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Avian flower visitors of *Helicteres isora* L. a deciduous forest species in Thathengalam forest of Kerala in Western Ghats.

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Abstract

Many plant species produce nectar to attract birds, butterflies and bees for ensuring the service of pollination. This action can be termed as positive interaction between plants and animals. Such animals play a major role in the pollination of their food plants. This paper brings about an account of avian flower visitors of *Helicteres isora* a deciduous forest shrub mostly associated with teak (*Tectona grandis*). It belongs to the family Sterculiaceae and flowers just after the rains (September-October). The flowers are large, red, bisexual and zygomorphic with robust corolla. The floral characteristics of this plant indicate ornithophilous pollination and all the flowers are exclusively pollinated by birds and butterflies. The study was carried out during March 2010 in Thathengalam forest area, Palakkad district of Kerala and the area is situated between 11° 02' 02" to 11° 02' 54" N latitudes and 76°26' 24" to 76°27' 36" E longitudes Observation on flower visitation was made for thirty two hours in three days duration. Twenty five species of nectarivore birds in twelve families were found foraging on this species for nectar. Highest number of visits were made by Purple-rumped Sunbird (11.39%) followed by Jungle Myna (11.00%), and Common Myna (10.12%). Birds, especially the above group helps in pollination of *Helictres isora*.

Keywords: *Helicteres isora*, avian flower visitors, pollination, nectarivore birds.

Introduction

Many flowering plants produce nectar that act as food for birds, bees and butterflies and in turn effecting pollination. Birds play a vital role as pollinators and seed dispersal agents to maintain and restore plant communities. Pollination by birds has been reported up to 22 percent of the plant species in tropics, although it is very rare in temperate forests (Stiles, 1981). Bird pollinated plants vary in their pollination syndromes in relation to the geographical difference of the avifauna (Stiles, 1981; Brown and Hopkins, 1995; Proctor *et al.,* 1996). Bird pollination is as important as insect pollination in the tropics and in Southern temperate zones. About 100 families of flowering plants are known to have at least some members adapted for bird-pollination (Meeuse and Morris, 1984). Balasubrmanian (2012) reported that 292 forest birds are involved in pollination and seed dispersal in south India. Out of them, birds belonging to family Nectariniidae, Sturnidae and Zosteropidae represented by sunbirds, mynas and starlings and Oriental White-eye etc. form the major avian pollinators in Indian forests.

The process of pollination is important for the long-term perpetuity of plants and is an essential event in the sexual life of flowering plants. It is through pollination that seed set occurs and on which depends the genetic future of the individual. Animal pollinators

of flowers are termed as "mutualist" (Kelly *et al*., 2006). Among the two major "mutualistic interactions", pollination is an important event in the life of plants. In this mutualistic relationship, the reward to animals is food in the form of nectar and pollen and for the plants it is the benefit of pollination. Potential pollinators include animal species belonging to the class Insecta (Bees, Beetles, Butterflies, Wasps, Flies and Thrips etc.), Aves (Birds) and Mammalia (Bats, Squirrels). Potential seed dispersers include birds, primates, bats, bears, squirrels, mongoose, nilgiri marten, rhinoceros and elephants etc. (Kitamura *et al*., 2007; Dinerstein and Wemmer, 1988, Howe, 1986; Jordano, 2000; Herrera, 1995; Balasubramanian *et al*. 1998; Corlett, 1998; Loiselle and Blake, 1999; Stiles, 2000; Mishra and Gupta, 2005).

The pollination mechanism is a very important event for fruit/seed set in plants. Most of the flowering plants depend on animal vectors for pollen transfer (Harder and Wilson, 1997). A pollinator's contribution to a plant's reproductive success is determined by its effectiveness (seed set resulting from a single visit) and its activity (Dafni, 1992). Moreover, in plants where cross-pollination is needed for adequate fruit set, effective pollination requires pollinators that move between compatible plants. Particularly, the pollination behaviour and efficiency may lead different complements to generate different patterns of pollen flow (Herrera, 1987).

Materials and Methods

The study was conducted in dry deciduous patch of Thathengalam forests of Mannakkad Forest range, Palakkad district of Kerala. Observations on foraging actions avian pollinators were made during September-October, 2010 in Thathengalam forest areas. Avian nectarivores were documented by recording the activities of birds foraging on nectar bearing individuals of *Helicteres isora*. Extended observations were made in focal nectar producing flowers to record the bird's visitation. Foraging observation was made following focal animal sampling method by (Dawkins, 2007). The bird activities were observed from 06:00 hrs to 18:00 hrs by using a pair of binoculars and observations was extended up to three days. In each observation, number of birds visited, their numbers, time of first appearance on plant duration and their foraging activities were carefully recorded. The number of visits to flowers made by each bird species was recorded in selected flowering bushes. Bird species were identified using the handbook of birds by Ali and Riply (1986).

