International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

Study of Phototoxic and Chemitotoxic Response of *Chrysocoris stolli* Wolf (Heteroptera-Pepentatomidae -Scutellerane)

P. K. Sehgal

Department of Zoology/Entomology Dolphin (P.G) Institutes of Biomedical &Natural, Sciences Manduwala Chakrata Road Dehradun Uttarakhand Pin 248007

Abstract: ***Chrysocoris stolli Wolf (Heteroptera- Pentatomidae-Scutellerinae) is a phytosuecivorous bug, which infests Cassia occidentalies, 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 occidentalies, (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, followingexperiments were conducted to find out the response of Chrysocorisstolli towards various shades and intensity of light. All these experiments were conducted in laboratory as well as in the fieldduring night. Two types of experiments were conducted for thispurpose. Chemotaxic response: A said earlier that Chrysocoris stolli is apolyphagous sap sucking bug which attacks the plants of differentfamilies. The plant sap of these families possesses carbohydrate likesucrose, glucose and cellulose, different amino acids and crudeproteins. Besides these, it also possess many inorganic minerals likeCa, P, K, Mg, Cu, Fe and I, etc and few fatty acids such as stearicacid, oleic acid and linoleum acid etc. This prompted to work out thepreference of this bug towards some chemicals and for this somesimple experiment was carried out disst Saharanpur.***

Keywords: Phototaxic responses: Chemotaxic response of *Chrysocoris stolli* 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 stolli*** Wolf (Heteroptera- Pentatomidae-Scutellerinae) is a phytosuecivorous bug, which infests ***Cassia occidentalies***, ***Croton sparisiflorum***, ***Pennisetum typhoides,*** (Bajra) and ***Litchi chinensis*** at Saharanpur in good number and by its despising 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 5to 10 meters. Firstly, a gas lantern (Patromax) was taken as a light source for field observations and attraction of the ***Chrysocoris stolli*** 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 andSaharanpur 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 stolli***, a pest of ***Cassia occidentalies***, 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 stolli*:** 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 occidentalies*** 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 ofbugs. 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 darkerchamber 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 ***Chrysocorisstolli*** any phototaxic response cannot be assigned from control point of view. The important point which was noticed that the fourth and fifthnymphal 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

Phototaxic responses: During present investigations, following experiments were conducted to find out the response of ***Chrysocorisstolli*** 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 5to 10 meters. Firstly, a gas lantern (Patromax) was taken as a light source for field observations and attraction of the ***Chrysocoris stolli*** 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; redblue, 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 43An examination of these table clearly exhibit that ***Chrysocorisstolli*** 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 (60x40x30xcm) 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 ***Chrysocorisstolli*** any phototaxic 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.

Chemotaxic response: A said earlier that ***Chrysocoris stolli*** is apolyphagous sap sucking bug which attacks the plants of differentfamilies. The plant sap of these families possesses carbohydrate likesucrose, glucose and cellulose, different amino acids and crudeproteins. Besides these, it also possess many inorganic minerals likeCa, P, K, Mg, Cu, Fe and I, etc and few fatty acids such as stearicacid, oleic acid and linoleum acid etc. This prompted to work out thepreference of this bug towards some chemicals and for this somesimple 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 layerwas maintained. A white paper was spreaded on it and in the centre awatch glass was kept having a cotton swab dipped in solution ofspecific chemical. Now, 5 adult bugs and 5 nymphs were released inthe cage. A constant vigil was kept for 2 to 6 hrs to note the activity of bugs towards different chemicals. During the experiment 44 chemicalsand biochemical 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 ***Chrysocorisstolli***. Adults as well as nymphs showed irritating action for somechemicals like acetic acid, formaldehyde, toluene, dichloromethane, sodium sulphate and potassium bromide etc and they retracted theirrostrum. However, chloroform and ammonium sulphate attracted themale and female but these soon entered in quiescent stage within twominutes.Regarding the bio chemicals such as carbohydrates, amino acidsand fatty acids, bugs and nymphs exhibited positive response agains carbohydrates like maltose glucose, sucrose and fructose and to someextent to glycogen and negative response to starch. The bugs showedpositive 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 forknowing chemotropic response of the bugs. ***Chrysocoris stolli***indicated positive response towards oleic acid and negative response towards stearic acid. Thus, a perusal of the aforesaid table shows thatalmost none of the used chemicals has attractant property for the bugsbut the bio-chemical substances carbohydrates, amino acids and fattyacid 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 occidentalies, 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 stolli*** is very specific in its preference to the extract of***Cassia occidentalies*** 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 stolli*** by using gas lantern

Date	Time of experiment started	Colour of light used	Number of *C.stolli* 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 stolli*** by using kerosene lantern

Date	Time of experiment started	Colour of light used	Number of *C.stolli* 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 stolli*** by using different bulbs of various colours of zero watts.

Date	Time of experiment started	Colour of light used	Number of *C.stolli* 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 stolli** by using 100 and 1000 watt bulbs.

