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REPORT OF *HOMOEOCERUS VARIABILIS* (HEMIPTERA: COREIDAE) ON KHEJRI (*PROSOPIS CINERARIA*) IN RAJASTHAN, INDIA: INCIDENCE AND MORPHOMETRIC ANALYSIS

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Abstract

An infestation of *Homoeocerus variabilis* Dallas (Hemiptera: Coreidae) on khejri, *Prosopis cineraria*, was first noticed in 2010 at the Experimental Farm of Central Institute for Arid Horticulture and other fields of Bikaner district, Rajasthan, India. The maximum incidence was observed in December (66.7%) and minimum in June (16.7%). The number of this bug ranged between 27.3 and 222.9 adults per plant. This species is characterized by an ochraceous body with a broad red basal fascia on the pronotum between the humeral angles, small pale scutellum, antennae 4-segmented, the basal part of second and third segment is pale yellow, third segment flattened at the tip and fourth segment is the shortest. The mean body lengths of the male and female adult vary and were recorded as 12.2 mm and 15.5 mm, respectively.

Key Words: *Homoeocerus variabilis*, *Prosopis cineraria*, bug, morphometric characters

Resumen

Se observó por primera vez en 2010 una infestación de *Homoeocerus variabilis* Dallas (Hemiptera: Coreidae) en khejri, *Prosopis cineraria*, en la Granja Experimental del Instituto Central de Horticultura Árido y otros campos del Distrito Bikaner, Rajastán, India. Se observó la incidencia máxima (% de árboles infestados) en diciembre (66.7%) y el mínimo en junio (16.7%). La densidad de la población de este chinche coreido varió entre 27.3 y 222.9 adultos por planta. El chinche coreido se caracteriza por tener el cuerpo del color café con una fascia ancha basal en el pronoto entre los ángulos laterales, el escutelo pálido y pequeño, las antenas de 4 segmentos con la parte basal del segundo y tercer segmento de color amarillo, el el apice del tercer segmento aplanado y el segmento 4 es el más corto. El promedio de la longitud del cuerpo de los machos y hembras varía y fue registrado a 12.2 mm y 15.5 mm, respectivamente.

Palabras Clave: *Homoeocerus variabilis*, *Prosopis cineraria*, bug, incidence, morphometric

Prosopis cineraria (L.) Druce (Fabales, Fabaceae), commonly called khejri (synonyms: jambi, jambu, shumi, jandi) is a leguminous, multipurpose tree species distributed in hot arid and semi-arid regions of India, Afghanistan, Pakistan, Iran and Arabia (Pareek & Purohit 2002; Hanelt & IPK, 2001). It is the most revered indigenous plant of hot arid and semi-arid regions of western India and mostly found in north-western parts of Rajasthan, Gujarat and Haryana. Khejri is also known as "Queen of the Desert", and it is predominant constituent of the vegetation complex in the hot arid region of Rajasthan. It is an integral part of the life support systems of rural communities. Leaves of this tree are used as animal fodder and its young pods used as vegetable. Apart from these uses, it is extremely drought tolerant, promotes soil fertility by increasing organic carbon, N, P and K under its canopy (Srivastava & Hetherington 1991).

In the recent years, khejri tree decline has been noticed in the Thar Desert of India. The tree decline has been suspected to be caused by the lowering of the water table, mechanization of farm lands and incidence of pests. Some 153 insect and non-insect pests have been reported to damage *P. cineraria* in the world (Beeson 1941; Mathur & Singh 1960; Singh & Bhandari 1986; Parihar 1993; Parihar & Singh 1993), of which 26 are known to be potential threats in arid and semi-arid regions (Ahmed et al. 2004). The coreid bug infestation on khejri has not yet been reported. Here, we report the new information on the incidence of *H. variabilis* on khejri, its morphological characters and taxonomic identification.

Materials and Methods

Incidence and Symptoms

Twenty 4-yr old khejri trees were randomly selected in each of 3 replicates at the Experimental

TABLE 1. MEAN PERCENT OF *PROSOPIS CINERARIA* TREES INFESTED THE COREID, *HOMOEOCERUS VARIABILIS* AND THEIR MEAN NUMBER PER *PROSOPIS CINERARIA* TREE IN 2010 AT THE EXPERIMENTAL FARM OF THE CENTRAL INSTITUTE FOR ARID HORTICULTURE, BIKANER DISTRICT, RAJASTHAN, INDIA.

