BIOLOGY OF *Corecoris dentiventris* BERG, 1884 (Hemiptera, Coreidae) in TOBACCO CULTURE (*Nicotiana tabacum*)

CALDAS, B.-H. C., REDAELLI, L. R. and DIEFENBACH, L. M. G.

Departamento de Fitossanidade, Faculdade de Agronomia, UFRGS, Av. Bento Gonçalves, 7712, CEP 90012-970, Porto Alegre, RS, Brazil

Correspondence to: Luiza Rodrigues Redaelli, Departamento de Fitossanidade, Faculdade de Agronomia, UFRGS, Av. Bento Gonçalves, 7712, CEP 90012-970, Porto Alegre, RS, Brazil

Received Juny 17, 1998 – Accepted March 5, 1999 – Distributed February 28, 2000

(With 2 figures)

ABSTRACT

Corecoris dentiventris Berg, 1884 (HEM., Coreidae) represents a pest in the tobacco culture in Southern Brazil. Nymphs and adults cause the wilting and twisting of the tobacco leaves due to their sucking habit. There are very few works about this species and these are restricted to concise description of the adult morphology, records of host plants and enumeration of injuries. The present investigation aims to study the life cycle of this bug. The experiment was carried out in a tobacco culture (Virginia type, var. K 326) implanted in the experimental area of the Departamento de Fitossanidade of the Universidade Federal do Rio Grande do Sul, in Porto Alegre, RS. The life cycle was studied in field conditions, in nylon cages, from egg clusters oviposited by females of the colonizing generation. The prefered oviposition site was the main vein in the abaxial side of the leaf. The average incubation period was 13.7 ± 0.04 days and the egg viability, 99.63%. The average periods of the different instars of the bug, in days, were: 5.4 ± 0.08, 9.7 ± 0.19, 4.5 ± 0.08, 5.3 ± 0.08, 9.0 ± 0.13 respectively for the first, second, third, fourth and fifth instars. The first instar presented the highest mortality (13.86%). The accumulated mortality of the nymphal phase was 35.29%. The sex ratio was 0.97 males : 1 female.

Key words: *Corecoris dentiventris*, life cycle, tobacco.

RESUMO

Biologia de *Corecoris dentiventris* Berg, 1884 (Hemiptera: Coreidae) em cultura de fumo (*Nicotiana tabacum*)

Na cultura do fumo, *Corecoris dentiventris* Berg 1884, (HEM., Coreidae) é apontado como inseto praga, no Rio Grande do Sul. Adultos e ninfas do percevejo, em decorrência de seu hábito sugador, provocam o murchamento e o enrolamento das folhas da cultura. Os trabalhos existentes sobre *C. dentiventris* são poucos e restringem-se a descrição morfológica sucinta dos adultos, registro de plantas hospedeiras e enumeração de danos. Esta investigação teve por objetivos estudar o ciclo de vida do inseto. O experimento foi realizado em uma cultura de fumo (tipo Virgínia, var. K 326) implantada na área experimental do Departamento de Fitossanidade, UFRGS, Porto Alegre, RS. O ciclo de vida foi estudado em condições de campo, em gaiolas de tela de nylon, a partir de grupos de ovos provenientes de fêmeas da geração colonizante. O sítio preferencial de oviposição foi a face abaxial das folhas, na nervura principal. O período médio de incubação foi de 13,7 ± 0,04 dias e a viabilidade dos ovos foi de 99,63%. A duração média, em dias, dos diferentes ínstares do percevejo foi: 5,4 ± 0,08, 9,7 ± 0,19, 4,5 ± 0,08, 5,3 ± 0,08, 9,0 ± 0,13, respectivamente para o 1°, 2°, 3°, 4° e 5° ínstares. Foi observada uma maior mortalidade no 1º ínstar (13,86%). A mortalidade acumulada da fase ninfal foi de 35,29%. A proporção sexual registrada foi 0,97 machos : 1 fêmea.

