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Parasitic capacity of *Apanteles militaris* (Hym., Braconidae) on its host *Mythimna unipuncta* (Lep., Noctuidae)

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Abstract: Aiming to study the parasitic capacity of *Apanteles militaris* through lifetime on *Mythimna unipuncta*, the following parameters were analyzed for each day of parasitism: number of cocoons per host; number of larvae that did not form cocoon; number of larvae that did not emerge from the host; sex-ratio; adult emergence rate; number of parasitized, dead or pupated armyworm. Maximum female longevity was 16 days. The number of cocoons per host decreased for older parasitoid females. The age of the females did not significantly affect the following parameters: the number of larvae that did not form cocoon, the number of larvae that did not emerge from the host, the sex-ratio and adult emergence. The number of dead or pupated armyworm increased with time while the number of parasitized host decreased.

Capacidad parasitaria de *Apanteles militaris* (Hym., Braconidae) sobre su patrón *Mythimna unipuncta* (Lep., Noctuidae).

Resumen: Para estudiar la capacidad parasitaria de *Apanteles militaris* a lo largo de su vida sobre la rosquilla *Mythimna unipuncta*, se analizaron los siguientes parámetros cada día: número de capullos por patrón; número de larvas que no hicieron capullo; número de larvas que no salieron del patrón; proporción de sexos; tasa de emergencia de adultos; número de rosquillas parasitadas, muertas o pupadas. La máxima longevidad de las hembras fue de 16 días. El número de capullos por patrón descendió en el caso de las hembras parasitoides más viejas. La edad de las hembras no afectó significativamente los siguientes parámetros: el número de larvas que no hizo capullo, el número de larvas que no salieron del patrón, la proproporción de sexos y la emergencia de adultos. El número de rosquillas muertas o pupadas aumentó con el tiempo mientras decrecía el número de patrones parasitados.

INTRODUCTION

Apanteles militaris (Walsh, 1861) is a gregarious braconid endoparasitoid wasp that mainly parasitizes the larvae of the pastures armyworm *Mythimna unipuncta* (Haworth), a pest that is responsible for the destruction of 8% of the annual grass production from permanent pastures in the Azorean Islands (TAVARES, 1989).

Host finding, oviposition behavior and mating of the genus *Apanteles* have been investigated by some authors with other species, such as, *A. glomeratus* L. (SATO, 1979; TAGAWA & KITANO, 1981; TAGAWA & HIDAKA, 1982; TAGAWA *et al.*, 1987), *A. flavipes* (Cameron) (ARAKAKI & GANAHA, 1986), but in the case of *A. militaris* it is practically unknown.

This species is arrhenotokous, virgin females can lay only male eggs. In field conditions, most of the collected cocoon clusters contained both sexes, and only a few consisted of males alone. Usually, in laboratory conditions we had the opposite situation, i.e., a lot of cocoon clusters with males and only a few with males and females. The present work was carried out in order to study the age effects of *A. militaris* on its parasitic capacity by investigating the wasp progeny.

MATERIAL AND METHODS

The population of *A. militaris* used in this experiment came from naturally parasitized *M. unipuncta* larvae collected in the pasture near Ponta Delgada. As a factitious host we used *M. unipuncta* larvae which came from the laboratory cultures, established from individuals collected in the fields.

On the third and next days after the parasitoid emergence, one isolated female parasitizes one isolated third instar larvae of *M. unipuncta*, each day until her death, always at the same hour. After the first sting hosts were removed from the parasitoid and individually kept in a plastic container (4.5 x 3 cm) with artificial diet (POITOUT & BUES, 1970) without nipagin, until the parasitoids emergence.

All the experiment was maintained at 22±1°C under a 8:16 dark-light photoperiod and 70±5% R.H. Containers were observed daily in the morning. Adult wasps were fed on honey solution drops in the glass vials.