S. No.	Month	Mean Incidence (%)	Mean No. *H. variabilis*/tree
1.	August	36.67 (37.24)[b*]	39.08 (06.31)[a**]
2.	September	51.67 (45.94)[cd]	65.87 (08.17)[ab]
3.	October	56.67 (48.82)[cd]	137.13 (11.75)[cd]
4.	November	61.67 (51.73)[d]	175.20 (13.27)[cd]
5.	December	66.67 (53.73)[d]	222.93 (14.92)[de]
6.	January	56.67 (48.82)[cd]	198.53 (14.11)[de]
7.	February	46.67 (43.07)[bc]	167.13 (12.96)[cd]
8.	March	41.67 (40.18)[bc]	118.27 (10.92)[bc]
9.	April	35.00 (36.22)[b]	93.87 (09.73)[bc]
10.	May	23.33 (28.84)[a]	65.47 (08.15)[ab]
11.	June	16.67 (24.04)[a]	45.27 (06.80)[ab]
12.	July	23.33 (28.84)[a]	27.33 (05.29)[a]

*Parentheses contain the angular transformation value of percent infested trees.
**Parentheses contain the square root transformation value of number of coreids/tree

Farm of the Central Institute for Arid Horticulture (CIAH) (N 28° 06' E 73° 21'). Each replicate was made at a different site. Incidence of infested trees, number of bugs observed on each tree and symptoms of damage and decline (in comparison with un-infested plants) were recorded from Aug 2010 to Jul 2011. The sampling was done by visual observation and manual counting. Average incidence was calculated as the percent of whole trees infested with *H. variabilis*. Average num-

Fig. 1. Aggregation of *Homoeocerus variabilis* on the leguminous tree, khejri (*Prosopis cineraria)*, during the winter season at the Central Institute for Arid Horticulture, ICAR, Bikaner, India.

Table 2. Mean linear morphometric measurements of various body parts of different life stages of the coreid, *Homoeocerus variabilis*. Each body part was measured on 20 individuals, and all measurements are expressed in millimeters.

S. No.	Body part Measured	Nymphs*					Adults*	
		I instar	II instar	III instar	IV instar	V instar	Male	Female
1.	Length of body	4.093 ± 0.011	7.444 ± 0.010	8.700 ± 0.014	10.523 ± 0.017	11.390 ± 0.081	12.220 ± 0.081	15.493 ± 0.036
2.	Width of body	1.971 ± 0.015	3.251 ± 0.010	3.993 ± 0.006	4.379 ± 0.007	4.848 ± 0.012	4.275 ± 0.027	5.775 ± 0.051
3.	Length of antenna	4.016 ± 0.016	6.603 ± 0.013	7.803 ± 0.017	8.406 ± 0.014	8.984 ± 0.010	10.405 ± 0.013	11.411 ± 0.022
4.	Width of head	0.727 ± 0.004	1.152 ± 0.003	1.276 ± 0.004	1.357 ± 0.003	1.405 ± 0.002	1.386 ± 0.004	1.541 ± 0.007
5.	Length of thorax	0.516 ± 0.004	0.862 ± 0.003	0.966 ± 0.003	1.119 ± 0.002	1.271 ± 0.003	1.999 ± 0.016	2.786 ± 0.020
6.	Width of thorax	0.827 ± 0.004	1.596 ± 0.005	1.786 ± 0.004	2.523 ± 0.010	2.761 ± 0.004	3.087 ± 0.014	4.506 ± 0.012
7.	Length of scutellum	1.158 ± 0.007	1.498 ± 0.013	2.491 ± 0.011	3.175 ± 0.007	3.488 ± 0.009	1.786 ± 0.008	2.045 ± 0.008
8.	Length of fore leg	2.508 ± 0.014	5.570 ± 0.021	6.564 ± 0.017	7.825 ± 0.013	8.128 ± 0.015	8.343 ± 0.016	9.449 ± 0.025
9.	Length of middle leg	2.753 ± 0.038	5.304 ± 0.013	6.584 ± 0.019	7.920 ± 0.016	8.355 ± 0.013	9.143 ± 0.020	10.136 ± 0.024
10.	Length of hind leg	3.288 ± 0.021	7.070 ± 0.015	8.325 ± 0.014	9.573 ± 0.013	10.242 ± 0.046	12.484 ± 0.026	14.689 ± 0.024

*Means of twenty specimens ± SE.

ber of bugs per tree was calculated on the basis of observations recorded of ten randomly selected whole khejri trees with 3 replications (different places).

Morphometric Measurements

Twenty bugs (20 males & 20 females) were used for observation and measurements. The bugs were reared under laboratory condition for measurement of different stages. The average linear measurements of various body parts of male and female bugs were obtained under a stereo binoculars microscope (Radical Instruments, Ambala, Haryana, India) using Jenoptic Pro 2.8.0 software. The terminology used to denote different parts of the body of the coreid bug followed Albrecht (1955). The bug samples collected from the CIAH farm and other fields were preserved in 70 per cent alcohol and deposited at the Insect Biosystematic Section, Division of Entomology, Indian Agricultural Research Institute, New Delhi for taxonomic identification.

