



## Seasonal occurrence and mode of damage of *Eusarcocoris capitatus* Distant, a pest of *Ocimum sanctum* L.

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### Abstract

*Eusarcocoris capitatus* Distant (Heteroptera: Pentatomidae), a pentatomid bug, infests valuable medicinal plant, *Ocimum sanctum* L. at Saharanpur District in good number. It is a phytosuccivorous bug, which with the help of their piercing and sucking mouth parts drains out sap from the seeds, flowers and leaves of Tulsi (*Ocimum sanctum*). During this study, it has been observed that *E. capitatus* occur maximum during March to mid of December. Adults of *E. capitatus* undergo hibernation during late December to first week of March to avoid unfavorable cold climatic conditions. Maximum population and infestation of this bug have been recorded during July to October when temperature and moisture content are suitable for its development and reproduction. Studies on mode of damage revealed that all the five nymphal instars and adults suck the sap content from all parts of *O. sanctum* plant. The damaged seeds shrink and loss viability and become unfit for germination. Looking to the medicinal value of Tulsi, control of this bug is urgently needed.

**Keywords:** *Eusarcocoris capitatus*, Damage, *Ocimum sanctum*, Tulsi, Bug, Medicinal

### Introduction

In India, the herb Tulsi or holy basil has been widely known for its health promoting and medicinal value for thousands of years. It is known as “The incomparable one”, “The Mother Medicine of Nature” and “The Queen of Herbs”. It is grown in every pious Hindu home and kitchen garden as it is remedy of many day to day ailments.

Modern agriculture is continuously facing insect problem since its inception. India faces an annual loss of about 1500 crores of rupees due to damage caused by insects to agriculture. Among various insect pests, Heteroptera insects, which are commonly called bugs, inflict good losses in terms of money to the agricultural and horticultural crops as well as medicinal plants. Among this group, pentatomid bugs make a good contribution. *E. capitatus* (Heteroptera: Pentatomidae) infests a valuable medicinal plant, Tulsi (*O. sanctum* L.) at Saharanpur District in large number. Though, on other pentatomid bugs a good piece of work has been carried out by Dhiman (1981, 1983 and 1985)

Dhiman and Dhiman (1985), Brown (2003), Colazza *et al.* (2004), Dhiman *et al.* (2004), Dhiman and Singh (2005), Nardi and Alves (2005), Chatterjee and Kumar (2006), Dhiman and Kumar (2006), Patel *et al.* (2006), Santosh *et al.* (2006) and Dhiman and Bhardwaj (2008), but on this bug only few observations were made by Dhiman and Jain (2008 a, b). Hence, looking to the medicinal value of its host plant and its pest status, present study has been under taken.

### Materials and Method

Tulsi plant (*O. sanctum*) was planted in good number in well manured irrigated soil of earthen pots. These were kept in the open field and some were caged by fine wire mesh. Plants were irrigated at regular interval. *E. capitatus* were reared in laboratory as well as in field in wire gauze cages. At inflorescence and seed setting stage of Tulsi plants, in 5 cages, 2 pairs of newly emerged bugs were released in each and their mode of damage was observed by making close observations. Mode of damage was also observed using a magnifying hand lens (20x) as well as under binocular microscope in reflected light. Rearing in laboratory was carried out in hurricane

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glass lantern chimneys covered at top by fine muslin cloth. In each chimney, 5 pairs of bugs were released and fresh food was supplied daily and stale was removed. A cotton swab dipped in water was also placed in the chimney in watch glass for maintaining necessary relative humidity. Population studies on the bug were made in open field on randomly selected plants. Effect of temperature was seen in laboratory by placing the bugs in a muslin cloth covered glass jar in temperature and humidity control cabinet. These were subjected to different temperature levels at different time and their survival was recorded.

### Results and Discussion

Mode of damage was observed in field as well as in laboratory which revealed that all five nymphal instars and adults suck the newly set seeds content as well as flowers and sap from the leaves.

