



Influence of colour on oviposition behaviour in green lacewing *Chrysoperla zastrowi sillemi* (Esben - Petersen) (Neuroptera: Chrysopidae)

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ABSTRACT: The Green lacewing, *Chrysoperla zastrowi sillemi* (Esben-Peterson), also known as “aphidlion” is a beneficial insect predator of various insect pests. The laboratory experiment was conducted during 2018-19 to evaluate the substrate colour preference for egg laying by *C. zastrowi sillemi*. Egg receiving sheets were pasted with white, black, green, indigo blue, yellow, brown, violet, sky blue, pink, red and orange colour papers. Among all colours *C. z. sillemi* females preferred orange colour as a substrate for egg laying with maximum number of eggs (43.13/female/day) followed by red colour substrate (25.50 eggs/female/day). White and black were least preferred.

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KEY WORDS: *Chrysoperla zastrowi sillemi*, colour preference, oviposition

Beneficial insects are important component in the food chain and they afford amenity for maintaining the ecological imbalance in the agro ecosystem. The parasitoids and predators devour the agricultural insect pests at egg, larval/ nymphal, pupal and adult stages and bring down the pest load below economic threshold level (Ballal and Verghese, 2015). The entomophagous insects have the ability of reducing the pest population below 30% under field condition even without insecticide application. The green lacewings are efficient and successful predators in the management of insect pests (Karthika *et al.*, 2015). The use of green lacewing, *Chrysoperla zastrowi sillemi* (Esben - Petersen) (Neuroptera : Chrysopidae) has gained importance in pest management in India (Elango and Sridharan, 2017).

It has long been considered as an important natural predator because of its potential to control a variety of soft bodied insects like aphids, whiteflies, coccids, mealybugs and thrips (Rao and Satyanarayana, 1984; Henry *et al.*, 2010).

Mass culturing of *Chrysoperla zastrowi sillemi*

Grubs were reared in GI round basins (28 cm dia) at 250 larvae/ basin covered with khada cloth. The eggs of *Corcyra cephalonica* were given as feeding material for the larvae in the laboratory. The *C. z. sillemi* larvae pupate into round white coloured silken cocoons in ten days. The cocoons were collected with fine brush and transferred into 1 litre plastic containers with wire mesh window for emergence of adults. The adults are collected

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Table 1. Substrate colour preference for egg laying of *C. zastrowi sillemi*

S.No	Treatments	No. of eggs laid by <i>C. zastrowi sillemi</i> *								Total	Mean
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8		
1	White	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	2.00 (1.41)	0.00 (0.00)	0.00 (0.00)	2.0	0.25
2	Black	1.00 (1.00)	1.00 (1.00)	17.00 (4.12)	3.00 (1.73)	1.00 (1.00)	23.00 (4.80)	5.00 (2.24)	3.00 (1.73)	54.0	6.75
3	Green	9.00 (3.00)	8.00 (2.83)	14.00 (3.74)	10.00 (3.16)	8.00 (2.83)	16.00 (4.00)	2.00 (1.41)	37.00 (6.08)	104.0	13.00
4	Indigo blue	1.00 (1.00)	0.00 (0.00)	21.00 (4.58)	2.00 (1.41)	22.00 (4.69)	14.00 (3.74)	4.00 (2.00)	0.00 (0.00)	64.0	8.00
5	Yellow	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	5.00 (2.24)	4.00 (2.00)	0.00 (0.00)	0.00 (0.00)	2.00 (1.41)	11.0	1.38
6	Brown	1.00 (1.00)	1.00 (1.00)	0.00 (0.00)	0.00 (0.00)	2.00 (1.41)	8.00 (2.83)	0.00 (0.00)	0.00 (0.00)	12.0	1.50
7	Violet	0.00 (0.00)	9.00 (3.00)	2.00 (1.41)	4.00 (2.00)	5.00 (2.24)	10.00 (3.16)	0.00 (0.00)	0.00 (0.00)	30.0	3.75
8	Sky blue	7.00 (2.65)	11.00 (3.32)	26.00 (5.10)	10.00 (3.16)	16.00 (4.00)	42.00 (6.48)	4.00 (2.00)	16.00 (4.00)	132.0	16.50
9	Pink	25.00 (5.00)	19.00 (4.36)	6.00 (2.45)	2.00 (1.41)	14.00 (3.74)	31.00 (5.57)	3.00 (1.73)	4.00 (2.00)	104.0	13.00
10	Red	29.00 (5.39)	21.00 (4.58)	10.00 (3.16)	17.00 (4.12)	41.00 (6.40)	17.00 (4.12)	25.00 (5.00)	44.00 (6.63)	204.0	25.50
11	Orange	41.00 (6.40)	11.00 (3.32)	59.00 (7.68)	26.00 (5.10)	17.00 (4.12)	69.00 (8.31)	36.00 (6.00)	86.00 (9.27)	345.0	43.13
	Total	114.00	81.00	155.00	79.00	130.00	232.00	79.00	192.00	1062.00	132.75
	SEd	0.0759	0.0500	0.0606	0.0478	0.0595	0.0767	0.0331	0.0842	-	-
	CD (P = 0.05)	0.1582	0.1043	0.1263	0.0996	0.1241	0.1599	0.0691	0.1756	-	-

