

Effect of different host plants on the developmental behaviour of lemon butterfly (*Papilio demolens* Lin.) under natural conditions

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To study the different life parameters of the *Papilio demoleus* on three host plants viz. lemon narangi and chakotra and one alternate host plants, i.e. bel under natural conditions. Highest apparent mortality of 33.71% was recorded at early stage on chakotra. Generation survival function revealed that Chakotra was the most favorable host for overall survival of this insect. Maximum indispensable mortality (27.79) was encountered at early larval stage on chakotra as compared to other stages. Data for K-value exhibited the highest value (0.27) at early larval stage while the lowest (0.12) was encountered at pre pupal and pupal stages, irrespective of host plant.

Key words : Lemon butterfly life table.

INTRODUCTION

In India citrus is grown 3.87 lakh ha. with a production of 44.3 lakh tones (Singh, 1999). The most important commercial citrus cultivars in India are the mandarins (*Citrus reticulata* Blanco), followed by sweet orange (*Citrus sinensis* Osbeck) and acid lime (*Citrus aurantifolia* Swingle) with a total production of 13.4, 8.9 and 7.5 lakh tones, respectively insect pest attack has been the basic reason for such a low production, short productive life and gradual decline of citrus orchards lemon butterfly *Papilio demolens* L. (Lepidopteron Papilionidae) is one of the most destructive pest of citrus in India. Earlier several workers have studied distribution, host range and effect of various biotic and abiotic factors on developmental stages of this insect Asokan and Atwal (1974). Radke and Kandalkar (1989) and Bilapate and Pawar (1978). However they used few plant species to determine the effect of certain range of temperature. No work has been done with respect to *P. demoleus* dynamics under natural condition. The attempt were, therefore made in present investigation to study the effect of different hosts (three host plant including on alternate) under natural host plant and stage specific life table for *P. demoleus* were constructed under natural conditions so that its population trend could be obtained and predicted on its most preferred host. The observation were recorded under sub heads. Apparent Mortality, survival fraction, mortality survival ratio indispensable mortality and K-values.

MATERIALS AND METHODS

The insect has been reported to breed a large number of citrus plant. As such attempt were made to breed test insect by putting potted lemon, narangi, chakotra and bel plants in the nylon cage 6x6x6 feet and liberating a large number of collected butterflies therein for mating to obtain nucleus culture. Pots containing fresh flowers were supplied as food for butterflies. Cotton swab soaked in 20% honey solution was also hanged as food for adults. The food was changed after every 24 hours along with cleaning of the cage. Required number of same age old eggs. So obtained were collected and placed in petri dishes and utilized for experimental purposes. All experiments were conducted in natural conditions. Four different hosts viz, lemon, narangi, chakotra and bel were used as test plants. Roughly 500 eggs of same age obtained from respective hosts were allowed to hatch in petri dishes and eggs hatch percentage was computed from each aliquot and subsequently adjusted so that life table commenced with 100 eggs in a cohort. One hundred first instars larvae were collected from hatched eggs and reared in batches for ten and ten same plants of one hosts. This method was

observed for each of the host in question. During entire period of observation mortality, if any at larval, per-pupal and pupal stage was also recorded daily till the emergence of adult. From the empirical data, various estimates such as apparent mortality, survival fraction, mortality survival ratio, indispensable mortality and k-values were worked out according to procedure describe by Harcourt (1969), Blapate *et al.* (1979) and Naqvi (1998).