The longevity of *A. militaris* females was registered daily. For each day of parasitism, the following nine parameters were analyzed: the number of cocoons per host, the number of larval parasitoid that emerged but fail to pupate per host, the number of larval parasitoids that fail to emerge from each host, the total number of larvae, the percentage of adult emergence, the adult sex ratio, the percentage of dead host, the percentage of pupated hosts and the percentage of parasitized hosts.

All data were analyzed with Kruskal-Wallis and Kolmogorov-Smirnov tests ($p<0.05$). This analysis was made only for the first eight days of parasitism, because, in the later days we did not had a sufficient number of repetitions. The data concerning the number of larval parasitoids that emerged but fail to pupate per host, the number of larval parasitoids that fail to emerge from each host, the percentage of adult emergence and the adult sex ratio, were transformed by $\sqrt{(x+0.5)}$ to stabilize the variances.

RESULTS AND DISCUSSION

The maximum female longevity, from emergence to death, was 16 days (9.3%); until the sixth day we had more than 62.9% of living females, decreasing after the eighth day to less than 38.9% (Figure 1).

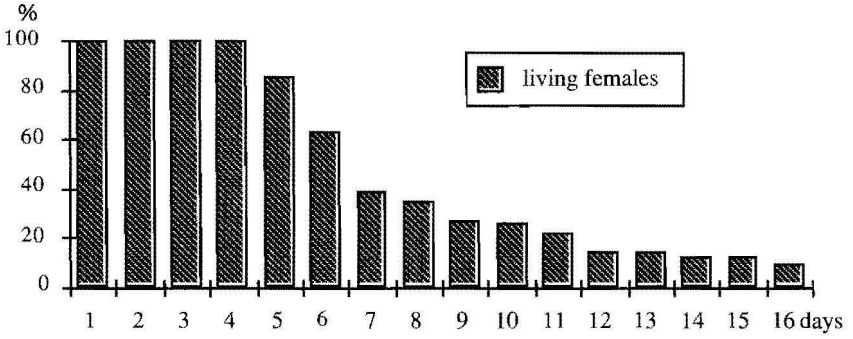

Figure 1. Percentage of *A. militaris* living females.

On the first day of parasitism we had the maximum number of cocoons per host and total number of larvae. On the eighth day we had the minimum for both parameters; the statistics analysis for these two parameters showed a significantly difference between the days of parasitism ($p<0.05$). The number of larval parasitoids that emerged but fail to pupate per host and the number of larval parasitoids that fail to emerge from each host were not significantly different between the days of parasitism ($p<0.05$) (Table 1).

Table 1

The number of larval parasitoids, the number of cocoons per host, the number of larval parasitoids that emerged but fail to pupate, the number of larval parasitoids that fail to emerge and the total number of larvae obtained during the first eight days, and its statistical analysis (*Data transformed by $\sqrt{(x+0.5)}$).

Day	N	Nº of cocoons/ host	Par. larva not pupated*	Par. larva not emerged*	Total larva
1	51	51.15±22.03	1.25±2.18	1.62±3.02	54.02±20.06
2	43	46.50±17.11	1.74±2.56	3.53±7.68	51.84*15.85
3	30	34.30±13.00	1.33±1.24	4.90±11.1	40.50±09.97
4	16	40.75±13.84	0.63±1.15	1.19±2.04	42.56±14.42
5	16	36.25±06.32	1.63±3.01	1.75±2.52	39.63±08.37
6	12	37.67±17.39	0.92±1.16	2.83±8.26	41.42±16.23
7	10	27.10±13.64	0.70±1.06	2.40±3.63	30.20±14.72
8	10	18.20±10.87	1.30±1.61	1.20±2.39	20.70±10.10
H-value		46.490	9.099	4.638	49.582
P-value		<0.0001	0.2499	0.704	<0.0001
Kolmogorov-Smirnov		1≠[3,5,7]; 2≠[7] 8≠[1,2,3,4,5,6]	-	-	1≠[3,5,7]; 2≠[7] 8≠[1,2,3,4,5,6]

The percentage of adult emergence and the sex ratios were not significantly different between the days of parasitism ($p<0.05$). The sex ratio was higher for younger females, specially during the first two days of parasitism (Table 2).

