

Variations of the External Male Genitalia in Three Populations of *Triatoma infestans* Klug, 1834

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Triatoma infestans is the triatomine that presents the greatest dispersion area in South America. However, it is not known whether the original characteristics of this insect remained in its long dispersion process. The purpose of this work was to study comparatively the external male genitalia of insects from different populations of *T. infestans*, two from Brazil (Minas Gerais and Bahia) and one from Bolivia (Cochabamba Valley), and to investigate the correlation between the morphological and behavioral variations. Differences were observed in one of the structures of the external genitalia (endosoma process) that could be used to characterize the insects from the three populations studied.

Key words: *Triatoma infestans* - male genitalia - populational variation

Triatoma infestans Klug, 1834 is the triatomine that presents the greatest dispersion area in South America. It is found in Argentina, Bolivia, Brazil, Chile, Paraguay, southern Peru and Uruguay (Lent & Wygodzinsky 1979). It is originally from Bolivia (Usinger et al. 1966, Forattini 1980) and dispersed passively to the other countries where it represents the most important domiciliary vector of *Trypanosoma cruzi*. As *T. infestans* is not found in the wild environment outside the endemic center, it is susceptible of being eradicated, through standard methods of vector control activities using residual insecticides and epidemiological vigilance, as presently reported by the joint programme of the countries participating in the Southern Cone Initiative (Moncayo 1993). However, it is not known whether the original characteristics of this insect were preserved through its long dispersion process.

Biosystematics assume a great importance for the study of different populations, investigating the correlation of eventual morphological differences with other biological features, including their behaviors (Casini et al. 1995). In most cases, morphological studies are restricted to the color of the

body and to the differences of the structures' dimensions. Nevertheless, some authors have concluded that such variability may occur in the genital structures, mainly of the males, due to their complexity, which becomes of great importance for the taxonomy of a species group (Singh-Pruthi 1926, Lent & Jurberg 1966).

In accordance with Jurberg (1977, 1996), the male genital organs of different species of triatomines may sometimes present very particular characteristics both in the articular system and in the aedeagus. These may be evaluated by the presence, absence and the location of the structures, being suitable for the development of systemic approaches at the species level, among species, genera and tribe. At present, these morphological variations of the male genitalia have not been observed in the studies covering populations. Lent and Jurberg (1985) found small differences in two structures of the male genitalia (endosoma process and phallosome support) while studying 15 specimens of *T. infestans* from different places, indicating the possibility that this variability could occur at a populational level. This work has the purpose of studying comparatively, for the first time, the external male genitalia of insects of different populations of *T. infestans* and to investigate the correlation between the morphological and behavioral variations.

MATERIALS AND METHODS

Three populations of *T. infestans* were studied. As the Chagas Disease Control Program has reached excellent results in Minas Gerais, reduc-

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ing the population of *T. infestans* to sparse and residual foci, it was not possible to obtain a recently isolated population in the field. In this way, descendants of insects captured intradomiciliary in different regions of the state from 1981 to 1983 were included in the first population. A second population comprised descendants of insects captured intradomiciliary in Cipó Segundo, county of Paratinga, State of Bahia, in 1995, and the third population descended from insects captured in peridomestic ecotopes of Cochabamba, Bolivia in 1991.

The three populations were maintained in the insectary of "Centro de Pesquisas René Rachou", since the date of the capture, under semi-controlled conditions of temperature and humidity ($27 \pm 2^\circ\text{C}$ and $60 \pm 5\%$ RH).

Each generation of the populations proceeding from Bahia and Bolivia were isolated, not allowing the crossing between them. The experiments for these populations were standardized, using the first generation of the population descending from insects proceeding from Bahia and the third generation of the population descending from insects from Bolivia.

Thirty insects of each population were used for the study of the parameres, median process of pygophore, phallus and its structures, using a light chamber attached to a Wild stereoscopic magnifying glass. The general procedure followed the description of Jurberg (1977).

RESULTS

No differences were observed in the parameres, median process of pygophore, vesica, phallosome and phallosome support among the three populations, even though some individual differences were observed. The phallosome support, for instance, presented three outlines: two with the apex opened, differing among themselves by the presence of a conjugating membrane joining two extremities and a third one with the apex closed (Fig. 1).

On the other hand, the endosoma process presented two morphological outlines with differences in their frequencies of manifestation, separating the Bolivian population from the others. One of these profiles is characterized by the presence of denticles in its apex and the other one is characterized by the absence of these structures (Fig. 2). The number of insects presenting or not denticles is shown in Fig. 3. No significant difference for this characteristic was observed among the insects of the Brazilian populations which were yet different from the Bolivian population ($X^2=p<0.05$).

The number of insects with denticles in the apex of the endosoma process have been different, and the quantity of denticles also varied among the

populations (Table). Concerning the phallic structures, the comparative analysis showed the proximity between the two Brazilian populations (Minas Gerais and Bahia), and their distance from the Bolivian one (Cochabamba).

DISCUSSION

The variation of the number of the denticles in the endosoma process of *T. infestans* was firstly observed by Lent and Jurberg (1985), while studying 15 individuals from Bolivia, Paraguay, Chile, Argentina, Brazil and a specimen from Chaco-i in Paraguay without denticles in the endosoma process.

