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BUTTERFLY–FLOWER INTERACTION IN KEOLADEO NATIONAL PARK, BHARATPUR, RAJASTHAN

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INTRODUCTION

India with an estimated diversity of about 15,000 flowering plants offer a vast potential for studying the role of butterflies and other insects in pollination. But for the contributions made by Subba Reddi *et. al.* (1983), Subba Reddi and Meerabai (1984), Alluri and Subba Reddi (1994), Byragi Reddi and Subba Reddi (1996), the subject has received no significant attention in India. In the present communication, we describe our observations on butterfly-flower interactions made in the Keoladeo National Park, Bharatpur, Rajasthan.

STUDY AREA

The Keoladeo National Park is situated between latitude 27° 7' 6" to 27° 12' 2"N and longitude 77° 29' 5" to 77° 33' 9"E in the Bharatpur district of Rajasthan. The park covers 29 sq. km. of which 12 sq. km. forms a man-made wetland. Water level fluctuates from 0 to 2 m. The park receives water from river Gambhir, a tributary of river Yamuna. Temperature varies from 2°C in winter (November to February) to 49°C in summer (March to June) exposing the park to extreme climatic conditions. The average annual rainfall is 662 mm, mostly received from the southwest monsoon during July to September. Due to varying eco-climatic conditions, the general vegetation of the park is remarkable, comprising of 379 species of plants, which include 96 species of wetland plants (Meena and Sharma, 1996).

METHODOLOGY

While conducting hydrobiological studies in the park from 13–24 April 1999 (Summer Survey) and 1–5 December 1999 (Winter Survey), we made a note of the flowering plants especially attended

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by the butterflies. Each flowering tree was carefully observed with naked eye or through 7 × 50 binoculars during morning and evening hours, every day, and the butterflies interacting with the flowering plants were counted and their activities observed. While enumerating the butterflies, their highest number at a time was recorded.

RESULTS

A total of 15 species of butterflies belonging to 5 families were recorded, interacting with 7 plant species during the study (Table 1). The family Pieridae was found dominant with 6 species followed by Nymphalidae with 4 species, Lycaenidae and Danaidae with 2 species and one species of Hesperiidae. An account of the nectar plants subjected to study and their associated butterfly species observed are given below.

Azadirachta indica A. Juss (Verbenaceae)

Azadirachta indica is a well-known tree of family Verbenaceae, commonly known as neem. The trees bear small, pale yellow flowers, from March to May. It is a common tree around the Keoladeo national park.

During our study in April, we noticed unusually large congregations of butterflies on the flower heads of neem, especially on trees along the road leading from the Park's entry point to the Keoladeo Temple. The Caper White (*Anaphaeis aurota*), Common Gull (*Cepora nerissa*), Lemon Pansy (*Junonia lemonias*), Striped Tiger (*Danaus genutia*) and Common Tiger (*Danaus chrysippus*) were found constantly visiting and feeding nectar from flowers of all the neem trees observed. Of these, Lemon Pansies and Striped tigers were found visiting the flowers in rapid succession and based on the observation, they could be considered as the major butterfly pollinators of neem in the Park. At the same time, swarms of Rock Honey bees (*Apis dorsata*) were also found visiting the flowers along with butterflies.

Interestingly, the neem flowers of Hyderabad (Andhra Pradesh) and Palakkad (Kerala) could never be found entertaining such swarms of butterflies. The role of butterflies on the pollination of neem tree is not known before and the effect of azadirachtin on butterflies can be an interesting subject for study.

Ageratum conyzoides Linnaeus (Asteraceae)

The troublesome annual weed, *Ageratum conyzoides* is known among the plant biologist as 'goat-weed' due to its peculiar odour. The plant can be commonly observed along the bund lines adjacent to the Sampanmori and Vackaliya areas of the park. During the April survey, we observed

Table 1. : Butterfly visitors (in number) on flowers of the plant species studied in Keoladeo National Park, Bharatpur, Rajasthan.

Sl. No.	Butterfly Species	Plant Species						
		1	2	3	4	5	6	7
	Family PIERIDAE							
1.	Caper White *Anapheis aurota*	40	13	8	8	25	–	20
2.	Small Salmon Arab *Colotis amata*	–	–	1	–	8	2	10
3.	Plain Orange Tip *Colotis eucharis*	–	–	–	–	–	4	–
4.	Common Gull *Cepora nerissa*	6	3	–	–	2	4	–
5.	White Orange Tip *Ixias marianne*	–	–	–	–	–	4	50
6.	Common Grass Yellow *Eurema hecabe*	–	–	–	–	–	4	–
	Family NYMPHALIDAE							
7.	Peacock Pansy *Junonia almana*	–	2	3	1	25	–	–
8.	Blue Pansy *Junonia orithya*	–	–	–	–	4	–	–
9.	Lemon Pansy *Junonia lemonias*	3	–	1	–	3	–	–
10.	Grey Pansy *Junonia atlites*	–	–	–	–	3	–	–
	Family DANAIDAE							
11.	Striped Tiger *Danaus genutia*	2	–	6	–	–	–	–
12.	Common Tiger *Danaus chrysippus*	8	12	14	–	30	–	–

Table 1. *(Cont'd.).*

Sl. No.	Butterfly Species	Plant Species						
		1	2	3	4	5	6	7
	Family LYCAENIDAE							
13.	Gram Blue *Euchrysops cnejus*	–	–	2	–	–	–	–
14.	Bright Babul Blue *Azanus ubaldus*	–	–	–	–	–	3	–
	Family HESPERIIDAE							
15.	Bank's Swift *Baoris kumara*	–	–	–	–	–	2	–

1 *Azadirachta indica*, 2. *Ageratum conyzoides*, 3. *Polygonum glabrum*, 4. *Polygonum barbatum*, 5. *Blumea* sp., 6. *Hygrophila auriculata*, 7 *Albizzia lebbeck.*

up to 12 Plain Tiger (*Danaus chrysippus*), 13 Caper White (*Anaphaeis aurota*), 3 Common Gull (*Cepora nerissa*) and 2 Peacock Pansy (*Junonia almana*) butterflies on a single plant, feeding nectar from its bloom of bluish-white flower heads. Presence of *Apis dorsata* was also noted during the study.

