

# Development of *Tibraca obscurata* and *Tibraca limbativentris* (Hemiptera: Pentatomidae) in rice in southwestern Colombia<sup>1,2</sup>

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## ABSTRACT

The development of *Tibraca obscurata* Bergroth and *T. limbativentris* Stal was studied in rice in southwestern Colombia. *Tibraca limbativentris* required more time to complete development than *T. obscurata*. Females of *T. limbativentris* required more time to complete development than males, but development of *T. obscurata* was similar between sexes. *Tibraca limbativentris* females live significantly longer than males. *Tibraca limbativentris* oviposited over 200 eggs in an 86-day oviposition period. The time from egg deposition to eclosion (egg incubation period) was the same (6.5 d) in the two sexes.

**Key words:** rice, biology, development, *Tibraca obscurata*, *Tibraca limbativentris*

## RESUMEN

Desarrollo de *Tibraca obscurata* y *Tibraca limbativentris* (Hemiptera: Pentatomidae) en arroz en el suroeste de Colombia

Se estudió el desarrollo de *Tibraca obscurata* Bergroth y *T. limbativentris* Stal en arroz en el suroeste de Colombia. *Tibraca limbativentris* requirió mayor tiempo para completar su desarrollo que *T. obscurata*. Las hembras de *T. limbativentris* requirieron más tiempo para completar su desarrollo que los machos, pero el desarrollo de *T. obscurata* fue similar en los dos sexos. Las hembras de *T. limbativentris* son más longevas que los machos. *Tibraca limbativentris* depositó aproximadamente 200 huevos en un periodo de 86 días. El tiempo de incubación de los huevos fue igual para los dos sexos (6.5 d).

**Palabras clave:** arroz, biología, desarrollo, *Tibraca obscurata*, *Tibraca limbativentris*

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## INTRODUCTION

Fourteen species of stinkbugs (Pentatomidae) have been identified in rice in Latin America (Pantoja et al., 1995; Pantoja, 1997; Panizzi, 1997). The genus *Tibraca* represents the largest pentatomid in rice in this region. Two species, *T. limbativentris* Stal and *T. obscurata* Bergroth, have been reported from commercial rice fields in Latin America (Pantoja et al., 1995). The geographic distribution and the economic importance of the two species are poorly understood. However, *T. obscurata* is considered an economic pest in Ecuador and Venezuela, whereas *T. limbativentris* is an important pest in Brazil, Peru, Ecuador, the Dominican Republic, and Venezuela (Prando et al., 1993; Ferreira et al., 1997; Pantoja, 1997; González, 1998; Vivas and Clavijo, 2000). Both species usually attack upland rice, but have been recovered from irrigated rice in several countries (Prando et al., 1993; Pantoja et al., 1995; Usta et al., 1995; Pantoja, 1997; Trujillo, 1991). *Tibraca limbativentris* is emerging as an important rice pest in several areas of Colombia (FEDEARROZ, 1993, 1995; Pérez, 1997; Usta et al., 1995) and Venezuela (Aponte et al., 1992; Vivas and Clavijo, 2000), but limited data are available on its biology, population dynamics, and development in rice in tropical America. Prando et al. (1993) studied the life cycle of *T. limbativentris* in Brazil. However, the climate conditions and photoperiod in southern Brazil are very different from conditions in tropical areas of Colombia, Venezuela and the Caribbean, where the pest has gained economic importance. Pérez (1997) reported on *T. limbativentris* development in Colombia; however, these studies did not state the temperature, rearing conditions or oviposition period used in the trial, which included a total of 30 insects of both sexes. Data on the number of instars and time to complete development are important for the construction of life tables for these pests in tropical rice areas of the Americas. Information on the time to complete development and the number of instars will help in the evaluation of damage. Information on factors affecting development of stinkbug populations under field conditions is of primary importance in the development of integrated pest management (IPM) strategies. In this work, we report on *T. obscurata* and *T. limbativentris* nymphal development, oviposition, and adult longevity in rice plants of southwestern Colombia.

## MATERIALS AND METHODS

Adult *T. limbativentris* and *T. obscurata* were collected in February 1991 with a standard insect net from commercial rice fields in Valle del Cauca, Colombia. Insects were confined in aluminum screen cages (1.5 × 1.5 × 1 m) provided with 90- to 120-d-old rice plants in 50- × 50-cm