Until now, no study has been reported to quantitatively compare this morphological feature of Triatominae populations. The present work shows results in agreement with those observed by Lent and Jurberg (1985), although it has a wider scope as it includes an analysis of the representatives of three populations that presented different characteristics.

As Bolivia, more precisely the Cochabamba Valley, is the probable region of origin of *T. infestans*, it is natural to expect populations from this region to present a greater genetic variability when compared with the populations of other places.

The similarity of the morphological profiles of the two Brazilian populations may be explained by the concept of founder effect, where a small number of individuals starts a population. In the specific case of *T. infestans* only one female may originate hundreds of individuals (Schofield 1985). Something very important to point out is that in the process of human migration the domiciliated population was probably the most frequent, making it possible for man to select insects which were more anthropophilic. These factors, together with the geographic proximity of the two Brazilian regions where the insects were captured, and the fact that they are not geographically isolated suggest either that they could derive from the same founder population, or that there may have been a genetic exchange among the individuals or that it is actually only one population.

In accordance with Dujardin (1997) the consideration of the geographic distance among populations of the same species is itself a factor predicting the differentiation, meaning that it is more likely a genetic exchange among neighbour populations than among populations which are more distant geographically.

As Bolivia is the only place where *T. infestans* could be found in domiciliary, peridomiciliary and wild environments, we believe that studies involving these populations will be of great importance.

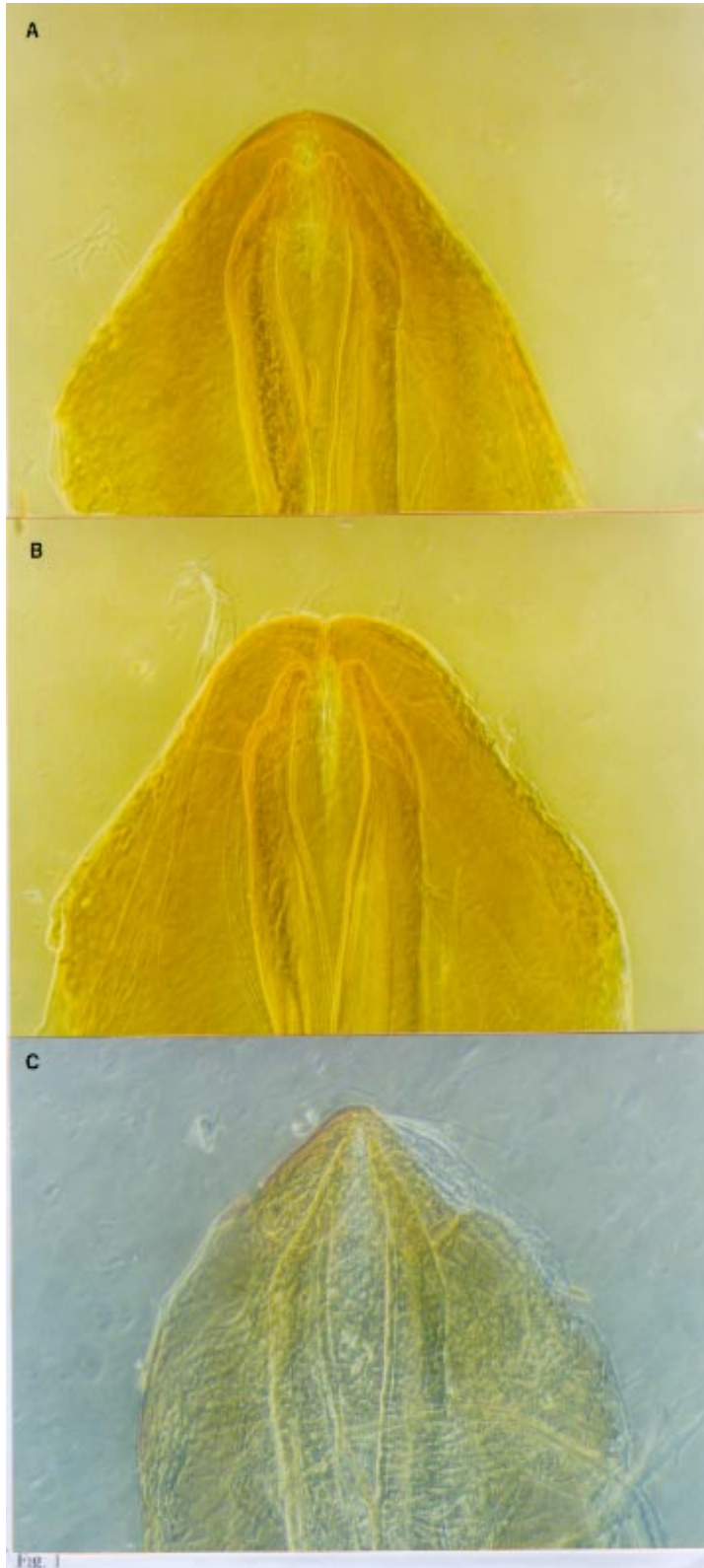


Fig. 1 - A: phallosome support with open apex, presenting conjugating membrane; B: phallosome support with open apex without conjugating membrane; C: phallosome support with closed apex.

