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## Biological Investigation on the Red Cotton Bug, *Dysdercuscingulatus* (F.) (Hemiptera: Pyrrhocoridae)

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The red cotton bug (RCB), *Dysdercuscingulatus* (F.) is an important pest of cotton as well as various malvaceous and bombacaceous plants in Thailand. Nymfs and adults of RCB were collected from fields and reared in the rearing containers. Copulation of males and females occurred on the second day after adult emergence. The females laideggs in groups on the soil surface averaged  $135.87 \pm 6.16$  eggs, ranging from 76 to 274 eggs. Egg incubation period was  $5.79 \pm 0.71$ (range, 5.15 - 7.60 days. Nymphs was carried out individually. The duration time of five nymphal instars of RCB were  $4.47 \pm 0.24$ ,  $4.43 \pm 0.25$ ,  $4.53 \pm 0.20$ ,  $4.66 \pm 0.17$ , and  $12.23 \pm 0.80$  days, respectively. The total nymphal period averaged  $30.32 \pm 1.60$ days (range, 28.38-32.36days).Newly emerged adults in pair were released in plastic containers for mating and egg collection and observations of adult longevity were also recorded. The results showed that the duration time of the male and female was  $20.53 \pm 3.81$  and  $23.73 \pm 3.67$  days, respectively.

Host plants of RCB in Thailand: *Abelmoschusesculentus*(L.), *A.moschatus*Medik, *Gossypiumhirsutum* (L), *G.arboreum*, *Hibiscus cannabinus* (L), *H.sabdariffa* (L), *Sidarhombifolia* (L), *Thespesiapopulnea* (L)(Malvaceae), *Bombaxceiba* (L)and *Ceibapentandra*Gaertn.(Bombacaceae).

**Keywords:** Biology,Host plants, Red cotton bug (*Dysdercuscingulatus* (F.)

### Introduction

The red cotton bug (*Dysdercuscingulatus*F.)(Hemiptera)is a species of insect in the family Pyrrhocoridae(Holm et al., 1979; Pandey and Tiwari, 2011) subgenus *Paradysdercus*Stehlik(Kohno and Bui Thi, 2005). The common names are red cotton bug, conttonstainer bug and oriental stainer. The red cotton bug (*D.cingulatus*) is found worldwide with 2 subspecies including *D.cingulatuscingulatus*(F.) and *D. c.nigriventria*Stehlik(Ansari and Khan, 1973; Kohno, 2001).Two specieswas reported in Australia,soultheastasia oriental region and Solomonisland(Kohno and Ngan, 2004).Hill (1994) reported that

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the Malvaceae such as kapok tree and sorghum was infested by this insect species. The nymph and adult of red cotton bug (family: Pyrrhocoridae) has no ocelli. The genus of red cotton bug were destructive pest of cotton and many other economical crops in Asia and many of them belonged to genus *Dydercus* having no less than 75 species (Nyamasyo and Karel, 1982). Many species of red cotton bugs caused direct and indirect damage to cotton. The wound was caused by its stylet to puncture on boll cotton. Kohno and Bui Thi (2005) found that the red cotton bug genus *Dydercus* at Ishigaki-jima island in Japan have 3 species including *D. dydercus*, *D. poecilus* and *D. decussatus*. The host plants are *Abelmoschus moschatus*, *A. esculentus*, *Hibiscus tiliaceus*, *H. rosa-sinensis*, *H. syriacus*, *H. mutabilis*, *H. cannabinus*, *Thespesia populnea*, *Abutilon indicum*, *Gossypium populnes* in family Malvaceae. *Bombax ceiba* in family Bombacaceae was also host plant of larvae and adult of red cotton bug (Satyanara et al., 1985).

