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New larval host plants association of *Pieris canidia indica* Evans, 1926 from India (Lepidoptera: Pieridae)

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Abstract

A survey conducted in Uttarey village, located in the western district of Sikkim, India, has revealed important findings regarding the larval host plants of the *Pieris canidia indica* Evans, 1926. This study is particularly noteworthy as it implicates *Matthiola incana* (L.) W. T. Aiton from the Brassicaceae family and *Spinacia oleracea* (L.) from the family Chenopodiaceae as new larval host plants for this species. This discovery is the first report of these plants serving as host plants for *Pieris canidia indica* Evans, 1926 in India. It adds valuable knowledge to the ecology of the Papilionoidea and expands the known range of larval food sources for this species.
Keyword: Lepidoptera, Pieridae, *Pieris canidia indica*, new host plants, Sikkim, India.

Nueva asociación de plantas nutricias de *Pieris canidia indica* Evans, 1926 de la India (Lepidoptera: Pieridae)

Resumen

Un estudio realizado en el pueblo de Uttarey, situado en el distrito occidental de Sikkim (India), ha revelado importantes hallazgos sobre las plantasnutricias de larvas de la *Pieris canidia indica* Evans, 1926. Este estudio es especialmente digno de mención, ya que implica a *Matthiola incana* (L.) W. T. Aiton, de la familia Brassicaceae, y a *Spinacia oleracea* (L.), de la familia Chenopodiaceae, como nuevas plantas hospedadoras de larvas de esta especie. Este descubrimiento es el primer informe de estas plantas como plantas nutricia de *Pieris canidia indica* Evans, 1926 en la India. Añade valiosos conocimientos a la ecología de los Papilionoidea y amplía la gama conocida de fuentes de alimento larvario para esta especie.
Palabras clave: Lepidoptera, Pieridae, *Pieris canidia indica*, nuevas plantas hospedadoras, Sikkim, India.

Introduction

Pieris canidia belong to the family Pieridae within the order Lepidoptera. There are only two subspecies of *Pieris canidia* found in India; that is *P. canidia canis Evans, 1912* and *P. canidia indica* Evans, 1926. *P. canidia* is distributed from Jammu and Kashmir to the Northeast India, reaching Uttar Pradesh, Delhi, Bihar, and Punjab, Rajasthan, Haryana, Odisha, Chattisgarh, Madhya Pradesh and Gujarat (Smetacek, 2025).

The Brassicaceae family, formerly known as Cruciferae, boasts a diverse range of economically important crops such as cabbage, cauliflower, knoll khol/kohlrabi, turnips, broccoli, kale, and others, which are cultivated on a large scale throughout the world (Rasool & Mir, 2023). This rise in popularity of Brassicaceae products is due to their nutritional richness and their recognized properties such as anti-cancer, antioxidant and anti-inflammatory properties (Jaiswal et al. 2011). *Matthiola incana* (L.) W. T. Aiton is a popular ornamental plant used for bedding or cut flowers, known for its variety of vibrant flower colours (Tatsuzawa et al. 2012) and has become an economically important floral plant (Hisamatsu et al. 2000).

Spinacia oleracea L. belongs belonging to the Chenopodiaceae family, a leafy green vegetable that originated in southwestern Asia, is now cultivated worldwide. It is primarily known for its culinary uses but also boasts medicinal properties. It is rich in vitamins, including vitamin A, vitamin C and vitamin E, and minerals such as magnesium, manganese, iron, calcium, and folic acid (Gaikwad et al. 2010).

