ASPECTS OF THE BIOLOGY AND BEHAVIOR OF *Nesolynx* sp. (HYMENOPTERA, EULOPHIDAE)*

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RESUMO

Foram estudados alguns aspectos da biologia e do comportamento de *Nesolynx* sp. (Hymenoptera, Eulophidae), parasito de pupas de *Psorocampa denticulata* (Lepidoptera, Notodontidae), uma das lagartas desfolhadoras do eucalipto no Brasil. Os adultos deixaram a pupa hospedeira através de um orifício circular aberto em sua região dorsal, ocorrendo o acasalamento imediatamente após a emergência. A longevidade dos adultos foi de dois dias para os machos e de quatro

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dias para as fêmeas. Com relação à espécie hospedeira constatou-se uma maior progênie originada em pupas de *Diatraea saccharalis* que em *Galleria mellonella*. A elevação da temperatura de 21 ± 1 °C para 26 ± 1 °C acarretou um aumento significativo no número de adultos emergidos, independentemente da espécie hospedeira. A emergência de adultos cresceu proporcionalmente ao tempo de exposição ao hospedeiro até 3,50 dias, diminuindo consideravelmente após este período. Como o parasitóide apresentou reprodução partenogenética o número de machos emergidos foi significativamente maior que o de fêmeas. A razão sexual foi de 0,96 para os insetos originários de fêmeas virgens ou acasaladas e o ciclo de vida foi de 18,34 dias nestas duas condições de acasalamento.

INTRODUCTION

The defoliating caterpillars are amongst the important pests of *Eucalyptys* spp. in Brazil (BERTI-FILHO, 1981). The species *Psorocampa denticulata* (SCHAUS) (Lepidoptera, Notodontidae) is one of these pests and although its pupal period is a month in laboratory, this period may last three to five months in the field (MORAES & SOARES, 1981). This paper deals with some aspects of the biology and behavior of *Nesolynx* sp. (Hymenoptera, Eulophidae), a pupal parasite of *P. denticulata*.

MATERIAL AND METHODS

The research was carried out in the laboratory of Entomology of the Department of Plant Protection, "Escola Superior de Agricultura de Lavras", in Lavras, State of Minas Gerais, Brazil. The laboratory conditions were 26 ± 1 °C, 70 ± 10% RH and 14 hour photoperiod. The parasitoids were obtained from pupae of *Psorocampa denticulata* (Schaus) (Lepidoptera, Notodondidae) collected in an *Eucalyptus* spp. plantation in Altinópolis, State of São Paulo. Two day old pupae of *Diatraea saccharalis* (Fabricius) and *Galleria mellonella* Linnê (Lepidoptera, Pyralidae) were used as alternative hosts. The adult parasitoids were fed with a 10% honey solution and kept in a glass vial. The mean number of parasitoids per vial was 50 females and 5 males. Also a number of vials were set with a couple of parasitoids, one per vial. Observations were made as to the emergence of the parasitoids. The mating behavior of *Nesolynx* was observed under two conditions: upon emergence of males and females from the parasitoid populations and on the isolated couples in the vials. Six parasitoid females were individually kept with one *D. saccharalis* pupa, in order to determine the sex ratio and the number of individuals produced per virgin and per mated females. The relationship between the number of parasitoids emerged per pupa of *D. saccharalis* and *G. mellonella*, under the temperatures of 21 ± 1 °C and 26 ± 1 °C, with regard to the time the host pupas remained available to the parasitoids were determined through the study of polynomial regression. The polynomials were considered up to the third order and the statistical analysis was performed in a microcomputer, through the SANEST program, by considering five replications for each variable.

RESULTS AND DISCUSSION

Emergence

The adults emerge from the host pupa through a circular hole made on the dorsal region of the pupal tegument. The parasitoid cuts the pupal tegument with its mandibles and firstly protudes the antennae to the exterior. Then it continues to cut in order to enlarge the hole to allow its exit. The process of exit hole opening lasted a mean period of 140 minutes and all the other parasitoids emerged through it. However it was observed one pupa with five emergence holes. According to MILLER (1966), the eulophid *Tetrastichus incertus* makes only one exit hole but occasionally one can observe two holes.