* Mean of eight replications, standard error values are given in parantheses.

a. Mass culturing of *Chrysoperla zastrowi sillemi*



b. Brown sheet with various substrate colours used in the experiment



c. G.I. round troughs with colour sheets



d. Releasing of adults



e. Maximum egg laying of *C. zastrowi sillemi* on Orange and Red sheets

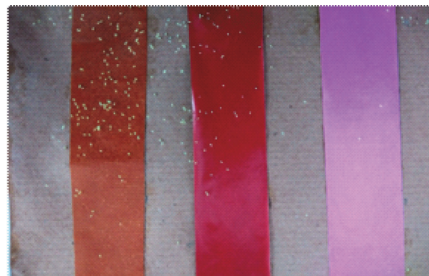


Fig 1. Substrate colour preference for egg laying of *C. zastrowisillemi*

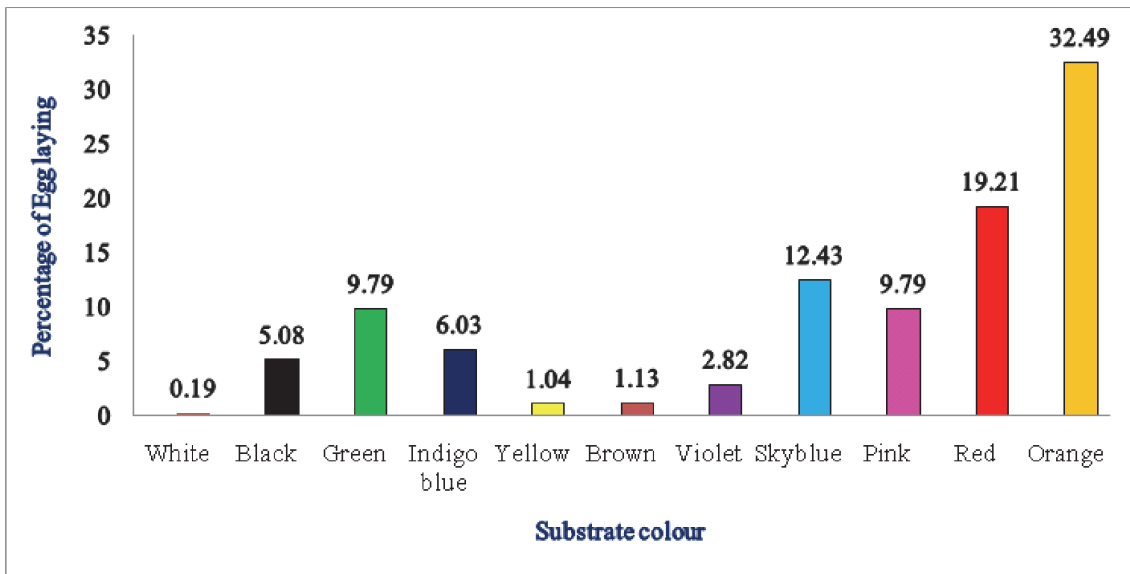


Fig 2. Percentage of egg laying of *C. zastrowi sillemi* on different colour substrates

