males have little hairs. Compared to males, females are larger (Figure 2a). The adult ♀♂ morph measurements with average length and width of male (3.4 ± 0.01mm and 3.0±3.6mm) and average length and width of female (5.4 ± 0.02mm and 3.25-4.8 mm) respectively, but the average body length of common adult lady bird beetle is 7.6*±12.7 mm [0.3–0.5 in*] (Table 1). The adult (♂: ♀) developmental time (22.2 ± 0.11days and 22.2 ± 0.09 days) respectively (Table 1).

Table 2: *Longevity and fecundity of Coccinellidae Coleopteran*

Parameters	Mean no (±SD) of days
Pre matting period	2.8 ± 1.2
Pre oviposition period	4.2 ± 2.0
Oviposition period	5.0 ± 10.5
Inter oviposition period	49.2 ± 4.3
Post oviposition period	5.9 ± 3.2
Fecundity	200-300 eggs per-day (per cluster 15-25 eggs)
Sex ratio	1:2 average (1.14±1.05) (male: female)
Longevity of matted males	9.0 ± 20.1
Longevity of matted females	8.4 ± 29.7
Longevity of unmated males	70.2 ± 20.0
Longevity of unmated females	72.4 ± 20.4

Mating period: *Coccinella Septempunctata* will breed during 10 to 14 day of sexual maturation. Although some members of the population persist into the autumn, the species' primary mating season is spring and early summer. This ensures that there will be beetles to mate with when spring arrives by drawing additional beetles to the overwintering areas. During a breeding season, males and females typically breed with several partners. Males use the five steps of approach, watch, examine, mount, and mating attempt to try to entice female partners. A male will approach a preferred girl within 1 cm and observe her without initiating physical contact. After 48hr. of emergence the mating time is started and duration of copulation lasted for 4hrs. After that, the male will investigate the female by using his own to feel her mouth and antennae. The male will attempt

to mate by climbing atop the female from behind if the female accepts him as a mate.When females do mate with males, they can do so as often as four or six times during the day, with a 10 to 45minute break in between. Each female will mate with numerous men throughout her life, with a pre-mating duration of 2.8 ± 1.2 days. (Table 2).

Oviposition period and pre-oviposition

The weakly oviposition trend of coccinellidae coleopteran exposed that 45 % of whole eggs were sited by the 5th weak; and it was clear that the high point was also the 5th weak. The average pre-oviposition period was averaged 2-4 days (4.2 ± 2.0 days) (Table 2), whereas mean oviposition period was 5-6days (5.0 ± 10.5 days) (Table 3)

Table 3: *Feeding efficiency of Seven-spotted ladybird, C. septempunctata beetle on aphids under laboratory conditions*

Aphids	No. of aphids	Plants leaves	Consumption %
Myzus Persicae (Sulzer)	972-1010	Corn, *Brassica*, Alfalfa leaves Cabbage , Cotton	99%
S. graminum	972-1010		89%
Brevicoryne brassicae,	972-1010		85%

Fecundity

The typical total number of eggs laid by a sexually mature adult female is 200–300 eggs every day (with 15–25 eggs per cluster) (Table 2). It was observed that most of the eggs were found nearest to the Aphid colonies, especially on the leaves.

Sex ratio: Male and female body sizes of the recently emerging adults were compared. The average sex ratio (male: female) is 1:2 (1.14±1.05) (Table 2).

Adult Longevity: *Coccinella Septempunctata* were fed *Aphis Myzus Persicae, S. graminum*, *Brevicoryne brassicae*, 972-1010, such as longevity extended mature Male 9.0 ± 20.1 days and female 8.4 ± 29.7 days, while immature adults of *Coccinellidae Septempunctata* were fed on same number *S. graminum*, *Brevicoryne brassicae*, *Aphis Myzus Persicae* there were significantly different longevity (P<00.5), longevity of males and females averaged 70.2 ± 20.0, and 72.4 ± 20.4 days respectively. The matted males and females lived for 80.3 days and 9.9 days. Whereas unmated males and females lived 70.2 and 75.3 days Longevity of unmated male and female was 70.2 ± 20.0 and 72.4 ± 20.4 respectively, (Table 2). The consumption % was highest on the *Aphis Myzus Persicae as compare to other aphids S. graminum*, *Brevicoryne brassicae*, throughout the different seasons and crops (Table 3). According to regression analysis between pest and predator indicates the (+ve) correlation with (y=2.03567; x= 0.0536; p=0.004), (Figure 1).The result of current research states that the inhabitants of predators *C.septempunctata* was grow rapidly with increase the inhabitants of Aphids.

