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(RESEARCH ARTICLE)

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Biological Control of Aphid by using Beetle (*Coccinella septempunctata*)

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Abstract

Development and reproductive potential of the *Coccinella septempunctata L* CSL was conducted under normal conditions to determine its fecundity and longevity on natural diet. Tests were made on normal temperature rearing materials and all development stages were carefully recorded. Diet quality is related to egg production, so CSL fertility is affected by diet type. CSL consumed highly significant (*Rhopalosiphum maidis*) approximately 28 aphids per day as compared to other treatments. The insect has the largest Oviposition, feeding on the 1st and 2nd instar of *Macrosiphum roseae*. Biological control (BC) of seven-spotted ladybirds emphasizes evaluating specific livestock for maximum efficiency, understanding agriculture in a new environment, and evaluating social interactions.

Keywords: *Coccinella septempunctata*; Cotton ball; Natural diets; Thermometer

1. Introduction

The aphidophagous ladybird beetle *Coccinella septempunctata* is one of the potential predators of the mustard aphid. These beetles are natural predators of many agricultural pests, particularly aphids, and are therefore used as a biological control agent in many farming systems. Lady bird beetle antennae are short, shorter than the front legs and are thicker at the ends than the middle and their larvae are very active and have rather rough looking bodies that are longer than the adults [6]. There are four development stages of ladybug beetle go through are embryonic, larval, pupal and adult stages [3]. Development and reproductive potential of the *Coccinella septempunctata* L [1,2] (CSL) was conducted under normal conditions to determine its fecundity and longevity on natural diet (2). Tests were made on normal temperature rearing materials and all development stages were carefully recorded [2]. Diet quality is related to egg production, so CSL fertility is affected by diet type. CSL consumed highly significant (*Rhopalosiphum maidis*) approximately 28 aphids per day as compared to other treatments. Biological control of seven-spotted ladybirds emphasizes evaluating specific livestock for maximum efficiency [2], understanding agriculture in a new environment, and evaluating social interactions.

Lady Bird Beetles, commonly known as Ladybugs, are a vital part of the ecosystem, particularly in the context of agriculture. The ladybird beetles. *Coccinella septempunctata*, is an important predator of soft-bodied insect [10]. So, it is defined as reduction of pest population by natural enemies [5]. Predatory ladybugs (Coleoptera: Coccinellidae) are important enemies of many pests in crops worldwide. [11]. The presence of Lady Bird Beetles can also serve as an indicator of ecosystem health. Both adults and larvae are predators and a single ladybug can consume perhaps as many as Health 3,000 or more aphids in its lifetime and may also feed on scale insects, mites and mealybugs [9]. By reducing pest populations, Ladybugs help to increase crop yields and quality. And its major component of food material is protein. Naturally, they fed upon aphid, thrips, spider mites and various soft body insect and their eggs [10].

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2. Materials and methods

The present study was conducted at normal temperature. During the experiment, Adults collected (CSL) were initially raised at room temperature and subsequently reconstructed and examined at each developmental stage. Three aphid prey species *Bravicoryne brassicae*, *Macrosiphum roseae* and *Rhopalosiphum maidis* were also reared within cages for feeding of *Coccinella septempunctata*. We used transparent box, cotton ball, Thermometer and natural diet for rearing. T1 *Brevicoryne brassicae*, T2 1st and 2nd in stars of *Macrosiphum rosae*, T3 *Rhopalosiphum maidis*. Beetle was collected from the college campus and for the experiment there are three diets were collected for the checking of the longevity of the beetle. One is natural diet. In natural diet there are three components are used viz. *Brevicoryne brassicae* First and second instar of *Macrosiphum rosae* and *Rhopalosiphum maidis*. *Brevicoryne brassicae* were collected for the college campus. That is also called cabbage aphid. [1, 2]. The length of *Brevicoryne brassicae* is about 1.9 to 8 mm. First and second instar of *Macrosiphum rosae* were collected form I. T. College in the month of February. It is also called rose aphid. *Rhopalosiphum maidis* were also collected from the I.T. college. It's is very destructive by nature. It is commonly called corn leaf aphid.

