



## Life History of the Type-Species *Pontia daplidice* (Linnaeus), the Bath white (Lepidoptera : Pieridae)

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**ABSTRACT:** The butterfly *Pontia daplidice* (Linnaeus) is available in good numbers in the premonsoon period i.e., from the end of March to June in Himachal Pradesh. Its larvae are diphagous. The nectar food plants of the species have been recorded. The egg show remarkable crypsis with buds on which they are laid. The Hymenopteran parasitoid, *Tetrastichus* sp. cause considerable damage to the larval population in the field.

**Key words:** *Pontia daplidice*, Pieridae, life history, behavior, larval parasitoid.

### INTRODUCTION

*Pontia daplidice* is a migratory butterfly species occurring in Palaearctic region (Wynter-Blyth, 1957; Varshney, 1994). The host plants of the larvae belong to family Brassicaceae and vary according to locality. They include *Arabis glabra* and *Cakile maritima* (Bell, 1909). During the course of present studies *Lepidium sativum* Linnaeus, *Senebira didyme* (Linnaeus) (Cruciferae) have been recorded its host plants from Solan district (Himachal Pradesh) from north-west India. *Lantana camara* Linnaeus, *Verbena bonariensis* Linnaeus, (Verbenaceae); *Murraya koenigii* (Linnaeus) (Rutaceae); *Tagetes erecta* (Linnaeus), *Saussurea candicans* Sch-Bip.; *Erigeron* sp. (Compositae); *Brassica* sp. (Cruciferae) and *Oxalis* sp. (Oxalidaceae) have been recorded as its nectar food plants from this area. The detailed account of various life history stages is as below :

### OBSERVATIONS

#### LIFE HISTORY STAGES AND DEVELOPMENTAL TIME.

**Egg :** Incubation period :  $2.50 \pm 0.50$  days.  
Height  $0.80 \pm 0.05$  mm, width  $0.50 \pm 0.05$  mm; fusiform; cream coloured, becomes orange near hatching; solitary laid in erect position; chorion sculptured with well-defined longitudinal ribs, horizontal ribs obscure; micropyle circular, with longitudinal ridges forming a small corona around it.

**Larva :** Number of instars : 5

Larval duration :  $9.65 \pm 2.97$  days.

**First instar :** Duration :  $2.33 \pm 0.57$  days.

**Head :** Width  $0.41 \pm 0.11$  mm; hypognathous; black when newly emerged, later turns brownish, vertex region whitish; primary setae present.

**Body :** Length  $2.16 \pm 0.70$  mm, width  $0.37 \pm 0.05$  mm; dirty yellowish brown, near moulting give obscure banded appearance, well segmented, tapered at anal end; primary setae originate from black tubercles; legs yellowish brown.

**Second instar :** Duration :  $1.33 \pm 0.57$  days.

**Head :** Width  $0.49 \pm 0.00$  mm; light green; secondary setae appear, setae black at base; rest as above.

**Body :** Length  $3.07 \pm 0.58$  mm, width  $0.5 \pm 0.03$  mm; beautifully coloured, especially dorsally and laterally with a pattern of cream coloured longitudinal bands, the latter impregnated with evenly spaced, yellow spots, dorsal, supraspiracular and subspiracular bands creamy in colour, alternating with addorsal, spiracular and subventral greenish grey bands, the latter decorated with black, shining chazalae bearing setae; legs and ventral side of body green.

**Third instar :** Duration :  $1.50 \pm 0.50$  days.

**Head :** Width  $0.81 \pm 0.01$ ; parietals with some colour of yellow; rest as above. **Body :** Length  $7.05 \pm 0.92$  mm, width  $1.08 \pm 0.11$  mm; legs white, with a large yellow spot, besides bearing some prominent black spots; rest as above.

**Fourth instar :** Duration :  $1.33 \pm 0.57$  days.

**Head :** Width  $1.16 \pm 0.00$  mm; same as above.

**Body** : Length  $11.33 \pm 3.21$  mm, width  $1.41 \pm 0.11$  mm; same as above, except yellow spots on legs become rather more distinct.

**Fifth instar**: Duration :  $3.16 \pm 0.76$  days.

**Head** : Width  $2.21 \pm 0.09$  mm; same as above.

**Body** : Length  $22.33 \pm 2.51$  mm, width  $2.73 \pm 0.25$  mm; similar to fourth instar.

**Pupa** : Duration :  $6.50 \pm 0.70$  days.

Length  $15.50 \pm 0.70$  mm, width  $4.75 \pm 0.35$  mm; stem serves as substratum, pupa affixed to it by anal attachment, supported by a silken girdle; green coloured when freshly formed, later turns creamish brown with minute black spots, cephalic projection finger-like, acuminate at apex; middorsal line of thorax with prominent rust coloured keel, the latter highest at middle of mesothorax, abdomen with pair of rust coloured carinate, ridges on second and third segments, ridges on latter segment more prominent; mesothorax with its lateral side with sharp prominences; ventral line almost straight; cremaster not well developed, dorsoventrally compressed, with terminal row of brown cremastral hooks, caudal end with chazalae prominent, bearing long setae.

