PRELIMINARY STUDY ON THE OVERWINTERING OF ANAGRUS IiVCARNATUS HALIDAY (HYMENOPTERA : MYMARIDAE), AN EGG PARASITOID OF THE RICE PLANTHOPPERS

Chantarasa-ARD, Su Jin

https://doi.org/10.5109/2461

出版情報：ESAKIA. 22, pp.159-162, 1984-11-20. Entomological Laboratory, Faculty of Agriculture, Kyushu University
バージョン：
権利関係：

PRELIMINARY STUDY ON THE OVERWINTERING OF *ANAGRUS INCARNATUS* HALIDAY (HYMENOPTERA : MYMARIDAE), AN EGG PARASITOID OF THE RICE PLANTHOPPERS"

SUJIN CHANTARASA-ARD[2)]

Entomological Laboratory, Faculty of Agriculture,
Kyushu University, Fukuoka 812, Japan

Abstract

Preliminary study on the overwintering of *Anagrus incarnatus* Haliday was conducted under the experimental conditions. The results revealed that this parasitoid has a capability to overwinter in the eggs of other delphacid planthoppers such as ***Nilaparvata muiri*** China.

Introduction

Anagrus incarnatus Haliday is a dominant egg parasitoid of the rice planthoppers in Japan (Chantarasa-ard et al., 1984a). So far, it has not clearly known that how this parasitoid overwinters in Japan. Among the 3 species of the host rice planthoppers, only *Laodelphax striatellus* (Fallen) can overwinter in Japan but diapauses in the nymphal stage. The other 2 species, *Nilaparvata lugens* (Stål) and *Sogatella furcifera* (Horvárth) have been known that they can not overwinter in this country but annually migrate from overseas. Thus the overwintering of this parasitoid may be suggested by two possibilities : one by hibernating in the adult stage, and another by means of diapausing within eggs of other host species. Several delphacid planthoppers, including *Nilaparvata muiri* China and *Nilaparvata bakeri* Muir, are known to be alternate hosts of this parasitoid (Chantarasa-ard *et al.*, 1984a). And these two host species are known to overwinter in the diapausing egg stage. If *A. incarnatus* overwinters in the immature stages, it is very probable that the parasitoid hibernates in the eggs of these hosts during the winter. Therefore, a preliminary study was done to investigate if there is such a possibility.

[1)] Contribution from the Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka (Ser. 3, No.164).

[2)] Present address: Division of Entomology and Zoology, Department of Agriculture, Ministry of Agriculture and Co-operatives, Bangkhen, Bangkok 10900, Thailand.

Materials and Methods

One may suggest a simple method for detecting the overwintering parasitoid eggs in the eggs of so-assumed host N. *muiri* or N. *bakeri* in winter. However, due to the very low populations of these planthopper species during the autumn, it was difficult to collect enough eggs of them in the winter. By this reason the experiment was conducted under the controlled conditions in the laboratory and at outdoors.

Anagrus *incarnatus* used in the experiment was from the laboratory stock cultures, which were reared successively on eggs of N. *lugens*. The present experiment was done during the autumn and winter in Fukuoka. As it has been known that both temperature and light play important role in the diapausing of animals, the parasitoid, prior to be used in the experiment, was reared at 18°C, LD 8 : 16 photoperiod to assimilate the condition of autumn. Then, the parasitoid of the next generation was used.

Eggs of N. *muiri* and *N. bakeri* were obtained by collecting adults of these planthoppers from grass fields nearby the Kyushu National Agricultural Experiment Station, Chikugo City, during the summer. They were reared for eggs on the grass ***Leesia*** *japonica* until late autumn. Host eggs were then divided into 5 groups for experiments in laboratory and at outdoors.

After the host eggs were exposed to the parasitoid, they were kept in the incubator at 5 °C, LD 8 : 16 photoperiod for 60 and 90 days, respectively. Thereafter, those eggs were kept at 25 °C, LD 16 : 8 photoperiod. Observation was made daily to examine the emergence of the parasitoid.

On the contrary, after the host eggs were exposed to the parasitoid, they were placed at outdoors for 30, 60 and 90 days, respectively, started on January 15. When the time was over those eggs were brought back to the laboratory, and then incubated at 25 °C, LD 16 : 8 photoperiod. Observation was made daily also for the emerging parasitoids. There was no artificial light at night where the host eggs were exposed.

