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Evaluation of green lacewing (*Crysoperla carnea*) eggs hatching in field and laboratory conditions

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Abstract
To evaluate the hatchability of *Chrysoperla cornea* on sugarcane variety HSF-242. Eggs of *C. cornea* were released in the form of rings containing 25 eggs twice in a month. Similarly 25 eggs per ring were *kept* in laboratory at optimum temperature 28 ± 2 ℃ and relative humidity 60-65%). In field conditions maximum hatching was observed during the month of March which was 70% and followed by April (67%), September (66%). August (65%), May (58%). July (40%) 2nd June (30%). Similarly damaging percentage was observed maximum during the month of June (70%) followed by July (60%). May (42%). August (35%), September (34%). April (33%) and March (30%). In laboratory conditions no significant difference in hatching which was observed and ranged from (72-76%).

Keywords: *Crysoperla carnea*, hatchings, field conditions, laboratory conditions, eggs laying

Introduction
Agriculture is the mainstay of Pakistan economy. Nearly one fourth of total output and 45% of total employment is engaged in agriculture sector (Anonymous. 2002) [2]. Sugarcane is an important cash crop of Pakistan. It is the main sources of sugar production and also produces numerous valuable by - product like alcohol, ethanol, bagasse and press mud which is the rich source of organic matter and nutrient for crop production (Shafi, 2000) [17]. In Pakistan sugarcane cultivated area is 1.7 million hectares and the national average cane yield is 47.5 ton/ ha and average sugar recovery is 8.97% which is less than worldwide yields which is more than 100 ton/ ha and recovery more than 14%, but the potential in Pakistan is also to obtain yield more than 100 ton/ ha. (Ehsan *et al*. 2000) [5]. Like considerable increase in sugarcane cultivated area, hut unfortunately per acre yield was stagnant during the past few years. There are many reasons of stagnation in per acre yield. Such us poor selection of soil, sowing of non-quality seed, poor tillage practices, use of unbalanced fertilizers and other agronomic practices. However, major factor which is usually overlooked has always been the attack of various insect pests and diseases on this crop. Sugarcane is attacked by a number of chewing pests including top, root, stem and gurdaspur borers (Rajeiulran *et al*. 2003) and sucking pests i.e. sugarcane pyrilla, whitefly and black bug are major pests (Patil *et al*. 2003) [14]. Unfortunately, plant protection in sugarcane is considered as a secondary importance in Pakistan. There have been several examples in past when there was a drastic decline in sugar production per unit area because of severe attack of insect pests. Sugarcane is a perennial crop, control of insect pests through direct methods such as cultural, mechanical and chemical control methods are not feasible because sugarcane attain maximum height in early days of their growth. It is most feasible to use biological control because low disturbance against natural fauna (Shenhmar *et al*. 2003) [18]. *Chrysoperla cornea* is bio-control agent and can easily be reared on commercial scale (Charles *et al*. 1998) [4]. It is a general predator of the larval stage of lepidopteron pests (Hydorn, 1971) [6] and found in wide variety of cropping systems (Aynew *et al*. 1981) [3]. It is a voracious feeder having sickle-like mouth part to cut the body of host larvae, eggs and to suck the body fluid
From prey (Prasad, 2003). The larvae of *C. cornea* are highly cannibalistic and observed to feed upon their fellow larvae when kept together. (Medina *et al*. 2004) [9] One larvae of Chrysopa can prey 250 leaf hoppers. 300-400 aphid, 11,200 spider mite and 6500 scale eggs (Ishfaq, 2003) [7].

It can be successfully used in Integrated Pest Management because it has resistance against iwanv insecticides (Paraveen and Dhunidapani, 2001) [12]. They used *C. cornea* with neem seed extract for control of whitefly and Jassid on tomato. Acetamaprid and spinosad are safe for *C. cornea* and used in Integrated Pest Management Acetmaprid exhibited little Ovicidal effect permitting 62.5-S2.5% egg hatching and also spinosad which permitting 62-85.5% egg hatching (Uthamasamy *et al*. 2003) [19].

1. The main objectives of these studies were.
2. To observe hatching percentage in field and laboratory' conditions.
3. To gauge the survival rate of this bio-control agent under prevailing environment conditions.
4. To observe feasibility of this bio agent on sugarcane crop.

Materials and Methods

Study site

Experiments were conducted during the season 2017-18 at experimental area and biological Control Research Laboratory, Layyah Sugar Mills, Layyah. Sugarcane ony HSP-242 was sown in field where *C. carnea* eggs were released. But in laboratory trial was conducted under laboratory condition at optimum temperature 28 + 2 °C and relative humidity 60-05%, The eggs of *C. carnea* was taken from Biological Control Research Laboratory Layyah Sugar Mills, Layyah.