Annex 1. Previous records of some host plants of *Pieris canidia.*

Species	**Host Plants**	**References**
Pieris canidia indica	*Brassica nigra* (L.)	Karmakar et al. 2018; Robinson et al. 2010
	Rorippa indica	Robinson et al. 2010
	Lepidium virginicum	Robinson et al. 2010
	Cleome spinosa	Robinson et al. 2010
	Cleome gynandra	Robinson et al. 2010
	Cardamine scutata	Robinson et al. 2010
	Cardamine flexuosa	Robinson et al. 2010
	Cardamine impatiens (L.)	Smetacek & Smetacek, 2011
	Brassica oleracea var. *capitata* (L.)	Robinson et al. 2010; Rasool & Mir, 2023
	Brassicae oleracea var. *botrytis* (L.)	Rasool & Mir, 2023
	Brassicae oleracea var. *acephala* DC.	Rasool & Mir, 2023
	Brassicae oleracea var. *gongylodes* (L.)	Rasool & Mir, 2023
	Alstonia scholaris	Robinson et al. 2010
	Tropaeolum sp.	Robinson et al. 2010
	Sinapis arvensis (L.)	Mukherjee & Mondal, 2023
	Matthiola incana (L.)	Present Study
	Spinacia oleracea (L.)	Present Study
Pieris canidia canis	*Brassica oleracea* var. *capitata* (L.)	Wynter-Blyth 1957; Kunte, 2000; Robinson et al. 2010
	Rorippa dubia	Nitin et al. 2018
	Rorippa indica	Nitin et al. 2018
	Sisymbrium sp.	Nitin et al. 2018

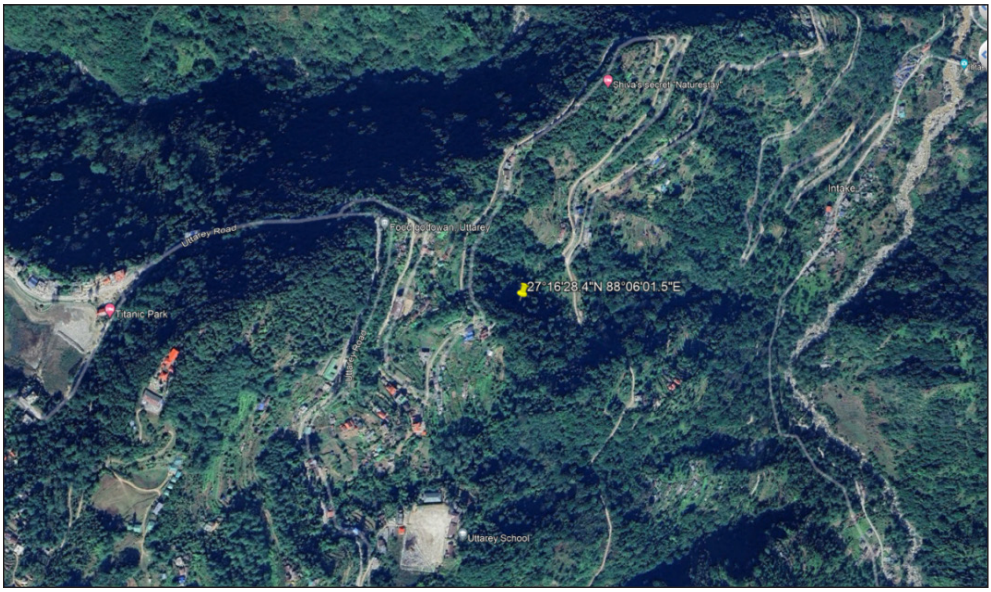
The lifecycle of Lepidoptera depends heavily on larval host plants because caterpillars, usually herbivorous, rely heavily on a select range of plants to meet their nutritional and chemical requirements (Nitin et al. 2018; Sharma et al. 2023). But still the knowledge about the larval host plants of butterflies and early life stages were rare (Sharma et al. 2023). Now-a-days, few works have been done regarding the larval host or food plants of Indian Lepidoptera. Robinson et al. (2010) prepared a database of the World's Lepidopteran Hostplants. Smetacek & Smetacek (2011) added few larval host plants of Indian lepidoptera. Das (2017) studied on the larval food preferences of *Pieris canidia indica* in the laboratory. Rasool & Mir (2023) studied about the distribution and host plant preferences of *Pieris species* in Kashmir Valley. Mukherjee & Mondal (2023) prepared a preliminary checklist of larval host plants of butterflies of Bankura and Purulia district of West Bengal. Recently, Sharma et al. (2023) reported new larval host plant of *Tagiades menaka* butterfly from Sikkim, India. Very recently, Thapa et al. (2023) studied about the butterflies' larval hostplants' specificity in Garbhanga Reserve Forest (Proposed Wildlife Sanctuary) and Rani Reserve Forest of Kamrup district of Assam, India. But they didn't record that *Matthiola incana* and *Spinacia oleracea* L. as a larval host plant of *P. canidia indica* (Annex 1).

