

**THE LIFE CYCLE OF *DANAUS CHRYSIPPUS* LINNAEUS
(LEPIDOPTERA: NYMPHALIDAE) ON *CALOTROPIS
PROCERA* IN BUSHEHR-IRAN.**

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ABSTRACT: *Danaus chrysippus* L. (Lep.: Nymphalidae) is the most important pest on *Calotropis procera* in Bushehr-Iran. The larvae feed on the leaves and make some damages and losses on host. This study carried out on *D. chrysippus* life cycle in Bushehr from 2006 to 2007. For the life cycle studies, the eggs were collected from the nature and were developed in Petri dishes and 10×12 plastic dishes from egg to adult at under laboratory condition (25±2 °C and 22±2 °C, %60±10 RH and 16/8 L:D). The Egg, Larval and Pupal periods were frequently 3.4 ± 0.1 and 4.5 ± 0.1; 12.5 ± 0.2 and 19.1 ± 0.4; 9.8 ± 0.3 and 14.6 ± 0.7 days in 25 °C and 22 °C at lab. The total period from egg to adult was 26.07± 0.8 and 37.08± 0.5 days in 25 °C and 22 °C at laboratory condition.

KEY WORDS: Life cycle, *Danaus chrysippus*, *Calotropis procera*, Bushehr, Iran.

Calotropis procera is an *Asclepias* genus that is distributed in tropical and subtropical areas such as Africa, India, Egypt, Pakistan, Iran, Arabic islands and Australia. In Iran this species has distributed in tropical and coastal areas from Khuzestan to Baluchistan in south of Iran (Sabeti, 1994; Mir Heidar, 1994; Faker Baher, 1994). *C. procera* has so important ecological roles because it's settlement in sandy soils, prevention of soil erosion, natural reproduction and its uses in the weaving, rubbering and medical industries (Hosseini, 2000). The important pest of *C. procera* in south of Iran is *Danaus chrysippus* L. (Lep.: Nymphalidae, Danainae). The adults are shiny, orange in color with black and white spots on their wings (Borror *et al.*, 1989). The larva feeds on the leaves and makes some damage and losses on the host. The larval attacks on young shrubs and causes decline and death at last (Abaii, 1999). In this project the life cycle of *D. chrysippus* was studied during 2006 to 2007 in Bushehr-Iran. *D. chrysippus* previously recorded from Iran (Farah Bakhsh, 1960; Pazucki *et al.*, 1995; Abaii, 1999). Its common name is plain tiger in Asia and African Monarch in Africa. *D. chrysippus* was found on an Egyptian tomb about 3500 B.C. and becomes the first record of butterflies in the world (Larsen, 1994). The Biology of *D. chrysippus* on *Calotropis gigantea* was studied in India in 1978. The egg, larval, pupal and adult longevity periods were frequently 3 days, 9.58 to 10.66 days, 5.86 to 6.96 days and 5 to 15 days (Wadnerkar *et al.*, 1979). The life cycle of *D. chrysippus* on medical plants was studied in India in 2005. The incubation period was 2.60 ± 0.54 days. The larval period was 9.80 ± 0.27 days. The pupal period was 8.80 ± 0.27 days and the adult's longevity was 6.60 ± 0.54 days (Sharma &

Verma, 2005). The life cycle of *D. chrysippus* on *C. gigantea* studied in India in 1997. The larval development time from first instars to fourth instars was 2 to 3 days for each larva but this time was 3 to 4 days for fifth instars. The pupal period was 6 to 7 days. A total between 22 to 24 days was taken from Egg to adult (Ramana et al., 1998). The biology of *D. chrysippus* on *Ipomoea bona_nox* was studied in Egypt in 1972. The oviposition was solitary. The larval development time from first to fourth instar was 2 days for each one in 22.5 °C, but this time was 4 days for fifth instar. The total larval periods were 8 to 14 days at 25.5 °C to 21.9 °C. The total pupal period was 8 to 28 days at 25.2 °C to 16.4 °C (Swaillem & Esmail, 1972).

MATERIAL & METHODS

For the morphological studies, the twenty numbers of each biological stage (eggs, larva, pupa, adults) were selected. All the stages were examined and photographed with an Olympus SZ60 wide zoom camera attached to an Olympus SZ-ST binocular stereo zoom microscope. Data was collected from Bushehr in south of Iran (29°N, 52°E) from 2006 to 2007. The sampling was done weekly by the two stage cluster sampling method in nature. One hundred eggs were collected from the nature and moved to Laboratory. In the Lab, each egg separately was inserted in a Petri dish of 8 cm in diameter and the data was recorded, daily. After the first instars larva, the seconds was transferred to cylindrical containers (10×12 cm) with the fresh leaves of *C. procera*. The containers were examined daily from larva to pupa. After the emergence of adults, the each pair was transferred to larger cylindrical containers (10×30 cm) with honey solution and fresh flowers of *C. procera*. The Laboratory conditions were (25±2 °C and 22±2 °C, 60±10 %RH and 16/8 L:D).

