

**Effects of different citrus varieties on the developmental behaviour of Citrus Butterfly *Papilio demoleus* in lower Sindh, Pakistan.**

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**Abstract**

The consumption of ten different varieties of citrus plantation by butterfly *Papilio demoleus* and its effects on its larval and postlarval development were studied at Tando Mohammad Khan, Lower Sindh. Different type of food showed significant effects on growth rate, food utilization and reproductive potential of this pest. It was revealed that the growth index value was highest being 13.84 in *Citrus aurantifolia* (kaghzi lime) while the lowest value was reported to be 4.0 in *Citrus sinensis* (orange Washington). On the basis of oviposition preference of adult, larval survival, percentage of pupation and emergence and survival of adults, the sequence of difference citrus varieties was determined.

Key Words: *Papilio demoleus*, Citrus varieties, developmental behaviour.

**Introduction**

*Papilio demoleus* is a serious pest of citrus plantation in Pakistan, India, Saudi Arabia, Iran, China and Africa (Badawi, 1981; F.A.O., 1970, 1972; Talbot, 1939; Mushtaque, 1964). The pest is active almost through out the year and the larvae are vigorous foliage feeders. In case of sever infestation, citrus trees are seriously affected and the young seedlings become completely defoliated (Ayyar, 1940). It is imperative to know that the food preference of this pest is based on the rate of food intake, indigestibility and efficacy of conversion of ingested food into body biomass. These parameters give an idea about the utilization efficiency of pest species with a view to know the preferential food habits. Yunus and Munir (1972), while studying the host plants and host preference of lemon butterfly (*P. demoleus*) reported that the larvae consumed all the 19 citrus varieties they tested. Pipatwantankul (1979), Gangwar and Singh (1989) studied different development stage of *P. demoleus* on different varieties of citrus from Thailand and India. Matsumoto and Noerdjito (1996) reported immature stages of *P. demoleus* from Java and Indonesia on different citrus varieties including *Citrus hystrix*, *Citrus aurantifolia* and *Citrus ambiyocarpa*. Roberts (2001) reported *P. demoleus* larvae feed on citrus plants species, of which lime and pomelos being preferred but they also feed on *Zizyphus* and other members of

family Rutaceae such as *Ruta graveolus* and *Glyeosims pentaphylla*. The life history of *P. demoleus* was worked out by Atwal (1976) and Khan (1940). Lakhnupal (1987) discussed certain aspects of host preference and effect of different host plant on the post larval development of *P. demoleus*. Present paper describes the effects on biology and developmental behaviour of citrus butterfly (*Papilio demoleus*), which were fed different citrus varieties available in the lower Sindh.

### Material and Methods

The rearing of citrus butterfly (*Papilio demoleus*) was conducted in wooden cages of size 10' x 15' x 10' at Tando Mohammad Khan, Lower Sindh. Ten varieties of citrus i.e. *Citrus aurantifolia* (kaghzi lime), *Citrus limonia* (common jamberi), *Citrus reticulata* (citrus willow leaf), *Citrus aurantifolia* (sweet lime), *Citrus reticulata* (sangtra coorg), *Citrus reticulata* (kinnow sangtra), *Citrus aurantium* (khatta root stock), *Citrus limon* (eureka lemon), *Citrus medica* (citron) and *Citrus sinensis* (orange Washington) were planted in pots. Five plants of 1-meter height belonging to each variety were selected for the experiment. The plants were placed randomly in a free choice environment for the subject species. Observation was taken daily by counting the numbers of egg laid by ten pair of butterflies on each variety for the observation of development behaviour. Ten first instar larvae were collected from the respected varieties and transferred to the plastic jars of size 15 x 12 x 6 cm. Larvae were provided the respective host plant leaves twice a day *ad libitum*. Various aspects of the host preference i.e. larval period, larvae pupated, growth index value, pupal period, adult emergence, adult sex ratio, adult longevity were observed on ten varieties of citrus plants.