### Seasonal occurrence

Weather is a composite condition of influence of temperature, light, humidity, rainfall and wind at any given moment in time. It varies continually through days, weeks, months, years and exerts an influence on insect abundance, longevity and development rate and so on, from one year or season to the next. Heteropteran bugs generally hibernate in adult stage on approach of cold weather (Dhiman, 1981, 1983). Similarly *E. capitatus* hibernates in adult stage from December to first week of March (at temp. ranging from 15°C to 24°C and relative humidity 68% to 56%) under fallen leaves, crevices of house wall and tree trunk, under the bark, stones etc. Duration of hibernation varies upon climatic conditions. Temp. and relative humidity. Plays a vital role in longevity of adult insect. Maximum survivality of the bugs was recorded at 30°C and minimum at 40°C (only in hrs). Its population lasts on Tulsi plant from March to November or mid of December. Peak level goes during July to October and being minimum during March to April and November to first week of December. However, fluctuation in population occurs depending upon temperature and relative humidity. of environment (Table. 1).

### Mode of damage

The *E. capitatus* is a phytosuccivorous bug and possesses piercing and sucking mouth parts. Prior

to the feeding, suitable feeding site is explored by the sensory setae present at the rostral tip and antennal sensillae present at the terminal clavate segment. Usually a soft feeding site is selected for easy penetration by its stylets.

**Table 1: Population fluctuation of *E. capitatus* on Tulsi during 2007 in field**

| Months    | *Average number of bugs per plant | *Average temp. (°C) | *Average R.H. (%) |
|-----------|-----------------------------------|---------------------|-------------------|
| January   | NIL                               | 13.05               | 79.15             |
| February  | NIL                               | 17.08               | 67.69             |
| March     | 10                                | 23.49               | 55.92             |
| April     | 20                                | 25.08               | 40.87             |
| May       | 30                                | 30.01               | 45.37             |
| June      | 40                                | 29.62               | 64.07             |
| July      | 50                                | 30.46               | 71.31             |
| August    | 50                                | 28.58               | 82.82             |
| September | 44                                | 28.40               | 74.37             |
| October   | 38                                | 25.38               | 72.89             |
| November  | 25                                | 18.87               | 70.78             |
| December  | 10                                | 15.62               | 68.31             |

\*Average has been taken of 10 observations

Prior to piercing operation by stylets, the insect probes the seed, leaf and flower with the proboscis 5 to 6 times. Stylets are able to pierce any part of the host tissue, but generally more woody part is avoided. In *E. capitatus* the mandibular stylets perform the major piercing organ while maxillary stylets in addition to suction, contribute towards the cutting of parenchymal tissue so as to ensure a continuous flow of sap. After probing, a suitable site piercing is done by mandibular and maxillary stylets, using powerful protractor and retractor muscles. Then saliva is poured by powerful salivary pump and the saliva mixed sap is sucked up by cibarial pump. In this bug feeding operation is similar as observed by Dhiman (1985) in *Metacanthus pulchellus* Dall. Feeding generally lasts for 35 to 65 minutes. When the feeding is over, the stylets are withdrawn from the host with a fairly great effort by means of retractor muscle. As soon as stylets are withdrawn, air bubbles are sucked-up into the food canal along with the sap column which ultimately reaches the midgut and

clean proboscis and antennae by antennae and rostrum cleaning device situated at the tibial extremities of fore legs as also described by Dhiman and Dhiman (1985).

Generally, *E. capitatus* (nymphs and adults both) are seed sucker, but some time they also feed upon the leaf and flower. The seeds of Tulsi, *O. sanctum* are dry, rich in amino acids, carbohydrate and fatty contents. The bug pierces the testa so as to reach the stylet to food content. A constant flow of saliva into wound is maintained till the food is well dissolved for sucking. This is the reason; a single penetration by the stylets may last upto 25 to 40 minutes in case of seed feeding. Saliva probably contains amylase and lipase which helps in dissolving the food. Salivary fluid might act as a lubricant also which helps in penetration of stylets. After feeding, labium is withdrawn from the seed and the tip is invariably cleaned between the fore-tarsi having antennae and rostrum cleaner device.