Palavras-chave: *Corecoris dentiventris*, biologia, fumo.

INTRODUCTION

The bug *Corecoris dentiventris* Berg, 1884, is a pest in the tobacco (*Nicotiana tabacum*) culture. Leaf development is severely impaired when attacked during its growing phase. This bug feeds on the sap of the green parts of the tobacco plant causing the wilting and twisting of the young leaves (Costa, 1941). According to Gallo *et al.* (1988) *C. dentiventris* occurs mainly from November to February in Rio Grande do Sul State. Regarding food plants, this bug shows a preference by Solanaceae, particularly tobacco (Costa, 1958; Silva *et al*., 1968; Basso *et al*., 1974; Schaefer & Mitchell, 1983). Literature about *C. dentiventris* are scarce, being restricted to succinct morphological descriptions of adults, food plants records and damage enumeration. Therefore, the present work is part of a broad project to study the bioecology of this bug and aims to establish the developmental time and mortality of immature stages.

METHODS AND MATERIALS

A tobacco culture (*Nicotiana tabacum*; type Virginia, var. k326) was established in the experimental area of the Departamento de Fitossanidade, UFRGS in Porto Alegre (30°01'S and 51°13'W) in the middle of August 1996, to study the life cycle of *C. dentiventris*.

There was no previous phytosanitary measures in the seedlings to avoid future impact in the colonizing fauna of the culture. Also, the use of growth suppresser agent was avoided.

Ten plants free of any stage of *C. dentiventris* were chosen randomly and protected by nylon cages (mesh 2 mm) measuring 0.9 x 0.9 x 1.7 m and framed, by iron rods buried in the soil. The bottom of each cage was covered with soil to avoid the entrance of any other organism. A longitudinal opening, in a lateral side of the cage, closed by a zipper allowed the entrance of the investigator. The cage remained closed even when the investigator was inside.

Each plant was artificially colonized by a female of *C. dentiventris,* identified by a number, aiming to obtain egg masses with at least 20 eggs. Only females for whom oviposition was already registered were utilized. After 24 h, the plant was inspected and the female removed if the egg mass had attained the required size. If not, the female remained inside the cage for more 24 h. In this way, eggs oviposited in a time interval up to 48 h were considered of the same age. A schematic drawing of each egg mass was done in a paper sheet allowing the individual recognition of each egg.

Daily registers were made until the fate of the last egg was assigned. All hatched nymphs were daily followed until reaching the adult stage.

The relative frequency of the number of eggs in the different incubation periods was calculated based upon the number of hatched nymphs.

The duration of the nymphal instars was followed from the emergence of the first nymph on December 4th, 1996 until the final ecdysis of the last nymph, which emerged as adult on January 28, 1997.

RESULTS AND DISCUSSION

A total of 239 eggs from 10 egg masses deposited by 5 females were observed. In average there was 23.9 ± 0.67 eggs per mass. The ovipositing female of *C. dentiventris* showed an erratic pattern concerning the egg disposal in the substrate as well as the number laid on each occasion.

Usually the ovipositions were done in the top third of the plant. The main vein in the abaxial side of the leaves was the preferred local of oviposition for *C. dentiventris*, considering that 77.1% of the eggs were there placed. This fact was also observed in a generalized way in the whole experimental area, along the investigation, during all the cycle of the culture (Table 1).

Different authors working with other coreids also found this same result.

Becker & Prato (1982) recorded for *Spartocera lativentris* Stal, in plants of *Solanum sisymbriifolium*, in Porto Alegre, RS, 74.3% and 7.9% of oviposition respectively in the leaf petiole and in the leaf main vein.

Wheeler & Miller (1990), working in field conditions, in Pennsylvania (USA) found that most ovipositions of *Leptoglossus fulvicornis* (Westwood) occurred in the main vein in the abaxial side of magnolia leaves. Bonjour *et al.* (1993), in Oklahoma (USA) studying the preferential site of oviposition in several cucurbitaceans species registered a higher percentage of egg masses in the abaxial side of the leaves, reaching a percentage of 100% in watermelon and melon.

