

Study of Phototoxic and Chemitotoxic Response of *Chrysocoris stollii* Wolf (Heteroptera-Pentatomidae -Scutellerane)

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Abstract: *Chrysocoris stollii* Wolf (Heteroptera- Pentatomidae-Scutellerinae) is a phytosuecivorous bug, which infests *Cassia occidentalis*, *Croton sparisiflorum*, *Pennisetum typhoides*, (Bajra) and *Litchi chinensis* at Saharanpur in good number and by its desapping habit causes considerable loss to these plants of economic value. The first food plant of this bug is *Cassia occidentalis*, (Kasaundi) (Leguminasae) (This plant is grown throughout India and it is useful in ringworm, elephantiasis and scorpion sting. The leaves are tasty, aphrodisiac, lexeteric, cure cough, Asthma, Kafka and vita. It is also used for stoma chic cure, Fridosha, fevers, sore throat and biliousness (Ayurveda) Phototaxic responses: During present investigations, following experiments were conducted to find out the response of *Chrysocorisstollii* towards various shades and intensity of light. All these experiments were conducted in laboratory as well as in the field during night. Two types of experiments were conducted for this purpose. Chemotaxic response: A said earlier that *Chrysocoris stollii* is apolyphagous sap sucking bug which attacks the plants of different families. The plant sap of these families possesses carbohydrate likesucrose, glucose and cellulose, different amino acids and crude proteins. Besides these, it also possess many inorganic minerals like Ca, P, K, Mg, Cu, Fe and I, etc and few fatty acids such as stearic acid, oleic acid and linoleum acid etc. This prompted to work out the preference of this bug towards some chemicals and for this some simple experiment was carried out disst Saharanpur.

Keywords: Phototaxic responses: Chemotaxic response of *Chrysocoris stollii* Wolf

1. Introduction

Insect an is the largest class of phylum arthropods and members of this class are characterized by the presence of three pairs of legs; hence, called Hexapoda, Besides, these tracheate organisms have usually one or two pairs of wings. Insects always have been associated with mankind in one way or the other as some of them are beneficial other are pests of crops and house hold articles. *Chrysocoris stollii* Wolf (Heteroptera- Pentatomidae-Scutellerinae) is a phytosuecivorous bug, which infests *Cassia occidentalis*, *Croton sparisiflorum*, *Pennisetum typhoides*, (Bajra) and *Litchi chinensis* at Saharanpur in good number and by its desapping habit causes considerable loss to these plants of economic value. : In this case various light sources of different intensities and colours, viz; 0, 15, 60, 100 and 1000 watt bulbs, gaslantern and kerosene lantern were used during 2005 to 2006 to attract the pest during dark night from infested host plants at a distance of 5 to 10 meters. Firstly, a gas lantern (Patromax) was taken as a light source for field observations and attraction of the *Chrysocoris stollii* towards light was keenly observed physically with the aid of a helper. The experiment was conducted from (10.00 p.m.) till morning (6a.m.). Transparent coloured paper was also used around the chimney. Though, many species of insects were found attracted but only the pest under study was taken into consideration. Data of the observations are recorded in table -40. The same experiment was repeated with kerosene lantern with transparent coloured papers and the data are recorded in table-41. Different coloured bulbs of zero watts viz; red, blue, green, yellow and orange fitted in a tin reflector, were also taken as light sources during independent night at Behat, Nakur, Nagal and Saharanpur proper. In this experiment various shades of lights, viz; - red,

blue, green, yellow and orange weretaken into consideration by using zero watt bulbs for attraction of bugs. For this purpose a big cage of the size (60x40x30xcm) wastaken and it was divided into six compartments leaving a small gap (2½ x 2½ cms) in each septum toward lower side.