Ageratum conyzoides is a confirmed source of pyrrolizidine alkaloids (Larsen, 1986). These compounds are essential for the synthesis of a pheromone necessary for successful courtship in the life of danine butterflies. Thcugh the Plain tiger is a known associate of the Goat weed plant, the association of Caper white, Common Gull and Peacock Pansy butterflies on *Ageratum* is not known before.

Polygonum glabrum Willd. (Polygonaceae)

An erect herb growing up to 1m heights, *Polygonum glabrum* produces pink flowers in terminal paniculate racemes. They are mostly found on the banks of the Ghana canal, especially near the Sampanmori and Mansarovar areas. The nectary inflorescence attracts many butterflies and other insect species. Of the 7 species of butterflies observed, the Plain Tiger, Caper White, Striped Tiger and Peacock Pansy were the more constant and abundant visitors. Small number of Gram Blue (*Euchrysops cnejus*), Lemon Pansy (*Junonia lemonias*) and Small Salmon Arab (*Colotis amata*) were also observed. Honey bees and many species of wasps were also noted during the study.

Polygonum barbatum Linnaeus (Polygonaceae)

An erect herb growing up to 1 m in height, *Polygonum barbatum* is mostly seen towards Keoladeo Temple area within the water edge. The plant is much rarer and localized than *P. glabrum* in the Park. The creamy white flower heads of the plant attract mainly Caper White (*Anaphaeis aurota*) and Peacock Pansy (*Junonia almana*) butterflies. Honey bees have also been observed on the flower heads during the summer season.

Blumea sp. (Asteraceae)

There are 5 species of *Blumea* recorded in the Park (Meena and Sharma, 1996). On 21st April 1999, one small shrubby species of *Blumea* with cream white inflorescence found near Kadamgunj area was observed with an unusually large assemblage of butterflies on its flower heads. 8 species of butterflies were noted attracted to the plant's inflorescence. Among them, as many as 30 Plain Tigers, 25 Caper Whites, 25 Peacock Pansies dominated the scene. The Small Salmon Arab, Common Gull, Blue Pansy, Lemon Pansy and Grey Pansy were found in less numbers ranging from 2 to 8 along with a good number of honey bees (*Apis dorsata*).

Hygrophila auriculata Linnaeus (Acanthaceae)

Hygrophila auriculata is a common spinescent herb observed in full bloom during winter survey in December. The plant is fairly well distributed along the bunds adjoining the marshy area. The nectary purple flowers attract many insects. The 7 species of butterflies observed attending the flowers are, Small Salmon Arab, Plain Orange Tip, Common Gull, White Orange Tip, common Grass Yellow, Bright Babul Blue and Bank's Swift. Large number of wasps, honey bees, damselflies, spiders and ants were also observed on the flower heads. In winter season, this is the only nectar-providing plant species for the butterflies in the park. On 5.12.1999 at Python Point, we made a sweep with an insect net among the *Hygrophila* bushes and it resulted in the collection of diverse group of insects, comprising of 5 species of butterflies, 4 species of Odonata, 2 species of grasshoppers, 2 species of Diptera, 1 species of honey bee and 1 species of Neuroptera. Lizards, Praying Mantis and Crab spiders were seen waiting near the flowers to prey upon the flower-visiting insects.

Albizzia lebbeck (Linnaeus) (Fabaceae)

The huge trees of *Albizzia* with large creamy-white flowers line either side of the road leading to Ajan Bund, in the southwestern area of the Park. The fallen flowers attract pierids such as Caper White, Small Salmon Arab and White Orange Tip. We enumerated as many as 50 White Orange Tips, 20 Caper Whites and 10 Small Salmon Arabs. The White Orange Tip butterflies were never seen attending on the flowers during summer season.

Besides the above plants, the flowers of *Lantana camara* and *Capparis* sp. were found attracting many species of butterflies during the study period.

Of the 7 flowering plants observed in our study, the *Blumea* sp., which flowers during April-May, was most preferred by butterflies. *Blumea* attracted a total of 8 species of butterflies, followed by *Polygonum glabrum* and *Hygrophila auriculata*, which attracted 7 species of butterflies each.

Maximum butterfly density was also recorded on *Blumea* sp., which was visited by about 100 specimens of 8 species, at a time, in April. The high density is likely to be due to the numerous flower heads that provide good source of nectar.

We have also observed that, in Keoladeo National Park, the butterfly diversity on flowering plants is higher in summer than during the winter season. This may be due to the need of higher intake of fluids required for the butterflies to cope-up with the summer heat. Vogel (1978) observed a great increase in the number of butterfly-visits to flowers during a drought, driven there by the need for water.

40 species of butterflies have been recorded to occur in the Park (Jafer and Soniya, 2001). The present study is only a preliminary one and an extensive survey is required to gain a comprehensive idea of the relationship of all the butterfly species with the floral components in the Park.

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