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NOTE

NATURAL HISTORY OF LARGE CABBAGE WHITE *PIERIS BRASSICAE NEPALENSIS* GRAY, 1846 (LEPIDOPTERA: PIERIDAE) ON *NASTURTIUM*, *TROPAEOLUM MAJUS* (TROPAEOLACEAE) IN UTTARAKHAND, INDIA

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**NATURAL HISTORY OF LARGE CABBAGE WHITE
PIERIS BRASSICAE NEPALENSIS GRAY, 1846
(LEPIDOPTERA: PIERIDAE) ON NASTURTIIUM,
TROPAEOLUM MAJUS (TROPAEOLACEAE) IN
UTTARAKHAND, INDIA**

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Larval food preferences and various life cycle stages of *Pieris brassicae nepalensis*, large cabbage butterfly of the family Pieridae was observed on *Tropaeolum majus*, Nasturtium or the Indian Cress, an orange coloured garden ornamental plant, in Almora District, Uttarakhand.

Pieris brassicae nepalensis belongs to the lepidopteran subfamily, Pierinae, which contains more than 700 species, and is found in a great diversity of colours, with black, yellow, orange, red bands, streaks or spots. A white butterfly, the nominate species has a wingspan of 65–75 mm. Males have secondary characters and have specialized scales on the forewing with upper side forewing white with black apex and no apical dot on the hind wing, whereas there are two discal spots on the forewing with underside hind wing pale yellow in the female.

The larval plant of *P. brassicae nepalensis*,

Tropaeolum majus, generally known as Nasturtium is a perennial or annual herb with a climbing or twining stem. The alternate, long-stalked leaves are reniform to rounded and entire. The large, long-stalked, trumpet-shaped flowers grow from the leaf axils and remain in bloom from May–October. They are orange, yellow or white, occasionally scarlet or mahogany red and have a prominent spur. They are unscented but produce abundant nectar and are also visited by bees (Volak & Stodola 1998).

Being a Palaearctic species, the large Cabbage White is centered largely in the Mediterranean sub-regions and in the Pamirs, with a distribution range extending from Baluchistan, Himalaya to Assam and the plains adjoining the Himalaya. It is one of the most abundant and commonest butterflies of the Himalaya between 1,000–4000 m (Wynter-Blyth 1957; Mani 1986). Whereas the plant *Tropaeolum majus* is a native species of South America, which reached Europe in the 17th century and other parts of the world thereafter, it has now become a popular garden ornamental.

The Large Cabbage Butterfly is essentially diurnal and active when the sun shines and the temperature is sufficiently high; otherwise, it remains under leaves or other shelter, its wings erect but with the fore wings hidden from view. Its flight is irregular. They mate during flight, soon after emergence. The entire host activity and life cycle (Image 1 A–L), was observed in the month of May 2007, on nasturtiums, similar activity



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was also observed in radishes. The egg laying could be most probably by over-wintered pupae due to prevailing favorable conditions in the Himalayas, for both the host plant and the Large Cabbage butterfly. The eggs are yellow, elongated in shape, ribbed lemon yellow and placed one beside the other, deposited in clusters of 20–100 or more, which is quite greater than 15–20 (Haribal 1992), on the underside of the leaves of the host nasturtium plant. Embryonic development lasts 6–10 days and soon after larvae crawl out and start eating leaf epidermis. Its head is black in front, grey at the back, black thoracic plate. Body greyish-green with three longitudinal yellow lines, numerous bristles and small black spots all over the body and grows 45–50 mm. They first live in colonies, narrowly grouped one against the other and superficially gnaw the leaf epidermis. After the second moult, they scatter into groups of 8–9 individuals. Then they become extremely voracious and perforate the foliage; eat almost all leaves of the host plant, often leaving only the large veins. The large number of larvae and fast feeding by larvae puts tremendous pressure on the host plant. This particular phenomenon is very harmful, resulting in high mortality among the growing larvae, who find themselves with no more food or cover from the scorching sunlight. Besides, their frass (insect excrement), thinned out by the rain or dew, accumulates in the heart of the plant rendering it inedible. Thus, adding extra pressure on the survival of the remaining growing larvae. The caterpillars develop and then pupate in June on various supports (walls, roofs, fence posts) most probably as no cover remains on the host plant for the most vulnerable stage of the butterfly, the pupae. Pupa is greenish-grey yellowish or brownish with often three sulphur lines and some parts of abdomen on the ventral side brownish and wing cases paler, held with a belt-like girdle of silk, not in a cocoon. Pupation generally lasts for 10–15 days.

The butterflies appear in July–August and produce a second generation much more harmful than the first. The caterpillars develop in July–August and pupate in September, the pupae over-winter. At first glance, it seems the host activity of the Large Cabbage killed the plant completely but it is observed that as soon as the weather changed and activities of the Large Cabbage butterfly diminished considerably, the plant bloomed again with full leaves.

The butterfly is comparatively stronger in flight than other species of the genus. It migrates to the adjoining plains in winter, rears a succession of broods there and returns in May. It is established that preference for certain plants of the butterfly is based on the

previous experiences rather than on the sense organs or physiological changes, whereas in the case of females, visual cues such as colour of the plant determines the suitability for oviposition. The mustard-oil glucosides content of the LFPs guides the eating behaviours and turning the larvae distasteful for many predators. In addition the butterfly also emits an unpleasant odour and displays warning colouration. Despite such mechanism in place the different stages of butterflies are relished mainly by insectivorous birds, insects and occasionally by others.

