



Study of feeding behaviours and feeding preference of different food plants of *Chrysocoris stoll* wolf (Heteroptera: Pentatomidae: Scutellerinae)

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Abstract

Insecta is the largest class of phylum arthropods and members of this class are characterized by the presence of three pairs of legs; hence, called Hexapods, 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 stoll* Wolf (Heteroptera-Pentatomidae-Scutellerinae): *Chrysocoris stoll* is a polyphagous phytosuccivorous bug found infesting many foods plants as mentioned in introduction chapter. To know the food preference experiments were conducted in laboratory. For this purpose, adults as well as nymphs were exposed to different parts of each host plants kept in wooden wire gauge cage. This experiment is showed that adults and nymphs fed only on the leaves, seed and inflorescence of food plants. Among a large number of food plants, ten plants were selected to know the preferential feeding of the bug population. The selected plants were *Litchi chinensis*, *Croton bonplandianus*, *Adhotoda vessica*, *Croton sparisisflorum*, *Pannisetium typhoides* (Bajra), *Brassica compestris*, *Mangifera indica*, *Parthenium*, *Zizyphus mauritiana* (Indian jujube), *Cassia occidentalis*. Then 25 adults and 25 numphs of *C.stoll* were released in the cage having food plant parts after two, four and six hours. Then, the number of bugs was counted on each host plant part and noted. Likewise, the experiment was repeated several times and observations of preferential feeding were recorded and noted in table 1. Dhiman, S.C. and Yadav, Y.K. 2003. Dhiman S.Cand Kumar P.2005.

Keywords: feeding behaviors and preference of *chrysocoris stoll* wolf

1. Introduction

Insecta is the largest class of phylum arthropoda and members of this class are characterized by the presence of three pairs of legs; hence, called Hexapods, 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 stoll* Wolf (Heteroptera-Pentatomidae-Scutellerinae): *Chrysocoris stoll* is a polyphagous phytosuccivorous bug found infesting many foods plants as mentioned in introduction chapter. Feeding behavior and feeding preference: *Chrysocoris stoll* is a polyphagous phytosuccivorous bug found infesting many plants as mentioned in introduction chapter. To know the food preference experiments were conducted in laboratory. For this purpose, adults as well as nymphs were exposed to different parts of each host plants kept in wooden wire gauge cage. This experiment showed that adults and nymphs fed only on the leaves, seed and inflorescence of food plants. Among a large number of food plants, ten plants were selected to know the preferential feeding of the bug population. The selected plants were *Litchi chinensis*, *Crotonbonplandianus*, *Adhotoda vessica*, *Croton sparisisflorum*, *Pannisetium typhoides* (Bajra), *Brassica compestris*, *Mangifera indica*, *Parthenium*, *Zizyphus mauritiana* (Indian Jujuba), *Cassia occidentalis*. Then 25 adults and 25 nymphs' of *C.stoll* were released in the cage having food plant parts after two, four and six hours. Then, the number of bugs was counted on each host plant part

and noted. Likewise, the experiment was repeated several times and observations of preferential feeding were recorded and noted in table – 47. The data of the aforesaid table clearly depict that both adults and nymphs preferred *Cassia occidentalis* and second place has gone to *Pennisetum typhoides* (Bajra) and *Croton sparisisflorum*. Among these food plants least preference was given to *Litchi chenensies*. Food searching behaviour of *Chrysocoris stoll* was also studied in laboratory in rearing cage (45x30x30cm). Ten adults and ten nymphs were released in the cage and water was also kept in watch glass to quench their thirst. Food was not supplied to them for two days so that the bugs remained in starving conditions. After this period, tender leaves of *Cassia occidentalis* were placed in the centre of the wooden floor of the cage.