After the emergence of the parasitoids kept at 21 $\pm$ 1 °C, they remained on the walls of the vial and then began to search for the females in slow movements. An opposite behavior was observed with the parasitoids kept at 26 $\pm$ 1 °C; they presented an intense movement on the walls of the vial. The females have maintained this behavior along the adult life while the males, after mating, have remained quiet or slowly moving. The parasitism was observed to occur only on pupae up to two days old.

Mating

Mating occurs righ after emergence. The male searches actively the females and upon finding one, it rides the female and then takes the mating position by lowering the tip of its abdome to the ventral backside of the female and inserting the aedeagus. The mean lenght of mating was one second. The mean longevity of adults was two days for the males and four days for the females.

Effects of Temperature and Host Species on The Emergence of Adults

A significative effect of host species and temperature increasing on the number of adults of *Nesolynx* sp. emerged from a single pupa was observed (Table 1). On average, *D. saccharalis* pupae showed a number of adults significantly greater than *G. mellonella* ones. These results were more conspicuous at the temperature of 26 ± 1 °C than at 21 ± 1 °C since at this temperature no significative differences were observed between the two studied species. In relation to the effects of the temperature it was observed that the average number of parasitoids per host pupae was significantly greater at 26 ± 1 °C than at 21 ± 1 °C and this fact did not depend on the species of the host.

In the four studied situations, considering *D. saccharalis* and *G. mellonella* pupae at 21± 1 and 26± 1 °C significant second order polinomial regression equations were determined for the relation between the number of emerged parasitoids and the period of exposition to the host (Fig. 1). The emergence of adults increased proportionally to the period of exposition to the host up to 3.50 days. The study of maximum and minimum on these equations showed that the highest adult emergence ocurred after 3.00 days for *D. saccharalis* at 21 ± 1 °C; 3.53 days for the same species at 26 ± 1 °C; 3.34 days for *G. mellonella* at 21 ± 1 °C and 3.40 days for this species at 26 ± 1 °C. The emergence decreased considerably after this period of exposition up to six days, except for *G. mellonella* at 21 ± 1 °C where the emergence of the parasitoids decreased to zero after 5.80 days. These results can be considered very reliable due to the high values obtained for the coeficients of determination, over 84.73%.

Table 1. Number of adults of *Nesolynx sp.* emerged from pupae of different species of hosts, under two environmental temperatures. Average of five replications. Lavras-MG, 1983.

Hosts	Temperature (°C)				Average	
	21 ± 1		26 ± 1			
Diatraea saccharalis	408.61 a	B	1.147.73 a	A	648.81	a
Galleria mellonella	284.93 a	B	556.25 b	A	398.11	b
AVERAGE	341.21	B	779.01	A	-	
C.V. (%)					7.70	

. In columns, results followed by the same small letter and in lines by the same capital letter did not show significant differences by the Tukey's test ($P \geq 0.05$).