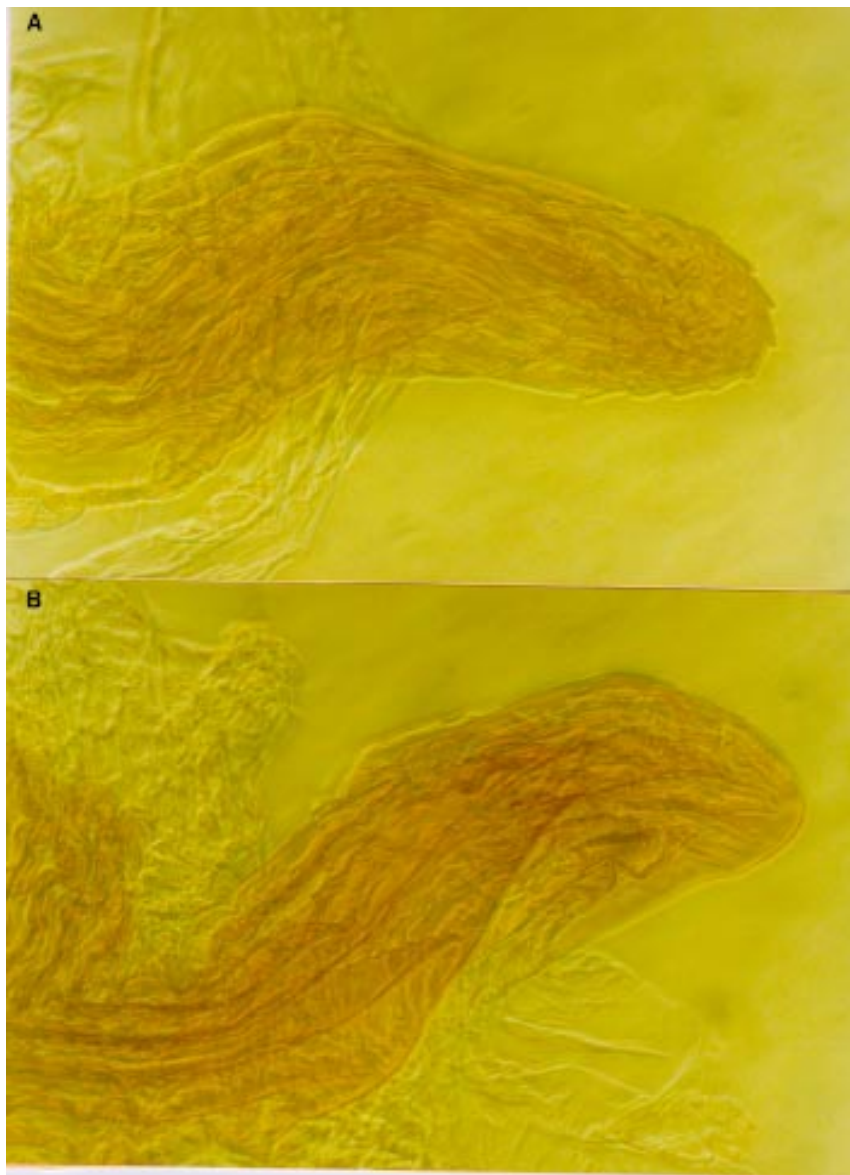


Fig. 2 - A: endosoma process with the apex presenting denticles; B: endosoma process with the apex without denticles.

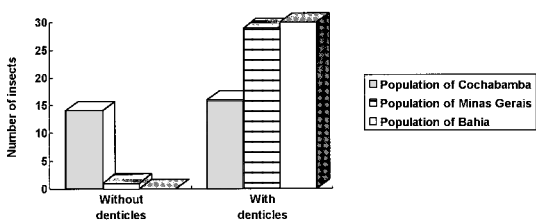


Fig. 3: presence and absence of denticles in the apex of the endosoma process in specimens of *Triatoma infestans* from the populations of Minas Gerais, Bahia and Cochabamba (n=30).

TABLE

Frequency (number of insects) distribution of the number of denticles in the endosome process observed of three populations of *Triatoma infestans* of different geographic origin. Sample size is 30 for each population

Number of denticles	Minas Gerais	Bahia	Cochabamba
0	1	0	14
1 - 10	2	0	12
11 - 30	17	16	4
> 30	10	14	0

The development of morphological markers characterizing insects with behavioral differences may be a useful tool in the evaluation of control programs. Probably all of the genitalia models observed in this work should occur in the Bolivian triatomines, whose frequencies may be altered in terms of the characteristics which prevail in the insects passively dispersed that originated the populations that colonized Brazil. A consistent tendency of the Brazilian and domiciliary populations to present a greater quantity of denticles in the endosoma process was observed in our work. This characteristic may have been selected by man in the long passive dispersion process of *T. infestans*. More data to test this hypothesis are needed including the study of *T. infestans* populations of other geographic origins. However, the results shown in the present work suggest a strong support to the existence of such a selection process in the species evolution.

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