2. Material and Methods

The present study deals with *Chrysocoris stoll*, 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 stoll*: For the study purpose, district Saharanpur was divided in 5 regions, ie, Saharanpurproper, Nakur, Behat, Sarsawa and Nagal. Plants were selected randomly in these regions and bugs were picked up from *Cassia occidentalis* and *Croton sparisisflorum* and Bajra by hand picking method. These were kept in perforated polyethylene bags (20x24 cm)

as well as in plastic containers and then brought alive in laboratory along with tender twigs and leaves of *Cassia occidentalis* and *Croton sparisiflorum* at atmospheric temperature and humidity and reared in hurricane glass lantern chimneys. 2. Rearing of bugs in hurricane glass lantern chimney. Five hurricane glass lantern chimneys were fitted with fine muslin cloth on the top to allow circulation of air and the bottom of each chimney was placed in large Petridis. A water filled glass vial was kept in each one to maintain necessary R.H. fresh tender twinges of *Cassia occidentalis* and *Croton sparisiflorum* were also kept in each chimney as a food source. Then, each chimney was placed on a wooden table in laboratory near a window at room temperature and humidity. Now, one male and one female bug were released in each chimney. The stale food was replaced daily with fresh one temperature and relative humidity was recorded at 07.20a.m. In the morning and afternoon at 2.20 p.m. data regarding biological events were recorded. The ecological studies were carried out in field as well as in laboratory during two consecutive years, 2005 and 2006. Above mentioned 5 regions of district Saharanpur were visited weekly and data were recorded. Predators and parasites of *Chrysocoris stoll* were also collected and reared in laboratory to note the bio-control efficacy. To confirm the effect of temperature and humidity on different. Life stage studies were carried out in laboratory in humidity and temperature control cabinet. For this, method and material is given with the concerned chapter. Ethological studies were also carried out in field during different seasons as well as in laboratory. The second instars stage is an actively feeding stage. Hence, after moulting from first instars, these nymphs were provided fresh tender twigs of *Croton sparisiflorum* and *Cassia occidentalis* as food source. With the increasing need of food and space, the second instars were transferred to wooden wire gauge cage (30x30x30cm) on tender twigs as food source. A cotton swab dipped into distilled water was also kept into a vial to maintain necessary R.H. within cage. Onward rearing from second instars to final instars (fifth) and thereafter up to moulting in to imago was carried out in the wooden wire gauge cages



Fig 1: (a, b): Hurricane glass lantern chimney use of rearing *C. stoll*
Wooden wire gauge cage use for rearing *C. stoll*

3. Results

Feeding behaviour and feeding preference: *Chrysocoris stoll* is a polyphagous phytosuccivorous bug found infesting many plants as mentioned in introduction chapter. To know the food preference experiments were conducted in laboratory. For this purpose, adults as well as nymphs were exposed to different parts of each host plants kept in wooden wire gauge cage.

These experiments showed that adults and nymphs fed only on the leaves, seed and inflorescence of food plants. Among a large number of food plants, ten plants were selected to know the preferential feeding of the bug population. The selected plants were *Litchi chinensis*, *Croton bonplandianus*, *Adhotoda vessica*, *Croton sparisiflorum*, *Pennisetum typhoides* (Bajra), *Brassica campestris*, *Mangifera indica*, *Parthenium*, *Zizyphus mauritiana* (Indian Jujuba), *Cassia occidentalis*. Then 25 adults and 25 nymphs of *C. stoll* were released in the cage having food plant parts after two, four and six hours. Then, the number of bugs was counted on each host plant part and noted. Likewise, the experiment was repeated several times and observations of preferential feeding were recorded and noted in table.



Fig 2: *Cassia occidentalis*, a food plant of *Chrysocoris stoll*



Fig 3: Bajra (*Pennisetum typhoides*), another food plant of *C. stoll*



Fig 4: *Croton sparisiflorum*, another food plant of *C. stoll*

The data of the aforesaid table clearly depict that both adults and nymphs preferred *Cassia occidentalis* and second place has gone to *Pennisetum typhoides* (Bajra) and *Croton sparisiflorum*. Among these food plants least preference was given to *Litchi chinensis*. Food searching behaviour of *Chrysocoris stoll* was also studied in laboratory in rearing cage (45x30x30cm). Ten adults and ten nymphs were released in the cage and water was also kept in watch glass to quench their thirst. Food was not supplied to them for two days so that the bugs remained in starving conditions. After this period, tender leaves of *Cassia occidentalis* were placed