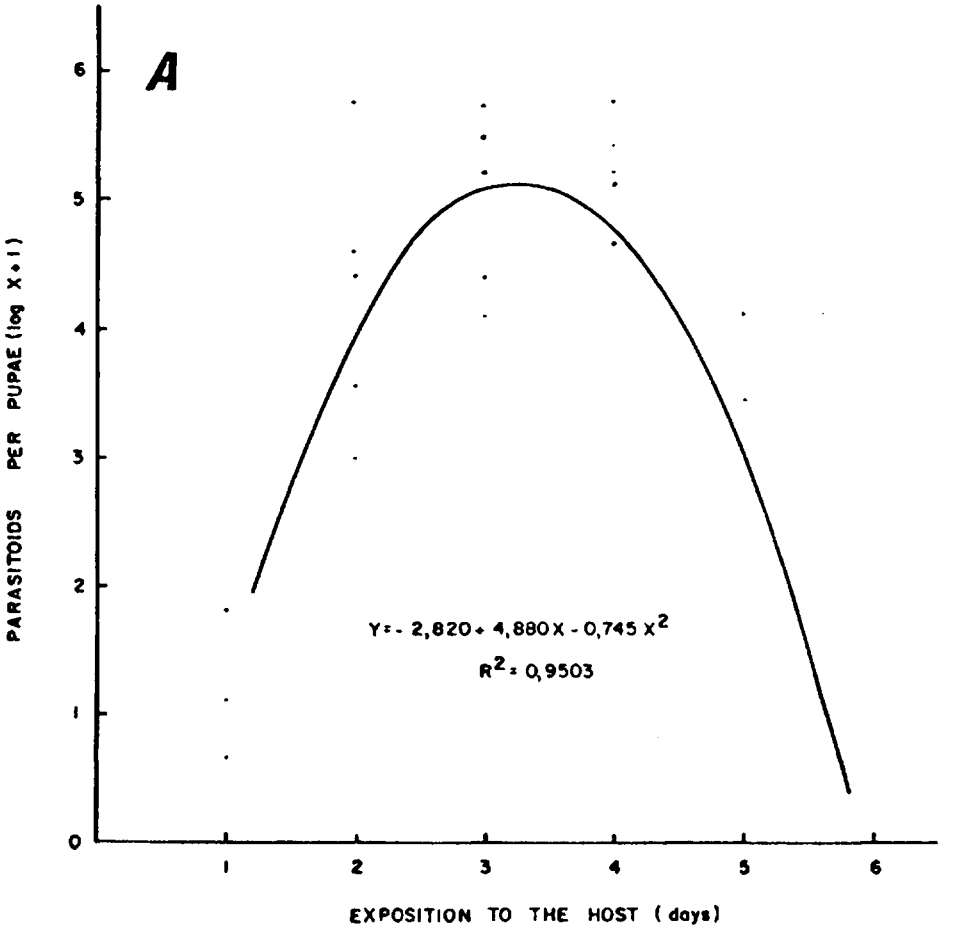