Date	Time of experiment started	Watt of bulb used	Number of *C.stolli* 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
	Inorganic compound		2hrs	4hrs	6hrs	
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

References

[1] Sehgal P.K and Dhiman S.C (2016) Description of Nymphal Instars of Chrysocoris stolli Wolf (Heteroptera-Pentatomidae - Scutellerinae) International Journal ofScience and Research (IJSR). Paper ID: NOV161062. International Journal of Science and Research (IJSR) .Volume 5 Issue 2, February 2016.p.723-729.

[2] Sehgal P.K and Dhiman S.C (2015).STUDY OF POPULATION DYNAMICS OF Chrysocoris stolli WOLF (HETEROPTERA_PENTATOMIDAE SCUTELLERINAE). International Journal of Pharma and Bio Sciences. Int J Pharm Bio Sci 2016 Jan; 7(1): (B).

[3] Sehgal P.K and Dhiman S.C (2015).Effect of temperature and relative humidity on the occurrence of Chrysocoris ***stolli*** wolf (Heteroptera_Pentatomidae – Scutellerinae) a potential bio control agent of *Cassiao ccidentalies.* European Journal of Biotechnology and Bio science..Volume 3.Issue 4,14-18 April 2015.

[4] Kumar P and Dhiman.S.C. (2013), Oviposition fecundity and egg structure ***Chrysocoris stolli*** (heteroptera –pentatomidae-scutellerene). International journals of zoology and research. ISSN 2278-8816 (Vol. 3, Issue 1 Mar, 27 - 34).

[5] Kumar. P. & Dhiman S.C.(2013, ***Chrysocoris stolli*** Wolf, A Sap Feeder Pentatomidae Bug on the Weed in North Western Districts of Uttar Pradesh. IJASR, 06/2013; 3(2):89-92.

[6] Dhiman S.C. and Kumar. P., 2005. Food plants and seasonal occurrence of ***Chrysocoris stolli*** Wolf. (Heteroptera – Pentatomidae - Scutellerinae). VI National symposium on Indian Entomology, Productivity and Health (A silver jubilee celebration), October 2- 4, 2005. Abstract 70; page 60. held at Haridwar by the Uttar Pradesh Zoological Society Muzaffarnagar 251001 (India).

[7] Dhiman, S.C. and Kumar, P, 2006. Oviposition, fecundity and egg structure of ***Chrysocoris stolli*** Wolf. (Heteroptera – Pentatomidae - Scutellerinae). National symposium on Role of Applied Zoology in food Production and Human Health. (A Golden jubilee celebration) 23rd and 24th December 2006, Abstract IP 10; page 43. held at Department of Zoology M.S. (P.G.) College, Saharanpur, India.

[8] Dhiman S.C. and Kumar P, 2007a. Some ethological aspect of ***Chrysocoris stolli*** Wolf. (Heteroptera-Pentatomiae-Scutellernae). AZRA, National conference on Applied zoology and sutainable development 13th – 14th July 2007 held at Indian Institute of Chemical Technology, Hydrabad. 500007. India, Abstract No. 018 page, 32.

[9] Dhiman, S.C. and Kumar. P, 2007b. Copulatery behaviour of ***Chrysocoris stolli*** Wolf. (Hepteroptera-Pentatomid-Scutellerinae). A polyphagous pest. National Seminar on threat Global warming to global warming (Sponsored by U.G.C. and C.S.I.R.). 31-03-07. Abstract 28 page 81-82. held at department of Zoology K.L.D.A.V. (P.G.) College, Roorkee, India (U.K.).

[10] Dhiman, S.C. and Kumar, P. 2007c. Biocontrol agent of ***Chrysocoris stolil*** Wolf and their biocont efficacy National seminar on Ailing earth and health Threats. (sponsared by U.G.C. and U.P.C.S.T.) 19th and 20th December 2007. Abstract No. 34; page 89 held at department of Zoology D.N. (P.G.) College (B++ NAAC ACCREDITED) Meerut (Uttar Pradesh).

[11] Dhiman, S.C. and Kumar, P. 2008d. ***Chrysocoris stolli*** Wolf, a sap feeder Pentatomidae bug on the weed in North western district of Uttar Pradesh. Biennial conference on Weed Management in modern Agriculture:Emergingchallengesandopportunities 27 - 28 February, 2008. Abstracts No . P,172, Page 214, held at National Research Centre for Weed Science, Jabalpur (M.P.), Rajendra Agricultural University, Pusa (Bihar).

[12] Kumar. P., 2008.Biology, Ecology and Population dynamics of ***Chrysocoris stolli*** Wolf (Heteroptera - Pentatomidae Scutellerinae) PhD thesis (unpublished) submitted to C.C.S. University Meerut page-181.

[13] Kumar.P and Dhiman S.C. (2013).Research journals of pharmaceutical. Biological and chemical sciences .ISSN:0975-8585 (Vol. 4 Issue 1, Page no .958).