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RESEARCH NOTES

Spalangia endius Walker (Pteromalidae) - A New Parasitoid of *Exorista sorbillans* Wiedemann (Tachinidae)

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The uzifly *Exorista sorbillans* Wied. is a serious larval endoparasite of silkworm, *Bombyx mori* L. causing heavy damage to an extent of 15-20% to sericulture industry (Mukherjee, 1919; Gosh, 1949; Jolly, 1981; Kasturi Bai *et al.*, 1986). Biological control methods have gained increasing acceptance and popularity because of its specificity to target pest and also being non-hazardous to human welfare, attempts are being made to contain uzifly menace using its parasitoids. Several larval/pupal parasitoids of *E.sorbillans* have been recorded. They are *Nesolynx thymus* (Pradip Kumar *et al.*, 1986), *Trichopria* sp, *Exoristibia philippinensis* (Veeranna *et al.*, 1987 a; 1987 b), *Dirhinus anthracia, Pachycrepoideus veerannai* (Veeranna and Jyothi, 1988, 1991), *Spilomicrus karnatakensis* (Pradip Kumar *et al.*, 1988) and *Brachymeria lugubris* (Samson and Ramadevi, 1985). In this report, yet another parasitoid *Spalangia endius* Walker of *E.sorbillans* has been reported for the first time. The life cycle of this species and its population growth rate have also been studied. The identity of *S.endius* was established by Dr.T.C.Narendran, Professor of Zoology, University of Calicut, India.

S.endius adults were collected from the uzifly pupae in the laboratory and fed with honey. The parasitoids were provided with pupae of *E.sorbillans, Megaselia* sp. and *Musca domestica* to determine the suitability for parasitism. This species completed its life cycle only on 1-3 day old pupae of *E.sorbillans*. The females were bigger than males with broad and pointed abdomen and the males had narrow abdomen with blunt end (Fig. 1 & 2). The males emerged earlier than females from the parasitized uzifly pupae making a circular hole. The mating took place soon after the emergence of females. The males followed the females with fluttering of wings and alighted on the females, tapped her with antennae, bent his abdominal tip against the lifted abdomen of female and copulated. The duration of mating ranged from 35-50 secs. Both females and males mated more than once. The mated female first alighted on the uzifly pupa, then moved all over the pupa, bent her abdomen slightly and pierced the

Fig. 1. Female of *Spalangia endius* Walk.

Fig. 2. Male of *Spalangia endius* Walk.

pupal case with her ovipositor and deposited 1-3 eggs per pupa. The egg measured 1.04 to 2 mm in length and 0.50 to 0.70 mm in width. The gravid females oviposited 7-10 h after mating. The unmated female oviposited 14-17 h after emergence. After oviposition, the adult female was observed to feed at the ovipositor wound. A Single female parasitized 15-20 uzifly pupae. The life cycle of this species was completed in 16 to 33 days. The larval and pupal stages ranged from 6-10 and 11- 20 days respectively. Number of adult parasitoids emerging from single pupa was 1-3. Arrhenotokous parthenogenesis was observed in this species. The different stages of uzifly and silkworm moth such as eggs, maggots/larvae and pupae were provided to the mated females of *S.endius* but there was no parasitization. This species parasitized only the pupae of uzifly.

To study the life table of *S.endius,* five males and five females were taken in a 500 ml conical flask in 3 replications and provided with 20 fresh uzi pupae for parasitization. These flies were fed with honey daily, throughout the life span. The parasitized pupae were replaced by fresh uzi pupae and were held separately till the emergence of adults. The number of females dying on the successive days and number of females produced per female were recorded. The temperature and relative humidity during the experimentation ranged from 24° to 30°C and 56 to 92% respectively. The life table was prepared using the methods of Andrewartha and Birch (1954). The formula and the abbreviations employed in this study are :

$$\sum_{x} e^{-rx} \; l_x m_x = 1$$

Where x = pivotal age in days
l_x = age specific longevity
m_x = No. of females produced per female
r_o = net reproductive rate
T = generation time
DT = doubling time
r = intrinsic rate of increase
λ = finite rate of increase

The fecundity table was constructed by preparing life table with x and l_x columns. The period from egg stage up to emergence was considered as immature stage, thereafter the pivotal age for the age class in units of time (days) was considered. The age-specific longevity l_x was considered as the number of adult females surviving at each age class. Based on the number of females produced per female, age - specific fertility or fecundity i.e., m_x column was constructed; m_x refers to the number of living females born per female, in each age interval. Columns l_x and m_x were multiplied together to get the total number of females produced in each age interval representing $l_x m_x$.

The net reproductive rate R_o is the number of times a population multiply per generation, and it is given by $R_o = \Sigma l_x m_x$.

The generation time T, the finite rate of increase λ and the doubling time DT were calculated using the formulae given below.

$$T = \log_e R_o / r$$

$$\lambda = e^r$$

$$DT = \frac{\ln 2}{r}$$

Where 'e' is the base of natural logarithms and 'ln' refers to natural logarithm.

The data on the age-specific longevity and fecundity are presented in Table 1, while the life table statistics are presented in Table 2. The females lived for 4-20 days. The maximum number of females produced per female was highest on 3rd day and was completely stopped after 10th day. The rate of multiplication per generation was found to be 8.67, while the intrinsic rate of natural increase was found to be 9-10.

Table 1. Life table (for female) : age specific fecundity for *Spalangia endius* Walker

Pivotal age in days (X)	Age specific longevity (l_x)	No.of females produced per female (m_x)	l_xm_x	xl_xm_x
1 - 19	Immature stage	-		
20	1.0	0.73	0.73	14.60
21	1.0	1.60	1.60	33.60
22	1.0	1.66	1.66	36.52
23	0.93	1.26	1.17	26.91
24	0.93	0.53	0.49	11.76
25	0.86	0.26	0.22	5.50
26	0.73	1.80	1.31	34.06
27	0.73	1.40	1.02	27.54
28	0.73	0.13	0.09	2.52
29	0.73	0.53	0.38	11.02
30	0.73	-	-	-
31	0.73	-	-	-
32	0.73	-	-	-
33	0.60	-	-	-
34	0.60	-	-	-
35	0.60	-	-	-
36	0.60	-	-	-
37	0.60	-	-	-
38	0.60	-	-	-
39	-	-	-	-

$\Sigma\ l_xm_x = R_o = 8.67$ $\Sigma\ xl_xm_x = 204.03$

S.endius was therefore superior in terms of intrinsic rate of increase over the other parasitoids of *E.sorbillans,* namely *Trichopria* sp., *E.philippinensis, N.thymus, D.anthracia* and *P.veerannai* and their 'r' values were found to be 0.17, 0.23, 0.17, 5.42 and 7.63 respectively. The observed finite rate of increase showed that the population of *S.endius* multiplied 1.09 times/female/day. The observed generation time was 23.15 days and its sex ratio was 1:3 (male:female). The investigation on *S.endius* on various aspects are in progress to exploit it as one of the biocontrol agents of *E.sorbillans.*

Table 2. Life table statistics of *Spalangia endius* Walker

Particulars	Value
x	9.10
λ	1.09
T	23.15
Ro	0.67
DT	0.07
Average longevity	15.13 days
Minimum longevity	4.00 days
Maximum longevity	20.00 days
Sex ratio (F:M)	3 : 1

KEY WORDS : Uzifly, *Exorista sorbillans,* parasitoid, *spalangia endius*

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