

Original Research Article

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Effect of Different Honeybee Species Combs on the Life Stages and Biological Parameters of Greater Wax Moth (*Galleria mellonella L.*)

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Studies on effect of different honeybee species combs on the life stages and biological parameters of greater wax moth (*Galleria mellonella L.*) Revealed that the egg, larval, prepupal and pupal periods (days) ranges from 8.60 ± 0.52 to 8.70 ± 0.48 , 49.30 ± 1.66 to 58.60 ± 3.03 , 2.10 ± 0.55 to 2.40 ± 0.50 and 9.65 ± 0.75 respectively on different species of *Apis cerana* F., *Apis dorsata* F., *Apis mellifera*, *Apis florea* and *apis floreae*. Similarly the male and female longevity ranges from 16.40 ± 2.84 to 16.00 ± 1.94 and 6.90 ± 0.74 to 6.50 ± 1.18 days respectively on different species combs. Pre-oviposition, oviposition and post-oviposition period ranges from 1.10 ± 0.32 to 1.20 ± 0.42 , 4.60 ± 0.70 to 3.90 ± 1.66 , 1.20 ± 0.42 to 1.40 ± 0.52 days respectively.

Introduction

Bee keeping has taken a shape of promising enterprise and also becoming popular as one of the components in mixed farming systems. There is a great scope for increasing the bee colonies for honey and wax production and also for pollination of crops. Despite its prosperity, potentiality and wider scope for development, there are certain built in problems in Indian beekeeping. One such major problem is the occurrence of various natural enemies, which cause considerable losses. Honeybee enemies weaken the colony, decreasing its value for honey production and pollination. Among the several bee enemies

the greater wax moth, *Galleria mellonella L.* causes greater loss to the bee keeping industry. The greater wax moth is responsible for heavy economic losses to bee keepers in developing countries (Paddock, 1918; Kapil and Sihag, 1983).

The information on the comparative biology of greater wax moth in different species of honey bee comb is not available. Hence, the present study was conducted to know the influence of different species of honey bee combs on the life stages and biological parameters of greater wax moth.

Materials and Methods

Studies on the comparative biology of greater wax moth *G. mellonella* were carried out on the combs of *Apis cerana* F., *Apis dorsata* F., *Apis florea* F. and *Apis mellifera* L. during 20011-12 at department of Zoology Bangalore University. Freshly laid eggs were collected from the stock culture and were observed at 24 h interval for hatching. After hatching the combs of *A. cerana*, *A. mellifera*, *A. dorsata* and *A. florea* were provided to the larvae separately. Observations were made daily for moulting, the number of moults and instars passed during the larval development. Larval duration, pre-pupal and pupal periods was recorded. After adult emergence, ten pairs of male and female moths were released separately in to wide mouthed plastic containers, provided with honey, as a source of adult food and folded paper strips in zigzag manner were placed inside the containers for egg laying. The paper strips were removed once in 24 hours and number of eggs, if any were counted and later paper strips were kept in plastic vials for incubation. Incubation period, longevity of male and female moth, pre-oviposition, oviposition and post oviposition periods were recorded simultaneously. Fecundity and eggs per day were calculated for each female and ten such pairs were monitored. The data was statistically analyzed in the factorial completely randomized design.

Results and Discussion

The egg period of *G. mellonella* on *A. cerana*, *A. dorsata*, *A. mellifera* and *A. florea* occupied on an average of 8.60, 8.60, 9.20 and 8.70 days, respectively. The shortest duration was observed in case of *A. cerana* and *A. dorsata*; the longest duration was observed in case of *A. mellifera*. There was no significant difference among all the treatments with respect to egg duration. The incubation period

was reported to vary from 5 to 17 days (Whit comb, 1936; El-sawaf, 1950 and Sehnal, 1966). The reasons for the variation may be attributed to possible differences in the ecological conditions. Larval period of *G. mellonella* on different species of honey bee combs viz., *A. cerana*, *A. dorsata*, *A. mellifera* and *A. florea* was on an average 49.30, 54.20, 110.65 and 58.60 days, respectively. The larvae reared on *A. cerana* comb were found to be significantly shorter in their duration, whereas the larval duration was significantly longer in case of *A. mellifera* comb than those reared on combs of other species of bees. The larval period was reported to vary from 22 to 62 days (El-sawaf, 1950 and Warren and Huddleston, 1962). The variations may be attributed to the difference in the quality and quantity of food in different colonies.

The pre-pupal duration of *G. mellonella* on the combs of *A. cerana*, *A. dorsata*, *A. mellifera* and *A. florea* was 2.1, 2.35, 2.60 and 2.40 days, respectively. However, the difference in the duration of the four sets of pre-pupae was not statistically significant. The duration of the pupa was 8.60, 9.40, 10.05 and 9.65 days, respectively on the combs of *A. cerana*, *A. dorsata*, *A. mellifera* and *A. florea*, respectively (Table 1). However, the pupal period was 10-12 days as per the reports of Adomson (1943), El-sawaf (1950) and Beck (1960). These variations in the pupal period may be ascribed to the changes in the climatic Factors.