Results and Discussion

A number of adults of *Anagrus incarnatus* were obtained from both laboratory and outdoor experiments (Tables 1 and 2). The time required from the start of incubation at 25 °C until adult emergence ranged from 13 to 22 days. Chantarasa-ard et al. (1984b) reported that the duration of development of this species from egg to adult emergence at 24 °C was about 13 days.

The coldest period of Japan is usually in January and February, during which the present experiments were made. Thus, from the results it is evident that ***A.*** *incarnatus* has a capability to overwinter in the eggs of these planthopper species. Judging from the incubation period at 25 °C, it is very probable that this parasitoid may hibernate or diapause in the egg stage or early larval stage. Armstrong (1936) found that A. *armatus* var. *nigriventris* Gir. passes the winter as a partially grown larva in eggs of the white apple leafhopper, *Typhlocuba pomaria.*

Table 1. Adult emergence of *Anagms incarnatus* from eggs of *Nilaparvata muiri* (laboratory experiment).

Experiment	Incubation period at 5℃, LD 8:16 (days)	Incubation period at 25℃, LD 16:8 (days)	No. of parasitoids emerged
II	60	13	13
		16	15
		17	2
		19	1
	90	15	3
		16	8
		17	11
		19	9
		21	2
		22	1

Table 2. Adult emergence of *Anagms incarnatus* from eggs of *Nilaparvata muiri* (outdoor experiment).

Experiment	Outdoor exposing period (days)	Date of retrieval from outdoors (1980)	Incubation period at 25℃, LD 16:8 (days)	No. of parasitoids emerged
I	30	Feb. 15	16	33
			18	3
			23	1
II	60	Mar. 15	10	7
			11	3
			13	
			15	2
III	90	April 15	16	1
			13	1
			20	1

Anagms *incarnatus* very poorly developed in the eggs of *Nilaparvata bakeri*, and only one adult of the former was obtained from all experiments. The reason is unknown.

According to the lo-years record (1966-1975) at the Kyushu National Agricultural Experiment Station, an average of 1, 715 (759-3, 729) adults of *N. muiri* was caught at light trap a year (Dr. J. Hirao, personal communication). Thus, this planthopper may be, among others, the important alternate host of ***A.*** *incarnatus* for overwintering in Japan. The alternate hosts are beneficial to this parasitoid for maintaining its population throughout the year. Doutt and DeBach (1964) and Huffaker et al. (1971) state that in a given situation such as the host population in periodically depressed by

other factors, other alternate host species may be required at time when the given host is unavailable.

Acknowledgements

I am grateful to Prof. Y. Hirashima of Entomological Laboratory, Kyushu University, for his encouragement and guidance. I am also grateful to Dr. J. Hirao and Mr. H. Inoue of Kyushu National Agricultural Experiment Station, for their invaluable suggestions and much help to my work. I thank Dr. 0. Tadauchi and Mr. K. Ôhara of Entomological Laboratory, Kyushu University, for their assistance during the course of my study. I also thank Dr. K. A. Sahad of Entomological Laboratory, Kyushu University (now Bangladesh Agriculture Institute, Dacca, Bangladesh) for the identification of *Anagrus incarnatus*.

References

Armstrong, T., 1936. Two parasites of the white apple leafhopper (*Typhlocyba pomaria* McA.). Ann. *Rep. Entomol. Soc. Ontario., 66: 16-31.*

Chantarasa-ard, S., Y. Hirashima and J. Hirao, 1984a. Host range and host suitability of *Anagrus incarnatus* Haliday (Hymenoptera : Mymaridae), an egg parasitoid of delphacid planthoppers. *Appl. Ent. Zool.*, **19**(4) (in press).

———, ——— and T. Miura, 1984b. Effects of temperature and food on the development and reproduction of *Anagms incarnatus* Haliday (Hymenoptera : Mymaridae), an egg parasitoid of the rice planthoppers. *Esakia, (22)* : *145-158.*

Doutt, R. L. and P. DeBach, 1964. Some biological control concepts and questions. *In* P. DeBach (ed.) *Biological Control of Insect Pests and Weeds.* p. 118-142. Chapman and Hall, London.

Huffaker, C.B., P.S. Messenger and P. DeBach, 1971. The natural enemy component in natural control and the theory of biological control. *In* C.B. Huffaker (ed.) *Biological Control.* pp. 16–67. Plenum Press, New York.