RESULTS

Oviposition observed just in the nature and our treatments that provided with the flowers and honey solution did not succeed in the lab. Females laid their eggs singly, only on the underside of the leaves. A butterfly settles on a leaf, then turns its abdomen to underside and inserts one egg on one leaf. At first, the egg is white shiny color then gradually change creamy and at last become brownish. The egg is dome shaped, with 12 – 13 longitudinal ridges and some cross ridges. It is 1.7 ± 0.5 mm in length and 0.5 ± 0.1 mm in diameter (Fig. 1A). The egg incubation period was 3.4 ± 0.1 mm days and 4.5 ± 0.1 mm days frequently at 25 °C and 22 °C (tables 1 and 2). We determined 5 instars larvae based on length and head capsule measurements that adapted with Dayar's law. The first instar body was creamy and its head capsule was black. It was 4 ± 0.1 mm in length and 0.9 ± 0.2 mm in wide (Fig. 1B). The first instar head capsule was 0.6 ± 0.3 mm. The second instar larva was grey and the black and yellow strips can be easily seen in dorsolateral. The second instar was 8.1 ± 0.2 mm in length and 1.5 ± 0.1 mm in wide and head capsule was 0.9 ± 0.2 mm (Fig.1C). The third instar was 14.3 ± 0.5 mm in length, 3 ± 0.1 mm in wide and its head capsule was 1.4 ± 0.4 mm (Fig. 1D). The fourth instar was 25.1 ± 0.6 mm in length, 5 ± 0.1 mm in wide and its head capsule was 2.3 ± 0.5 mm (Fig.1E). The fifth instar was 36.5 ± 0.4 mm in length, 6.8 ± 0.1 mm in wide and its head capsule was 3.4 ± 0.1 mm (Fig. 1F). The larval development time was 12.5 ± 0.2 and 19.1 ± 0.4 days frequently at 25 °C and 22 °C (Tables 1 and 2). In prepupal period, the larva stops feeding and settle down motionless. Its color changes from grey to brown (Fig.1G). The prepupa size

decreases with 36 ± 0.1 mm in length and 6.4 ± 0.1 mm in wide. The prepupa development time was 1.5 ± 0.1 and 2.4 ± 0.1 days frequently at 25°C and 22°C (Tables 1 and 2). Pupa was found either pale green or pale brown in color (Fig. 1H - I). The pupa was 17.4 ± 0.4 mm in length and 7.5 ± 0.4 mm in wide. Its development time was 9.8 ± 0.3 days and 14.6 ± 0.7 days frequently at 25°C and 22°C (Tables 1 and 2). This study didn't observe any difference between males and females pupae. The adults are the shiny butterflies with orange and brown colors. The main difference between males and females is the spots on the hind wings. Each hind wing of males has four black spots while the females have only three black spots (Fig. 1J - K). The adult males and females were similar in sizes. The antenna was 12 ± 0.1 mm in length. Wingspans was 75.4 ± 0.7 mm. The body was 22.7 ± 0.4 mm in length and 4.4 ± 0.1 mm in wide. The adults head capsule was 3.4 ± 0.1 mm. The male longevity was 10.4 ± 0.7 and 15.1 ± 0.4 days frequently at 25°C and 22°C . The female longevity was 7.8 ± 0.3 and 11.2 ± 0.3 days frequently at 25°C and 22°C . The total development time from egg to adult was 26.7 ± 0.8 and 37.8 ± 0.5 days frequently at 25°C and 22°C (Tables 1 and 2).

DISCUSSION

This was the first study on *D. chrysippus* in Iran. The morphological studies showed that *D. chrysippus* sub sp. *chrysippus* is distributed in the south of Iran. The oviposition just observed in nature that adapted with Swilem & Esmail (1972), Wadnerkar et al. (1979), Smith et al. (1988) and Sharma & Verma (2005). Non oviposition in laboratory makes some problems on culturing this butterfly for laboratory investigations, genetical studies and life tables. It seems the main reason that makes this problem is the adult need to feed on different flowers for ovary and fermons development that as well as described by Smith et al. (1988). The oviposition behavior was same as Wadnerkar et al. (1979), Kunte (2005) and Sharma & Verma (2005) but different from Swilem & Esmail (1972) and Ramana et al. (1998). The laying of more than one egg on one leaf can be due to few hosts or invasion population. The larval, prepupal and pupal development times were same with Ramana et al. (1998) and Sharma & Verma (2005) but different from Swilem & Esmail (1972) and Wadnerkar et al. (1979). The main reasons for these differences can be because of the variety in subspecies, hosts and climates. Pupa was found in pale green and pale brown colors that same with Swilem & Esmail (1972) and Sharma & Verma (2005) but different from Ramana et al. (1998) and Braby (2000) who reported just one color form in the pupal period. The color variety in pupa was reported by Smith et al. (1988) that controlled by the greening hormone in the larval head. Diapuse didn't observe in any biological stages of *D. chrysippus*. A total of 26 to 37 days were taken for development from egg to adult that adapted with Swilem & Esmail (1972), Wadnerkar et al. (1979), Ramana et al. (1998) and Sharma & Verma (2005).