TABLE 1

Preference for oviposition sites in *Nicotiana tabacum* L. by *Corecoris dentiventris* Berg based on 10 sampled egg-groups in field, 1996, Porto Alegre, RS.

Oviposition sites		Observed egg number	% eggs
Leaf –	Abaxial side, main vein	170	71,1
Stem –	Leaf base	37	15,5
Stem –	Flower bud base	12	5,0
Leaf –	Adaxial side, limb, near the main vein	10	4,2
Leaf –	Abaxial side, limb	7	2,9
Leaf –	Adaxial side, limb	3	1,2

The preference to oviposit in the abaxial side of the leaves could in part be explained as a mechanism to reduce the desiccation risks by the excessive exposure to the solar radiation. According to Strong *et al*. (1984) the desiccation risks are particularly severe for the insect eggs due to their high surface/volume ratio besides the fact that eggs can not replace the water loss.

The average developmental time of the egg of *C. dentiventris* was 13.7 ± 0.04 days, with a minimum of 12 and a maximum of 17 days.

The highest frequency of hatching occurred in the 14^{th} day (Fig. 1). Similar results to the grayish-tobacco bug were found by Van Reenen (1973), in Africa do Sul, for *Leptoglossus membranaceus* (Fabricius) (12.3 days), by Amaral-Filho & Cajueiro (1977), in São Paulo, for *Veneza stigma* (Herbst) (13.10 ± 0.13 days) and for *Crinocerus sanctus* (Fabricius), also in São Paulo 12.27 ± 0.06 days by Amaral-Filho (1986).

The egg viability observed for *C. dentiventris* was 99.63%, no infertile egg was registered in the present work and only one egg failure. Other coreids also show a high egg viability like, *L. membranaceus* (100%), *Leptoglossus gonagra* Fabricius (93.4%), *V. stigma* (91.66%) e *C. sanctus* according to Van Reenen (1973), Amaral-Filho & Storti-Filho (1976), Amaral-Filho & Cajueiro (1977) and Amaral-Filho (1986), respectively.

All observed specimens showed 5 nymphal instars (Table 2). Comparing the average duration in days, the second and fifth instars were the longest, and the third the shortest. The first and fourth instars were similar regarding the average, minimum and maximum duration. The first and fourth instars showed similar and the lowest range in days, the second and third similar and intermediary and the fifth instar presented the largest.

The average cumulative nymphal development time in days was 34.4 ± 0.11 (Table 2). The largest frequency of ecdysis were: in the first instar, in the sixth day (31.2%); in the second, in the eighth day (36.8%); in the third, in the fourth day (27.4%); in the fourth, in the fifth day (27.9%) and in the fifth, in the ninety day (24.0%).

Similar values to those registered for *C. dentiventris*, regarding the average, minimum and maximum duration, in days, in the first instar were also observed in other coreids: *L. membranaceus* (4.1), *V. stigma* (4.95 ± 0.07), *Phthia picta* (Drury) (4.64 ± 0.06), and *C. sanctus* (5.13 ± 0.12), respectively, by Van Reenen (1973), Amaral-Filho & Cajueiro (1977), Amaral-Filho (1981, 1986).

The first instar is registered for many coreid species as the shortest in duration. Nevertheless, this was not observed for *C. dentiventris*, and this instar showed a similar duration to those of the third and fourth instars. The average duration of the second instar of *C. dentiventris* was similar to that found for *Leptoglossus zonatus* (Dallas) (9.6 ± 0.38) (Panizzi, 1989) and of the third instar similar to that of *L. fulvicornis* (4.9 ± 0.1) (Wheeler & Miller, 1990). The second, third and fourth instars in *L. gonagra* (Amaral-Filho & Storti-Filho, 1976) and *C. sanctus* (Amaral-Filho, 1986) have similar duration. The duration of the second instar of *C. dentiventris* was almost two times longer than that registered for its third and fourth instars. In *C. dentiventris* the duration of the fifth instar although lightly lower than that of the second instar is longer than the others.

