

**THE BIOLOGY AND PREDATORY POTENTIAL OF *COCCINELLA ARCUATA*  
FABRICIUS (Coccinellidae : Coleoptera), A PREDATOR OF THE  
BROWN PLANT HOPPER *NILAPARVATA LUGENS* STAL.**

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The brown plant hopper *Nilaparvata lugens* is one of the most serious pests of rice in Kerala. Large numbers of *Coccinella arcuata* were reported to feed on nymphal stages of the pest in different parts of the State. (Abraham *et al.*, 1973) New information on the biology, feeding capacity and seasonal occurrence of this predator, obtained in objective studies, are presented in this paper.

**Materials and Methods**

Insects bred out of adults collected from rice crop infested with the brown hopper were used in these studies. Rearings to observe biology were done in cylindrical glass jars 30 cm x 20 cm covered with moistened muslin cloth. The beetles were fed on third instar nymphs of *N. lugens* cultured in the laboratory on "Jaya" rice.

To study the feeding capacity and behaviour of the different stages of the beetle, freshly emerged stages were starved for 6 hours and supplied individually with 100 each of adults and nymphs of the hopper confined on paddy plants enclosed in cylindrical glass tubes 15 cm x 3.5 cm covered by wet muslin clothing. The feeding capacity of the different stages was obtained from counts of surviving hoppers taken 24 hours after exposure. All these studies were conducted under laboratory conditions at  $28 \pm 1.5^\circ$  C and  $80 \pm 2\%$  relative humidity.

Mating in *C. arcuata* starts 5 days after adult emergence. The beetles mate repeatedly throughout the adult life at different intervals. The female starts ovipositing on the fourth day after mating and egg laying is continued for 25 days. The average number of eggs deposited per female is 210. The eggs are laid vertically in clusters of 30 to 50 on the lower surface of leaves with their long axes perpendicular to the lamina. Very rarely the eggs are deposited singly and scattered on the leaf surface in a haphazard manner. The adult may at times feed on their egg masses.

The egg is oval (Fig. 1) yellowish with smooth shiny surface and measuring 1.6 mm x 0.7 mm. Incubation period lasts for 3 days, the mean percentage of hatching being 60. The grub undergoes 4 instars. The first instar grub (Fig. 2) measuring 2.2 x 0.9 mm is, greyish in colour. The thoracic and abdominal segments

bear transverse rows of hairs dorsally. The grub remains inactive for 2 to 3 hours after hatching. If suitable prey is not available the grub turns cannibalistic feeding on eggs and grubs. Hodeck (1957) has recorded such cannibalism among coccinellid predators. The first instar lasts for 2 days. The 2nd, 3rd and 4th instars last for 2, 3 and 5 days respectively and these are characterised by the presence dorsally on the 1st and 5th abdominal segments transverse rows of yellowish tubercles each. The fully fed grub (Fig. 3) measures 10 x 3 mm.

The fully developed grub pupates on the lower surface of leaves remaining attached by the posterior end. The pupa (Fig. 4) is 7.5 mm long and 3 mm wide with light brick red colour. Dorsally, the body segments have variable number of black spots. The pupal period varies from 4 to 7 days; average being 5 days. The complete life cycle from egg to adult lasts for 20 days.

The adult is a large ladybird beetle measuring 7 mm x 4.5 mm. The elytra has varying numbers of black spots; in most cases these conspicuous spots are present toward the distal end only. (Fig. 5). In rare cases the spots become confluent and appear as a continuous band of irregular shape. The spots on the pronotum are also variable in number and relatively fainter. Such intraspecific variability with respect to elytral spotting has been reported in other coccinellids (Kapoor, 1950)

The adults prefer the first, second and third instar nymphs of *N. lugens* for feeding. The first instar grubs of *C. arcuata* feeds on first and second instar hopper nymphs, while the other stages eat all the nymphal stages of the prey.

Data on the predatory potential of different stages of *C. arcuata* on *N. lugens* are presented in Table. I. The first, second, third and fourth instar nymphs and the adults of the beetle consumed 15, 18, 25, 27 and 29 nymphs of forwn hoppers (all stages included) respectively.

Table 1

Number of *N. lugens* eaten per day by stages of *C. arcuata*

Stage of host	Number consumed per day	
	Range	Average
<i>Grubs</i>	1st instar	8-24
	2nd instar	7-82
	3rd instar	16-41
	4th instar	9-58
<i>Adults</i>		15-68
		29

Summary

The details of biology and feeding capacity of *Coccinella arcuata* Fabr., a predator of *Nilaparvata lugens* stal were studied under laboratory conditions at  $28 \pm 1.5^\circ$  C and  $80 \pm 2\%$  RH, The mean fecundity was 210 per female. The incubation period of eggs lasted for 3 days. There are four larval instars occupying 12 days followed by a pupal period of 5 days. The total life span from egg to adult emergence lasted for 20 days. The different stages in the life cycle have been discribed. On an average the freshly emerging first instar grub ate first and second instar nymphs of *N. lugens* at 15 per day. The second, third and fourth larval instars and the adults consumed all nymphal stages of the host at 18, 25, 27, 29 per day respectively. The adults occasionally feed on adult hoppers. The predatory population was maximum during February - March occurring on the 'Punja' rice crop.