Table 2

The sex ratio and the percentage of adult emergence obtained during the first eight days, and its statistical analysis (*Data transformed by $\sqrt{(x+0.5)}$).

Day	Sex ratio (%)*	Emergence (%)*
1	44.69±20.06	93.79±06.03
2	40.55±24.63	89.98±10.61
3	32.98±24.43	82.99±76.92
4	34.69±26.70	96.41±04.52
5	33.75±27.77	95.24±03.01
6	25.98±29.22	93.68±09.30
7	32.47±27.70	90.10±08.98
8	38.41±31.91	88.09±15.85
H-value	8.493	13.001
P-value	0.2911	0.0721

The percentage of dead or pupated armyworm increased with time as the number of parasitized host decreased (Figure 2), with some oscillating values throughout time.

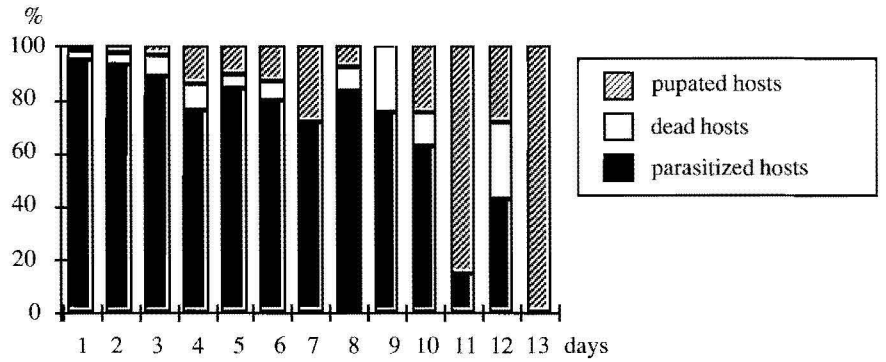

Figure 2. Percentage of pupated hosts, percentage of dead hosts and percentage of parasitized hosts until the thirteenth day of parasitism.

CONCLUSION

We may conclude that the age of the *A. militaris* females influenced the number of eggs laid by the parasitoid into *M. unipuncta*, as well as the quantity

of cocoons obtained, i. e., younger females produce a larger quantity of eggs. The period between the fourth and the eighth day of life proved to be the best for a laboratory production of *A. militaris* if we want to mass rear the parasitoid.

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REFERENCES

ARAKAKI, N. & GANAHA, Y. (1986): Emergence pattern and mating behavior of *Apanteles flavipes* (Cameron) (Hymenoptera: Braconidae). *Appl. Ent. Zool.*, 21 (3): 382-388.

TAVARES, J. (1989): *Mythimna unipuncta (Haworth) (Lep., Noctuidae) aux Açores. Bioécologie et lutte biologique.* Thèse de docteur d'État Ès-Sciences, Univ. d'Aix-Marseille.

POITOUT S. & BUES, R. (1970): Élevage de plusieurs espèces de Lépidoptères Noctuidae sur milieu artificiel riche et sur milieu artificiel simplifié. *Ann. Zool. Ecol. Anim.*, 2 (1): 79-91.

SATO, Y. (1979): Experimental studies on parasitization by *Apanteles glomeratus.* IV. Factors leading a female to the host. *Physiol. Entomol.* 4: 63-70.

TAGAWA, J. & HIDAKA, T. (1982): Mating behaviour of the braconid wasp, *Apanteles glomeratus* L. (Hymenoptera: Braconidae): Mating sequence and the factor for correct orientation of male to female. *Appl. Ent. Zool.* 17: 32-39.

TAGAWA, J. & KITANO, H. (1981): Mating behaviour of the braconid wasp, *Apanteles glomeratus* L. (Hymenoptera: Braconidae) in the field. *Appl. Ent. Zool.* 16: 345-350.