Mass rearing of Adults

To rear the adults' two different kinds of cages were used for good eggs laying. To maintain the healthy culture different designs were used.

Transparent glass cages

This cage was made with transparent glass and black muslin cloth was used and pinned tightly with common paper pins which make them easy to rear and adults did not escape. The front side consist of hole which size 7.4 cm use for handling of insects and it is covered with muslin white cloth. To maintain the moisture placing white cotton wig in glass vials. This cage is very unique because no need to shift the adults for food.

Wooden cages

This kind of cage mostly made up of wood (40x 40) and four sides consist of net. Lid was replaceable with wooden sheet and covered with muslin cloth. For proper sanitation whole was made diameter 7.6cm for transfer of food and water and release of insects. Cotton soaked with water for moisture inside the cages in glass vials.

Maintenance of culture

Adult diet

Common adult diet for better egg laying was used honey 1g, protein 6mg, sucrose 5m, yeast 1g and distilled water 40ml. This food was provided daily two times a day in form of droplet with the help of common hairbrush.

Eggs collection

Eggs were collected from replaceable black muslin cloth with use of sharp razor blade. Some eggs were laid on other suitable structures for example water containing vials etc.

Cage cleaning

Cages were cleaned with wet cotton wig after dried gently with help of tissue paper. The time of eggs hatching noted regularly.

Data Analysis

Grey eggs of *C. carnea* were released in the form of staked eggs on paper ring @25 eggs per ring. Each ring was tagged on single plant randomly. Released schedule of *C. carnea* and mean temperature are given in Table 1. After three days of releases these rings was collected from the field to observe hatching percentage under microscope. In case of laboratory condition after three days hatching percentage was also observed under microscope. In both laboratory and field condition hatching percentage and damaging percentage were also observed. The data collected was subjected to be analysis by suitable computer software.

Table 1: Schedule of *Chrysoperla carnea* Eggs Releases on Sugarcane Crop and Temperature

No. of Releases	Date of eggs Releases	No. of eggs per Releases	Date of eggs collection	No. of observed eggs	Mean Temperature °C
1	15 March	4000	18 March	50	34
2	30 March	4000	2 April	50	37
3	15 April	4000	18 April	50	39.5
4	30 April	4000	3 May	50	34
5	15 May	4000	18 May	50	40
6	30 May	4000	2 June	50	40
7	15 June	4000	18 June	50	41
8	30 June	4000	3 July	50	45
9	15 July	4000	18 July	50	39
10	30 July	4000	2 August	50	44
11	15 August	4000	18 August	50	41
12	30 August	4000	2 Sept	50	39
13	15 Sept	4000	18 Sept	50	35
14	30 Sept	4000	3 Oct	50	36

Results and Discussion

Study in Field Conditions Month wise evaluation of *C. carne* eggs hatching and damaging percentage in field conditions are given in Table No.1 Maximum eggs hatching (70%) was observed during the month of March followed by April (67%), September (66%), August (65%), May (58%), July (40%) and June (0%), Maximum damaging percentage was observed during the month of June which was 70% and followed by July, May, August, September, April and March which were OUY%, 42%, 45'7 34%, 33% and 30% respectively. Our research has indicated that some biotic and abiotic factor influenced the hatching of *C. carnea* eggs. In

biotic factor cannibalism was very important where newly emerged larvae feed upon the un-hatched eggs and also feed upon their fellow larvae. (Parsad, 2003) [13] Observed that *C. carnea* was highly cannibalistic among, their fellow larvae when kept together. (Jagadish and Jayaramaih, 2004) [8] Observed that Second instars larvae consumed their eggs and newly emerged larvae in its successive stages. (Rosenheim, 2001) [16] Assessed that higher woolly aphid population on sugarcane enhanced the survival of *C. carne* in field condition. (Adane, *et al*. 2002) [1] Assessed that *C. carnea* female laid maximum eves i.e. 1079 and oviposition period were affected significantly due to the variation in prey species, while hatchability and sex ratio were unaffected. In abiotic factor, temperature play vital role in egg hatching. In our results maximum hatching was observed during the month of March, mean temperature during this month was 35.5 °C. Similarly minimum hatching was observed during the month of June when mean temperature was 43 °C. So the temperature was a factor which directly affected the hatchability. (Usthamasamy *et al*. 2003) [19] Confirms our finding that temperature effects eggs hatching of green lacewing. Their results showed maximum hatching was i.e. 62-82% when Temperature was 31-39 °C. (Patil *et al*. 1999) observed that maximum population of *C. carnea* in field during the month of March and April i.e. 770, 289 and 210 in number of eggs, larvae and adult respectively.

