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Host-age preference of **Trichogramma embryophagum** (Hartig), **T. turkeiensis** Kostadinov, **T. dendrolimi** Matsumura and **Trichogramma** sp. for the factitious host **Ephestia kuehniella** Zeller

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Summary

Four Trichogramma species were tested for their ability to parasitize eggs of various ages of E. kuehniella. The reason of the determination of the parasitization and emergence rates of the parasites were to decrease the costs and increase the production.

It showed, as in many other literature that Trichogramma species prefer younger hosts. Emergence varied in four species but it was mostly higher than 80 %.

Introduction

The use of Trichogramma as a biological insecticide against many lepidopterous pests is common in many countries (Isac, 1973; Delucchi, 1975; Andreev, 1977; Marchenko, 1983; Yu et al., 1984; King et al.,

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1986; Tran and Hassan, 1986; Hagley, 1986). Different laboratory hosts have been used for mass-culture of Trichogramma, and their effects on the parasites have been studied (Flanders, 1930; Navarajan, 1979; Neuffer, 1980; Hassan, 1981; Kfir, 1981; van Lenteren, 1981; Bigler, 1986).

This paper deals about the host-age preference of four Trichogramma species. This is of main importance on the mass-culture because we can increase production of parasites and decrease the costs.

Materials and Methods

Ephestia kuehniella eggs were used for the mass-culture of Trichogramma species.

Mass-culture of the host: E. kuehniella has been reared continously, following the procedure reported by Neuffer (1980), in our laboratory for approximately 60 generations. After emergence of the adult, E. kuehniella are placed inside a canister, and lay their eggs. Enviromental conditions are 60-70 % RH, 25 ± 1 °C and dark. Eggs are collected daily. Afterwards, they are stored at 4 °C.

Mass - culture of parasites: In our laboratory four different Trichogramma species are being reared continuosly on egg masses of E. kuehniella. This rearing carried out in greenhouse cabinet with constant temparature (25 ± 1 °C) and 14 h light. E. kuehniella eggs were sticked on the paper with glue solution. This paper strips were put into glass tubes and parasites were released to them. Eggs were exposed for 24 h in tubes for mass production at a ratio of 10 eggs per one female parasite. Parasites were fed with %10 honey solution. These eggs were parasited and incubated under the same conditions.

Host-age preference tests: These experiments were set up for estimation of host-age preference. For these tests, it was necessary to have eggs from different live ages. We made a timetable (see figure 1). Eggs of E. kuehniella were gathered at 10 o'clock AM and incubated at 25 ± 1°C, 60-70 % RH and 14 h light, every day for a period of 4 days.

Eggs of E. kuehniella were sticked on the paper strip (9x1.5 cm) in batches of 50 same age-eggs (Figure 2). The distance between the eggs batches is 1 cm. The age batches were placed at random on each strip. The test was repeated for 3 times for each Trichogramma species.

The eggs were parasited and incubated under the same conditions as mentioned above paragraph.