Figure 1 Matting occur between female ladybug beetle and male ladybug beetle

Figure 2 Pair of beetle consuming no. of *Brevicoryne brassicae*

Figure 3 Pair of beetle consuming 1st and 2nd instar of *Macrosiphum rosae*

Figure 4 Pair of beetles consuming *Rhopalosiphum maidis*

3. Result and discussion

3.1. No. of eggs are produced by the *Coccinella septempunctata* after consuming *Brevicoryne brassicae*

The pair of ladybird beetle has consumed 5 *Brevicoryne brassicae* the female beetle is produced 9 eggs in the first box. The pair of beetles have consumed 5 *Brevicoryne brassicae* then female beetle produced 10 eggs in 2nd box. The pair of beetles have consumed 6 *Brevicoryne brassicae* then female beetle produced 8 eggs in the 3rd box. The pair of beetles have consumed 7 then female beetle produced 7 eggs in the 4th box. The pair of beetles have consumed 8 *Brevicoryne brassicae* then female beetle produced 8 eggs in the 5th box (Table 1 and 2).

3.2. No. of eggs are produced by *Coccinella septempunctata* after consuming 1st and 2nd instar of *Macrosiphum rosae*

The pair of ladybird beetles have consumed 20 (1st and 2nd instar of *Macrosiphum rosae*) then female beetles produced ±15eggs in the 1st box. The beetles have consumed 20 (1st and 2nd instar of *Macrosiphum rosae*) then female is produced 15 eggs in the 2nd box. The pair of beetles have consumed 23 (1st and 2nd instar of *Macrosiphum rosae*), female beetle produced 16 eggs in the 3rd box. The pair of beetles have consumed 21 (1st and 2nd instar of *Macrosiphum rosae*), female beetle is produced 17 eggs in the 4th box. The pair of beetles have consumed 25 (1st and 2nd instar of *Macrosiphum rosae*) then female beetle is produced 17 eggs in the 5th box (Table 1 and 2).

3.3. No. of eggs are produced by *Coccinella septempunctata* after consuming *Rhopalosiphum maidis*

The pair of beetles have consumed 22 *Rhopalosiphum maidis*, female beetle is produced 17eggs 1st box. The pair of beetles have consumed 30 *Rhopalosiphum maidis*, female beetle produced eggs 20 in 2nd box. The pair of beetles have consumed 31 *Rhopalsiphum maidis*, female is produced 17 eggs in 3rd box. The pair of beetles have consumed 31 *Rhopalosiphum maidis*, female beetle is produced 17 eggs in 4th box. The pair of beetles have consumed 32 *Rhopalosiphum maidis* then female beetle produced about 18 eggs in 5th box (Table 1 and 2).

It was noted, the large no. of natural diet is consumed by the beetle is *Rhopalosiphum maidis*. Increasing order of natural diet consumed by the *Coccinella septempunctata* is:

Brevicoryne brassicae<1st and 2nd instar of *Macrosiphum rosae*<*Rhopalosiphum maidis*.

The effect of temperature and humidity on rearing of ladybird beetles in the laboratory was also observed. We found that optimal rearing conditions for ladybird beetles generally involve temperatures ranging between 20°C to 25°C [4] and relative humidity levels between 60% to 70%. These conditions promote healthy development, feeding activity, and reproduction in ladybird beetles. The nutritional requirements are very important for development of different stages of ladybird beetles. The protein-rich diets significantly enhance the growth and development of ladybird beetle larvae, leading to larger adult body size and higher species fecundity. *Coccinella septempunctata* was efficient in predation and its biological performance was the best compared to the other tested coccinellid species [8].

Table 1 No. of Natural diet (*Brevicoryne brassicae*) consumed by *Coccinella septempunctata*

Natural diets	No. of different natural diets consumed by pair of beetle in box 1	No. of different natural diets consumed by pair of beetle in box 2	No. of different natural diets consumed by pair of beetle in box 3	No. of different natural diets consumed by pair of beetle in box 4	No. of different natural diets consumed by pair of beetle in box 5
Brevicoryne brassicae	5.00	5.00	6.00	7.00	8.00
1*st and* 2*nd instar of Macrosiphum rosae*	20.0	20.0	23.0	21.0	25.0
Rhopalosiphum maidis	22.0	30.0	31.0	31.0	32.0

Table 2 No. of eggs are produced by *Coccinella septempunctata* on different natural diet