TABLE 2

Duration, in days, of the nymphal instars of *Corecoris dentiventris* Berg (n = number of nymphs; $\bar{x}$ = average; SE = standard error; CV = coefficient of variation). Porto Alegre, RS, 1996/1997.

Instar	n	Duration (days)		Range (days)	
		$\bar{x}$ ± SE	CV	Min	Max
1st	205	5.4 ± 0.08a	20.56	3	8
2nd	182	9.7 ± 0.19b	26.39	8	16
3rd	175	4.5 ± 0.08a	24.67	3	11
4th	168	5.3 ± 0.08a	19.06	3	8
5th	154	9.0 ± 0.13b	17.44	5	14
TOTAL		34.40 ± 0.11	3.98	31	40

Averages followed by the same letter are not significantly different, according the Duncan's test at 5%.

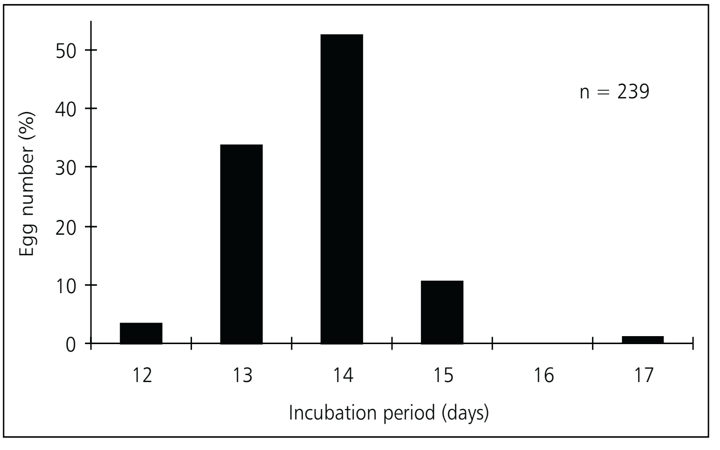

Fig. 1 — Relative frequency of the number of eggs of *Corecoris dentiventris* Berg, in different incubation periods, in field conditions. Porto Alegre, RS, 1996.

The longer duration of the fifth instar could be explained considering that in this instar occurs the differentiation of the internal reproductive organs and the completion of the wings development. The fifth instar also was the longest in other coreids as in *L. membranaceus* (Van Reenen, 1973), in *L. gonagra* (Amaral-Filho & Storti- Filho, 1976), in *C. sanctus* (Amaral-Filho, 1986), in *L. zonatus* (Panizzi, 1989) and in *L. fulvicornis* (Wheeler & Miller, 1990).

The relative mortality of *C. dentiventris* was largest in the first instar (13.87%), second (11.22%) and fifth (8.3%) instars, being similar in the third (3.85%) and fourth (4%). The cumulative relative mortality of the nymphal stage was 35.29% (Fig. 2).

According Panizzi & Parra (1991), the survival of the first nymphal instar depends upon the energy accumulated by the previous stage considering that the size and frailness of their mouth parts do not allow their feeding (Panizzi & Parra, 1991). In this way, the mortality in the first instar could be ascribed to a possible deficient nutrition, abiotic factors or even to the action of predators which escaped to observation by the investigator.

The high mortality found in the second instar of *C. dentiventris* could be explained considering that in this instar feeding activity begins, implying in the need to metabolize for the first time toxic or non-nutritive compounds (allelochemics) contained in the food.