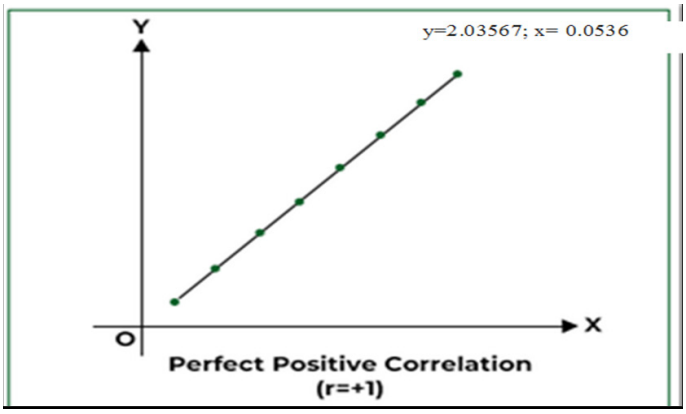

Figure 1: *Shows the consumption co-relation between the Sevens spotted beetles and Aphids*

Primarily found in biotopes, meadows, fields, Pontic–Caspian steppe, parkland, gardens, Western European broadleaf forests, and mixed woods, *C.septempunctata* is the world's best aphid predator. Current laboratory-based experimental work Predator traits including as longevity, fertility, and survival were found to be influenced by the quality of the prey on various diets. The current findings display the morphometric analysis, including the egg's size (0.2-2.0 m) (Table 1) and the egg's morphology matched that of earlier research (Sahito *et al.*, 2019), such as laying and hatching period similarly the single clusters eggs per female ranged from 20-25 eggs. Mahyoub (2013) and Agarwala and Dixon (2013) observed on Adalia decempunctata and C.se*ptempunctata*. They observed that healthy eggs in a batch may hatch successively over a period of several hours. The incubation or hatching period was recorded two to four days with an average 3.10 ± 0.22 days (Table 2), same results were discovered by Sattar *et al.* (2008), Xu (1985), Nasiruddin and Islam (1979) hatching period two days on cotton Aphids, although Ngammuang (1987) and Prodhan *et al.* (1995) reported that it was two –three days respectively using on been aphids as host while above studies are very close to current observations on

brassica Aphids. The larvae of *C.septempunctata passes* '4th instars' *with* different size and morphology. The "first instar" was very small, transcullent, and inactive for 24hrs. Same results describe by Sahito *et al.* (2019), here this study also contradict with (Mahyoub, 2013) according to him it was resting conditions for one hr (Figure a, b). According to current observation 1st instars appear with black back ground with white spotted; visible character of maxillae and mandible in small size and setae were observed on all part of the body especially on the dorso lateral part, same study of morphology characteristic of 1st instar larvae was discussed in coccinellidae family by Kemabonta (2018).

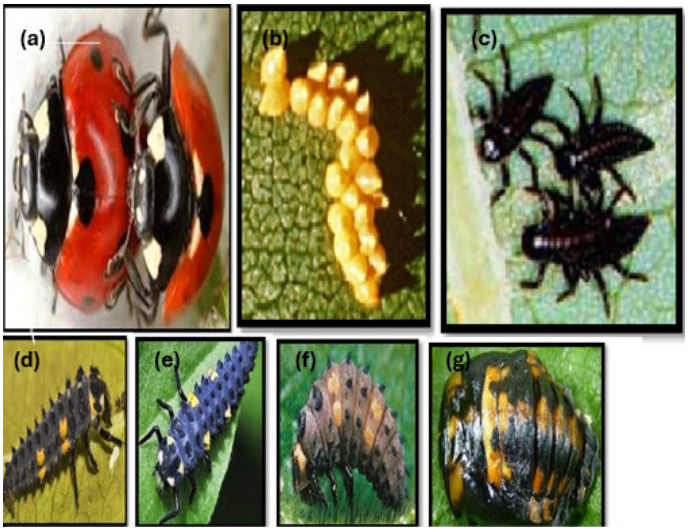

Figure 2: *SEPTUMPUNCTATA (SEVEN SPOT-TED); 2a, male, female, 2b, eggs; 2c, 1st instar; 2d, 2nd instar; 3rd instar; 2f, Pre-pupal; 2g, Pupae*