Materials and Methods

An opportunistic field survey was conducted in SL's backyard garden. On 01-IV-2024, the first author observed an adult female of *P. canidia indica* laying eggs on leaves of *Matthiola incana* (Figure 2b) at Uttarey village in the district of West Sikkim, India at an altitude of around 6600 ft. from the mean sea level and the coordinates were recorded as (27º16'28.4"N latitude and 88º06'01.5"E longitude) (Figure 1). Four days later,

the yellow-coloured eggs successfully hatched into yellowish 1st instar larvae, which began to feed on the leaves of the same plant (Figure 2d). The author closely monitored the caterpillar during this period and note down its feeding and shelter patterns. After few days, the caterpillar goes into second instar with some black dots on the body (Figure 2e). On the day 16th, the same larva was observed as third instar and transformed his body into green colour (Figure 2f). After 24 days of hatching, the larva, it moves into another plant (*Spinacia oleracea* L.) and started to feed the leaves of the spinach plant (Figures 2g-h). On the day 30, the larva goes into fifth larval stage. The caterpillar continued its life cycle by feeding on the leaves of *Spinacia oleracea* L. and two days later, the caterpillar goes to pupal stage (Figure 2i). Thirteen days after (45th day) pupating, an adult *P. canidia indica* emerged from the chrysalis (Figure 2j). The life history and larval host plants of this species in India have not been previously recorded on *Matthiola incana* and *Spinacia oleracea* plant. The identification of the enclosed Papilionoidea was based on Kehimkar (2016), and observations of immature stages were also made in the natural environment.

Figure 1. The map shows the study area Uttarey village in the district of West Sikkim, India.



Result

The host plants of *P. canidia indica* were observed to be *Matthiola incana* and *Spinacia oleracea* which had not been recorded before. It took a total of 45 days to emerge as an adult butterfly from the egg stage. The life cycle of *P. canidia indica* in the plants *Matthiola incana* and *Spinacia oleracea* in India have not been illustrated or recorded to date. Therefore, this will be the first record of the larval host plants and the life cycle of *P. canidia indica* in *Matthiola incana* and *Spinacia oleracea*.

Discussion

Survey at Uttarey village of West Sikkim reveals that *Matthiola incana* (L.) and *Spinacia oleracea* (L.) are the new larval host plants for the large cabbage white butterfly, *Pieris canidia indica* Evans, 1926, a first in India. The discovery expands the known range of larval food sources, highlighting the adaptability of the species to different environments and plants. Previously, the larval hosts of *P. canidia* in India were mainly restricted to cruciferous vegetables. The inclusion of these new plants suggests greater flexibility in the butterfly's larval diet, indicating potential resilience to habitat change and the implications for pest management in agriculture. This information is crucial for further studies on growth and plant interactions of *P. canidia*.

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Conflict of Interest

The authors declare that there is no known financial interest or personal relationships that could have influenced the work presented in this article.

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Figure 2. (a) Host plant *Matthiola incana* (L.) of *Pieris canidia indica.* **(b)** *P. canidia* laying eggs. **(c)** Egg of *P. canidia*. **(d)** First instar larva. **(e)** Second instar larva. **(f)** Third instar larva.

Figure 2. (g) Fourth instar larva moves to *Spinacia oleracea* plant and started to feed the leaves. **(h)** Larva feeding *Spinacia oleracea* plant. **(i)** Pupa. **(j)** Freshly emerged adult *P. canidia*.