Table 2: Evaluation of *C. Carnea* eggs Hatching and Damaging in Field Conditions

Month	Mean No. of observed eggs	Mean hatched eggs	Hatching Percentage	Mean damaged eggs	Damage percentage	Mean Temperature °C
March	50	35	70	15	30	35.5
April	50	33.5	67	16.5	33	36.5
May	50	29	58	21	42	40
June	50	15	30	35	70	43
July	50	20	40	30	60	41.5
August	50	32.5	65	17.5	35	40
Sept	50	33	66	17	34	34.5

Study in Laboratory Conditions Month wise evaluation of *C. carnea* eggs hatching and damaging percentage in laboratory condition are given in Table No.2 In laboratory condition no significant difference among month wise eggs hatchability i.e. 72 — 76% and also damaging percentage was observed i.e., 24 - 28%, Our results showed that in laboratory condition where optimum temperature was 28 4: 2 C* and relative humidity was 6065%, So the temperature remained constant and variation of hatching percentage were also minimum. (Osman *et al*. 1993) [11] Confirmed our results they studied the egg hatching and adult emergence i.e. 75% and 74.8% respectively at temperature 28 °C and relative humidity 65 - 70%. (Mustafa *et.al*, 2003) [10] observed maximum eggs viability (82.89%) in laboratory condition when eggs was harvested by razor.

Table 3: Evaluation of *C. Carnea* Eggs Hatching and Damaging in Laboratory Conditions

Month	Mean No. of observed eggs	Mean hatched eggs	Hatching percentage	Mean damaged eggs	Damaging percentage	Mean Temperature °C
March	50	37	74	13	26	30
April	50	38	76	12	24	28
May	50	36	72	14	28	26
June	50	36	72	14	28	27
July	50	37	74	13	26	27
August	50	38	76	12	24	28
Sept	50	38	76	12	24	28

Conclusions

In conclusions, *Chrysoperla carnea* is bio-control agent which can adopt this climatic conditions and may successively control insect pests of sugarcane i.e. Borer complex, sugarcane bug and sugarcane pyrilla. The population of *Chrysoperla carnea* so an important tool for integrated whitefly, sugarcane black synchronized with pest's emergence on sugarcane crop. It is al pest management.

Recommendations

- Handling of these rings should be proper during the releases in the field.
- Grey eggs should be released.
- Rings of grey eggs should be tagged on 4th. Top portion of plant.
- Release should be equivalent in field.
- Releases should be repeated after 15 days interval.
- Protect the eggs from direct sunlight during tagging on plant.

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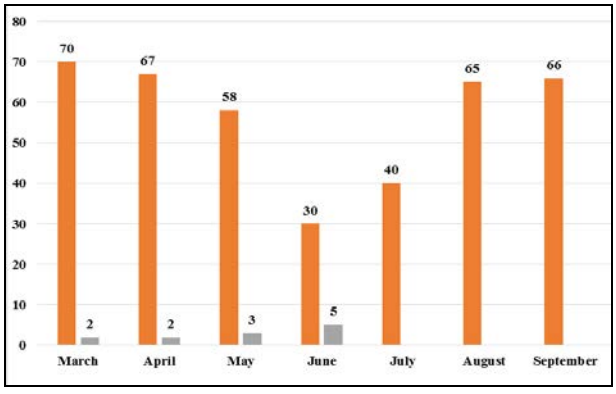

Fig 1: Months wise eggs hatching *C. carnea* in field conditions

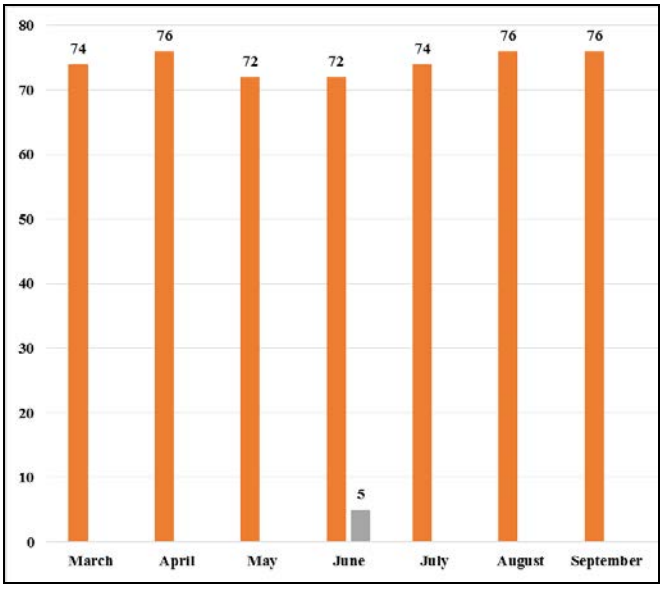

Fig 2: Month wise eggs hatching of *C. carnea* in Laboratory conditions

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