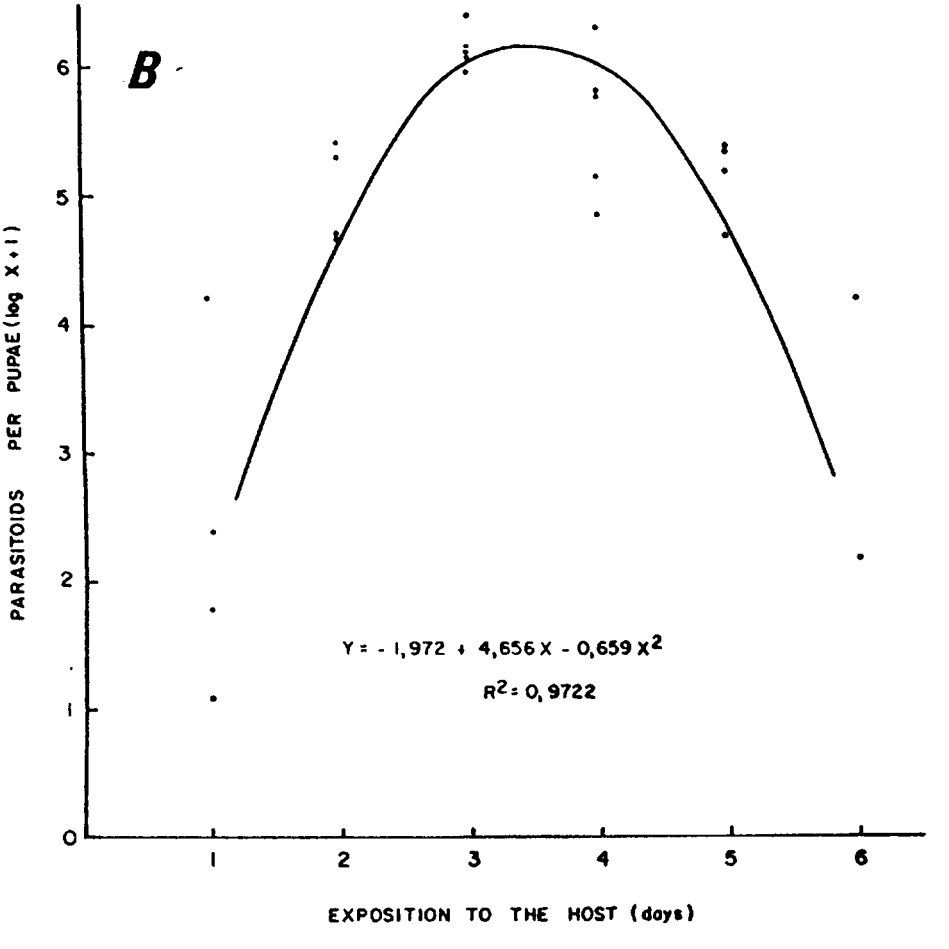
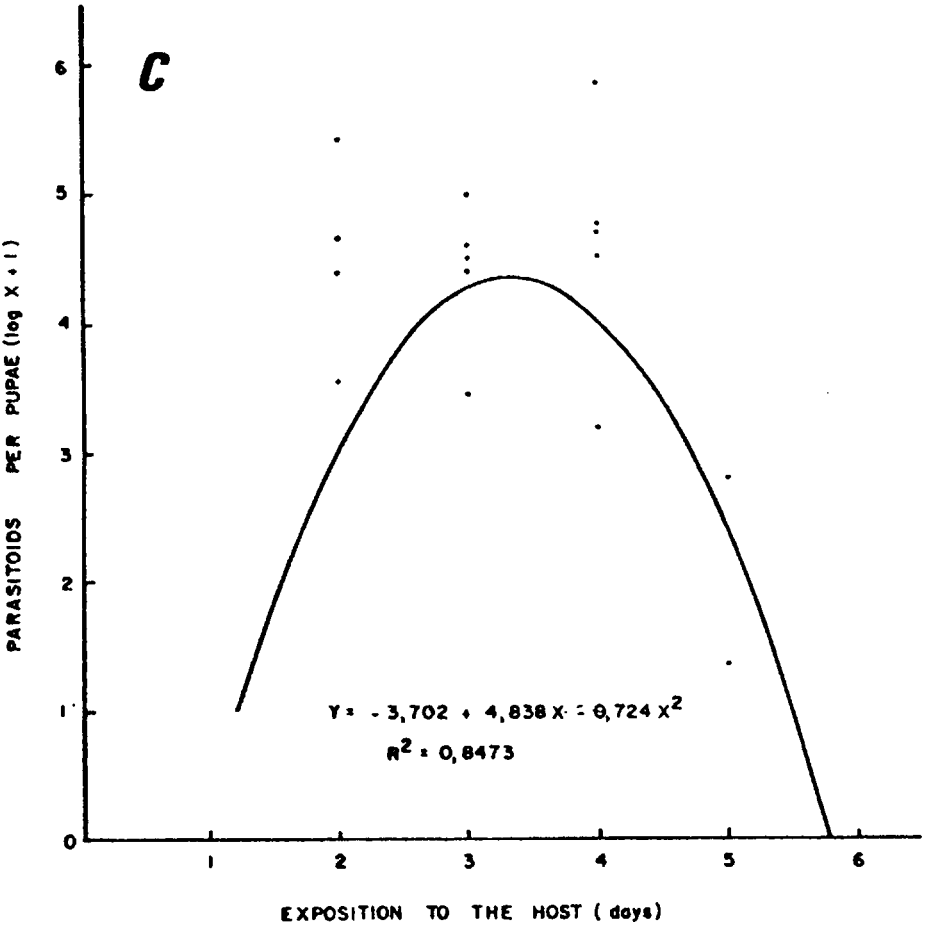