Statistical Analysis

Transformations were used as necessary to achieve normality in the data before analysis. The data on incidence and population of bugs were analyzed through one-way ANOVA using SPSS software (O'Connor 2000). The means of significant parameters, among tested month wise incidence and population were compared using Turkey's honestly significant difference (HSD) tests for paired comparisons at probability level of 5%. The standard error of the mean was calculated by this formula $\frac{s}{\sqrt{n}}$ where, 's' is the sample standard deviation and 'n' is the size (number of observations) of the sample.

Results and Discussion

For the first time, bugs were observed on khejri tree in the hot arid region of northwestern India, (i.e., Thar Desert) and identified as *Homoeocerus variabilis* Dallas. During the present study, the average incidence of bugs on trees ranged between 16.7 and 66.7 per cent (Table 1). The incidence and the numbers were higher in winter months (Nov to Feb) than during other seasons and the maximum incidence of 66.7 per cent was recorded in Dec and the minimum in Jul. Thus the highest mean number of this bug species per tree was recorded in Dec (222.9/plant) followed by Jan (198.5/plant) and the lowest was in Jul (27.3/ plant) (Table 1). The bugs were found to be aggregated on the middle stems and branches with dense foliage during the winter season. During a survey of the natural vegetation, the population of this pest was found to be higher on young

TABLE 3. MEAN LINEAR MORPHOMETRIC MEASUREMENTS OF VARIOUS TRAITS OF ADULT MALES AND FEMALES OF *HOMOEOCERUS VARIABILIS*, WHICH WAS FOUND INFESTING *PROSOPIS CINERARIA* TREES IN 2010. EACH BODY PART WAS MEASURED ON 20 INDIVIDUALS, AND ALL MEASUREMENTS ARE EXPRESSED IN MILLIMETERS.

S. No.	Body parts measured (mm)	Male Mean* ± SE	Female Mean* ± SE
1.	Length of parts of antenna		
	Scape	0.436 ± 0.002	0.496 ± 0.002
	Pedicel	2.467 ± 0.007	2.662 ± 0.008
	Flagellum	7.543 ± 0.012	8.265 ± 0.033
2.	Length of hemielytra	9.049 ± 0.033	11.185 ± 0.056
3.	Width of hemielytra	2.579 ± 0.006	8.371 ± 0.009
4.	Length of hind wing	7.278 ± 0.025	9.019 ± 0.016
5.	Width of hind wing	2.404 ± 0.006	3.409 ± 0.007
6.	Length of body up to genitalia	12.220 ± 0.081	15.493 ± 0.036
7.	Length of body up to wing tip	11.678 ± 0.043	14.362 ± 0.039
8.	Width of scutellum	2.366 ± 0.014	2.886 ± 0.005
9.	Width of vertex	0.255 ± 0.002	0.360 ± 0.004
10.	Vertical diameter of eye	0.464 ± 0.003	0.571 ± 0.004
11.	Transverse diameter of eye	0.441 ± 0.002	0.494 ± 0.003
12.	Length of sternum region	2.251 ± 0.008	2.779 ± 0.018
13.	Width of sternum region	2.993 ± 0.013	3.347 ± 0.008
14.	Length of rostrum	3.077 ± 0.016	3.695 ± 0.024
15.	Length of parts of fore leg		
	Coxa	0.697 ± 0.004	0.742 ± 0.003
	Femur	2.984 ± 0.014	3.239 ± 0.013
	Tibia	3.075 ± 0.012	3.720 ± 0.014
	Tarsus	1.588 ± 0.013	1.748 ± 0.006
16.	Length of parts of middle leg		
	Coxa	0.700 ± 0.004	0.843 ± 0.004
	Femur	3.150 ± 0.010	3.631 ± 0.015
	Tibia	3.539 ± 0.013	3.846 ± 0.013
	Tarsus	1.755 ± 0.008	1.817 ± 0.006
17.	Length of parts of hind leg		
	Coxa	0.803 ± 0.003	0.881 ± 0.006
	Femur	4.726 ± 0.016	5.251 ± 0.017
	Tibia	5.084 ± 0.017	6.323 ± 0.016
	Tarsus	1.872 ± 0.003	2.235 ± 0.007

*Mean of twenty specimens.

trees (less than 5 yr old) than the old trees. The bugs sucked the sap from newly emerging leaves, young branches and flowers, which led to the suppression of growth of the khejri tree through drying of branches, leaves and flowers (Fig. 1). The affected trees produced defective pods unsuitable for human consumption. Other *Homoeocerus* species like *H. signatus* on *Acacia nilotica* and *Prosopis juliflora* saplings (Yousuf & Gaur 1993), *H. prominulus* on *Prosopis cineraria* (Ward et al. 1977), *Homoeocerus* sp. on *Prosopis cineraria* (Parihar 1993) and *H. pallens* on guava (Agunloye 1986) have been reported to damage these tree species. These latter pests were also found to occur in all seasons of the year. The females laid eggs in soil at depths of 4 to 7 mm. Eggs were light green in color, elongated and oval shaped.

