COMUNICAÇÃO CIENTÍFICA

POLYMORPHISM ON *Nezara viridula* (L.) AND ITS PARASITOID *Trichopoda pennipes* FABR.

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RESUMO

Polimorfismo em *Nezara viridula* (L.) e seu parasitóide *Trichopoda pennipes* Fabr.

A ocorrência de polimorfismo em *Nezara viridula* (L.) e em seu principal parasitóide, *Trichopoda pennipes* Fabr., foi estudada em populações de campo na Flórida, E.U.A. *N. viridula* ocorreu em uma só variação mórfica, a dourada, *N. v. aurantica* Costa, tanto em adultos fêmeas como machos. Os adultos de *T. pennipes* são polimórficos em relação ao padrão de cor abdominal e alar.

PALAVRAS-CHAVE: Insecta, Hemiptera, Tachinidae, percevejo verde da soja, polimorfismo.

Nezara viridula (L.) (Heteroptera: Pentatomidae), commonly known as the green stink bug, occurrs throughout the tropical, subtropical and low temperate parts of the world. This species is believed to have originated in the Southeast Asia region and occurrs in several color varieties (Yukawa & Kiritani 1965). Polymorphism, according to T. J. Walker (personal communication), is a term used in ecological literature in a variety of senses, but he defined the term as "the occurrence, within a deme, of individuals of two or more distinctive forms at the same ontogenic stage"; he classified polymorphism into eight categories, one of which was color forms (discontinuous variation in color and including simple color dimorphism). Probably this is the best explanation of *N. viridula* adult color variations. This species may exist with nine different color morphs throughtout the world as originally describeb (Yukawa &

Recebido em 19/05/92.
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Kiritani 1965) and later (De Witt 1972).

The occurrence of color morphs in *Trichopoda pennipes* Fabr. is still unclear. This subject was discussed for West Indian *Trichopoda* (Davis 1964). F. D. Bennett (1963, unpublished report) discussed identity of the West Indian *Trichopoda* and raised the question of morphs in 1954 when long series of adult *Trichopoda* were reared from *N. viridula* from Florida (USA) and Montserrat (Leeward Islands). Van Emden (personal communication) noted "it is obvious that the material of males with orange wing base is insufficient for deciding the question of the status of this form, but the present evidence seems to indicate that the difference in wing coloration is not closely linked up with the differences in other characters, especially the genitalia". F. D. Bennett (personal communication) sent specimens collected in Antigua (Leeward Islands) to the Commonwealth Institute of Entomology and these were examined by R. W. Crossby who made the following comments: "these specimens are all dark-winged and agree with *Trichopoda pillipes* whether this is regarded as a good species or as a variety of *pennipes* F. So, as far as I know the relationship between the different color forms is stil not understood and I can add nothing to the remarks already made by Van Emden on this complex. However, the specimens are not *pennipes* sensu stricto and the name *pillipes* applies, and it might be better to call the material *pennipes* var. *pillipes*". Worthley (1924) indicated the difficulty in determining the sex of living *T. pennipes* flies without handling. It was also mentioned as secondary sexual chacacters of the species the ferrugioneous spot in the wing of the female as against the evenly dusky wing of the male, and the black tip of the female abdomen versus the dark orange of the male. Beard (1940) mentioned that the abdomen is bright orange, darkening at the tip particularly on the female, where it is shining black and he stated that this is the most conspicuos secondary characteristic, although the wing of the male bears a ferrugineous spot at its base along the anterior margin. Drake (1920) reported that the sexes were readily distinguished by color markings. In the male the tip of the abdomen is black and wings are entirely black. The abdomen of the female is entirely yellow or reddish-yellow and wings are marginated with yellow on about one-half of the basal portion of the anterior margin. He also presented a photo of two *T. pennipes* specimens with erroneous sex determination (page 69), but ironically, he indicated correctly that during copulation the male being uppermost. More recent papers (Mitchell & Mau 1971, Todd & Lewis 1976, Shahjahan 1968, Harris & Todd 1980, Harris & Todd 1982) dealing with *T. pennipes* biology did not mention the difficulty of sex determination nor did they mention how the sex was determined.

In our study the main objective was to qualify-quantify polymorphic variations among adult populations of *N. viridula* and *T. pennipes*.