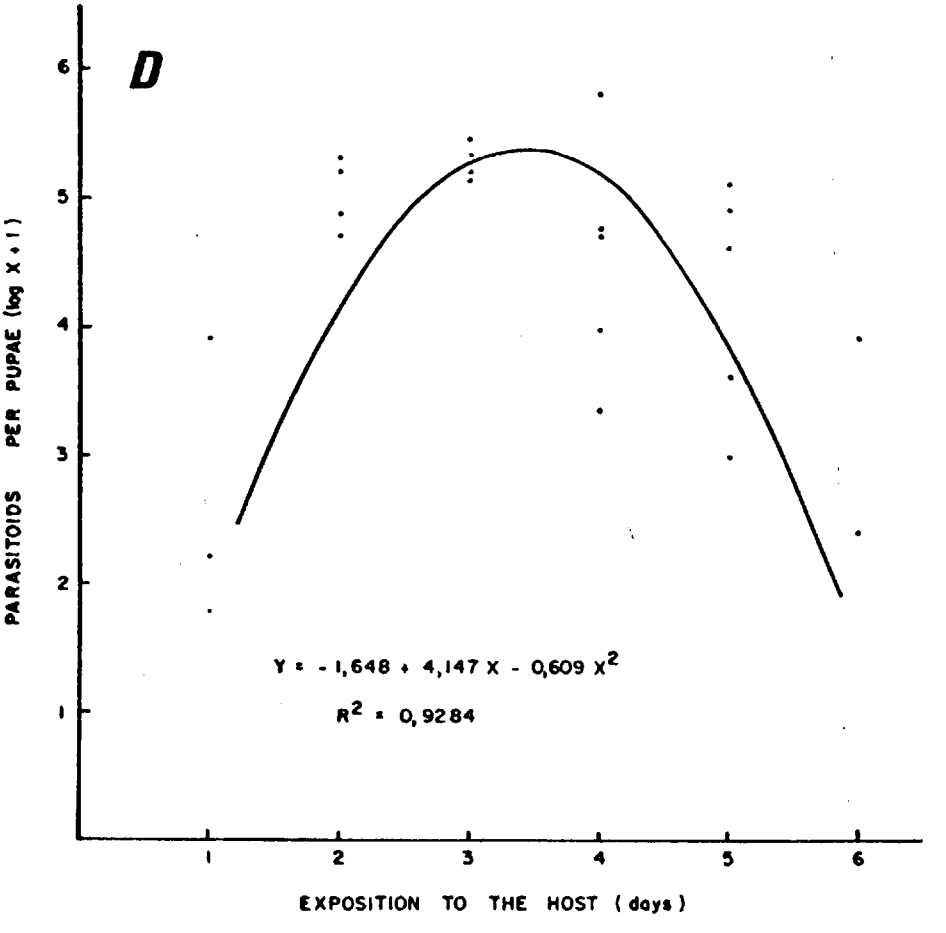