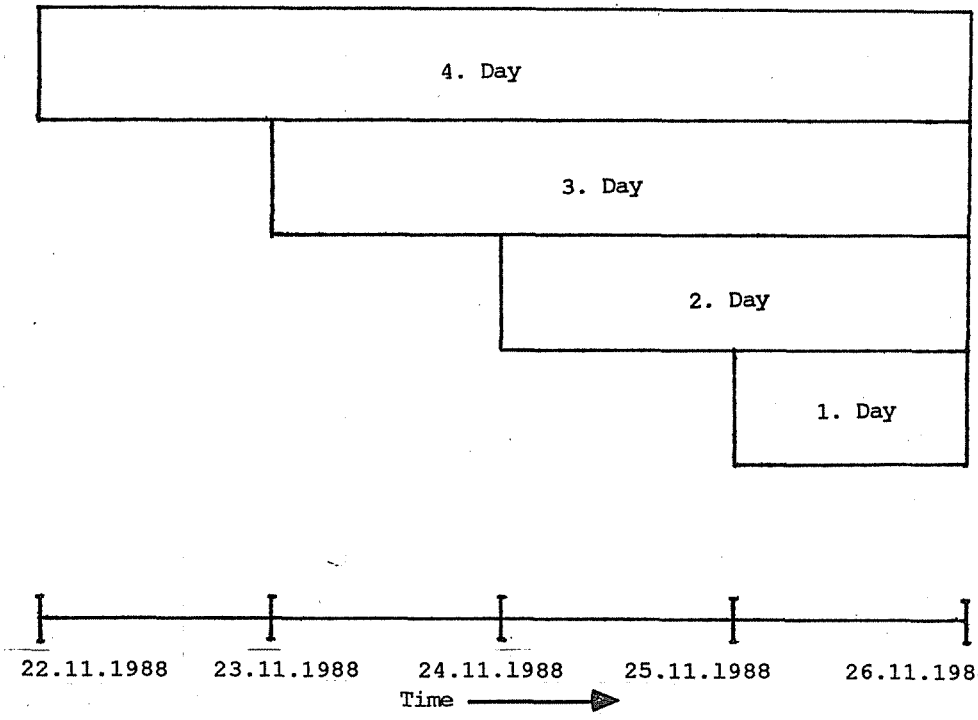

Figure 1. Time-table for the gathering of E. kuehniella eggs

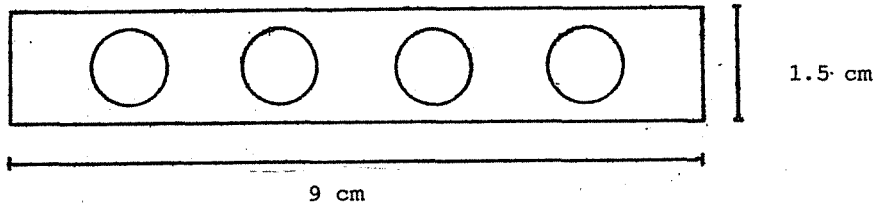

Figure 2. Eggs batches of different ages of E. kuehniella

The parasitism rate was determined by counting the portion of black coloured eggs, the rate of emergence was determined after emergence by counting the number of eggs with exit holes.

Results and Discussion

The data collected on the percentage of eggs parasitised, number of parasited eggs, percentage and number of parasites emerged of for Trichogramma species as influenced by the age of the eggs E. kuehniella are shown in Table 1 and Figure 3,4.

Table 1. Influence of host age on the Trichogramma species

Species	1 day old E. kuehniella egg			2 day old E. kuehniella egg			3 day old E. kuehniella egg			4 day old E. kuehniella egg		
	Avarage parazited egg	% parasitism	% emerge	Avarage parazited egg	% parasitism	% emerge	Avarage parazited egg	% parasitism	% emerge	Avarage parasizted egg	% parasitism	% emerge
Trichogramma sp.	39.3±6.6	79	100	29.6±4.04	59	94	25.3±9.3	51	99	4.66±3.51	9	85
T.dendrolimi	35.3±8.5	71	100	23.3±10.9	47	96	24.0±3.60	48	96	13.6±0.57	27	95
T.turkeiensis	20.0±3.46	40	79	26.0±1.0	52	95	11.3±10.5	23	100	8.33±7.02	17	80
T.embryophagum	32.3±5.03	65	85	24.0±6.92	48	95	14.0±6.24	28	100	4.0±3.46	8	97

