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Development and Voracity of *Chrysopa lacciperda* Kimmins on *Planococcus citri* (Risso)

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ABSTRACT

The green lace wing, *Chrysopa lacciperda* Kimmins is a predator of citrus mealybug *Planococcus citri* (Risso). A study was conducted to determine the developmental period and the ability of *C. lacciperda* to consume the nymphs of *P. citri* under laboratory conditions. Nymphs; 10-15 days old were offered. *C. lacciperda* took 22.52 days to develop from egg to adult. First, 2nd and 3rd instar larvae consumed a mean of 35.0, 96.0 and 636.1 nymphs respectively. *C. lacciperda* developed faster and consumed almost double the number of eggs of *C. cephalonica* when compared to nymphs of *P. citri*.

KEY WORDS : *Chrysopa lacciperda*, development, feeding potential, *Planococcus citri*

The citrus mealybug, *Planococcus citri* (Risso) (Homo., Pseudococcidae) is a key pest in several citrus orchards. Satisfactory control of this pest has been achieved hitherto with chemicals in India (Krishnamoorthy and Singh, 1987). Efforts are being made to combat this pest through biocontrol means. In India, periodic releases of an exotic beetle *Cryptolaemus montrouzieri* Muls. (Col., Coccinellidae) and inoculative releases of the exotic parasitoid *Leptomastix dactylopii* How. (Hym., Encyrtidae) have kept *P. citri* under control in released orchards (Krishnamoorthy and Singh, 1987). During the survey for natural enemies of *P. citri*, Krishnamoorthy and Mani (1988) collected four species of green lacewings preying on *P. citri* in citrus orchards and reported that these were also responsible for bringing down the mealybug populations. Success or failure of biocontrol programme depends normally on the degree to which the selected species / strains are adapted (Bartlett, 1964) and the parasitizing / predatory potential of the insect. A study on this line therefore was conducted to determine the development and feeding potential of the green lacewings, *Chrysopa lacciperda* Kimmins (Neuro., Chrysopidae), a well adapted species on *P. citri* and results are presented in this paper.

MATERIALS AND METHODS

The culture of *P. citri* was maintained on pumpkin fruits (Singh, 1978; Krishnamoorthy and Singh, 1987) and *C. lacciperda* on frozen eggs of rice moth *Corcyra cephalonica* (Staint.) (Krishnamoorthy and Nagarkatti, 1981). The eggs of *C. lacciperda* collected from stock culture were separated from paper discs and confined individually in glass vials (7.5 x 2.5 cm). The larvae upon hatching were provided with known number of 10-15 day old nymphs of *P. citri* for feeding and development. Observations were made at 24 h interval on the development and the number of nymphs preyed. Mealybugs left unpreyed were removed and known number of fresh nymphs was offered to the predator daily until formation of cocoons. A total of 10 larvae were used and each larva was considered as one replicate. In another batch, the chrysopid larvae were provided with known number of frozen eggs of *C. cephalonica* daily until cocoon formation to compare the efficacy of the predator. All studies were conducted at 26 ± 2°C and 60 - 75% RH.

RESULTS AND DISCUSSION

Data on the development of *C. lacciperda* on *P. citri* and *C. cephalonica* are furnished in table 1. Incubation period varied from 3.5 to 4.5 days; average being 4 days. Development of the first, second and third instars of the predator took 3.09, 2.10 and 3.21 days respectively on the nymphs of *P. citri* and 2.50, 1.70 and 2.87 days respectively on eggs of *C. cephalonica*. The cocoon period lasted for 10.12 and 10.20 days on *P. citri* and *C. cephalonica* respectively. A total of 22.52 days were required for the predator to develop on nymphs of *P. citri* as compared to 21.27 days on eggs of *C. cephalonica*. Faster development of other species of chrysopids on eggs of *C. cephalonica* has already been documented (Lee and Shih, 1981; Mani and Krishnamoorthy, 1988). The prolonged development of the predator on the nymphal diet may be due to the fact that it could not attack as many prey as it could quickly because it spent lot of time in handling the prey and also availability of food from such non feeding nymphs may be less. Thus, in a given unit of time, the predator of the same age could not acquire sufficient food from non feeding nymphs of *P.citri* as compared to food obtained from eggs of

C.cephalonica. This might be one of the reasons for delayed development, although the food was most suitable for the predator.

The number of mealybug nymphs preyed upon by the first, second and third instars of the predator averaged 35, 96 and 636.1 respectively (Table 2). Third instar larva consumed more number of nymphs than first and second instars. Such voracious nature was also found when eggs of *C. cephalonica* were provided. Similar results were obtained with other species of chrysopids also (Samson and Blood, 1980; Krishnamoorthy and Nagarkatti, 1981; Krishnamoorthy and Mani, 1982; Mani and Krishnamoorthy, 1988). A total of 767.1 nymphs were consumed by the predator during the entire larval development which is 3 times more than the consumption rate of *Mallada boninensis* (Okamota) with the nymphs of *Maconellicoccus hirsutus* (Green) (Mani and Krishnamoorthy, 1988). The predator consumed almost double the number of eggs of *C. cephalonica* compared to nymphs of *P. citri*. This variation may be due to the fact that each egg of *C. cephalonica* provided less quantity of food than those of 10 - 15 day old nymphs. The efficiency of feeding of *C. lacciperda* increased greatly with the age. Hence second and third instar could be used for field releases against *P. citri*. Since this predator has a greater feeding potential than *M. boninensis* (Mani and Krishnamoorthy, 1988), it could be used in biocontrol programme although *M. boninensis* also occurs on *P.citri* (Krishnamoorthy and Mani, 1988).

TABLE 1 : Development of *C. lacciperda* on *P. citri* in comparison with *C. cephalonica*

Stage of chrysopid	$\bar{x}$ developmental period ± SD* (days)	
	P. citri nymph	*Corcyra* eggs
Egg	4.00 ± 0.38	4.00 ± 0.38
Larva		
I instar	3.09 ± 0.11	2.50 ± 0.13
II instar	2.10 ± 0.06	1.70 ± 0.11
III instar	3.21 ± 0.19	2.87 ± 0.16
Cocoon	10.12 ± 0.41	10.20 ± 0.29
Total (egg to adult)	22.52 ± 0.60	21.27 ± 0.37

* Mean of 10 replicates ± standard Deviation

TABLE 2 : Feeding potential of *C.lacciperda* on *P.citri* and *C. cephalonica*.

Instar	Prey consumption $\bar{x}$ ± SD*	
	Nymphs of *P. citri*	eggs of *Corcyra*
I	35.00 ± 1.70	35.00 ± 5.58
II	96.00 ± 5.91	134.60 ± 59.13
III	636.10 ± 18.92	1265.90 ± 85.45
Total	767.10 ± 22.10	1435.58 ± 83.45

* Mean of 10 replicate ± standard Deviation

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