Figure 1 - Adjusted curves and dispersion on the values observed for the polinomial regression between the number of *Nesolynx sp.* emerged from a single pupa of the host and the period of exposition of this pupa to the parasitoid, at different temperatures. A = *D. saccharalis* at 21 ± 1 °C; B = *D. saccharalis* at 26 ± 1 °C; C = *G. melonella* at 21 ± 1 °C and D = *G. Melonella* at 26 ± 1 °C.


B
PARASITOIDS PER PUPAE (log X + 1)
0
1
2
3
4
5
6
Y = - 1,972 + 4,656 X - 0,659 X²
R² = 0,9722
EXPOSITION TO THE HOST (days)


C
PARASITOIDS PER PUPAE (log X + 1)
EXPOSITION TO THE HOST (days)
Y = - 3,702 + 4,838 X - 0,724 X²
R² = 0,8473
0
1
2
3
4
5
6


D
PARASITOIDS PER PUPAE (log X + 1)
EXPOSITION TO THE HOST (days)
Y = - 1,648 + 4,147 X - 0,609 X²
R² = 0,9284
1
2
3
4
5
6

Effects of The Condition of The Females of *Nesolynx* sp. (virgin/mated) on The Adult Emergence, Sex Ratio and Life Cycle Lenght

The virgin condition in relation to mated females did not showe significant effects on the average number of emerged insects per pupae of *D. saccharalis*. It shows a parthenogenetic reproduction type for this species, therefore the average number of emerged males was significantly greater than the number of females for both conditions of the insects (Table 2). The sex ratio was similar in the two cases, around 0.96. The duration of the life cycle was the same for the insects emerged from virgin and mated females, near to 18.34 days.

SUMMARY

ASPECTS OF THE BIOLOGY AND BEHAVIOR OF *Nesolynx sp.* (HYMENOPTERA, EULOPHIDAE)

This research was carried out to study some aspects of the biology and behavior of *Nesolynx* sp. (Hymenoptera, Eulophidae), a pupal parasite of *Pseorocampa denticulata* (Lepidoptera, Notodontidae) a defoliating caterpillar of *Eucalyptus* spp. in Brazil. The adults emerge from the host pupa through a circular hole on its dorsal region. Mating occurs righ after the emergence and the longevity of adults was two days for the males and four days for the females. Regarding to the host species *Diatraea saccharalis* showed a number of adults significantly greater than *Galleria mellonella* and the increasing temperature from 21±1 °C to 26±1°C caused a significative increasing in the number of emerged adults in both host species. The emergence of adults increased proportionally to the period of exposition to the host up to 3.50 days; after that, a considerable decrease in the emergence was observed. The parasitoid showed

Table 2. Number of adults emerged from virgin and mated females of *Nesolynx* sp. per pupae of *D. saccharalis*, sex ratio and life cycle lenght. Average of three replications. Lavras-MG, 1983.

CONDITION	SEX		AVERAGE	SEX RATIO	BIOL. CYCLE (days)
	female	male			
Virgin	2.00 a B	81.63 a A	14.74 a	0.97 ± 0.005	18.34 ± 0.57
Mated	2.97 a B	89.56 a A	17.98 a	0.96 ± 0.020	18.34 ± 0.57
AVERAGE	2.45 B	85.50 A	-	-	-
C.V. (%)			11.69		

In columns, results followed by the same small letter and in lines by the same capital letter did not show significant differences by the Tukey's test ($P \geq 0.05$).

parthenogenetic reproduction therefore the average number of emerged males was significantly greater than the number of females. The sex ratio was similar for the insects emerged from virgin or mated females (0,96) and the life cycle lenght was around 18.34 days for both conditions.

REFERENCES

BERTI-FILHO, E. **Insetos associados a plantações de** *Eucalyptus* **nos estados da Bahia, Espírito Santo, Mato Grosso do Sul, Minas Gerais e São Paulo-Piracicaba, ESALQ/USP**, 1981. 175pp. (Tese de livre docência).

MILLER, M.C. Emergence and mating of *Tetrastichus incertus*, a parasite of the alfalfa weevil. **Journal of Economic Entomology**, 59 (6): 1532-3, 1966.

MORAES, G.W. & SOARES, L.A. Ciclo biológico e consumo foliar de *Psorocampa denticulata* Schaus (Notodontidae) Lepidóptera desfolhador de eucalipto. In: CONGRESSO BRASILEIRO DE ENTOMOLOGIA, 7, Fortaleza-CE, 1981. **Resumos** ... Fortaleza, Sociedade Entomológica do Brasil, 1981 p. 141.