## **Materials and methods**

### ***Sample collection***

Nymphs and egg clusters of the RCB were collected from Jamaica sorrel in the area of asiatic pennywort plots belonged to the Faculty of Agricultural Technology, King Mongkut's Institute of Technology Ladkrabang, Bangkok. They were placed in plastic boxes sized 19×28.5×10 cm. The date and

### ***Insect rearing in the laboratory***

The nymphs and eggs were all reared at room temperature (27-35°C) in the entomological laboratory at King Mongkut's Institute of Technology Ladkrabang. The Jamaica sorrel was provided as food for both adults and nymphs. Developmental and morphological characteristics of eggs, nymphs and adults of the red cotton bug were recorded, measured and photographed (n=25).

## **Results and discussion**

### ***Morphology of the red cotton bug***

Egg: Red cotton bug eggs are white. It has a broadly oval shape and about 1.10-1.26 mm long and 0.72-0.90 mm wide.

### *Description of the nymphal instars*

Nymphal instar 1: The antennae and legs are pale. It has red compound eyes, yellowish head and thorax. A pronotum width is 0.28-0.46 mm. It has 4 segmented antennae.

Nymphal instar 2: Head, abdomen, thorax and legs are red. The antennae have 4 segments. The segment 1, 3, 2 and 4 have length sorted from most to least. The pronotum was 1.38-1.65 mm wide.

Nymphal instar 3: Head, abdomen, thorax and legs are red. The lateral pronotum has 1 white bar. The anterior part of abdomen is white. The pronotum was 3.10-3.89 mm wide.

Nymphal instar 4: Head, abdomen, thorax and legs are red with a white abdomen. The metathorax of leg have 3 couples are red. The antenna are brownish-red. The first segment of antenna is long. Females have a pronotum with 3.54-4.03 mm wide and 4.12-4.74 mm in males.

Nymphal instar 5: The body is big as compared to the younger instars. Its morphological character is similar to the fourth nymphal instar. The first antenna segment is long and brownish-red color. Females have a larger pronotum than the male (width: 5.12-5.54 and 4.69-5.03 mm, respectively).

Description of male: The adult of this insect species has rounded central spot black color on corium and black scutellum. The red cotton bug is similar to the red bug but red femurs. The head was red with red labium. It has red compound eyes. The beak have 4 segments. The 4 segmented black antenna is the longest on the first segment and the shortest on the third segment. The brownish-red pronotum is slender on the anterior part and wider at the posterior end. A black scutellum was triangle. The tarsal formula was 3-3-3. The dorso-ventral side of abdomen is white color with 5 transverse white bar. The body was 11.81-14.83 mm long (mean  $12.98 \pm 1.15$  mm). The metathorax was 4.14-7.35 mm long (mean  $5.06 \pm 1.01$  mm). The antenna was 9.21-12.63 mm long (mean  $10.99 \pm 0.88$  mm). The pronotum was 3.11-3.90 mm long (mean  $3.71 \pm 0.22$  mm) and 1.16-1.81 mm width (mean  $1.59 \pm 0.16$  mm). The beak was 5.19-10.30 mm long (mean  $6.92 \pm 1.51$  mm). The front wing was 10.16-12.85 mm long (mean  $11.42 \pm 0.85$  mm) and 2.00-4.74 mm wide (mean  $3.11 \pm 0.67$  mm) (Table 1).

Description of female: Females are slightly larger than males. The female had larger abdomen than the male. The body was 14.14-16.92 mm long (mean  $15.23 \pm 0.74$  mm). The beak was 6.01-7.56 mm long (mean  $7.01 \pm 0.40$  mm). The front wing was 10.40-13.91 mm long and was 2.30-4.66 mm wide. The pronotum was 3.11-3.94 mm wide (mean  $3.75 \pm 0.21$  mm) and 1.32-1.94 mm long (mean  $1.65 \pm 0.16$  mm) (Table 1).

