



BIOLOGY AND ECOLOGY OF DUSKY COTTON BUG (*OXYCARENUS HYALINIPENNIS*: HEMIPTERA) FROM DISTRICT JAMSHORO, SINDH, PAKISTAN

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J.A.K. performed the experiments, T.J.U. designed the study, Y.F. compiled the data Z & F.S. edit the data.

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ABSTRACT

Cotton is one of Pakistan's major foreign exchange earning crops. It is attacked by a number of insect pests, which not only affects the yield but also exports. The dusky cotton bug, *Oxycarenus* spp which used to be regarded as a minor pest, has now attained the status of a major pest due to its affects on cotton lint as well as the seed quality of cotton. In the past, dusky cotton bugs usually appeared on cotton once most of the cotton bolls had opened. The damage caused by the bugs on unripe seeds was therefore negligible. Surveys were conducted to explore the hibernating sites in the district Jamshoro. Total ten sites were selected and 3055 specimen were collected. We found that this bug not only harm the quality and quantity of the cotton crop but also caused itching to those farmers who collect the cotton from crop. It was also noticed that they occurs in huge number in September and October when second or third time collection of cotton takes place. The ecological factor like temperature and humidity were regarded as most affecting abiotic factor.

1. INTRODUCTION

The dusky cotton bug *Oxycarinus hyalinipennis* is a species of plant bugs belongs to family Lygasidea, Sub-family oxycareninae, Genus *Oxycarenus*, species *Oxycarenus hyalinipennis* (Costa). It was originally named as *Alphanus tardus* Var. *hyalinnipenis*. This species has various synonyms with different common names, and it is a common pest of cotton found worldwide, which is commonly known cotton seed bug or Cotton Stainer. Historically it has been verified as an important pest of cotton in Mediterranean region and in Coastal Africa. It has been obstruct on various places on material from Africa, Asia, Europe, The Middle East, Central America, South America, and the Carribean region [1].

DCB, *Oxycarenus hyalinipennis* was accounted to be sub-ordinate pest of cotton but currently, it has ranked as a threat to early and late cotton crop in Pakistan. In Pakistan Dusky Cotton Bug (DCB) is found throughout the year and can survive on guava, moringo, mango, okra, chillies, lemon, and cotton [2]. Its chief value fall in the catogory that the adults and nymphs get crushed during ginning, thus tainting the lint and reducing the market value of cotton. The cotton crop is hurted by the sucking behaviour of these insects both at early and late stages. The cell sap is taken up by the reproductive part of plants which decay the caliber of seed. The size of *Oxycarenus hyalinipennis* can reach upto 3.8mm of length in males and about 4.3mm in females. Body is black with transparent wings. Head is black in color and shaped like a rat with a pair of ocelli.

The antennae is brownish-whitish. Corium colored as yellowish-whitish and hyaline. Femora are black in color while Tibia is brown with a yellow white band. Males and Females possess alike coloration but vary in sizes such as females are slightly greater in size than males. Three diverse types of setae are also found on the body of dusky cotton bug. Dusky cotton bug population come out during 3rd week of July and reached ETL (10-15 nymphs/adult or both per plant) during August. Literature search demonstrate that in past there was no attention paid on the Biology and Ecology of *Oxycarenus hyalinnipennis* in Sindh Province, from District, Jamshoro Pakistan. It is a substantial pest of cotton to keep an eye on its destructive behavior to cure and protection of our important Agricultural cash crop of Pakistan. Once host plant seeds open, DCB start feeding, make and lay eggs [3]. Copulation occurs in 2-3 days in cooler months. The ovipositor matures at evening or night [4]. After copulation nearly, 20 eggs are laid by females on the lint of open balls [5]. Eggs are laid singly or in groups of 2-4 eggs [6]. Eggs hatch around 4 days afterwards when the temperature optimal range appears [7]. After nymph come out of eggs, group together for nearly about half an hour before they start trolling for food [8]. The nymph, depending on the temperature pass through five nymphal stages [9]. The adult than emerge after few days, both nymph and adults of dusky cotton bug get nourished on seeds and entire generation can be completed in 20 days with 3-4 generation occurring annually [10]. When the relative humidity is constant, the temperature affects the duration of life stages. [11]. Dusky cotton bug shows local migratory behavior in which it goes through between host plants whole years [12]. This research work is first and foremost contributed that this bug from district Jamshoro which is now become major cotton pest due to very highest growth rate which affect the quantity, quality and rate of the cotton crop on the other hand it also effects upon the growth of buds and flowers. This dusky cotton bug arise in the peak season of cotton during the months of August to September, hence it badly affect the cash crop. Sometimes it causes trouble for cotton collectors specially farmers because these insects causes the itching and impatient.