in the centre of the wooden floor of the cage. Now, searching behaviour of starved bugs towards food source was keenly observed and their movement route marked and sketched on a paper (Fig-30). The experiment was repeated several times. Observations have revealed that adult bugs orient towards food not directly. Firstly they took turn to their right side and then reached towards food (as in case of female bugs) or towards left, moved a little distance and then turned to right so as to reach towards the food source (as in case of male bugs). During orientation both the antennae, continuously performed up and down movements. The sensory setae present on terminal segment takes active part in the olfaction of food. It was further noticed that whenever the sensation is perceived by antennae, the rostrum also attain erected position moving in search of food. The taste of food is testified by setae present at the tip of the terminal segment of rostrum and gustatory organs present in the roof of ciborium as also observed by Dhiman (1988) [16, 6]. In case of the nymph instars, second and third nymphal instars directly move towards food, while fourth and fifth took a looping path to reach to the food. Shorter loops were taken by fourth and fifth instars in comparison to adults. After approaching food source, the bugs first probe suitable feeding site with the aid of sensory setae of the rostrum and then piercing is done by stylets and when feeding is over, the bugs withdraw their stylets and either move away from the feeding site or remain in nearby vicinity. After feeding, rostrum and antennae are cleaned by antennae and rostrum cleaner device named by Dhiman and Dhiman (1985) [5, 7]. The device is situated at the inner side of prothoracic tibia extremity. Combing is done several times either by one or both cleaning device on the rostrum and antennae, to get rid of foreign matter. It was further noticed that after feeding second and third instars move towards water dipped cotton swab kept in Petridis. It seem that some odorous chemicals emitted by the food source is perceived by the antennal sensillae of the bug. These chemicals are not identified during present course of studies but this observation opens the doors for further investigations.

Field studies have revealed that in this locality the active breeding and feeding of *Chrysocoris stollii* occurs from mid March to mid October. During March to June, they moderately increase their number and after June in the months or rainy season, i.e., July to September, they multiply their number rapidly. The maximum number of adult's as well as nymphs reaches in September. In mid October the older nymphs, i.e., 4th and 5th instars prepare for quick feeding and moulting to become adults. From late November to mid February hibernation occurs in adult's stage. Thus the *Chrysocoris stollii* can be seen actively during March to October. Seasonal occurrence of *C.stollii* in relation to host plants is shown in table- and Fig. – 29. *H.marginatus* as well as of host *Chrysocoris stollii*. Ist nymph instars consumed minimum

land maximum 4 nymphs with an average of 3 nymph per day. IInd nymphal instars consumed minimum 2 and maximum 6 nymphs' within average of 4 nymphs per day. IIIrd nymphal instar killed minimum 2 and maximum 7 nymphs with an average of 6 nymph's per day. IVth instars killed minimum 3 and maximum 9 with an average 6 nymph per day. In the same duration, Vth instars killed 4 to 10 nymph's within average of 8 nymph's per day. Male consumed minimum 1 and maximum 5 with an average 4 adults per day. Female utilized minimum 1 and maximum 7 with an average 6 adults during the same duration. Ist nymphal instars of reduviid bug preferred for food IInd nymphal stages of *Chrysocoris stollii* IInd and IIIrd instars also preferred the IInd nymphal stages while IV and Vth nymphal instars preferred fourth and fifth stage nymphs of *C.stollii*. Adult male and female of *H.marginatus* preferred the adult female as well as Vth instar nymphs of *Chrysocoris stollii* (Table - 46 and 47). Bug population feed on *Chrysocoris stollii* in nature during March to July when the population of *Chrysocoris stollii* reaches on peak. Simultaneously, the bug population also increases many folds. The bug has alarming red color, high adaptation and capability for unfavorable condition and it can live up to 2 months in starvation at room temperature and R.H, the bug is polyphagous and has a wide range of prey. It is also observed showing cannibalism in absence of other preys. Powerful individual attacks the member of its own species and suck their body content.



Fig 5: (a b): Litchi (*Litchi chinensis*), another food plant of *C. stollii*
Mustard (*Brassica campesteres*), another food plant of *C. stollii*



Fig 6: *Jatropha* food plants of *Chrysocoris stollii* wolf

Table – 37
Seasonal occurrence of *C.stolli* on different host plants.