**Table 1** Sizes in mm of the female and male of red cotton bugs, *D.cingulatus*F.

Length	Female	Male
Body	15.23±0.74	12.98±1.15
Wingspan	12.83±0.83	11.42±0.85
Antenna	11.89±0.84	10.99±0.80
Proboscis	7.01±0.40	6.92±1.51
Pronotum	1.65±0.16	1.51±0.16
Metafemur	4.65±0.51	5.06±1.01

### ***Biology of the red cotton bug***

The adult mating occurred after dark. Its copulatory position was observed as end to end position. The female laid eggs in group (30-60 egg/batch) on soil surface. Number of eggs laid was more than 76-274 eggs/female insect. The egg normally hatches in 5.15-7.60 day (mean 5.79±0.71 days). They have 5 nymphal stages and pass through 5 molts. A newly hatched nymph will live on the soil surface. After molting, eat cotton and kenaf. The nymphs suck sap from put forth leaf-buds. The nymph instar 1-5 was 4.47±0.24, 4.43±0.25, 4.53±0.20, 4.66±0.17 and 12.23±0.80 day, respectively. The total developmental time for nymphal stages takes about 30.32±1.60 days, adult males 15-26 days (mean 20.53 day) and female 18-32 days (mean 23.73 day) (Table 2). It is a serious pest of cotton including plants in family Malvaceae and Bombacaceae in South and Southeast Asia and host plants recorded in Thailand and at various locations from the Oriental Region is quite similar. Host plants of red cotton bug include kapok tree (*Ceiba pentandra*), cotton (*Gossypium hirsutum* L.), okra (*Abelmoschus esculentus* L.), Jamaica sorrel (*Hibiscus sabdariffa* L.) and Cuban kenaf (*Hibiscus cannabinus* L.) (Ahmad and Schaefer, 1987; Pancho and Kim, 1985) (Table 3). It is a polyphagous pest and host plants of nymphs and adults in family Malvaceae and Bombacaceae. It is an important insect pest of cotton and various commercial cultivated crops (Swarbrich, 1997). At present, the cotton growing areas are diminished due to insect infestation problems. The study found that nymphal instar four, five and adult somewhat a significant role because the beak is long and strong, capable of drilling and sucking the sap from cotton boll. In addition, there are Jamaica sorrel and Cuban kenaf are insects to heavily infested as well as cotton (Ahmad and Khan, 1980).

**Table 2** Developmental stages of *Dysdercuscingulatus*(F.)

Stage of development	Life cycle (day)		Metafemur Length	
	Mean±SD	Range	Mean±SD	Range
egg	5.79±0.71	5.15-7.60		
nymph				
1 <sup>st</sup> instar	4.47±0.24	4.21-4.83	0.34±0.05	0.28-0.46
2 <sup>nd</sup> instar	4.43±0.25	4.13-4.75	1.52±0.07	1.38-1.65
3 <sup>rd</sup> instar	4.53±0.20	4.29-4.83	3.32±0.25	3.10-8.90
4 <sup>th</sup> instar	4.66±0.17	4.50-4.90	3.84±0.14	3.54-4.03
5 <sup>th</sup> instar	11.23±0.80	11.25-13.05	4.41±0.19	4.12-4.74
Total nymphal period	29.32±1.66	28.38-32.36		
adult				
female	20.53±3.81	15-26	4.65±0.51	4.11-5.81
male	23.73±3.67	18-32	5.06±1.01	4.14-7.35

**Table 3** Host plants of *Dysdercuscingulatus* (F.)(Ahmad and Schaefer, 1987; Pancho and Kim, 1985)

Reg cotton bug species	Host plant	Plant family
<i>Dysdercuscingulatus</i> (F.)	<i>Abelmoschusesculentus</i> L.	Malvaceae
	<i>Abelmoschusmoschatus</i>	Malvaceae
	<i>Hibiscuscannabinus</i> L.	Malvaceae
	<i>Hibiscus sabdariffa</i> L.	Malvaceae
	<i>Gossypium arboretum</i> L.	Malvaceae
	<i>Gossypiumarboreum</i> L.	Malvaceae
	<i>Gossypiumhirsutum</i> L.	Malvaceae
	<i>Sidarhombifolia</i> L.	Malvaceae
	<i>Thespesiapopulnea</i> L.	Malvaceae
	<i>Ceibapentandra</i> L.	Bombacaceae
	<i>Bombaxceiba</i> L.	Bombacaceae

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