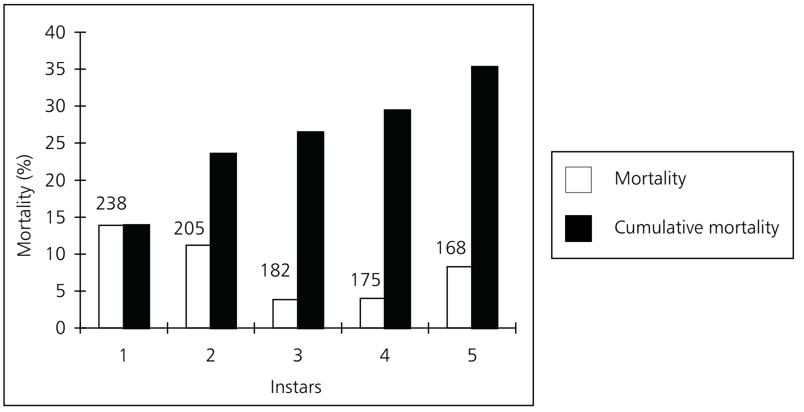

Fig. 2 — Relative mortality (%) in the different instars of *Corecoris dentiventris* Berg. Porto Alegre, RS. December 1996/January 1997. (The numbers on the top of the columns represent the initial number in each instar.)

In the fifth instar, also the mortality was high when compared to the others instars. According Panizzi & Parra (1991) the last instar could be considered the most critical in the Heteroptera nymphal development, during this period, the insect should obtain a high quality food in order to generate an adult with the maximum reproductive potential. Beyond this, the enormous changes in the insect body, at this moment, represent a large impact in its survival. The total mortality found for *C. dentiventris* (35.29%) was much lower than those showed by other coreids. Amaral-Filho (1976) found that from 184 eggs of *Anisosceles foliaceus* (Fabricius) observed in laboratory just one nymph survived the nymphal phase. In a similar work Panizzi (1989) registered a mortality of 50% for *L. zonatus*. This difference probably could be explained considering that *C. dentiventris* was followed in field conditions, which could eliminate some laboratory experimental mistakes, as inadequate temperatures or photoperiod. Besides this, either the oviposition substrate as well as the food was a host plant of this bug. Also, in laboratory studies frequently the nymphs are individualized in vials, and if this practice occurs too early the nymphal contamination with endosymbionts could not have time to occur.

From a total of 239 eggs obtained, 154 adults emerged, 76 males and 78 females, originating a sex ratio of 0.49 (0.97 males : 1 female), which does not differ significantly from the expected ratio 0.5 (1 male : 1 female; $\alpha = 0.05$; $X^2 = 0.0065$).

In other coreids, a sex ratio favoring males was registered as in *L. gonagra* (1 male : 0.69 females) (Amaral-Filho & Storti-Filho, 1976), and *C. sanctus* (1 male : 0.71 females) (Amaral-Filho, 1986). Nevertheless, Matrangolo & Waquil (1994) found a proportion of 1 male : 1.1 females, similar to that obtained for the grayish tobacco bug.

REFERENCES

AMARAL FILHO, B. F., 1976, *Nota preliminar sobre a biologia Anisosceles foliaceus* (Fabricius, 1803) *em laboratório* (Coreidae, Hemiptera). *In*: Reunião Anual – *SBPC*, 28. *Resumos*, São Paulo, p. 439.

AMARAL FILHO, B. F., 1981, Efeito de dietas naturais e de fatores ambientais na biologia de *Phthia picta* (Drury, 1770) sob condições de laboratório (Hemiptera, Coreidae). *Rev. Brasil. Biol.*, *41*(4): 845-853.

AMARAL FILHO, B. F, 1986, Observações sobre o ciclo biológico de *Crinocerus sanctus* (Fabricius, 1775) (Hemiptera: Coreidae) sob condições de laboratório. *An. Soc. Entomol. Brasil.*, *15*(1): 5-18.

AMARAL FILHO, B. F. & CAJUEIRO, I. V. M., 1977, Observações sobre o ciclo biológico de *Veneza stigma* (Herbest, 1784) Osuna, 1975 (Hemiptera, Coreidae) em laboratório. *An. Soc. Entomol. Brasil.*, *6*(2): 164-172.