trays and were allowed to oviposit. Egg masses were removed from caged plants and allowed to hatch in petri dishes (100 × 15 mm) lined with moistened filter paper. Upon eclosion, nymphs were placed individually on petri dishes provided with moistened filter paper and the basal section of a rice stem (7 to 8 cm) with roots. Roots were washed and covered with cotton and aluminum foil to preserve humidity. Rice stems were replaced every four days. Rearing was conducted under controlled conditions at a temperature of 26°C ± 6°, 40% RH ± 10%, 12:12 h dark/light conditions (CIAT, 1991). A total of 250 *T. limbiventris* and 125 *T. obscurata* were studied in separate trials of 50 (*T. limbiventris*) or 25 (*T. obscurata*) insects arranged in a completely randomized design. Each insect represented a replicate. Dishes were inspected daily for evidence of exuvia, which was used as an indicator of molting. The number of instars, the time in each nymphal stage, and the time from egg to adult was calculated. The sex of the adults was determined. Only data from insects that completed development to adults were used for statistical analysis. To measure reproductive parameters, we confined one virgin female and a male in a petri dish (one couple per dish) as described above. Insects were inspected every 24 h to detect mating and oviposition. Egg masses were removed from the dish and the eggs counted. Preoviposition days were calculated from the time of the first mating to deposition of the first egg mass. The pre-mating period represents the time between the emergence of the adult and the first mating. The eggs were counted until the female died.

Because of unequal variances, data were analyzed by using PROC TTEST with the Satterthwaite approximation for degrees of freedom (SAS, 1999; Satterthwaite, 1946; UCLA, 2005). Degrees of freedom (DF) and significance levels ( $P > t$ ) of the pooled or Satterthwaite method are provided in tables.

## RESULTS AND DISCUSSION

*Tibraca limbiventris* development time was significantly longer ( $P < 0.01$ ) than that of *T. obscurata*, requiring on average 10 and 25 additional days to complete nymphal and total development, respectively (Table 1). Significant differences ( $P < 0.01$ ) in developmental time were detected between species for all stages of development except for the egg incubation period, in which the two species completed egg development in nearly equal time. Except for the first instar, *T. limbiventris* required a significantly longer time than *T. obscurata* to complete each developmental stage. On average, first instars of *T. obscurata* required a half day longer than *T. limbiventris* to complete that stage of development. Both species required more time to complete the fifth instar

TABLE 1.—*Developmental parameters for Tribaca limbiventris (TL) and T. obscurata (TO) in rice, Palmira, Colombia, 1991-92.*

	Days $\pm$ SE								
	Egg incubation	Instar					Egg to adult	Adult longevity	Total life cycle
		I	II	III	IV	V			
TL <sup>1</sup>	6.3 $\pm$ 0.07	3.6 $\pm$ 0.05	6.8 $\pm$ 0.08	6.2 $\pm$ 0.09	7.3 $\pm$ 0.13	16.0 $\pm$ 0.37	46.2 $\pm$ 0.46	36.8 $\pm$ 0.93	82.7 $\pm$ 0.88
TO	6.2 $\pm$ 0.07	4.1 $\pm$ 0.08	5.9 $\pm$ 0.13	5.6 $\pm$ 0.15	5.7 $\pm$ 0.16	8.7 $\pm$ 0.15	36.2 $\pm$ 0.28	36.3 $\pm$ 0.28	57.2 $\pm$ 0.78
P > T/ DF <sup>2</sup>	0.2786 237*	0.0001 317**	0.0001 317**	0.0005 317**	0.0001 208*	0.0001 290*	0.0001 317*	0.0001 298*	0.0001 275*

<sup>1</sup>n = 233 for TL and 86 for TO.

<sup>2</sup>F for variance; \* = Satterthwite, unequal variance; \*\* = Pooled, equal variance.

n = 108 for females and 125 for males.

than the other instars. The time to complete fifth instar development for *T. limbativentris* was twice that for *T. obscurata*. The developmental time for *T. limbativentris* observed in our trial was longer than that reported in Brazil (Ferreira et al., 1997; Prando et al., 1993); however, our trial was under 26°C, 12:12 dark: light conditions, whereas the report from Brazil was with 14:10 h dark: light conditions and 25°C. Temperature and photoperiod differences between the two trials are possible explanations for the developmental difference between reports from our trials and those from Ferreira et al. (1997) and Prando et al. (1993). The longer days in Brazil (14 h) as compared to 12 h of daylight in our trials might have provided longer periods of feeding time in the southern latitudes, thus allowing for a shorter life cycle. The developmental time (egg to adult) in our study is three days longer than that in reports by Pérez (1997) and FEDEARROZ (1993), who reported an average of 43.8 d for *T. limbativentris* development. Neither Pérez (1997) nor FEDEARROZ (1993), stated the temperature and rearing conditions used in the trial that included only 30 insects.