Data on linear measurements of *H. variabilis* have been presented in Tables 2 and 3 and Fig. 2. The female was distinctly larger than the male in respect to all body parts. This bug was typically characterized as having an ochraceous body with a broad red basal fascia on the pronotum between the humeral angles, small pale scutellum, antennae 4-segmented, the basal part of second and third segment was pale yellow, third segment flattened at the tip and 4th segment was the shortest. In published literature no morphometric details given on *H. variabilis* could be found; and the first morphometric study of *H. variabilis* is described herein. The mean body lengths of males

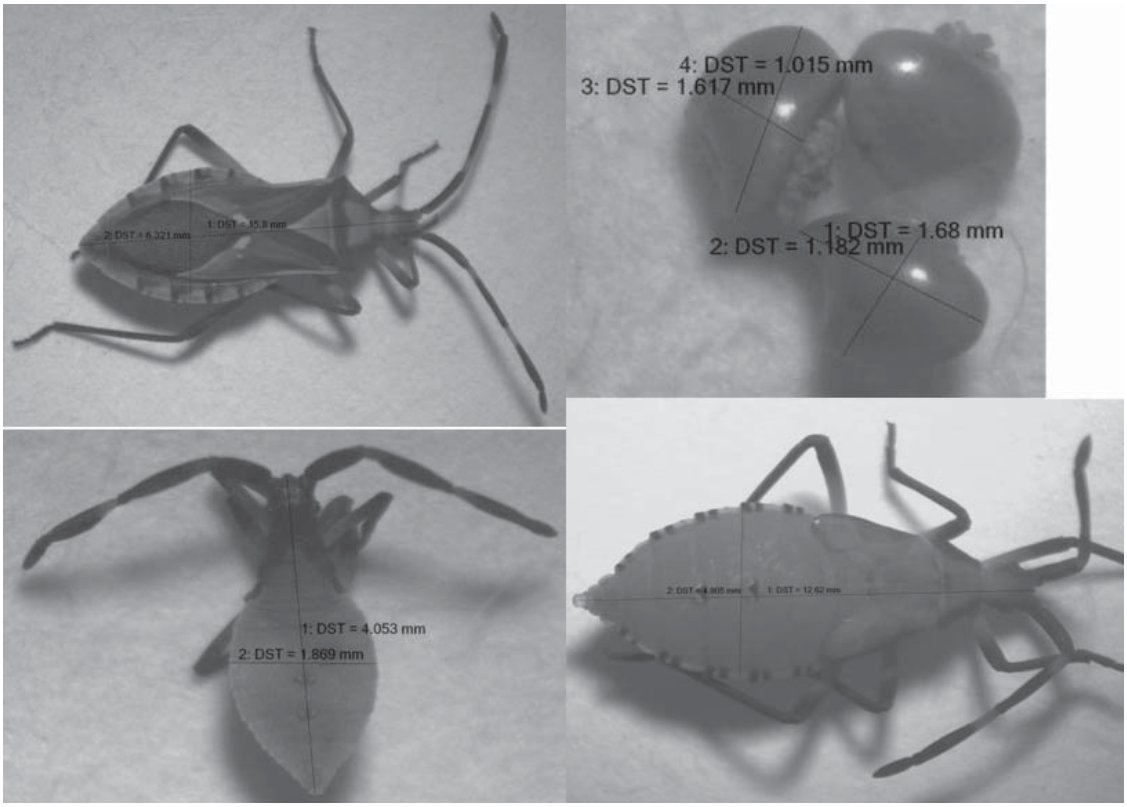

Fig. 2. Different developmental stages of *Homoeocerus variabilis*: Upper left, adult; upper right eggs; lower left, 1st instar nymph; lower right, 5th instar nymph.

and females were 12.2 mm and 15.5 mm, respectively (Table 3.) In comparison, second and third antennal segment *H. signatus* are black and of body length is 19 mm (Yousuf & Gaur 1993).

To our knowledge this is the first report of *H. variabilis* on khejri. This bug is damaging economically important parts of tree, such as leaves, flowers and pods. Therefore, management practices needs to be developed and implemented to minimize the losses caused by this pest.

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