According to Nsiamashe *et al.* (1984), morphological distinguished 2nd instar & 3rd instar same morphology such as antenna and labial palps became more noticeable as the larvae become older and their morpho measures slightly different (Kemabonta, 2018). The 4th instar morphology differentiate from other instars on the basses antennal segments and well developed maxillae and mandibles same discussed by the Kemabonta (2018) It stops eating for a full day before the fourth instar pupates and uses the tip of its body to cling to a surface, like a leaf. The morphology of *C.septempunctata* pupae is described by various researchers, as we have observed that pupae were shorten in their length and attached with the petri dish at the caudal and morphology almost resemble to study of Sahito *et al.* (2019) and Kemabonta (2018) described that pupal stage hang its body in vertical position. Although Sahito *et al.* (2019) described that pupae shaped are "v" like which is contradict with current studies. According to current findings the developmental period was 22-25 days but different workers (Sahito *et al.*, 2019) recorded from 1st stage to adult 16.9 days which is almost nearby current observations, and similar results were observed by Fletcher (2014) according to this study total developmental time of complete life cycle of *C. septempunctata* was 13 to 29 days. Although it was contradicted with the study of Sahito *et al.* (2019) and describe that in January-February it completes life cycle in eighteen days while in October it lasts 18 days. Rana and Kakar (2000) found that the species' overall developmental periods during the months of March and April, which are close to these experiments, were 34 days, respectively. The nature of the various aphid species may be the source of the variance in larval developing time. All three species of Aphids shared the same morphometric characteristics, such as colour length and width, across all developmental stages of *C. septempunctata*. As we have used the 972-1010 specimen of different three Aphids, Aphis *Myzus Persicae, S. graminum*, *Brevicoryne brassicae*, As we saw in ten specimens of each developmental stage, there may have been an occasional tiny variance, but no appreciable alterations in each developmental stage's measurements or physical characteristics were discovered. The current findings closely matched the findings of earlier research by Debaraj and Singh (1990) reported about pupal which may last "3-12 days", are similar to above studies main reasoning for survival is favorable ecological coditiontios (temperature). Rana and kakar (2000), Sattar *et al.* (2008), Kemabonta (2018), Cantrell (2011) and Majerus Kearns (1989) observed that pupal developmental time 4.8 days. These studies of morphology and developmental time of pupae very similar to current studies. Results were found by Cantrell (2011) work generally on morphology of *C.septempunctata* which are resembles to current studies (6.50 to 7.8mm) (Sahito *et al.*, 2019) discussed the morphology of adults almost same to present study, over all their developmental time was determined from 1st stage to adult was 16.9 days although during current study observed the developmental time 22.2 days respectively. (Majerus and Kearns, 1989) were observed the same morphology as the current studies and Kontodimas *et al.* (2007) found the average longevity 2months and 4-5days of adults which is almost same to current study. According to Rana and Kakker (2000) discussed that four and seven days survival of beetles, although freshly emerged adults beetles did not mate for four to