Results and Discussion

Helicteres isora is a large shrub, commonly found as undergrowth in deciduous forests dominated by teak. It is distributed in Indo-Malesia, China and Australia. In India it is gregariously distributed throughout India. It is considered as teak associate in deciduous forest. It is a browsable species thus in certain places it is used as fodder. The fibre obtained from the bark of this plant is durable and used for making rope, bags and paper. Root, Leaves, bark, fruits and seeds are used in medicinal preparation and have different therapeutic properties like antimicrobial (Venkatesh et al., 2007; Sriram et al., 2010), antidiabetic (Kumar and Murugesan, 2007; Kumar et al., 2007), hepato-protective (Dhevi et al. 2008; Chtra et al. 2009) antioxidant (Pradhan et al. 2008) and anticancer activities(Raman et al. 2012).

Not much information is available on the pollination and breeding behaviour except the study of plant phenology and pollination by birds reported by Santharam (1996). The flowering season of this plant varies according to locality and appears to follow the rainy season (September to October). The flowers come in sparse clusters and are large, bisexual and zygomarphic with robust corolla. Flower is tubular, measuring about 4 cm in length and are red in colour (Photo 1), fading to 'lead' (bluish) towards the end of the day (Gamble, 1957). Fruits are brownish green, beaked, cylindrical and spirally twisted (Photo 2). The red colour and tubular shape of the flower with a robust corolla and lack of any odour suggests that the plant is a typical bird pollinated species (Raven, 1972; Faegri and Pijl, 1979). Initially the flowers are red in colour with less quantity of nectar, which gradually change into bluish colour with copious nectar. The colour changes in flowers may help the flower visitors in distinguishing the nectar-bearing flowers from other ones, thereby increasing their foraging efficiency (Baker *et al.,* 1983). The plant bushes were monitored for three days between 06.00 to 18.00hrs. The number of flowers in a bush ranged from 500 to 700. The flowers open during evening hours from 03.00-04.00 PM. Number of flower visits by all the species of birds recorded in 32 hours extended to three days was 2510. A total of twenty five species of nectarivore birds in twelve families were identified and recorded as flower visitors. The flowers of *H. isora* were visited by both passerine and non passerine birds. Jungle Myna, Purple-rumped Sunbird, Purple Sunbird, Black Drongo, Gold-fronted Chloropsis, Red-vented Bulbul, Large Green Barbet (Table 1) are the frequent flower visitors. Highest nectar feeding visits were made by Purple-rumped Sunbird (11.39%) followed by Jungle

Myna (11%) Common Myna (10.12%), Purple Sunbird (9.88%), Red-vented bulbul (7.37%), and Gold-fronted Chloropsis (5.46%) etc. Role of each group of birds also recorded and found that Sun birds (21%) contributed the highest percentage of flower visit followed by Myna(20%) and Bulbuls (18%) (Fig.1). These birds play a major role in the pollination of their food plants. Passerine birds like bulbuls, drongos, mynas, and babblers who visited the flowers. These birds, especially the Jungle Myna, Purple-rumbed Sunbird, Red-vented Bulbul, and Chloropsis appeared on the flowering bush whole day with more activity and frequently visited during forenoon and late afternoon hours. Birds collect nectar more frequently from older flower of this plant species.