2. Materials and Methods

The present study deals with *Chrysocoris stollii*, a pest of *Cassia occidentalis*, *Croton* and *Bajra* and *Litchi* etc. Regarding this, the method of collection of bugs, biology, ecology, population dynamics, studies, rearing techniques and mounting methods are described here-A. **Rearing of *Chrysocoris stollii*:** For the study purpose, district Saharanpur was divided in 5 regions, in, Saharanpur proper, Nakur, Behat, Sarsawa and Nagal. Plantsware selected randomly in these regions and bugs were picked up from *Cassia occidentalis* and *Croton sparisiflorum* and *Bajra* by hand picking method. In this experiment various shades of lights, viz;- red, blue, green, yellow and orange weretaken into consideration by using zero watt bulbs for attraction of bugs. For this purpose a big cage of the size (60x40x30xcm) wastaken and it was divided into six compartments leaving a small gap (2½ x 2½ cms) in each septum toward lower side. In this way all these six chambers were internally connected to each other so that bugs may move freely in each one without any interference. Now, in each chamber zero watt bulb of various shades of light, viz;- red, green, blue, yellow and orange were provided except a central chamber which was kept dark. In this chamber bugs were released and the bulbs were switched on during the night and observations were recorded. It was noticed that not even a single bug moved to other lighted chambers from central dark one. To ascertain further, 10 bugswere released

in each chamber except central dark one and the bulbs were lighted. It was observed that the bugs migrated to darker chamber within half an hour. This indicates negative attitude of the bug towards light. During strong illumination, the pest showed active movements and hides in dark places, as during mid summer day. Thus, to *Chrysocoris stollii* any phototactic response cannot be assigned from control point of view. The important point which was noticed that the fourth and fifth nymphal instars moult in presence of sun lights during the day on dorsal surface of the host while younger instars moult usually on the ventral side of the leaf.

3. Results

Phototactic responses: During present investigations, following experiments were conducted to find out the response of *Chrysocoris stollii* towards various shades and intensity of light. All these experiments were conducted in laboratory as well as in the field during night. Two types of experiments were conducted for this purpose.

A. Experiment first

In this case various light sources of different intensities and colours, viz; 0, 15, 60, 100 and 1000 watt bulbs, gas lantern and kerosene lantern were used during 2005 to 2006 to attract the pest during dark night from infested host plants at a distance of 5 to 10 meters. Firstly, a gas lantern (Patromax) was taken as a light source for field observations and attraction of the *Chrysocoris stollii* towards light was keenly observed physically with the aid of a helper. The experiment was conducted from (10.00 p.m.) till morning (6 a.m.). Transparent coloured paper was also used around the chimney. Though, many species of insects were found attracted but only the pest under study was taken into consideration. Data of the observations are recorded in table-40. The same experiment was repeated with kerosene lantern with transparent coloured papers and the data are recorded in table-41. Different coloured bulbs of zero watts viz; red, blue, green, yellow and orange fitted in a tin reflector, were also taken as light sources during independent night at Behat, Nakur, Nagal and Saharanpur proper. The electric supply was maintained from a tube well situated nearby field area. Similarly, 100 and 1000 watt bulbs were also used as high intensity source of light. Data of these experiments are presented in table 42 to 43. An examination of these table clearly exhibit that *Chrysocoris stollii* is not attracted either towards various colours or different intensities of light used in the experiments. They avoid light and move towards dark during night.

B. Experiment second

In this experiment various shades of lights, viz;- red, blue, green, yellow and orange were taken into consideration by using zero watt bulbs for attraction of bugs. For this purpose a big cage of the size (60x40x30cm) was taken and it was divided into six compartments leaving a small gap (2½ x 2½ cms) in each septum toward lower side. In this way all these six chambers were internally connected to each other so that bugs may move freely in each one without any interference. Now, in each chamber zero watt bulb of various shades of light, viz;- red, green, blue, yellow and orange were provided except a central chamber which was kept dark. In this