**Adult longevity** :  $3.50 \pm 0.70$  days.

**Adult diagnosis** :

**Male** : Forewing dorsally white with large black bar at end cell black with white spots, ventrally white, markings as on upperside, basal area of cell with irroration of green scales. Hindwing above white, a costal spot in  $S_c + R_1$ , present before apex; below green, with white spot in cell, basal white spot in  $S_c + R_1$ , complete series of discal and marginal white spots present.

**Female** : Similar to male but with extended black markings and a black discal spot in Culb.

**Wing expanse** : Half, Male : 22.00 - 25.00 mm.

Female : 23.00 - 25.00 mm.

**Study sites** : Parwanoo, Dharmpur, Kandhaghat, Sadhopul, Chail, Solan (Solan, Himachal Pradesh).

## OBSERVATIONS ON BEHAVIOUR

**Oviposition behaviour** : In the species, *Pontia daplidice* (Linnaeus) the oviposition behaviour has been observed in localities such as Kalka (in April), Parwanoo (April), Solan (April) and Sadhupul (April and June). It has been recorded that the eggs are always laid during bright sunshine between 9:15 A.M. to 12.30 P.M., with no wind blowing. In a few instances, more than one female (3 or 4) were seen ovipositing in the same vicinity on both the host plants. During a search flight for location an egg laying host/site/substratum the

females generally flies 25-30 cms above the ground in clear sunshine period. Spending a great deal of time, she encircles around the host plant over the inflorescence spikes in order to locate some unopened buds. Many a times, it has been observed that though the female alights on an inflorescence yet flies away without laying any egg. In case of a suitable site, she holds the peduncle with her legs, lowers her abdomen to lay a single egg on a small delicate bud. It takes about 2-3 seconds to deposit an egg. While in the field, in rare of the rarest instances, the eggs have also been observed to be laid on uppersurface of the young leaves and seldom on undersurface of the old leaves. The freshly laid cream coloured egg reveal an excellent example of crypsis with the flower buds. However, the eggs turning orange subsequently can be located rather more easily.

**Larval behaviour** : Immediately after wriggling out of the egg shell by an exit hole through the micropyle, the larva not only devours the chorion completely but immediately switches to feed on the unopened bud of an inflorescence. However, from the second instar onwards, the larva also start corroding and consuming all layers of the leaf. The extent of feeding vis-a-vis infestation goes higher and higher after each moult. So much so, a single last instar larva may excavate, as many as, 8-10 leaves per day. Having scarcity of leaves, the mature larvae have also been seen consuming the petiole and soft portion of stem, as well. The larvae of different ages may rest either on the peduncle of the inflorescence or the stem. However, in addition to this, the first instar also take a repose in between the flowers of a spike. In the field studies, as and when, the first instar larvae get disturbed, they tend to move very fast before adopting, a comma-shaped posture. In an attempt to collect them with a fine brush, they start secreting silken thread under stress. Besides this defensive behaviour, the last instar have also been noticed to play possum by quickly falling on the ground and remaining motionless for sometime.

**Moulting** : During the present studies on the species, under reference, the moulting has always been observed to take place in the morning hours before 9:00 A.M. The entire process of moulting lasts from 30 to 50 minutes for completion.

**Pupation** : The process of pupal formation is same, as mentioned under the general account of the family Pieridae. However, it has been noted to take place on the twig of the host plant between 4.30 P.M. to 5.00 P.M. in month of April.



Dorsal View of Larva



Lateral View of Larva

LAST INSTAR LARVA



PUPA



ADULT (MALE)



ADULT (FEMALE)

**PLATE I.** Species *Pontia daplidice* (Linnaeus) (Last instar larva (Dorsal View), Last instar larva (lateral view), Pupa, Adult (male), Adult (female)).

**Larval parasitoid :** Some of the third instar larvae brought from the field, after two moultings, failed to pupate in the laboratory. Instead, it was observed that a number of larval endoparasitoids crawled out from different exit holes in the abdomen, except the last two segments. Soon after the emergence, these larvae started spinning a white silken cocoon and transformed themselves into pupae. In the meantime, it was noted that butterfly host larvae died immediately. After completing pupal duration of 7-8 days, the adult parasitoids emerged out of the cocoons after uplifting the circular lids. Upon identification, the parasitoids found be a species referable to the genus *Tetrastichus*. of the family Eulophidae (Hymenoptera).

**Adult behaviour :** The medium sized adults of the species, under reference, are weak flyers and undertake irregular flight many a times. However, when disturbed, they have been seen adopting erratic flight patterns. In the field, both the sexes keep themselves busy in sucking nectar. While doing so, they keep their wings folded on their back, partially opening them intermediately and uncoil their proboscis to probe different ray florets of an inflorescence. While foraging on a single inflorescence, the adults were seen moving their proboscis from one flower to another, hardly making any body movements.

After remaining there for almost 10-12 seconds, they swiftly shift to another inflorescence and repeat the same process. As a part of thermoregulatory behaviour, the adults are fond of dorsal sunbasking which was observed at Kalka (in April at 9:30 A.M.) and Sadhopul (in April at 10:30 A.M.) during the course of present field work. While basking, the adults open their wings and orient them towards the sun rays. The basking may take place on the ground or on the leaves of a plant. In a single instance at one of the localities i.e., Kalka one male individual was seen actively involved in mud puddling at a sewage disposal site in April at 12: 15 P.M.

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