### Results and Discussion

Selected plants with more number of newly leaves of favourite selected host plants preferred by *Papilio demoleus* has usually higher number of eggs, larvae and pupae. The data presented in Table 1 shows number of eggs laid, mean larval duration, number of larvae pupated, growth index value, pupal period, number of pupa emerged, sex ratio, longevity in days in relation to different host plants. Results suggested that in *Citrus aurantifolia* (kaghzi lime) highest growth index value was recorded as 13.84 followed by *Citrus limoni* (common jamberi) being 12.30 and lowest in *Citrus medica* (citron), *Citrus sinensis* (orange Washington) being 4. The above observations indicate that shorter the larval period greater is the number of larvae pupated and higher the growth index value. Further, it is also seen that the number of pupae emerged was highest in kaghzi lime and lowest in orange Washington. Yunus and Munir (1972) reported that the extent of damage was found 21 to 54% on freshly sprouted rough lemon hedge plant, 8-9 % in kinnow nursery plants and 3-19 % on branches of kinnow tree.

Table-1. Growth index values of the developmental stages of *Papilio.demoleus* to different citrus varieties.

| Species  | Total no of eggs | Total no of larvae | Mean larval period (days) | No. of larvae % pupated | Growth index value | Pupal Period (days) | No. of pupa showing emergence | Adult sex ratio |   | Survival % |
|--|------------------|--------------------|---------------------------|-------------------------|--------------------|---------------------|-------------------------------|-----------------|---|------------|
|  |                  |                    |                           |                         |                    |                     |                               | M               | F |            |
| <i>Citrus aurantifolia</i><br>Kaghizi lime     | 20.6             | 10                 | 6.5                       | 90                      | 13.84              |                     | 9                             | 3               | 6 | 90         |
| <i>Citrus reticulata</i><br>Citrus willow leaf | 19.8             | 10                 | 6.3                       | 80                      | 12.30              | 6                   | 8                             | 3               | 5 | 80         |
| <i>Citrus limonia</i><br>Common jamberi        | 14.4             | 10                 | 6.5                       | 80                      | 12.30              | 7                   | 8                             | 2               | 6 | 80         |
| <i>Citrus aurantifolia</i><br>Sweet lime       | 13.4             | 10                 | 7.0                       | 70                      | 10.0               | 6                   | 7                             | 3               | 4 | 70         |
| <i>Citrus aurantium</i><br>Khatta root stock   | 17.6             | 10                 | 7.0                       | 70                      | 10.0               | 6                   | 7                             | 3               | 4 | 70         |
| <i>Citrus reticulata</i><br>Kinnow Sangtra     | 11.8             | 10                 | 7.5                       | 60                      | 8.0                | 8                   | 5                             | 2               | 3 | 50         |
| <i>Citrus Union</i><br>Eureka lemon            | 11.6             | 10                 | 5.0                       | 50                      | 7.14               | 9                   | 4                             | 2               | 2 | 40         |
| <i>Citrus reticulata</i><br>Sangtra coorg      | 11.6             | 10                 | 5.0                       | 50                      | 7.14               | 7                   | 4                             | 2               | 2 | 40         |
| <i>Citrus sinensis</i><br>Orange Washington    | 10.8             | 10                 | 10                        | 40                      | 4.00               | 8                   | 3                             | 1               | 2 | 30         |
| <i>Citrus medica</i><br>Citron                 | 11.4             | 10                 | 10.0                      | 40                      | 4.00               | 7                   | 3                             | 1               | 2 | 30         |

During present study, it was clearly observed that *P.demoleus* lays eggs on all varieties of citrus but their numbers are different and duration of life cycle is different Pipatwatanakul (1979) indicated that *P. demoleus* could complete its life cycle on lime trees, few citrus varieties, i.e. (*Citrus aurantifolia*), pumelo

(*Citrus grandus*), leech lime (*Citrus hystrix*) and tangerine (*Citrus reticulata*), however, it fails to complete its lifecycle on bael (*Aegle marmelos*) and jasmine (*Murraya paniculata*). Presently, *P. demoleus* showed short life cycle on *Citrus aurantifolia* and *Citrus sinensis*, majority of larvae do not survive, if their duration is longer. Rafi and Khan (1999) observed the host preference of lemon butterfly in barani area of Pakistan laying the large number of egg on *Citrus aurantiurn* in comparison to *Citrus sinensis*. Similarly, during present study, large number of eggs laying were found on *Citrus aurantifolia* with comparatively less on *Citrus aurantiurn*. It is also seen that the healthy larvae ratio was highest in kaghzi lime and orange Washington.

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