Table 1. Number of bird visit to the *Helicteres isora* plant

S.No	Name of the Birds	English Name	No. of birds visit	% of bird visit
1	**Capitonidae** *Megalaima viridis*	Large-green Barbet	67	2.69
2	*Pycnonotidae* *Hypsipetes leucocephalus*	Black Bulbul	27	1.12
3	*Pycnonotus luteolus*	White-browed bulbul	167	6.90
4	*Pycnonotus cafer*	Red-vented Bulbul	185	7.64
5	*Pycnonotus jocosus*	Red-whiskered Bulbul	92	3.80
6	**Dicruridae** Dicrurus macrocercus	Black Drongo	112	4.63
7	Dicrurus paradiseus	Racket-tailed Drongo	86	3.55
8	Dicrurus caerulescens	White-bellied Drongo	26	1.07
9	**Oriolidae** *Oriolus xanthornus*	Black-headed Oriole	15	0.62
10	**Psittacida** *Psittacula columboides*	Blue-winged Parakeet	68	2.81
11	*Psittacula krameri*	Rose-ringed Parakeet	72	2.97
12	*Psittacula cynocephala*	Plum-headed Parakeet	54	2.23
13	*Loriculus vernalis*	Indian Hanging Parrot	65	2.68
14	**Sturnidae** *Acridotheres tristis*	Common Myna	254	10.49
15	*Acridotheres fuscus*	Jungle Myna	276	11.40
16	**Corvidae** *Dendrocitta vagabunda*	Indian Treepie	5	0.21
17	**Muscicapidae** *Turdoides striatus*	Jungle Babbler	84	3.47
18	*Turdoides affinis*	White-headed Babbler	123	5.08
19	**Nectarinidae** *Nectarinia lotenia*	Lotens Sunbird	35	1.45
20	*Nectarinia zeylanica*	Puple-rumped Sunbird	286	11.81
21	*Nectarinia asiatica*	Purple Sunbird	248	10.24
22	**Zosteropidae** *Zosterops palpebrosus*	Oriental-white Eye	18	0.74
23	**Dicaeidae** *Dicaeum erythrorhynchos*	Tickle's Flower Pecker	47	1.94
24	*Dicaeum aegile*	Thick-billed Flower Pecker	7	0.22
25	*Chloropsis aurifrons*	Gold fronded Chloropsis	148	5.46
			2567	105.22

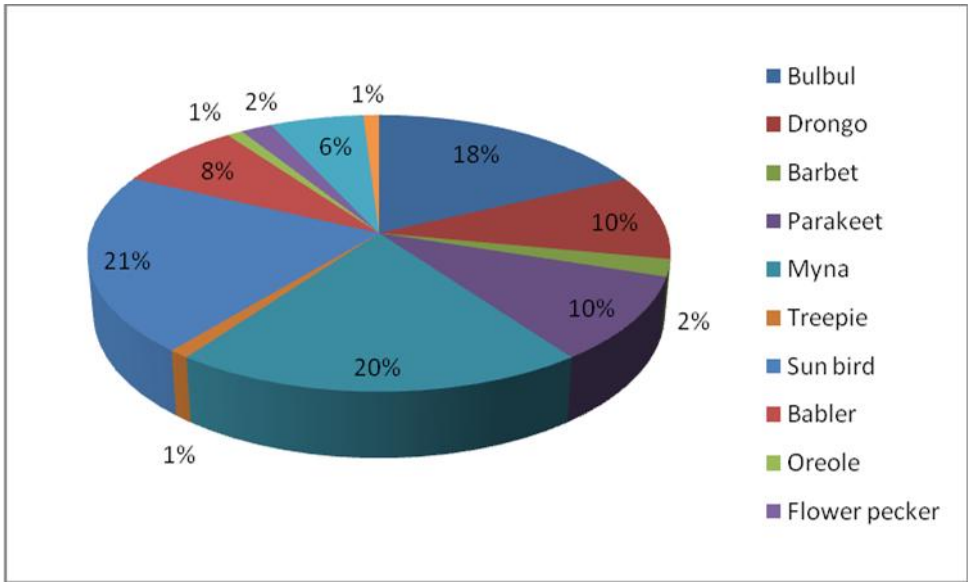

Fig. 1. Percentage bird visit by different group of birds

Photo 1 Flowering branch of *Helicteres isora* with bluish oder flowers and red younger flower.

Photo 2. Characteristic twisted fruit of *Helicteres isora*

All the birds visited the flowers throughout the day with more foraging activity during early morning and late afternoon hours. During foraging, they land on the branches, move towards the flowers and probed flowers thoroughly to collect nectar. While doing so, their bills and foreheads invariably contact the stigma and stamens dorsally effecting pollination. The sunbirds, bulbuls and chloropsis were the regular visitors, while the remaining species were occasional visitors only. All these bird species were found to move frequently between flowers of *H.isora* in search of more nectar; such a nectar feeding behavior was considered to promoting cross-pollination. Foraging of nectar by birds is reported by various workers especially Rangaiah et al. (2004), Woodcock (2012). Santaram (1996) reported Pollination by birds along with butterflies in *Helicteres isora*. Interaction between the plant and the birds is very important in case of plants having some specialized mechanism of pollination and structure of the flower. This plant support the birds by providing nectar and in turn benefitted with pollination.

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