eleven days with an average pre-mating period of six days. While current study also describe same results about the oviposition and pre-oviposition. (Table 1 describes that pre-ovipositoin time period two to four days while previous studies contradict with these studies. The different scientist discussed almost same sex ratio (♂: ♀) regarding to the *C.septempunctata* was same to this study such as 1;1 describe (Sahito *et al*., 2019, Kemabonta, 2018, Rana and Kakker, 2000). The current laboratory experiment revealed that the predatory beetle's sex ratio was biassed towards female adults. Consequently, the beetle population grew quickly, increasing the effectiveness of bio-control of aphids (Saharia, 1981). In the Coccinellidae, longevity is linked to dormancy mechanisms and prey synchronicity because species with adults that hibernate or aestivate for extended periods of time can live up to a year (Hodek, 1967), although multivoltine species in warmer climates usually only survive for two or more months. And an adult female lays 10 -15 eggs per day. In the current experimental work under laboratory conditions, the lengthy life span of both unmated and matted females and males is an advantageous trait in predator-prey interactions, although the protracted oviposition period may be a favorable trait. The predator live much longer than the prey and succeed the oviposition period of the aphid, therefore defended stable supply of meal for newly hatched larvae. All the Lady beetle beetles stages were predacious, apart from pupal stage which is not predacious in nature, thus contributing to the depletion of the prey. This step should be taken towards farmers to inform the importance of the predator in the field. A mass rearing and declare of the predator become profitable in times when the population of pest outbreak. This is an important for the integrated paste management (IPM) of Aphid overspread farm that are the major crops of country. In order to become a pupa, the larval stage must shed four times. Additionally, he discovered that the seven-spotted ladybird beetle had a stronger propensity to feed on aphids than *B. brassicae*, *A. gossypii*, *M. pisum*, and *A. craccivora*. Of these, the beetle consumed L. erysimi the most, followed by *B. brassicae* and Aphis gossypii the least. The seven-spotted ladybird beetle, on the other hand, consumed the most aphids of cabbage (B. brassicae), followed by *L. erysimi, A. craccivora,* and *A. gossypii*, according to experiments on the four aphid species. Under laboratory conditions, the adult seven-spotted ladybird beetle, *C.septempunctata*, consumed an average of 72.77 mustard aphids every day, ranging from 58 to 90 aphids (Sahito *et al*., 2019, Kemabonta, 2018, Rana and Kakker, 2000). According to our findings, the average number of *Myzus Persicae* (Sulzer) nymphs ingested daily in the lab by the first through fourth larval instar stages of *C.septempunctata* was 1.74, 18.60, 33.75, and 47.70. Additionally, a laboratory experiment was conducted to determine the seven-spotted ladybird's capacity for predatory behaviour.he findings are shown in Table 1, which demonstrates that the highest egg-laying capability (fecundity) of the adult female bird beetle suggests that the mandible and maxillae of the first larval instar are relatively tiny and conspicuous (Kemabonta, 2018; Hodek, 1967). Several species of lady bird beetles, including *Hyperaspis jucunda*, have been observed to have setae distributed throughout their whole larval instar (Ngammuang, 1987). The fact that all of the larval instars released brownish droplets when lightly pressed was an intriguing characteristic. The big repugnatorial glands, which are positioned dorsally into the intersegment skin on either side of the first 8 abdominal segments, are responsible for releasing these drops (Burkill, 1953). The labial palps and antennae were difficult to see.

Conclusions and Recommendations

The present study indicates that the seven spotted lady bird beetles coccinellidae coleopteran, is a holometabolous insect. that go through with all stages of transformation, including the egg, four larval instars, pre-pupa, pupa, and adult. The mean incubation period was 3.44 ± 0.50 days. The average hatching percentage was 80.37 ± 9.00 per cent. The larval duration was around 1 month and the pre-pupal and pupal duration were 3-12 days. Respectively, the duration of adult emergence after pupate is about to 4 days. The sex ratio of the male and female was 2: 2. The pre matting period was 2.8 ± 1.2, the pre oviposition period was 4.2 ± 2.0, the oviposition was 5.0 ± 10.5, the inter oviposition period was 49.2 ± 4.3, the post oviposition period was 5.8 ± 3.2, the average longevity of matted males and females was 9.0 ± 20.1 and 8.4 ± 29.7. The starved beetles however could survive only for four to seven days.

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Novelty Statement

For biological pest control programs understanding life stage aids habitat management. *C. septempunctata* preys on Aphids protection crops, according to research contribution filling gaps in entomological data for Pakistan's biodiversity.

Author's Contribution

Bhojoo Mal: Conduct the research work
Aiman Amur: Guidance in research work and helped in writing.
Abdul Manan Shaikh: Provided guidance during research work.
Shabana Mangi and Mansoor Anwar: Helped in field survey
Arisha Ayaz: Collection, write up, literature review
Abdul Waheed: Helped in field survey and laboratory examination
Ranjeet Kumar: Helped laboratory
Farhan Ali: Helped in field survey and experimental work

Generative AI or AI assisted technology statement
The authorsdeclare that no genrative AI was used in the creation of this manuscript.

Conflict of interest
The authors have no conflict of interest.

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