Globally, Large Cabbage White is well known as a major crop pest of cruciferous plants, and can be very detrimental for the produce. The butterfly is relatively less threatening now due to several measures in place for control, ranging from natural to chemical ones.

Besides being considered a major pest, the butterfly was observed to visit several other crops (apple, lemon, guava, mustard) and wild plants in flowering, indicating its role in pollination. Its outbreak during the summer usually coincides with many migrant bird species in the region, thus appears to help in perpetuating viable population of the birds as well.

The association between butterflies and plants is highly specific. Truly polyphagous species (feed on various unrelated species of plants) are uncommon, but oligophagy (on closely related species) and monophagy (restricted plant species) mark extreme specialization. This specialization naturally limits the distribution of butterflies (Mani 1986) as they appear to be obligatorily bound up with the occurrence of larval food plants (LFP). The diversity of closely related larval food plant species indicates oligophagy by the large Cabbage White for oviposition, like cruciferous plants Brassica, cauliflower, cabbage, turnip, red cabbage, radish of family Brassicaceae and nasturtium of family Tropaeolaceae. Interestingly both the families belong to the order Brassicales. The Cabbage White Butterfly completes its life cycle on both cruciferous plants (Brassicaceae) and on Nasturtium plants (Tropaeolaceae) indicating extreme specialization of the butterfly between oligophagy and Polyphagy. Belonging to the same order Brassicales, however, the families suggest similarity in plant chemistry as well. Keeping in view the observations, possibilities of more LFPS within related families are obvious.

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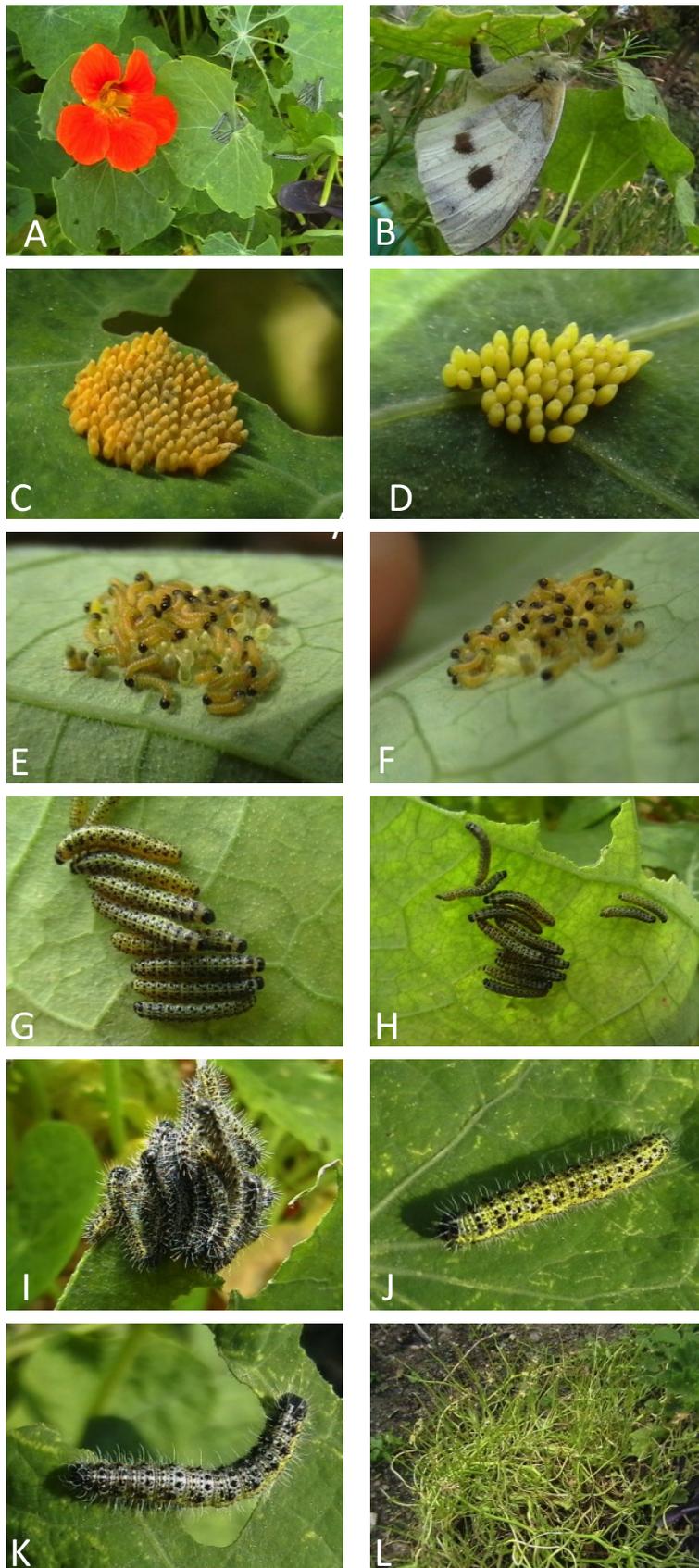


Image 1. A & L - shows of initial and final stage of infection on host plant, Indian Cress; B-K - different stages of lifecycle of the Indian Cabbage White. © Authors

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