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Short Communication

Role of the ectoparasitoid, *Choetospila elegans* Westwood (Hymenoptera: Pteromalidae) in suppression of *Sitophilus oryzae* (L.)

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Biocontrol agents like beneficial insects, parasitoids, predators, pathogens etc. are essential elements of biological control of insect pests (6). Success of using this parasitoid in biocontrol programme usually depends not only on the availability of their insect hosts but sometimes on a complex system of other factors such as additional food sources, alternate hosts and shelter (5,6). Earlier research workers (3,1,2) indicated that the most favourable combinations of natural enemies would be those that tend to parasitize or prey on different optimum/suitable stages of the host. The purpose of this study was to assess the suitability of the parasitoid, *Choetospila elegans* in controlling the noxious insect pest, *Sitophilus oryzae* infesting stored rice and wheat kernels in tropical conditions of Bangladesh. *S. oryzae* adult, larvae and pupae were collected from laboratory mass cultures maintained on rice kernels. *S. oryzae* adult larvae and pupae were mass reared on rice grains, at a constant temperature of 27±1ºC in a low temperature incubator. The parasitoid, *C. elegans* were stock cultured in the laboratory on *S. oryzae* host for respective uses in different experiments and mass release of the parasitoids for suppression of the host (pest) population.

The ability of *C. elegans* to suppress the population of *S. oryzae* was established through different experiments. To test the ability of *C. elegans* to suppress the hosts in rice kernels, a rectangular plastic container of 25 cm in height and 12 cm in width and 30 cm in depth (depth) was entirely filled with fresh rice kernels of which the bottom was filled with parasitized rice kernels of *S. oryzae* (host) and newly emerged 30 males and 50 mated females of *C. elegans* were released at the top surface and per cent suppression of the host insect (*S. oryzae*) was calculated by counting the emerged parasitoids and dead insects (hosts) which became paralyzed and ultimately dead by thrusts of the ovipositor of the egg-laying females. Then the container was covered with fine meshed cloth and tightly fastened with rubber band for proper ventilation and to prevent parasitoids, easy escape from the column. A small piece of cotton dipped in 50% honey solution inverted over the top for nourishment of the adult parasitoids. The penetration time of the parasitoid to reach the bottom in the container was observed carefully. Then the depth of 10, 20 and 30cm were checked for calculation of dead and live parasitoids. The experiments were based on 20 observations. The depth of the rice grains were checked for dead and live parasitoids and recorded. In order to detect the suitability of *C. elegans* for suppression of *S. oryzae,* 200 optimum rice kernels containing host larvae, pre-pupae or pupae were kept in Petri dishes and thoroughly mixed with 200g of un-infested rice grains. These samples containing host, *S. oryzae* were then kept in an isolated sterilized closed room free from other natural enemies at 5 different places and a mated female was released in each sample and after 7 days interval the parasitoids if still remained, were removed from each sample and the host containing grains of each sample were incubated in the laboratory for adult parasitoid emergence. The sexes and total number of parasitoid progeny thus produced from each sample were carefully recorded.

From the experiment it is evident that when male and female adults were liberated at the surface of 30cm deep layer of wheat kernels in a transparent plastic container, the females after 2-3 minutes of release walked over the kernels and tried to locate host seeds among grains. Due to the presence of a 20cm layer of un-infested wheat the grains from the top, it was quite difficult for the parasite to travel down. A careful and persistent observation revealed that 1 female reached the bottom of the container within 3.8hours. Subsequently it was found that out of 30 males, 3 males died at 10 cm depth, only two males reached the bottom successfully. Among the 50 females released at the top of the grain surface, 4 females died at the 10cm and 11 died at the 20cm depth but 15 females could penetrate through the grains and reached the bottom of the column and parasitized the hosts there. The infested wheat kernels then after incubation produced 40 progeny showing successful oviposition of 15 females at the depth of 30 cm. (Table 1). It was observed in another series of experiments performed for determining penetration capability of the parasite at a column depth of 60cm that a maximum of 5 males died at the surface and 6 females died at the depth of 20cm when newly emerged 30 males and 50 females were released at the top of the grain column, but 5 females penetrated successfully and reached at the bottom depth of 60cm and parasitize the host containing rice kernels. Experimental studies to evaluate the effectiveness of *C. elegans* for suppression of *S. oryzae* population in the sterilized room revealed that per cent suppression was highest at the introduction level of 15 parasitoid females, i.e. 56.6±1.17% (Table 2).The next average per cent suppression of host population was lower, i.e. 17.6±1.12% . It is apparent from the results obtained that introduction levels with 5-15 female parasites always exhibited greater suppression. The more the parasitoid released, the number of host progeny (pest) was lower. The highest parasitoid progeny were produced when a single parasitoid female was released and it was 35.3±3.2 (Table 2). It is evident that a female parasite always keeps herself busy in finding suitable hosts for parasitization even when the hosts were kept at 30cm and 60cm depths. This is a common phenomenon detected among the hymenopteran parasitoids for their better survival and existence in nature facing adverse conditions (1).

Table 1.
Ability of *C. elegans* to reach the host containing rice kernels kept at different depths in grain columns in laboratory conditions

Column Depth tested	Top surface	Total no. of parasitoids released		Maximum time required for penetration	Total no. of progeny produced
		Male	Female		
30 cm	10cm 20cm 30cm	30	50	3.8 hrs	40
60 cm	20cm 40cm 60cm	30	50	25 hrs	27

Table 2.
Mean percent suppression of rice weevil, *S. oryzae* with mated *C. elegans* female progeny produced reared under laboratory conditions

No. of parasitoid released	Total no. parasitoid progeny produced	Per cent suppression	Progeny produced per female parasitoid
1	35.3d ± 3.2	17.6 ±1.12	35.3 ± 3.20*
5	87.5 e ± 5.3	43.7 ± 1.52	7.5 ±1.06
10	95.7b ± 8.5	47.8 ±1.63	9.5 ± 0.85
15	113.2a ± 6.7	56.6± 1.17	7.5 ± 0.44

*Mean ± S.D

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