COMPARATIVE BIOLOGY OF THREE *TRICHOGRAMMA* SP. (HYM.: TRICHOGRAMMATIDAE) POPULATIONS CAPTURED IN THE AZORES

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With 3 figures and 3 tables

ABSTRACT: In the present work, three *Trichogramma* sp. populations captured in the islands of Pico (A), São Miguel (B), and São Jorge (C) were compared using the following parameters: longevity, parasitic capacity, emergence rate and development time at 15°C.

In what regards longevity and parasitic capacity, a significant difference ($p<0,05$) was found between the population of São Jorge and the other two. A significant difference was also observed between the population of São Miguel and the others, when comparing development time.

Concerning daily parasitism, was higher relevant in the first four weeks for any of the studied populations, that is 80.15, 78.38 and 72.42 % for A, B and C, although, 50% parasitism was attained in the first week.

Comparing the emergence rates it was observed that they presented similar mean values, that is 95.41, 91.70 and 90.48 %, for A, B and C populations.

INTRODUCTION

In June 1989, *Trichogramma cordubensis* VARGAS & CABELLO (Hym., Trichogrammatidae) was captured in the island of São Miguel (PINTUREAU *et al.*, 1990). Later studies made over the parasitism and longevity of this species (PINTO & TAVARES, 1991), demonstrated a good parasitic potential in what concerns the control of agricultural plagues existing in the Azores islands. Between October 1991 and June 1992, a population dynamics preliminary study of these oophagous parasitoids (GARCIA, 1992) was carried out in the Island of São Miguel, revealing that between December 1991 and May 1992, no parasitized eggs were found in the fields.

Considering the capture of *Trichogramma* sp. in other two azorean islands (São Jorge and Pico), as well the fact that during the winter no captures of these parasitoids were made in the fields, the present study was carried out in order to better understand their population dynamics and biology at 15°C.

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MATERIAL AND METHODS

The *Trichogramma* sp. populations used in this comparative study were captured in three different islands of the Azores: Pico (A), São Miguel (B) and São Jorge (C). Their capture was made in 1991 and 1992 through parasitized eggs of noctuid lepidoptera. The populations rearing in laboratory was made with the host *Ephestia kuheniella* ZELLER (Lep., Pyralidae), according to the methods of VOEGELÉ *et al.* (1974).

Parasitic capacity, emergence rate, development time from egg to adult and longevity, were the parameters compared in the present work. The populations were held simultaneously in temperature cabinets at 15±0.5°C, with 70±5% of RH and a photoperiod of LD 16:8.

From each population 40 females with less than 24 hours, were individually isolated in glass tubes (7x1 cm) containing an egg card (2x2.5 cm) with ± 200 eggs of *E. kuheniella* and a drop of honey for feed. The host eggs had less than 24 hours and were previously irradiated with ultra-violet for 20 minutes. Each egg card was labeled with the female number and parasitism date.

Daily, each egg card was replaced by a fresh one, and introduced into another glass tube to allow the development of the parasitized eggs in the same conditions.

For each egg card, the number of parasitized eggs (hatched and not hatched) was counted, as well the number of emerged adults. The number of dead females was daily recorded, except for those who died in the honey that were eliminated from the statistic analysis.

An analysis of variance (ANOVA) was conducted on all data. When statistical differences ($p<0.05$) existed between data sets, PLSD Fischer's test was used to separate the means.

RESULTS AND DISCUSSION

Parasitic capacity

For the parasitic, capacity a significant difference ($p<0.05$) was found between the population C and the others (Table 1).

Parasitism was higher in the first day, with an average of parasitized eggs per female of 13.4 for the population C and 16.2 for A and B (Fig. 1). The parasitism declined in the second day, having the followings averages: 3.81, 1.97 and 2.94, for the populations A, B and C.

In the first day, the parasitized eggs percentage reached 21.4%, 20.4% and 23.4% of the total parasitism, for the populations A, B, and C. In the following days, these values tend to decrease untill zero, although with oscillating values along the time (Fig. 1)

Regarding commulative parasitism, this was more relevant in the first four weeks for all the populations, with the following percentages: 80.15% (A), 78.38% (B) and 72.42% (C). Although, it was in the first week that almost 50% of the total parasitism was achieved (Fig. 2).

Longevity

A significant difference ($p<0.05$) was found between the population C and the other two. Population C average longevity was 23 days; This value is very inferior to the ones achieved by populations A (35.9 days) and B (37.5 days) (Table 2).

At 15 °C, the observed maximum longevity values were 55 days for the population A, 57 for B and 53 for C; For the minimum values, they were 8 days for population A, 1 for B and 2 for C (Fig. 3).

Development time

A significant difference ($p<0.05$) was found between the population B and the others (Table 3).

According to TAVARES (1985) and HARRISON et. al. (1985), the development time of these parasitoids increases as the temperature decreases, so, and as it was expected, this parameter at 15 °C was extended in the three populations.

Adult emergence

No significant difference ($p<0.05$) was found concerning the daily emergence percentages in the three populations. The averages of these values were 95.41% for the population A, 91.70% for B and 90.48% for C.

According to the number of emerged adults per parasitized egg, no cases of superparasitism were observed.

After the 20 th day of parasitism, some males occurred in the progeny of the three populations, although these are thelytokous.

CONCLUSIONS

The biology studies at low temperature should be a good criteria to evaluate the strains of *Trichogramma* sp. to be used in biological control during the winter periods, because these parasitoids have different ovipositional activity under this condition (PAK & HEININGEN, 1985). At 15 °C, the populations A and B had higher parasitism than C, which reveals a better adaptation of these first two populations to the winter periods. However, the population C lower parasitism might be due to the longevity, which is minor than the ones from A and B.