സംഗ്രഹം

നെല്ലിന്റെ 'തുള്ളനെ' തിന്നുന്ന ശിപ്പിക്കുന്ന 'കോക്സിനെല്ലാ rar'o'-icsajoo<sup>1</sup> എന്ന വണ്ടിന്റെ ജീവിത ശൈലി പരീക്ഷണശാലയിൽ വിശദമായി നിരീക്ഷിക്കുകയുണ്ടായി. ഓരോ പെൺവണ്ടും 210 മുട്ടകളോളം ഇടുന്നു. ഇവ മൂന്നു ദിവസംകൊണ്ടു വിരിയും. മുട്ട വിരിഞ്ഞുണ്ടാകുന്ന പൂഴക്കൾ 12 ദിവസംകൊണ്ടു പൂർണ്ണ വളർച്ചയെത്തി സമാധിയാകുന്നു. 8 ദിവസംകൊണ്ടു സമാധിയിൽനിന്നും വണ്ടു പുറത്തുവരുന്നു. ഇവ 20 ദിവസം ജീവിച്ചിരിക്കും. മുട്ട വിരിഞ്ഞു പുറത്തുവരുന്ന പൂഴക്കൾ ഒരു ദിവസം ശരാശരി 15 തുള്ളൻ കുഞ്ഞുങ്ങളെ ഭക്ഷിക്കുന്നു. വളർച്ച കൂടുന്തോറും ഈ പൂഴക്കൾ 18 മുതൽ 29 വരെ തുള്ളൻ കുഞ്ഞുങ്ങളെയും, ചിലപ്പോൾ പൂർണ്ണ വളർച്ചയെത്തിയ തുള്ളന്മാരെയും raiffinmoa-arra. ffi.i'taajfoT-cDoA-a മാസങ്ങളിലാണ് ഈ വണ്ടു പാടത്തു ധാരാളം കണ്ടു വരുന്നത്.

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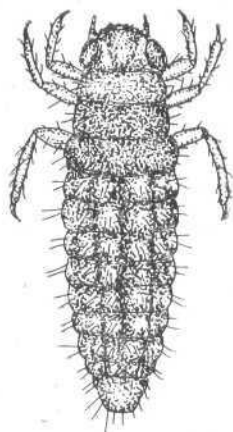
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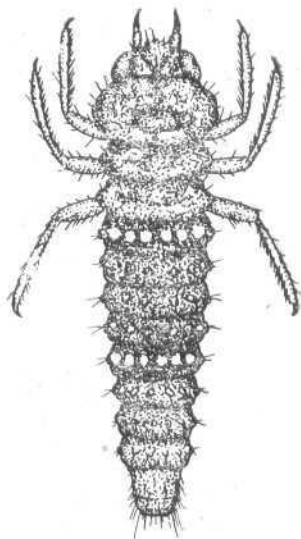
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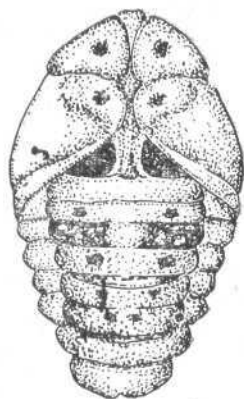
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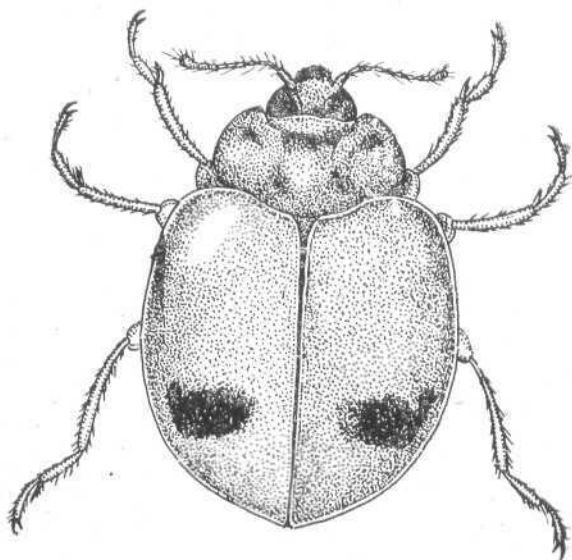
2x35



3x10



4x10



5x15

Figs. 1-5 Different stages of *Coccinella arcuata* Fabricius.

1. Egg      2. First instar larva.      3. Fourth instar larva.      4. Pupa.  
5. Adult female.