daily and transferred to pneumatic glass troughs or GI round troughs (30 cm x 12 cm). Before allowing the adults, the rearing troughs were wrapped inside with brown sheet which act as egg receiving card. About 250 adults (60% females) were allowed into each trough and covered with white nylon or georgette cloth secured by rubber band. Three bits of foam sponge (2 sq.in) dripped in water were kept above the nylon cloth cover. Besides an artificial protein rich diet (yeast, fructose, honey, Proteinex^R and water in the ratio 1:1:1:1) was provided in semisolid paste form in three spots on the cloth outside. The adults were collected daily and allowed into fresh rearing troughs with fresh food. From the old troughs, the brown paper sheets along with *Chrysopa* eggs were removed and used for maintaining culture of chrysopids.

Substrate colour preference for egg laying of *C. zastrowi sillemi*

An experiment was conducted during 2018-19 in the biocontrol laboratory, Department of Agricultural Entomology, Tamil Nadu Agricultural University, Coimbatore to evaluate the substrate colour preference for egg laying by *C. z. sillemi*. The rearing troughs are wrapped inside with brown sheet which act as egg receiving card. Sheets were pasted with white, black, green, indigo blue, yellow,

brown, violet, sky blue, pink, red and orange colour papers (Table 1). Twenty pairs of male and female were confined in GI round troughs (30 cm x 12 cm) to lay eggs for 20 days. The eggs laid on the coloured papers were collected and counted carefully. This experiment was replicated eight times.

The data were analyzed using analysis of variance (ANOVA) using AGRES 3.01 and AGDATA software. Data in the form of percentages were transformed to arcsine values and those in numbers were transformed to $\sqrt{(x+0.5)}$ and analyzed. The mean values of the treatments were compared using DMRT at 5 per cent level of significance. During the process, the insects attracted to the non colour sheets to test the difference in insect count between the coloured and ordinary sheets, t test was carried out. Before t test, the unknown variance of the two groups is tested using F test.

Females of *C.z.sillemi* visually distinguished different colours and preferred certain colours as a substrate for egg laying. The egg laying was started by *C. z. sillemi* after 6 days of release inside cage. The egg laying was continued up to eight days. Among the various colours of substrate, *C.z.sillemi* females preferred orange colour as a substrate for egg laying and laid the maximum

number of eggs (43.13/ female/day) followed by red colour substrate (25.50 eggs/ female/day). Skyblue colour had 16.50 eggs/ female/day. Brown and yellow colour substrates were statistically on par with each other. White colour was least preferred by *C. z. sillemi* for egg laying.

Different colour charts are used to test the insect attraction the number of insects are counted. The critical value $F_{(0.05,87)}$ is 1.43 which is less than the calculated value (2.44). The two groups are having significantly different variances. Since, two groups have different variances; t test for unequal variance was used to calculate the significant difference between two groups (coloured and ordinary). The critical value $t_{(0.05,148)}$ is 1.66 which is less than the calculated value (1.66). So, the two means are significantly different from each other.

After that, the significant difference among the different colour bands for the two groups were identified separately using the ANOVA for coloured groups calculated value $F(0.05,10,77)$ is 13.811 and probability lesser than 0.05. Insects attracted to the different colour bands are significantly different. The Critical difference at 5% level of significance between the colour bands are estimated as 1.316. This analysis infer that, T11 and T10 bands attract more insects than the other bands. Since, our target is the better colour band; the ordinary may not be useful. If needed, it can be interpreted as above stanza.

Green lacewing fly, *C. z. sillemi* females preferred orange colour as a substrate for egg laying and laid the maximum number of eggs (43.13) followed by red colour substrate (25.50 eggs). So far there are no such studies on *C.z.sillemi* egg laying colour preference. However, Sattar and Abro (2011) reported least preference to green and brown colour by *C. carnea* females for egg laying. Carvalho *et al.* (2002) have determined the influence of density of green lacewing, *C. mediterranea* adults on their

production potential Anonymous (1994) also reported black as most preferred colour for oviposition in *C. carnea*.

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