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Host and Host Age Preference by the Exotic Parasite *Cotesia kazak* Telenga*

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Cotesia kazak Telenga is an important larval parasite of *Heliothis armigera* (Hbn.) in the various Republics of the USSR (Zhumanov, 1979; Rustamova, 1981). It also parasitises *H. armigera* on various crops like groundnut, tomato and tobacco (Stoeva, 1979). In New Zealand, Singh *et al.* (1982) reported extensive field recoveries even after two years of the last release. Although *C. kazak* has proved to be a potential biological control agent, yet very little studies have been made on the host acceptability and host age preference. Identification of appropriate laboratory host and its exact age is a pre-requisite for mass rearing programme. The present study was therefore conducted to search for a suitable host and its age for mass multiplication of this parasite.

Six species of lepidopterous larvae, *viz.*, *H. armigera*, *Spodoptera litura* (F.), *S. exigua* (Hbn.), *Earias vittella* (F.), *Galleria mellonella* (L.) and *Corcyra cephalonica* Stn. obtained from laboratory/field were reared on a known diet. *C. kazak* was reared in our laboratory by exposing *H. armigera* larvae. On emergence, the parasites were caged in the ratio of 1 : 1 (male : female) for mating. Such mated females were used in the present study.

Parasitisation on different host larvae was obtained by placing 25 second instar larvae of each species separately in plastic jars (12.5 × 10 cm) into which one mated female of *C. kazak* was introduced and confined for 24h. Artificial diet/natural diet was provided in the plastic jar for larval feeding. Each treatment was replicated 4 times. After exposure, parasitised larvae were reared individually. Observations were recorded on successful parasitism, number of larvae died and number of unparasitised larvae.

Host age preference studies were conducted by exposing 25 larvae of each age (1-9 day old *H. armigera* larvae) in the same manner as described for host range testing. Observations on parasitism, developmental time and sex ratio were recorded in each age group larvae. In another experiment, *H. armigera* larvae were divided into 3 groups *viz.*, 1-3, 4-6 and 7-9 days old. These were exposed in the same manner as described above to know the exact preference of the parasite. *H. armigera* was selected as this species was preferred more by the parasite. The treatments were replicated 3 times.

TABLE 1. Host preference by *Cotesia kazak*

Host	% parasitism	No. of larvae dead	No. of unparasitised	% emergence
H. armigera	50.5a	20.2a	21.5c	73.0
S. litura	0.0b	4.2b	95.7b	0.0
S. exigua	0.0b	0.0c	100.0a	0.0
G. mellonella	0.0b	0.0c	100.0a	0.0
C. cephalonica	0.0b	0.0b	100.0a	0.0
E. vittella	0.0b	6.0b	94.0b	0.0

In a vertical column, means followed by same letters are not different statistically (P = 0.05) by L.S.D.

The results showed that *C. kazak* could parasitise 50.5% of *H. armigera* larvae whereas, *S. litura*, *S. exigua*, *G. mellonella*, *C. cephalonica* and *E. vittella* were not parasitized (Table 1). A mortality of 20.2% was observed in *H. armigera*. On dissection of such larvae, 80.0% of them were found to contain the parasite larvae. *C. kazak* was not attracted towards any other host larvae. However, when *H. armigera* frass or haemolymph was smeared over other larvae, the parasite was observed pricking *S. litura*, *S. exigua* and *E. vittella* but none of them yielded any cocoon. On dissecting these larvae which had received eggs, no parasite larvae were found. Lewis

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TABLE 2. Host age preference, developmental time and sex-ratio of *C. kazak* in different age *H. armigera* larvae.

Host age (in days)	% parasitism	Developmental time (in days) mean ±SE	Sex-ratio Male : Female
1	11.7d	9.25 ± 0.22	1 : 0.65 ± 0.05
2	17.0c	9.10 ± 0.15	1 : 0.62 ± 0.03
3	27.7b	8.47 ± 0.26	1 : 0.81 ± 0.04
4	50.5a	8.30 ± 0.17	1 : 0.89 ± 0.04
5	31.2b	8.12 ± 0.17	1 : 0.90 ± 0.02
6	14.0c	7.92 ± 0.21	1 : 0.70 ± 0.08
7	3.5e	8.07 ± 0.14	1 : 0.51 ± 0.12
8	1.5e	8.10 ± 0.12	1 : 0.27 ± 0.20
9	0.0	0.0	0.0

In a vertical column, means followed by same letters are not different statistically (P = 0.05) by L.S.D.

and Jones (1971) reported that frass of larvae of *Heliothis zea* Bod., elicited a host seeking response by female of *Microplitis croceipes.*

C.kazak preferred 4-6 day old *H. armigera* larvae with 27.75, 50.5 and 31.25 per cent parasitism of 1-3, 4-6, 7-9 day old larvae, respectively (Table 2). Tagawa *et al.* (1982) reported that *Apanteles ruficrus* prefered young *Leucania separata* larvae for parasitisation. Similarly, Jalali *et al.* (1987) reported preference of 3-5 day old *S. litura* larvae by *C. marginiventris* (Cresson).

Mean developmental time ranged from 7.92 ± 0.21 in 6 day-old larvae to 9.25 ± 0.22 days in 1 day old larvae (Table 2). Higher female progeny was obtained when 4-6 day old larvae were exposed. Variation in sex-ratio could be due to low parasitism on 1, 2, 7, and 8 day old larvae. Tagawa *et al.* (1982) reported that *A. ruficrus* developed in 9.5 days irrespective of host age at the time of parasitisation. In our studies also non-significant difference was observed. The slight variation in developmental time in one and two day old larvae could be due to insufficient food available and probably the parasite took more time to acquire sufficient nutrients to complete development as described by Salt (1964). The results of the present investigations indicate that second instar *H. armigera* larvae could be utilised for mass multiplying the parasite in the laboratory.

KEY WORDS: *Cotesia kazak*, host, host age, *Heliothis armigera*, *Spodoptera litura*, *S. exigua*, *Earias vitella*, *Galleria mellonella*, *Corcyra cephalonica*

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