chamber bugs were released and the bulbs were switched on during the night and observations were recorded. It was noticed that not even a single bug moved to other lighted chambers from central dark one. To ascertain further, 10 bugs were released in each chamber except central dark one and the bulbs were lighted. It was observed that the bugs migrated to darker chamber within half an hour. This indicates negative attitude of the bug towards light. During strong illumination, the pest showed active movements and hides in dark places, as during mid summer day. Thus, to *Chrysocoris stollii* any phototactic response cannot be assigned from control point of view. The important point which was noticed that the fourth and fifth nymphal instars moult in presence of sun lights during the day on dorsal surface of the host while younger instars moult usually on the ventral side of the leaf.

Chemotactic response: As said earlier that *Chrysocoris stollii* is an apolyphagous sap sucking bug which attacks the plants of different families. The plant sap of these families possesses carbohydrate like sucrose, glucose and cellulose, different amino acids and crude proteins. Besides these, it also possesses many inorganic minerals like Ca, P, K, Mg, Cu, Fe and I, etc and few fatty acids such as stearic acid, oleic acid and linoleum acid etc. This prompted to work out the preference of this bug towards some chemicals and for this a simple experiment was carried out.

Experiment: The experiment was conducted in a rearing cage (45x30x30cm). On the bottom of the cage 3 cm thick moist sand layer was maintained. A white paper was spreaded on it and in the centre a watch glass was kept having a cotton swab dipped in solution of specific chemical. Now, 5 adult bugs and 5 nymphs were released in the cage. A constant vigil was kept for 2 to 6 hrs to note the activity of bugs towards different chemicals. During the experiment 44 chemicals and biochemicals were replaced one by one and observations thus, sought are recorded in the table - 44. A perusal of aforesaid table reveals that most of the chemicals used in the experiments showed negative response to *Chrysocoris stollii*. Adults as well as nymphs showed irritating action for some chemicals like acetic acid, formaldehyde, toluene, dichloromethane, sodium sulphate and potassium bromide etc and they retracted their rostrum. However, chloroform and ammonium sulphate attracted the male and female but these soon entered in quiescent stage within two minutes. Regarding the bio chemicals such as carbohydrates, amino acids and fatty acids, bugs and nymphs exhibited positive response against carbohydrates like maltose, glucose, sucrose and fructose and to some extent to glycogen and negative response to starch. The bugs showed positive response towards most of the amino acids like L-arginine, β-alanine, L-tyrosine, DL-isoleucine, Threonine, L (+) - Cystein, L1-amino butyric acid and negative response to rest of the amino acids mentioned in 4 table. Moreover, two fatty acids were taken for knowing chemotropic response of the bugs. *Chrysocoris stollii* indicated positive response towards oleic acid and negative response towards stearic acid. Thus, a perusal of the aforesaid table shows that almost none of the used chemicals has attractant property for the bugs but the bio-chemical substances carbohydrates, amino acids and fatty acid which are the main component of food have shown

positiveresponse. The same experiment was repeated but this time cotton swabwas dipped in the extract of different food plant parts, flowers, fruits,seeds leaves. The plant selected were, *Cassia occidentalis*, *Crotonsparisiflorum*, Indian jujuba, Litchi, Bajra, *Mangifera indica* etc. Theresponse of the bugs towards these extract in recorded in table-45. Aclose review of the above table clearly reveals that the

bug, *Chrysocoris stoll* is very specific in its preference to the extract of *Cassia occidentalis* which acts as on attractant for it. In nature, too, itdrains out the sap from main trunk or side branches, but, on thecontrary, the extracts of the other plant attracted less number of thebugs and also after a long

Table 40 Phototropic response of *Chrysocoris stoll* by using gas lantern

Date	Time of experiment started	Colour of light used	Number of <i>C.stoll</i> attracted	Response of adults.
9-7-5005	9.00pm	Butter paper	Nil	Negative
10-7-2005	8.45pm	Blue	Nil	Negative
11-7-2005	9.30pm	Red	Nil	Negative
12-7-2005	8.50pm	Yellow	Nil	Negative
13-7-2005	9.15pm	Green	Nil	Negative
14-7-2005	9.30pm	Orange	Nil	Negative