S. No.	Host Plant	Family	Time of occurrence	Host pest relation
1	<i>Litchi chinensis</i>	Sapinduaceae	Arial, May, June	Food, shelter and breeding
2	<i>Croton bonplandianus</i>	Euphorbiaceae	Jan, Feb, March, Aug. Sep. Oct. Nov. December.	Food, shelter and breeding
3	<i>Adhatada vesica</i>	Acantheceae	March, April, July, Sept. Jan, Feb.	Food, shelter and breeding
4	<i>Croton sparisiflorum</i>	Euphorbiaceae	March, April, May, June, July, Aug, Sept, late Nov.	Food, shelter and breeding
5	<i>Brassica compestris</i>	Cruciferae	Feb. March	Shelter only
6	<i>Mangifer indica</i>	Anacardiaceae	April, May, June	Shelter only
7	<i>Pennisetum typhoides</i>	Poaceae	Sept. Oct, July, Nov	Food and shelter only
8	<i>Parthenium hysterophorus</i>	Compositae	Apr.May.June, July	Shelter only
9	<i>Zizyphus mauritiana</i>	Rhamnaceae	Feb. Mar. Apr. Aug.	Shelter only
10	<i>Cassia occidentalis</i>	Leguminasae	Late Feb. March, April, May, June, July, Aug. Sept, Oct.	Food and Shelter only

Table-38
Number of bugs per plants on *Cassia occidentalis* and *Croton sparisiflorum* on different compost manure.

Date	Buffalow dung manure	Cow dung manure	Horse dung manure	Goat dung manure	With out manure
01-06-2005	4	3	2	1	0
02-06-2005	5	3	1	2	0
03-06-2005	6	3	0	0	1
04-06-2005	3	2	1	1	0
05-06-2005	5	4	1	1	1
06-06-2005	6	4	1	0	0
07-06-2005	3	2	0	0	0
08-06-2005	4	3	1	0	0
09-06-2005	4	4	1	1	1
10-06-2005	5	4	1	1	0

Table-45							
Preferential feeding of <i>Chrysocoris stollii</i> on the extract of different vegetative parts of food plants.							
S.No.	No. of insects released	Name of host plant	Vegetative part	No. of bugs observed feeding on vegetative parts after			Response
1	10	<i>Cassia Occidentalis</i>	Flower	-	-	-	+ve
2	10		Fruits	-	-	-	-ve
3	10		Leaves	2	4	3	-ve
4	10		Seeds	-	-	-	+ve
5	10	<i>Croton sparisiflorum</i>	Leaves	2	4	6	+ve
6	10		Seeds	-	-	-	+ve
7	10		Fruits	-	-	-	+ve
8	10	<i>Litchi chinensis</i>	Flower	1	1	1	+ve
9	10		Fruits	-	-	-	-ve
10	10		Seeds	-	-	-	-ve
11	10		Leaves	2	1	2	+ve
12	10	<i>Mangifera indica</i>	Flower	-	-	-	-ve
13	10		Fruits	-	-	-	-ve
14	10		Seeds	-	-	-	-ve
15	10		Leaves	1	2	1	+ve
16	10	<i>Pennisetum typhoides</i>	Fruits	-	2	3	+ve
17	10		Flowers	-	-	-	-ve
18	10		Seeds	2	3	2	+ve
19	10		Leaves	1	2	3	+ve
20	10	<i>Brassica campestris</i>	Fruits	1	1	2	+ve
21	10		Seeds	-	-	-	-ve
22	10		Leaves	-	-	-	-ve
23	10		Flowers	2	2	3	+ve
24	10		Flowers	1	1	1	+ve
25	10		Fruits	-	-	-	-ve
26	10		Leaves	-	-	-	-ve

Table-47

Feeding preference of *H.marginatus* on different stages of *Chrysocoris stollii* (in lab conditions) during 24 hrs.

Different stage of <i>H.marginatus</i>	Average number of different nymphal stages and adults of <i>Chrysocoris stollii</i> consumed by <i>H.marginatus</i> per day.							
	Ist	IInd	IIIrd	IVth	Vth	Adult Male	Adult female	Total killing capacity per day
Ist instar	1	2	2	1	1	-	-	7
IInd instar	2	3	3	1	2	-	-	11
IIIrd instar	2	3	1	2	1	-	-	9
IVth instar	1	2	3	1	2	-	-	9
Vth instar	1	2	3	2	2	2	1	13
Adult male	-	1	1	2	1	2	1	8
Adult female	-	-	2	3	1	1	2	9

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