Natural diets	No. of eggs are produced by pair of beetles in 1st Box	No. of eggs are produced by pair of beetles in 2st Box	No. of eggs are produced by pair of beetles in 3st Box	No. of eggs are produced by pair of beetles in 4st Box	No. of eggs are produced by pair of beetles in 5st Box
Brevicoryne brassicae	9	10	8	7	8
1*st and* 2*nd instar of Macrosiphum rosae*	15	15	16	17	17
Rhopalosiphum maidis	17	20	17	17	18

4. Conclusion

Ladybugs predators of aphids and other plant-damaging pests. A single ladybug can consume hundreds of aphids during its lifetime. By preying on these pests, ladybugs help control their populations, reducing the need for chemical pesticides in agriculture. Ladybugs are often used as part of integrated pest management strategies in agriculture. By releasing ladybugs into crop fields, farmers can reduce the need for chemical pesticides while maintaining effective pest control.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors have no any conflict of interest for publishing this article.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study

References

[1] Abbas Sohail., Abbas Muneer., Alam Aleena., Raza Ali., 2023. Dietary assessment across various life stages of seven spoted lady beetle *Coccinella septempunctata* (coleoptera; coccinellnellidae). The journal of Basic and Applied Zoology., Vol 84.,26..

[2] Ashraf Muhammed., Ishtiaq Muhammed, Asif Muhammed., Muhammed Nauman Ayub.,2010. A study on laboratory rearing of lady Bird beetle *Coccinella septempunctata* to observe it's fecundity and longevity on natural and artificial diets., International journal of Biology., Vol 2,No.1, 165-171.

[3] Bashir Junaid., Mehraj Mudasir., Zakir Husain khan., Md.Niamat Ali.,2023. Biological control of insect and fungal pests by predominant *Coccinellnellidae* beetle., International Journal of current Microbiology and applied science.,vol-12., No. 9.

[4] Gupta Garima., R. Kumar., 2017. Growth and development of ladybird beetle *Coccinella septempunctata*L.(Coleoptera:Coccinella) on plant and animal based protein diets., Journal of Asia -Pacific Entomology.,vol 20., 959-963.

[5] Hala A. El-Serafi.,A.A. Ghanim., S.S.Awadalla., and Mona M. Shalaby 2019. Cooperative studies between on artificial and *Ephestia kuhniella* Zeller eggs on the biological aspects three different temperatures., Economic Entomology Department Faculty of agriculture. Vol. 10(i) ;65-68.

[6] Muhammad Sarwar.,2016. Recognition of some lady beetle (Coleoptera:Coccinellnellidae) deadly sighted for insect and mite pest in agreoecosystem., International journal of Entomology Research., vol 1., 29-34.

[7] Muhammed Sarwar, Muhammed Syed Saqib 2010. Rearing of predatory seven spotted ladybird beetle *Coccinella septseptempunctata* L.(Coleoptera: Coccinellnellidae) on natural and artificial diets under laboratory condition., Nuclear Institute of agriculture and department of entomology., vol.42(1)., P.P.47-51., 2010.

[8] Salam I brashim Askar., Monir Mohammed El Mussein., 2020. Energy reserve in *Coccinella septseptempunctata* (lin) (Homoptera: Aphididae) instar and their effect on predation and longevity of three coccinellnellid species under laboratory conditions., Egyptian Journal of Biological pest control., vol 30.,article no. 126.,2020.

[9] Suleman Nazia., Riaz Asia., 2023. Laboratory Approach: Alternate Dietary Source for coccinellnellid ladybird Beetles., Nuclear Institute for agriculture and biology., vol 32.,977to 981.

[10] Yi, Yu, Cheng Ying.,Yuhang Zhou., Fengliang Li 2022. Effect of various components of artificial diet on survival, development and reproduction of *Coccinella septempunctata* L. (Coleoptera: Coccinellnellidae)., Biocontrol Science and Technology. Vol 32.,2022.

[11] Yuan-Xing sun., Ya-Nan Hao., Eric W Riddick., Tong-XianLiu,2017. Facititious prey and artificial diets for predatory lady beetle; current situation, obstacles and approaches for improvement., Biocontrol Science and technology., vol. 27.,601-619.