2. MATERIALS AND METHODS

Total numbers of 3678 specimens were collected during the months of August to September 2018, from various sites and localities of district Jamshoro by hand picking. Specimens were killed by means of potassium cyanide in standard entomological bottles. Specimens were not left too long (½ hours) in cyanide because the color changed. Specimens stored in standard entomological bottles having 70% ethanol with labels showing locality, date of collection and collector's name (Fig 1-3). Identification of specimens done with the help of keys and descriptions given by a few researchers of China, Indian and Pakistan. Observations on the feeding behaviors were determined on live bugs in open fields early in the morning, glass house cages in the lab and green house at advanced laboratory of Entomology & Aracnology. After locating the species and quietly watching their feeding for about 2 to 4 hours. Photographs captured by digital camera.

3. RESULTS

The specimens of dusky cotton bug (DCB) were collected from District Jamshoro, area RIVER INDUS (ITS BOTH BANKES) and field of by hand picking method (Table.1). The eggs and specimens were collected from August to September (Table.2) with their high no of population present on cotton balls, flowers and young buds growing in cotton plant as observed during collection. The high no of population were found affecting the quality of cotton, by their sucking type of behavior, they inject their long proboscis into the young buds, balls and flower for feeding or sucking juices which reduces the quality of cotton plant hence the buds, flower and ball fall down on floor destroying plants by-product. It was reported as minor pest of cotton in literature but the no of pest population about more than 100's on one flower or bud indicate that it has become the major pest of cotton at this time. The need of time is to manage their population by following the instructions given by IPM (Integrated pest management) to secure the quality of our major cash crop of Pakistan. It is also beneficial economically for the GDP of Pakistan; if their population is not controlled they will become serious pest of cotton, badly effect the economy of Pakistan. Life Cycle Of

Dusky Cotton Bug *Oxycarenus hyalinipennis* have 3-4 generation annually. They have incomplete metamorphosis. Whole generation of dusky cotton bug can be completed in 20 days. They are summer loving insect so they produce their eggs in August to October. Each female lays about 20 eggs which are cigar in shape. The eggs are deposited singly or in cluster. The incubation period varies from 3-5 days according to temperature and humidity. They go through the five nymphal instar or stages. The first three instars are very similar except in size. Early instar nymph is about 2.5mm long, they become orange in colour when about to moult. After first moult the nymph becomes reddish brown and becomes darker after each moult. The size of adult is 4-5mm and have a pointed head. They have white, transparent wings with black spots on forewings and having deep red legs. They have a long proboscis for taking meal. **Eggs** are laid in cluster or singly in about 20 eggs batches on an open cotton boll (fig.1,2). Eggs were dense yellow in color and oval in shape, and some eggs are in cigar shape. Eggs hatched out in 2-3 days depending on temperature and humidity. **First Instar** is reddish, yellowish in color. The legs are not properly formed in first instar (fig.11-15 & Table.3). **Second Instar** is reddish brown with few yellowish segments appeared on legs, antennae and proboscis. The ventral view of instar. **Third Instar** is same as the first two instar except it is bigger in size. Legs are expended. **Fourth Instar** body became reddish brown in color and body is expended in size, compound eyes, head and citae on whole body were prominently visible. **Fifth Instar** finally it is about to molt last and here the head becomes darker in color with brownish from back side along with transparent wings are developed. This research first and foremost contributed that this bug is now become major cotton pest due to very highest growth rate which affect the quantity, quality and rate of the cotton crop on the other hand it also effects upon the growth of buds and flowers. This dusky cotton bug arise in the peak season of cotton during the months of August to September, hence it badly affect the cash crop. Sometimes it causes trouble for cotton collectors specially farmers because these insects causes the itching and impatient.