AMARAL FILHO, B. F. & STORTI FILHO, A., 1976, Estudos biológicos sobre *Leptoglossus gonagra* (Fabricius, 1775) (Coreidae, Hemiptera) em laboratório. *An. Soc. Entomol. Brasil.*, *5*(2): 130-137.

BASSO, I. V., LINK, D. & LOPES, O. J., 1974, Entomofauna de algumas solanáceas em Santa Maria, Rio Grande do Sul. *Rev. Centro de Ciências Rurais*, *4*(3): 263-270.

BECKER, M. & PRATO, M. D., 1982, Natality and natural mortality of *Spartocera lativentris* Stal, 1870 (Heteroptera: Coreidae) in the egg stage. *An. Soc. Entomol. Brasil.*, *11*(2): 269-281.

BONJOUR, E. L., FARGO, W. S., AL-OBAIDI, A. A. & PAYTON, M. E., 1993, Host effects on reproduction and adult longevity of squash bugs (Heteroptera: Coreidae). *Environ. Entom.*, *22*(6): 1344-1348.

COSTA, R. G., 1941, *Pragas das plantas cultivadas no Rio Grande do Sul.* Sec. da Agricultura, Porto Alegre. 136p.

COSTA, R. G., 1958, *Alguns insetos e outros pequenos animais que danificam plantas cultivadas no Rio Grande do Sul.* Secretaria da Agricultura, Porto Alegre, 296p.

GALLO, D., NAKANO, O., NETO, S. S., CARVALHO, R. P. L., BATISTA, G. C., Filho, E. B., Parra, J. R. P., ZUCCHI, R. A., ALVES, S. B., VENDRAMIM, J. D., 1988, *Manual de entomologia agrícola*. Ceres, São Paulo, 469p.

MATRANGOLO, W. J. R. & WAQUIL, J. M., 1994, Biologia de *Leptoglossus zonatus* (Dallas) (Hemiptera: Coreidae) alimentados com milho e sorgo. *An. Soc. Entomol. Brasil.*, *23*(3): 419-423.

PANIZZI, A. R., 1989, Desempenho de ninfas e adultos de *Leptoglossus zonatus* (Dallas, 1852) (Hemiptera: Coreidae) em diferentes alimentos. *An. Soc. Entomol. Brasil.*, *18*(2): 375-389.

PANIZZI, A. R. & PARRA, J. R. P., 1991, *Ecologia nutricional de insetos e suas implicações no manejo de pragas*. Manole, São Paulo, 359p.

SCHAEFER, C. W. & MITCHELL, P. L., 1983, Food Plants of the Coreoidea (Hemiptera: Heteroptera). *Ann. Entom. Soc. Am*, *76*(4): 591-615.

SILVA, A. G. A., GONÇALVES, C. R., GALVÃO, D. M., GONÇALVES, A. J. L., GOMES, J., SILVA, M. N., SIMONI, L., 1968, *Quarto catálogo dos insetos que vivem nas plantas do Brasil, seus parasitos e predadores*. Ministério da Agricultura, Rio de Janeiro, Parte II, 1º tomo, 622p.

STRONG, D. R., LAWTON, J. H. & SOUTHWOOD, T. R. E., 1984, *Insects on plants*. Blackwell Scientific, Oxford, 313p.

VAN REENEN, J. A., 1973, Behaviour and biology of *Leptoglossus membranaceus* (Fabricius) in the Transvaal, with description of the genitalia (Heteroptera: Coreidae). *Ann. Transvaal-Museum*, *28*(14): 257-286.

WHEELER, A. G. JR. & MILLER, G. L., 1990, *Leptoglossus fulvicornis* (Heteroptera: Coreidae), a Specialist on Magnolia Fruits: Seasonal History, Habitats, and Descriptions of Immature Stages. *Ann. Entom. Soc. Am.*, *83*: 753-765.