Developmental parameters for *T. limbativentris*, segregated by sex, are presented in Table 2. Significant ( $P < 0.001$ ) differences in developmental parameters were recorded for fifth instar and time from egg to adult, but both sexes completed first to fourth instar and egg development in approximately equal time. The total life cycle was significantly longer ( $P > 0.0210$ ) for females than for males. Prando et al. (1993) reported greater longevity for males than for females, but the temperature and photoperiod conditions are not comparable to those of our experiment. On the other hand, and similar to our study, Pérez (1997) reported a longer development time for *T. limbativentris* females than for males. For both sexes, instar one presented the shortest developmental stage, whereas the longest developmental time was recorded for instar five. Females required a significantly longer time (four days longer) than males to complete development.

*Tibraca limbativentris* initiated mating  $11.1 \pm 0.8$  d after reaching the adult stage. Females deposited their first eggs  $6.4 \pm 0.62$  d after mating. An average of  $222.3 \pm 16.6$  eggs per female was recorded during the 86.2 d of the oviposition period. Prando et al. (1993) and Pérez (1997) reported 20.6 and 14.9 eggs per *T. limbativentris* female, respectively, but did not state the oviposition period. To our knowledge the present study represents the first report on the complete life cycle of the female *T. limbativentris*.

Table 3 presents developmental parameters for *T. obscurata*. Contrary to the case of *T. limbativentris*, no significant difference in developmental parameters was observed between sexes. To our knowledge, this research represents the first report on *T. obscurata*

TABLE 2.—*Developmental parameters for Tribaca limbiventris in rice, Palmira, Colombia, 1991-92.*

	Days $\pm$ SE								
	Egg incubation	Instar					Egg to adult	Adult longevity	Total life cycle
		I	II	III	IV	V			
Females <sup>1</sup>	6.3 $\pm$ 0.11	3.6 $\pm$ 0.08	6.9 $\pm$ 0.12	6.3 $\pm$ 0.13	7.4 $\pm$ 0.22	17.7 $\pm$ 0.60	48.1 $\pm$ 0.78	36.8 $\pm$ 1.04	84.9 $\pm$ 1.32
Males	6.4 $\pm$ 0.10	3.7 $\pm$ 0.07	6.8 $\pm$ 0.12	6.1 $\pm$ 0.12	7.1 $\pm$ 0.13	14.4 $\pm$ 0.42	44.5 $\pm$ 0.50	36.3 $\pm$ 14.0	80.8 $\pm$ 1.24
P > /T/	0.5710	0.5448	0.4948	0.4225	0.3514	0.0001	0.0001	0.8102	0.0210
DF <sup>2</sup>	231**	231**	231**	231**	195*	198*	187**	231**	231**

<sup>1</sup>n = 108 for females and 125 for males.

<sup>2</sup>DF for variance; \* = Sattertwhite, unequal variance; \*\* = Pooled, equal variance.

TABLE 3.—*Developmental parameters for Tribaca obscurata in rice, Palmira, Colombia, 1992-93.*

	Days $\pm$ SE								
	Egg incubation	Instar					Egg to adult	Adult longevity	Total life cycle
		I	II	III	IV	V			
Females <sup>1</sup>	6.1 $\pm$ 0.13	4.0 $\pm$ 0.11	6.0 $\pm$ 0.21	5.7 $\pm$ 0.25	5.7 $\pm$ 0.28	8.6 $\pm$ 0.24	36.0 $\pm$ 0.47	21.1 $\pm$ 1.60	57.1 $\pm$ 1.24
Males	6.3 $\pm$ 0.10	4.1 $\pm$ 0.11	5.8 $\pm$ 0.17	5.5 $\pm$ 0.18	5.4 $\pm$ 0.19	8.8 $\pm$ 0.18	36.3 $\pm$ 0.36	19.0 $\pm$ 0.95	57.2 $\pm$ 1.02
P > /T/	0.2321	0.7562	0.6313	0.6053	0.6953	0.5828	0.6733	0.8978	0.9736
DF <sup>2</sup>	84	84	84	84	84	84	84	84	84

<sup>1</sup>n = 35 for females and 51 for males.

<sup>2</sup>DF for pooled variance.

development in rice. Additional research is needed to study *T. obscurata* oviposition behavior on rice plants under laboratory conditions.

Both species presented a slightly higher percentage of males than females, with values of 59 and 54% for *T. obscurata* and *T. limbativentris*, respectively. Mortality was higher for *T. obscurata* (31%) than for *T. limbativentris* (7%). Although both species reproduced well under greenhouse conditions, *T. obscurata* did not reproduce under petri dish conditions as described in this study and was more susceptible to disturbance than *T. limbativentris*, which remained hiding in the plant tissue most of the time.

The information on the number of instars, difference in growth between sexes, and time to complete development for *T. limbativentris* and *T. obscurata* will help in the evaluation of their damage to rice and in constructing their life tables. The data presented here will be of importance in the development of IPM strategies for these two pentatomids in rice. Future work should contemplate sampling, damage functions, and establishment of threshold levels.

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