Males reared on the combs of *A. cerana*, *A. dorsata*, *A. mellifera* and *A. florea* lived for 16.40, 17.50, 15.70 and 16.00 days, respectively. This duration among different colonies did not differ significantly. Females also exhibited similar pattern and lived longer when reared on *A. dorsata* comb (7.40 days) than *A. cerana* (6.90 days), *A. florea* (6.50 days) and *A. Mellifera* combs (5.90 days), but

this difference among the various combs was significant (Table 2). These results are almost similar to those of Warren and Huddleston

(1962) who reported a mean longevity of 15 days for males and shorter duration of 7 days for females.

Table.1 Influence of different species of honey bee comb on the development of life stages of greater wax moth, *Galleria mellonella*

Different combs of honey bee species	Egg period (days)	Larval period (days)	Prepupal period(days)	Pupal period (days)
<i>A. cerana</i>	8.60±0.52 (8-9)	49.30±1.66 (47-53)	2.10±0.55 (1-3)	8.60±0.75 (8-10)
<i>A. dorsata</i>	8.60±0.52 (8-9)	54.20±1.32 (52-57)	2.35±0.49 (2-3)	9.40±0.60 (8-10)
<i>A. mellifera</i>	9.20±0.63 (9-11)	110.65±8.28 (91-123)	2.60±0.68 (2-4)	10.05±0.69 (9-12)
<i>A. florea</i>	8.70±0.48 (8-9)	58.60±3.03 (54-64)	2.40±0.50 (2-3)	9.65±0.75 (9-11)
CV%	6.15	6.65	23.76	7.41
F-value	2.82NS	793.47**	2.68NS	15.33**
Prob.	0.0521	0.0001	0.0526	0.0001
C.D.(0.05)	-	2.81	-	0.43

Values in parenthesis indicate the range, NS- Non significant

**- significant at P=0.01, *-Significant at P=0.05

Table.2 Influence of different species of honey bee combs on biological parameters of *Galleria mellonella* moths

Combs of species of honeybees	Male longevity (days)	Female longevit y (days)	Pre- oviposition period(days)	Ovi- position period (days)	Post- ovipositi on period (days)	Fecundity	
						Eggs/ female	Eggs/female/ day
<i>A. cerana</i>	16.40±84 (11.20)	6.90±0.7 4 (6-8)	1.10±0.32 (1-2)	4.60±0.70(3 -5)	1.20±0.42 (1-2)	750.90±16 9.78 (525-1093)	159.70±46.87 (118.16- 227.50)
<i>A. dorsata</i>	17.50±1.51(15-20)	7.40±1.2 6(6-10)	1.10±0.32 (1-2)	5.00±1.63(3 -8)	1.30±0.48 (1-2)	869.90±28 6.95(428- 1399)	173.96±45.42 (133.85- 280.66)
<i>A. mellifera</i>	15.70±3.53(7-19)	5.90±0.8 8(5-7)	1.30±0.48 (1-2)	2.40±1.65(1 -5)	2.20±1.23 (1-5)	258.90±16 9.71(106- 714)	108.94±24.62 (79-138)
<i>A. florea</i>	16.00±1.94(13-19)	6.50±1.1 8(5-8)	1.20±0.42 (1-2)	3.90±1.66(1 -6)	1.40±0.52 (1-2)	546.30±20 6.83(314- 1062)	142.82±34.31 (92-218.20)
C.V.(%)	15.71	15.53	33.27	36.96	48.51	35.24	26.56
F-Value	0.93NS	3.74**	0.60NS	6.06**	3.82**	15.66**	5.19**
Prob.	-	0.0194	-	0.0019	0.0178	0.0001	5.19**
C.D.(0.05)	-	0.90	-	1.29	0.65	187.35	34.07

Values in parenthesis indicate the range, NS- Non significant

**- significant at P=0.01, *-Significant at P=0.05

Pre-oviposition period for females was not found to differ significantly. However, the significant difference was noticed in the durations of oviposition and post-oviposition when reared on four types of combs. The pre-oviposition period was 1.10 days on *A. cerana*, 1.10 days on *A. dorsata*, 1.30 days on *A. mellifera* and 1.20 days on *A. florea* combs. The corresponding oviposition and post-oviposition periods were 4.6 and 1.20 days, respectively on *A. cerana*, 5.00 and 1.30 days, respectively on *A. dorsata*, 2.40 and 2.20 days, respectively, on *A. mellifera*, 3.90 and 1.40 days, respectively on *A. florea* combs. Fecundity was found to differ significantly between the females reared on the combs of four species of honeybees. Females reared on *A. cerana* combs laid an average of 750.9 eggs/female with 159.70 eggs/day, whereas on *A. dorsata*, they laid on an average of 869.90 eggs/female with 173.96 eggs/day, on *A. mellifera*, they laid 258.90 eggs/day, on *A. florea*, they laid an average of 546.30 eggs in their life time distributing at the rate of 142.82 eggs/day. The differences in the fecundity of the four sets of the females were statistically significant (Table 2). These results are in partial agreement with those of Warren and the Huddleston (1962) who reported that the average number of eggs laid by individual female was 754 in *A. cerana* combs. Studies carried out on the comparative biology of greater wax moth revealed that the greater wax moth successfully completed its life cycle on combs of all four species of honey bees. The present investigation clearly indicated that *A. Cerana* and *A. dorsata* combs to favour higher fecundity and better larval growth of greater wax moth compared

to other species of bee combs. While, *A. mellifera* comb demonstrated lesser fecundity and prolonged larval and pupal stages could be attributed to the presence of high content of propolis in the combs.

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