RESULTS AND DISCUSSION

The data obtained on apparent mortality revealed that during egg stage there was higher incidence of egg mortality (11.00 percent) on chakotra while the lowest (8.00 percent) was encountered on narangi (table -1). A cursory glance over comparative study of mortality among the different developmental stages on different host and revealed that incidence of percent mortality at early larval stage (33.71 days old) on chakotra was always higher as compared to other stages. Another interesting features observed, was per-pupal and pupal stage of *P. demoleus* did not exhibit any mortality on any given host at any condition maintained for the purpose. As far as the survival fraction was concerned, variation in the values was of low magnitude at egg, early and late larval stage. However, at per-pupal and pupal stage, values remained same on all hosts. The mortality survival rate followed the opposite trend as observed in case of survival fraction. The highest value (0.51) was observed at early larval stage on chakotra followed by 0.22 at the same condition on narangi, Nevertheless, per-pupal and upal stages were the exception, which did not show any variation on account of no mortality and values obtained were zero. This was true in all on respective hosts. When a comparison was made between developmental stages, early larval stages exhibited the highest ratio as compared to others, Similar was the case with indispensable mortality. It was found to be at its minimum (0.00) in per-pupal and pupal stages irrespective of hosts. The trarned observed was similar to that of mortality survival ratio here the early larval stage exhibited the maximum value of (27.97) followed by 20.33 on chakotra and bel, respectively. The highest k-values were encountered at early larval followed by egg and late larval stage, invariably on all hosts. However, there was an exception at egg and late larval stage on norangi, in this case the values obtained for "K" were of similar magnitude (K 0.02), when a comparison was made between developmental stages, quite discernible were the data obtained. The total generation mortality (K) revealed that it was maximum (0.27) on chakotra followed by 0.21 on bel and, however lemon, narangi exhibited the lowest (0.16).

The stage specific life table with respect various developmental stages revealed vary distinct variation. While

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Table 1 : Summary of stage specific life table of *P demoleus* Lemon, Narangi, Chakotra and Bel Under natural conditions.

Parameter studied	Lemon	Narangi	Chakotra	Bel
I APPARENT MORTALITY				
Egg	9.00	7.00	11.00	8.00
Early Larva	20.88	18.28	33.71	25.00
Late Larva	5.56	9.21	6.78	11.59
Pre Pupa	0.00	0.00	0.00	0.00
Pupa	0.00	0.00	0.00	0.00
II SURVIVAL FRACTION				
Egg	0.91	0.93	0.89	0.92
Early Larva	0.79	0.82	0.66	0.75
Late Larva	0.94	0.91	0.93	0.88
Pre Pupa	1.00	1.00	1.00	1.00
Pupa	1.00	1.00	1.00	1.00
III MORTALITY SURVIVAL RATIO				
Egg	0.10	0.08	0.12	0.09
Early Larva	0.26	0.22	0.51	0.33
Late Larva	0.06	0.10	0.07	0.13
Pre Pupa	0.00	0.00	0.00	0.00
Pupa	0.00	0.00	0.00	0.00
IV INDESPENSABLE MORTALITY				
Egg	6.73	5.19	6.80	5.30
Early Larva	17.94	15.43	27.97	20.33
Late Larva	4.00	7.00	4.00	8.00
Pre Pupa	0.00	0.00	0.00	0.00
Pupa	0.00	0.00	0.00	0.00
V K-VALUES				
Egg	0.04	0.03	0.05	0.04
Early Larva	0.10	0.09	0.18	0.12
Late Larva	0.02	0.04	0.03	0.05
Pre Pupa	0.00	0.00	0.00	0.00
Pupa	0.00	0.00	0.00	0.00

considering survival fraction it was highest at per-pupal and pupal stage in all the cases, these information did have a direct bearing not only on the "K" values at various developmental stages within the generation but also for "K" value (the total generation mortality). The mortality fraction was found maximum at early larval stage (days old) on all the four hosts, while at per-pupal and pupal stages, mortality did not occur at all. Many workers framed ecological life-table to study the population dynamics by taking similar trials. It stand in conformity to the opinions of Harcourt (1969) that such type of table noticed a series of sequential measurements indicating populating changes during life cycle of a insect in its natural environment. The finding of Bilapate *et al.* (1979) on *H. armiger*, Ray and Bains (1983) on *Tryporyza nivella* and Nagvi (1998) on *Corcyra cephalonica* supported our observation.

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