Table – 41 Phototropic response of *Chrysocoris stoll* by using kerosene lantern

Date	Time of experiment started	Colour of light used	Number of <i>C.stoll</i> attracted	Response of adults.
15-8-2006	8.45pm	Butter paper	Nil	Negative
16-8-2005	8.30pm	Blue	Nil	Negative
17-8-2005	8.45pm	Red	Nil	Negative
18-8-2005	9.30pm	Yellow	Nil	Negative
19-8-2005	8.45pm	Green	Nil	Negative
20-8-2005	9.15Pm	Orange	Nil	Negative

Table – 42 Phototropic response of *Chrysocoris stoll* by using different bulbs of various colours of zero watts.

Date	Time of experiment started	Colour of light used	Number of <i>C.stoll</i> attracted	Response of adults.
3-9-2006	9.30pm	Red	Nil	Negative
4-9-2005	8.45pm	Blue	Nil	Negative
5-9-2005	10.00pm	Orange	Nil	Negative
6-9-2005	9.45pm	Green	Nil	Negative
7-9-2005	9.30pm	Yellow	Nil	Negative

Table – 43 Phototropic response of *Chrysocoris stoll* by using 100 and 1000 watt bulbs.

Date	Time of experiment started	Watt of bulb used	Number of <i>C.stoll</i> attracted	Response of adults.
8-2-2006	9.30pm	100	Nil	Negative
12-2-2006	10.00pm	1000	Nil	Negative

Table – 44 Chemotrophic response of adults and nymphs of *C.stolli*.

S.No.	Name of the Chemicals	No of insects released	No. of insects found attracted after			Response
			2hrs	4hrs	6hrs	
	Inorganic compound					
1.	Sulphuric acid	10	Nil	Nil	Nil	-ve
2	Hydrochloric acid	10	Nil	Nil	Nil	-ve
3	Sodium hydroxide	10	Nil	Nil	Nil	-ve
	Organic compound					
4	Acetic acid	10	1	Nil	Nil	-ve
5	Chloroform	10	1	Nil	Nil	Male attracted And went into quiescent
6	Formaldehyde	10	1	Nil	Nil	- Same as above
7	Menthol	10	Nil	Nil	Nil	-ve
8	Ethyl acetate	10	Nil	Nil	Nil	-ve
9	Dichloromethane	10	1	Nil	Nil	Bugs were irritated
10	Acetone	10	Nil	Nil	Nil	-ve
11	Hydrogen peroxide	10	Nil	Nil	Nil	-ve
	Salts					
12	Sodium Sulphate	10	1	Nil	Nil	Female attracted and rostrum retracted soon
13	Ammonium sulphate	10	1	Nil	Nil	Female attracted
14	Sodium Carbonate monohydrate	10	Nil	Nil	Nil	Went in to Quiescent stage
15	Potassium iodide	10	Nil	Nil	Nil	Male and fifth instars were attracted but retracted rostrum
16	Glucose	10	2	2	Nil	+ve
17	Fructose	10	1	1	Nil	+ve
18	Maltose	10	4	2	Nil	+ve
19	Starch	10	Nil	Nil	Nil	--ve
	Amino acid					
20	β-Alanine	10	2	1	1	+ve
21	L-Lysine	10	Nil	Nil	Nil	+ve
22	L(-) Serine	10	2	1	1	+ve
23	L-Glutamine	10	Nil	Nil	Nil	-ve
24	4-Aminobutyric acid	10	2	1	Nil	+ve
	Faty acid					
25	Stearic acid	10	Nil	Nil	Nil	-ve
26	Oleic acid	10	2	2	1	+ve

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