The present survey was conducted in Alachua County, Florida (USA), during 1986 and 1987, from March to November of each year. Thirteen host plants were investigated during this period. During the course of field surveys, color morph adults and nymphs of *N. viridula* were

collected whenever found. Specimens were brought to laboratory, sexed and recorded according to date and host plant from which they were collected. Denomination and determination of morph type was according to those presented by Yukawa & Kiritani (1965).

All tachinid puparia obtained from field collected *N. viridula* were held for emergence of adult flies. Each adult specimen was pinned for determination of species, sex and collor patterns. Adult flies were identified by comparison to the specimens held in the Florida State Collection of Arthropods in the Division of Plant Industry, Gainesville, FL., and confirmed by Howard Weems. Four basic color patterns were established: abdomen entirely orange; abdomen orange with dark (black) tip; wings entirely black; wings black with orange (yellowish) stripes. Adults sexed by genitalia were compared with these four patterns. Frequency of distribution, mean, standard deviation were determined for both sexes.

The only *N. viridula* adult polymorphic form collected in Alachua Co. in Florida (USA) during observations and surveys taken in 1986 and 1987 was the gold form, *N. v. aurantica* Costa, according to Yukawa & Kiritani (1965). Only eight adult specimens of the gold form (two females and six males) were collected on four different dates in 1986, on two crops in the same geographical area (Newberry) and none were observed or collected during 1987. The occurrence, as proposed by Kiritani (1980) and Sailer (1981), of gold form in adult population is expressed under genetic control. *N. viridula* population level was much higher in 1986 than 1987, and this could be the reason for observing these eight individuals in a single day (9/15/86), during the acme of the population in soybean field; four gold males were collected. According to Dr. R. I. Sailer (personal communication) this was the first time that a *N. viridula* adult gold form was field collected in Alachua County.

Nymphs (2º, 3º, 4º instars) with a yellow/yellowish (= gold) body color were commonly collected from the field. However, when these nymphs molted they change to normal color. A 5º instar gold/yellow nymph was never collected. Nymphs (2º, 3º, 4º, 5º instars) had a broad diversity of green color tonality patterns, varying from light to dark green (almost black), but this variation was not observed in adults. Nymph polymorphism is controlled to some degree by environmental conditions, e.g. temperature and population density (Kiritani 1980). None of the yellow/ nymphs, either laboratory or field collected, ever became an adult gold form. It was mentioned that the 5º instar nymph is also color polymorphic (Kiritani 1980). Green adults change color primarily as a function of age, from shiny light to dull-dark green. When reaching "diapause" a gren-purple cuticle color may be observed, but this typical color pattern was only observed in early spring (March/April) and early winter (November/December).

One hundred and sixty three *T. pennipes* flies emerged in the laboratory, 82 females and 81 males. All emerged from puparia obtained from *N. viridula* (all from green forms) collected during field surveys on host plants during 1986 and 1987. This was a representative and

diversified sub-sample of the present population on these crops during these two years. Female flies had a predominant orange with black tip coloration on their abdomens but often females were recorded with entirely orange abdomens. The abdomens of male flies were entirely orange. None of the males had large black areas, covering 2-3 abdominal segments as the females, however some had "blackish/darker spots" on some portion of the abdomen (not necessarily at the tip). All of the analyzed female population had entirely black wings. Predominately males had black with orange wings (74,1%), but 25,9% of the males had entirely black wings.

Females are color polymorphic relative to abdominal color, but not wings, contrasting to males that are polymorphic relative to wings but not abdomen. Wings are very uniform in terms of size, color and spot distribution. It seems to be unrealistic to determine shapes and/or colored areas to characterize such differences between wings of each sex and between sexes. Females with black tipped abdomens have longer and thicker hairs between 4-5 and 5-6 abdominal segments. Females with entirely orange abdomens do not have such hairs, but only "normal" ones (shorter and thinner). Males have only very short and more uniform hairs (in size) covering the abdomen. It is unrealistic to characterize adult *T. pennipes* according to secondary sexual characteristics as proposed by Drake (1920), and if such characteristics are utilized, a large margin of error shoud be expected . *T. pennipes* adults should be sexed by the genitalia for a correct determination.

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