They picked up seed with the help of tibia and tarsi of forelegs and then punctuation occurs with the aid of mandibular and maxillary stylets as described above. They may feed at one spot or carry the seed to some distant places hanging it by stylets. Now, it may take rest or select another feeding site and similarly food content or sap is drained out from the leaves, flowers or newly set seeds. Carbohydrate and protein or lipid diet is taken from seeds while water, minerals and vitamins are taken from leaf sap. In damaged leaf, punctuations and decolorized areas appear when viewed under binocular microscope in reflected light. The chlorophyll content of damaged parts is lost. On a single leaf, many such areas develop after 4 to 6 hours of feeding. Such leaf later on turns brown and wilts up. This reflects the magnitude of damage caused of this bug. Some punctuations on the leaf can be seen without the aid of artificial light after feeding is over. Moreover, damaged seeds lost viability and weight. Only covering of seeds is left while soft cotyledon content is sucked up. The affected seeds of the important host plant *O. sanctum* could not germinate even after a period of 40 days. 99.6 to 99.67 % seeds of Tulsi are damaged in laboratory feeding. On a single Tulsi plant as many as 50 bugs were recorded while on a single inflorescence upto 15 bugs were counted. Thus, all five nymphal instars and adults suck the newly set seeds content as well as of flowers and sap from

the leaves. As a result, the seed setting is greatly affected. *O. sanctum* has high medicinal value and *Eusarcocoris capitatus* occurrence on it in large number at Saharanpur is a new record. Other authors only reported *Monanthia globulifera* its pest (Dhiman and Bhardwaj, 2008). *Monanthia globulifera* population feeds on the leaves while *E. capitatus* mainly feed on inflorescence and seeds. At Saharanpur it occurs during March to November and hibernates during December to first week of March. Dhiman (1983) also recorded hibernation in *Cletus signatus* at Saharanpur. Peak population of *E. capitatus* occur during June to October and minimum from March to May. Dhiman *et al.* (2004) recorded both bug species *Halys dentatus* and *Erthesina fullo* occur throughout the year. The active breeding period of these last from March to October. Dhiman and Singh (2005) stated that *Audinetia spinidens* hibernated in adult stage during late November to mid February. The population increased till June reached its peak in rainy months (July-September) and then declined in October-late November. Dhiman and Kumar (2006) recorded the period of occurrence from March to November, after that *Chrysocoris stoll* under went to hibernation from late November to February. The maximum population occurs in September and minimum in February and November. By desapping habit, *Chrysocoris stoll* population causes damage to these food plants of economic value. Santosh *et al.* (2006) said that *Ocbealus poecilus* hibernates during the coldest months of the year in refuges such as bamboo litter. It left this refuge from middle October to the end of December. Thus, hibernation is found in most bug species in the regions where climatic conditions differ throughout the year.

*E. capitatus* (nymphs and adults) both are seed sucker, but some time they also feed upon the leaf and flowers. *E. capitatus* caused damage to the growing milky seeds and damage has been recorded on *Ocimum sanctum* from 99.6 to 99.67%. The damage seed loss viability, weight and become unfit for germination. Brown (2003) described the damage caused by stink bugs was eliminated by caging fruits in early July, whereas damage was higher on fruits caged with stink bugs for a 2 week period late July and harvest than on fruits that were not caged. Most stink bug damage occurred from 26 to 60 days before harvest.



Colazza *et al.* (2004) described that the feeding activity of the *Bagrada hilaris* can result in severe damage, potentially capable of causing economic damages. Nardi and Alves (2005) said that infestation of *Euschistus heros* on soyabean plants at the R3-R8 stage, which had significant effects on seed production, number of pods, total number of seeds and total weight, reduced plant height. Chatterjee and Kumar (2006) recorded that *Dolycoris indicus* population caused damage to the growing milky seeds and net damage has been recorded in berseem from 32.02 to 36.73% (maximum, average, 34.65% in May and on *O. sativa* between 59.28% (maximum) and 57.97% (minimum, average 34.65%). Patel *et al.* (2006) recorded that average grain weight were lower in infestation of *Oebalus pugnax pugnax* (Fab.) on rice. *Oryza sativa* L. during anthesis and milky stage and higher infestations during later grain development. Thus percent of damage varies according to the species of pentatomid bug and host plant. Damage caused by them reflects very high magnitude of damage which indicates for the necessary action for the control of these bugs at appropriate time.

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