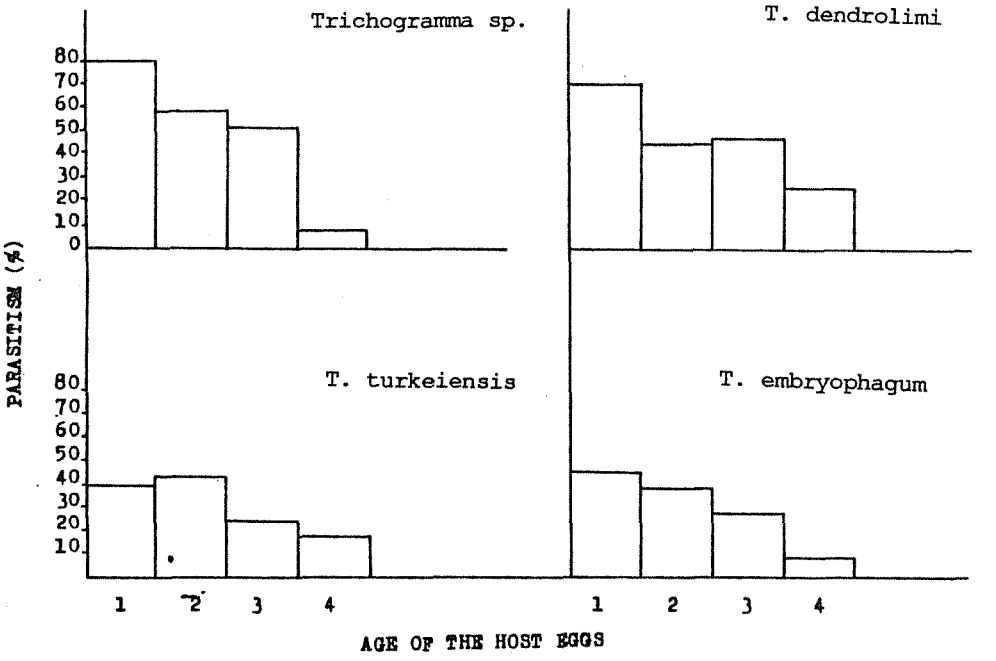

Figure 3. Influence of host age on the parasitism rate

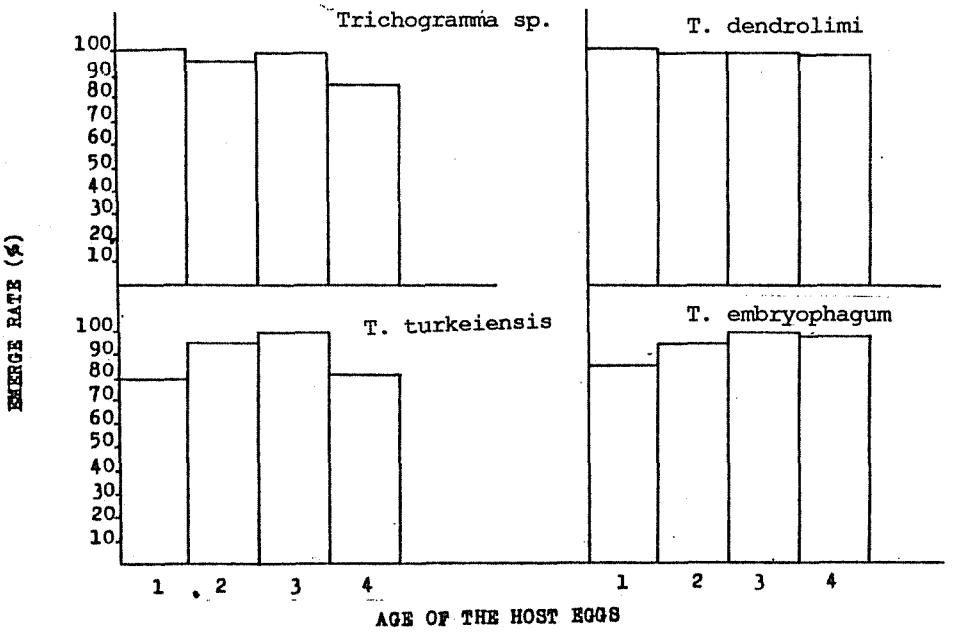

Figure 4. Influence of host age on the emergence rate

The studies indicated that parasitization was generally high in younger eggs and when the eggs become older, there was a fall in the parasitization rate in all species. As reported also by Pak (1986), generally younger host eggs are more preferred by Trichogramma species than the older host eggs. In all species (Trichogramma sp., T. dendrolimi, T. turkeiensis, T. embryophagum), age of host eggs have much

influence on the rate of parasitisation. For example, in Trichogramma sp. percentage of parasitism was 79 % on 1 day old E. kuehniella eggs while on 4 days old eggs that percentage was 9 %.