The parasitic capacity and longevity values achieved by the three populations, in association with the fact that during females lifetime they parasite, reveals that these populations have characteristics which enables their survival in biotopes with temperature values of 15 °C.

Male occurrence in the progeny might be due to the temperature inactivation effect of Rickettsia of the genus *Wolbachia* associated with the thelytokous parthenogenetic reproduction (STOUTHAMER et. al., 1993; PINTUREAU et. al., 1993), because males have only hatched from eggs which were parasitized after the 20th day of the parental submission to 15 °C.

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TABLE I

Average parasitic capacity and statistic analysis for *Trichogramma* sp. populations from Pico (A), São Miguel (B) and São Jorge (C).

Population	A	B	C*
Average	75,8	79,7	51,1
Standard deviation	29,9	27,4	30,5
n	36	33	33

* Significative difference ($p<0,05$)

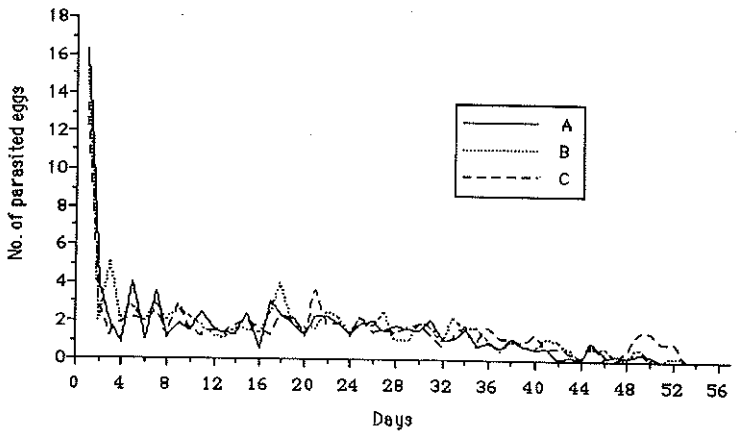

Figure 1 - Average daily parasitism for *Trichogramma* sp. populations from Pico (A), São Miguel (B) and São Jorge (C).

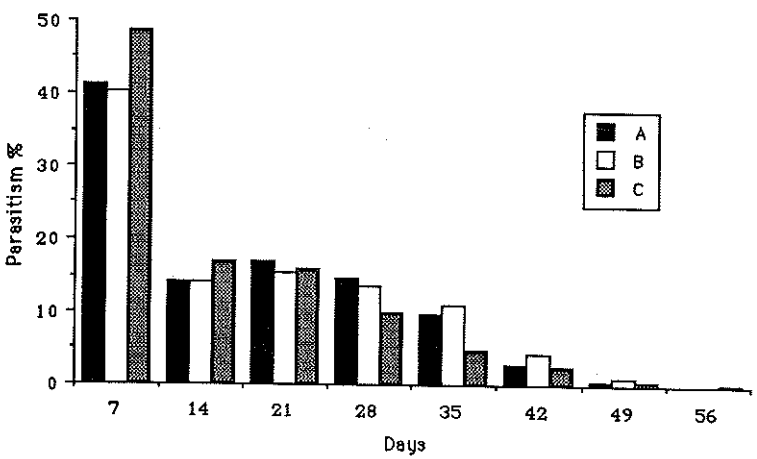

Figure 2 - Commulative weekly parasitism percentages for *Trichogramma* sp. populations from Pico (A), São Miguel (B) and São Jorge (C).

TABLE II

Average longevity and statistic analysis for *Trichogramma* sp. populations from Pico (A), São Miguel (B) and São Jorge (C).

Population	A	B	C*
Average	35,9	37,5	23,0
Standard deviation	11,0	15,2	15,1
n	36	33	33

* Significative difference ($p<0,05$)

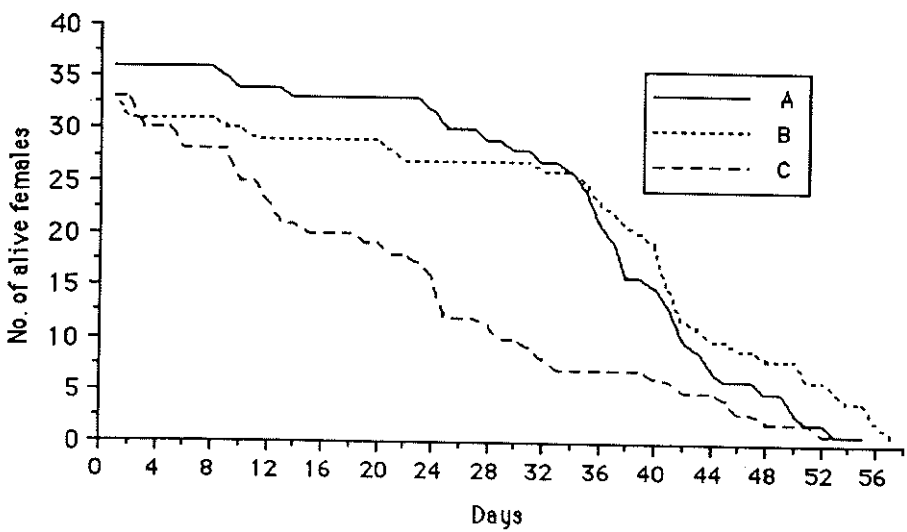

Figure 3 - Survival curve of *Trichogramma* sp. populations from Pico (A), São Miguel (B) and São Jorge (C).

TABLE III

Average development time and statistic analysis for *Trichogramma* sp. populations from Pico (A), São Miguel (B) and São Jorge (C).

Population	A	B*	C
Average	32,5	33,6	32,7
Standard deviation	0,82	0,64	0,77
n	35	28	33

* Significative difference ($p<0,05$)