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Table 1: Developmental time for biological stages of *Danaus chrysippus* at 25 °C

Stages/instar	Days
Egg	3.4 ± 0.1
First larva	2.5 ± 0.1
Second larva	2.5 ± 0.1
Third larva	2.5 ± 0.1
Fourth larva	2.5 ± 0.1
Fifth larva	2.5 ± 0.1
Prepupa	1.5 ± 0.1
Pupa	9.8 ± 0.2
Adult female	7.8 ± 0.3
Adult male	10.4 ± 0.7

Table 2: Development time for biological stages of *Danaus chrysippus* at 22°C

Stages/instar	Days
Egg	4.5 ± 0.1
First larva	3.4 ± 0.1
Second larva	3.9 ± 0.1
Third larva	3.9 ± 0.1
Fourth larva	3.9 ± 0.1
Fifth larva	3.9 ± 0.1
Prepupa	2.4 ± 0.1
Pupa	14.6 ± 0.7
Adult female	11.2 ± 0.3
Adult male	15.1 ± 0.4

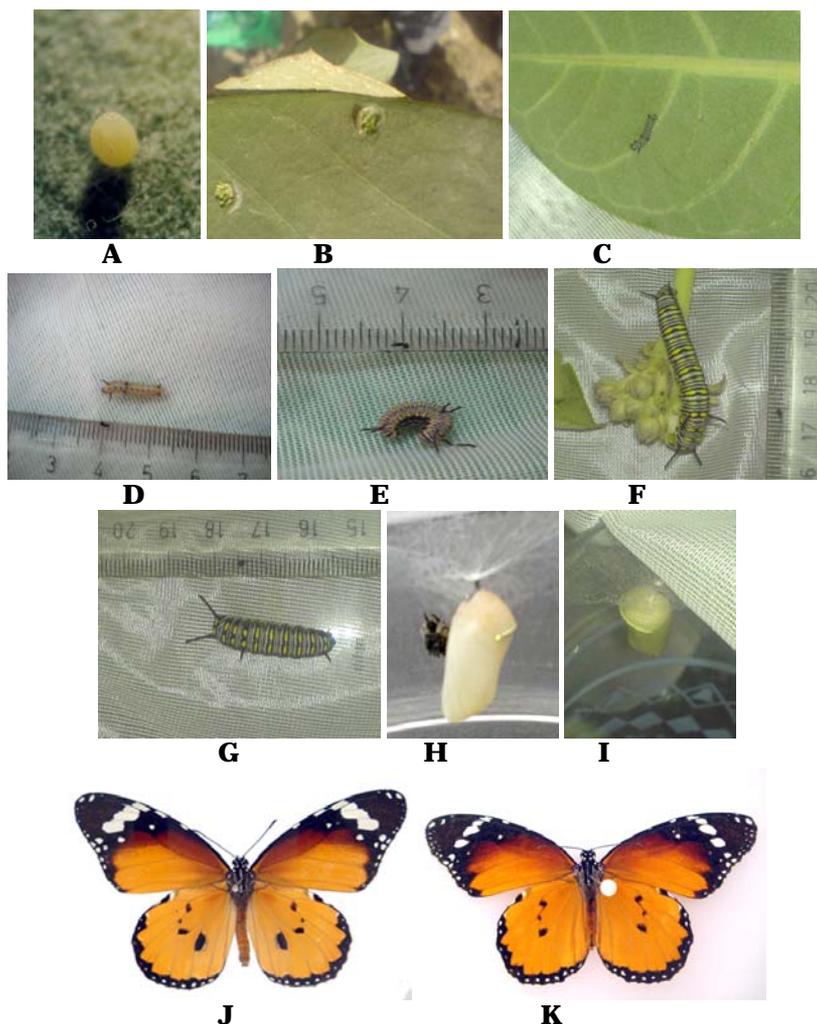


Figure 1. Biological stages of *Danaus chrysippus*. (A) An egg; (B-F): Larvae (B) First instar; (C) Second instar; (D) Third instar; (E) Fourth instar; (F) Fifth instar; (G) Pre pupa; (H) Pale Brown pupa; (I) Pale Green pupa; (J) Adult Male; (K) Adult Female.