4. DISCUSSION

The dusky cotton bug *Oxycarenus hyalinipennis* occurrence recommence in cultivated crop during first week of August, 2018 in the company of a population of 1.14 dusky cotton bugs per cotton bolls which was steadily increased and it was observed that its population become higher during the second week of September, 2018, 31.57 dusky cotton bugs per cotton bolls and arrived at peak level from the first week of October, 2018 which was noticed 54.85 dusky cotton bugs per bolls. It was due to existence of plentiful immature cotton seeds and favorable abiotic factors and climatic conditions during September and October might be advantageous conditions for the growth, development and oviposition of the dusky cotton bugs. Afterward, the population of dusky cotton bugs ongoing decreasing and reached minimum during third week of November, 2018, 9.68 dusky cotton bugs per bolls. The movement of dusky cotton bugs were completed with the final harvest of cotton Maximum and minimum temperature showed positive and significant correlation with Dusky cotton bug and they influenced the bug population. However, the weather parameters such as morning and afternoon relative humidity were negatively significant with bug population in irrigated cotton crop. From the above studies, it is clear that dusky cotton bug's incidences were early and higher in cultivated cotton crop and control measures must be taken otherwise it may become a major cotton pest.

5. CONCLUSION

This research first and foremost contributed that this bug is now become major cotton pest due to very highest growth rate which affect the quantity, quality and rate of the cotton crop on the other hand it also effects upon the growth of buds and flowers. This dusky cotton bug arise in the peak season of cotton during the months of August to September, hence it badly affect the cash crop. Sometimes it causes trouble for cotton collectors specially farmers because these insects causes the itching and impatient if it will not controlled in above mentioned months it may cause a considerable loss of cotton lint.

6. CONFLICT OF INTEREST

All authors have declared that there is no conflict of interest regarding publication of this article.

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Table1. Collection of DCB from Ten (10) sites of District Jamshoro

NAME OF SITES	KS	RBR	LBR	PV	MK	MS	JM	AM	KM	SM	#sp
Dusky Cotton Bug	+	+	+	+	+	+	+	+	+	+	3056

Note: (+) sign indicates the presence of species.

KS= Kirn Shoro, RBR= Right Bank of River Indus, LBR= Left Bank of River Indus, PV= Peero Khoso, MK= Mirkhan Village, MS= Malik Sikander , JM= Jamshoro, AM= Alminzar, KM= Khan Muhammad Village, SM, Sattar Memon Field

Table 2. Temperature & Humidity data for two months

Months	Temperature °C Average		Relative Humidity (%) Average
	Maximum	Minimum	
September	37.9 -39.4	32.7-34.8	66- 73
October	36.6- 38.4	23.9-28.5	56- 68

Table 3. Measurements of the nymphs after each molt and feeding status.

Nymph stage	Length in mm	Nymph period in days	Feeding status noted/ stage
1 st instar	2.3 to 2.5	1 to 5	Juice of cotton seeds & Buds
2 nd instar	2.5 to 2.8	5 to 7	Leafs
3 rd instar	2.9 to 3.0	4 to 5	Bolls juice
4 th instar	3.5 to 3.8	2 to 3	Bolls juice
5 th instar	4 to 5	3 to 4	Bolls juice



(1)



(2)



(3)

Fig. (1-3) collection of DCB from cotton field in District Jamshoro



Fig. (4-5) showing the nymph observation under the stereoscopic microscope



Fig.6 showing the head part of DCB

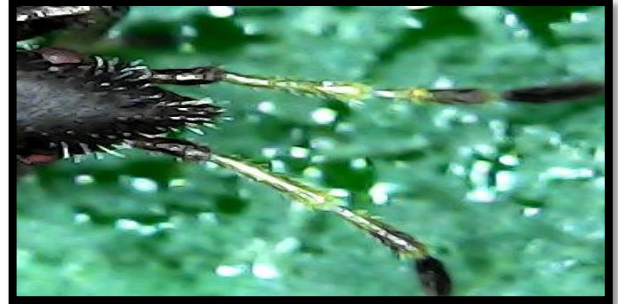


Fig.7 showing the antennae of DCB



Fig.8 showing the Thoracic part of DCB



Fig.9 showing the compound eye of DCB

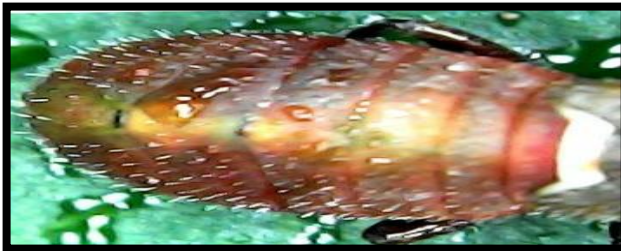


Fig. 10 showing the abdominal segments



Fig.11 showing the first instar of DCB



Fig. 12 showing the second instar of DCB



Fig.13 showing the 3rd instar of DCB



Fig.14 showing the 4th instar of DCB



Fig. 15 showing the 5th instar of DCB