The same results were obtained for all species. In 1 day old E. kuehniella eggs parasitism rate was high in Trichogramma sp. and T. dendrolimi while low in T. turkeiensis and T. embryophagum. But in other host ages this rate was similar in all species except 4 days old ages. We tested our results by making a statistical analysis. There was highly significant difference between host ages.

Host age is an important fact in parasitisation level, many authors already described this fenomen (van Dijken et al., 1986; Pak, 1986). Host age preference is the process in which parasites enable to choose between hosts of different ages and species (van Lenteren, 1981). A lot of authors have written about host perference but most of literature is connected with Trichogramma minutum on various host eggs (Pak, 1986). Marston and Ertyle (1969) reported that the parasite T. minutum accepted all stages of the eggs Trichoplusia ni (Hübner) but the maximum parasitisation was observed in the eggs which were less than 11 h old. On E. kuehniella eggs it was shown a similar graphic (Benoit and Voegele, 1979) as we examined.

T. dendrolimi was tested on the host Papilio xuthus L. (Papillionidae) and showed a strong fall from young to old eggs in host age preference (Hiehata et al., 1976). T. embryophagum was tested on Bupalus piniarus L. (Arctiidae), it showed a slight "S" shape curve, but again a fall in preference when eggs are become older (Kennel-Heckel, 1963). Navarajan (1979), compared Trichogramma australicum Gir. and Trichogramma japonicum Ashm. for host age preference, and found difference between two species.

T. australicum did not show much variation in percentage of parasitism on 6 and 72 h old eggs, but in T. japonicum a definite relationship was observed with the age of host eggs and parasitisation.

We also tested the emergence rate from the infested E. kuehniella eggs. After 12 days, their development was completed and emerged out of the host eggs. Percentage of emergence did not have much variation among species. In different host ages, this rate was changed but the differences were not significant. We found out that in 1 E. kuehniella egg, 1 parasite developed. This is also what Neuffer (1980) and Benoit et Voegele (1979) found in their experiments. We counted the number of eggs with emerging holes and showed them graphically (Figure 4). The number of parasites emerged was more in 1 and 3 days old eggs in the case of Trichogramma sp., in 1, 3 and 4 days old eggs in the case of T. embryophagum, 2 and 3 days old eggs in the case of T. turkeiensis.

This supports the observation made by Marston and Ertyle (1969) on T. minutum that the emergence was more from 11 h old eggs than from 69 h old eggs of Trichoplusia ni.

Özet

Trichogramma embryophagum, T. turkelensis, T. dendrolimi ve Trichogramma sp.'nin konukçuları **Ephestia kuehniella** Zeller'da konukçu yaşı tercihleri

Ankara Üniversitesi Ziraat Fakültesi Bitki Koruma Bölümü'nde yetiştirilen dört Trichogramma türünün, üzerinde yetiştirildikleri laboratuvar konukçuları E. kuehniella'nın değişik yaştaki yumurtalarını tercihlerinde bir farklılık olup olmadığı belirlenmeye çalışılmıştır.

Çalışmada E. kuehniella'nın 1-4 günlük yumurtalarında parazitlenme ve parazitlenen konukçu yumurtasında parazitoid çıkış oranları 4 parazitoid tür için ayrı ayrı saptanmış ve farklılıklar belirlenmiştir. Dört yumurta parazitoidinde de parazitleme oranı genç konukçu yumurtasından yaşlı konukçu yumurtasına doğru belirgin şekilde azalmaktadır. Ancak parazitli yumurtalardan parazitoid çıkışı dört türde de hemen hemen aynıdır.

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