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Butterfly as Pollinating Insects of Flowering Plants

By Pollobi Duara & Jatin Kalita

Gauhati University, Assam, India

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Butterfly as Pollinating Insects of Flowering Plants

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I. INTRODUCTION

Plants and animals have a close interrelationship for their survival, propagation and control. Berenbaum (1995) states that "Sexual reproduction is just as important for plants as it is for animals when it comes to sex they can't just get up and find themselves a mate." Plants must rely on pollen vectors, from wind to insects to birds, to transport their pollen to another individual.

The process of transportation of pollens from stamens to the ovary is called pollination. The insects that visit flowers belongs to the group Hymenoptera, Lepidoptera, Diptera, Coleoptera, Thysanoptera and Hemiptera. Very scanty works have been done on pollinating insects of North Eastern states. However, it is generally only adult winged insects that specialise in visiting flowers. Bhattacharjee (1985a, 1985b) studies the taxonomy and distribution of Nymphalidae, Pieridae and Lycanidae butterflies in North Eastern region of India. North East India accounts for nearly a two-third (962 species) (Evans, 1932) of the India's total butterfly species (Kunte et.al, 1999) Plant diversity influences the diversity of pollinating insects like butterfly. The present study is conducted on Pollinating insects of *Ixora coccinea*.

II. MATERIALS AND METHOD

Study Site: Study was conducted at Nambor Doigrung wild life sanctuary which is situated in the Golaghat district of Assam. This sanctuary shares its boundaries with the Nambor Reserve Forest and Garampani wild life sanctuary. It covers and entire area

of 97.15 sq. km. Study was conducted from January 2011 to december 2011. Nambor Doigrung Wildlife sanctuary is geographically located between 92° 52' to 92° 53' east longitude and 26° 22' to 26° 24' North latitude.

The area is in tropical basin of India and as a result of that the temperature are never too high or low with a very heavy monsoon. The maximum/minimum temperature remains in between 8° to 30°C. Annual rainfall is 2500mm.

Study plant: The study was conducted on *Ixora coccinea*. *Ixora* is a genus of flowering plants in the Rubiaceae family. It consists of tropical evergreen trees and shrubs and holds around 500 species. The plants possess leathery leaves, ranging from 3 to 6 inches in length, and produce large clusters of tiny flowers in the summer. *I. coccinea* is a dense, multi-branched evergreen shrub, commonly 4–6 ft (1.2–2 m) in height, but capable of reaching up to 12 ft (3.6 m) high. It has a rounded form, with a spread that may exceed its height. The glossy, leathery, oblong leaves are about 4 in (10 cm) long, with entire margins, and are carried in opposite pairs or whorled on the stems. Small tubular, scarlet flowers in dense rounded clusters 2-5 in (5–13 cm) across are produced almost all year long.

Pollination Syndrome: Pollination syndrome study include flower shape, size, colour, odour, reward type and amount, nectar composition, timing of flowering, etc. Pollination syndromes reflect convergent evolution towards forms (phenotypes) that limit the number of species of pollinators visiting the plant.

Medicinal value: The flowers, leaves, roots, and the stem are used to treat various ailments in the Indian traditional system of medicine, the Ayurveda, and in various folk medicines. The fruits, when fully ripe, are used as a dietary source. Phytochemical studies indicate that the plant contains the phytochemicals lupeol, ursolic acid, oleanolic acid, sitosterol, rutin, leucocyanadin, anthocyanins, proanthocyanidins, and glycosides of kaempferol and quercetin.[1]

Flower Phenology : Flower phenology was observed at both plant and inflorescence level with reference to day to day flowering pattern. Flower phenology is determined by observations made atleast 3times per week, flowering time, time of opening and closing of flowers (Mark and Francoise, 2005) The flowering season of *Ixora coccinea* was recorded. The

Authors α σ : Department of Zoology, Gauhati University,
e-mail: pallu111.111@gmail.com

phenological traits were estimated by counting flower heads in anthesis on individual plants every seven days.

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Insect Pollinators Diversity : Diversity of insect pollinators was observed using line transect and point transect method. Several insect visitors were collected for species identification purpose.

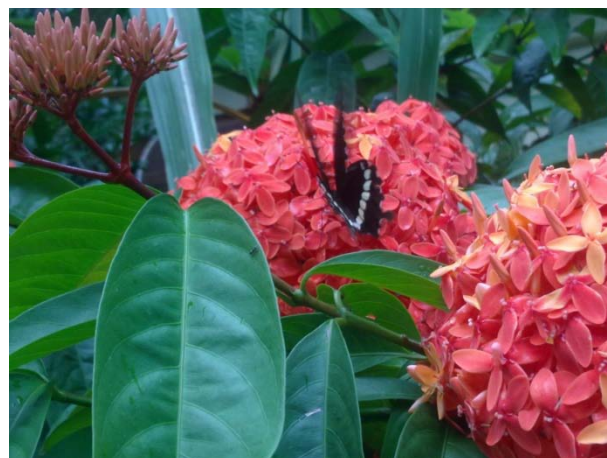
Insect Pollinator visiting Frequency: Observations of insect flower visiting frequency were conducted by scan sampling methods (Martin and Bateson, 1993). The observations included foraging rate (number of flowers/minute), flower handling time (seconds/flower) and plant handling time (seconds/plant) [Dafni 1992]

Data Analysis: Measures used were Visitor abundance, number of flower visitors seen per transect, and visitor species richness, number of insect species visiting flowers in each transect in each week.

III. RESULT

Table 1 : Family and species of butterfly as pollinator for 12 month observation

Taxon	Family	Species	Percentage
	Papilionidae	1. <i>Atrophaneura varuna</i> 2. <i>Papilio clytia</i> 3. <i>Papilio nephelus</i> 4. <i>Papilio helenus</i> 5. <i>Papilio polytes</i> 6. <i>Papilio mormon</i>	54.54%
Lepidoptera	Nymphalidae	1. <i>Melantis leda</i> 2. <i>Ypthima huebneri</i>	18.18%
	Pieridae	1. <i>Hebomoia glaucippe</i> 2. <i>Ixias pyrene</i> 3. <i>Ixias moriame</i>	27.27
Total	3	11	100%



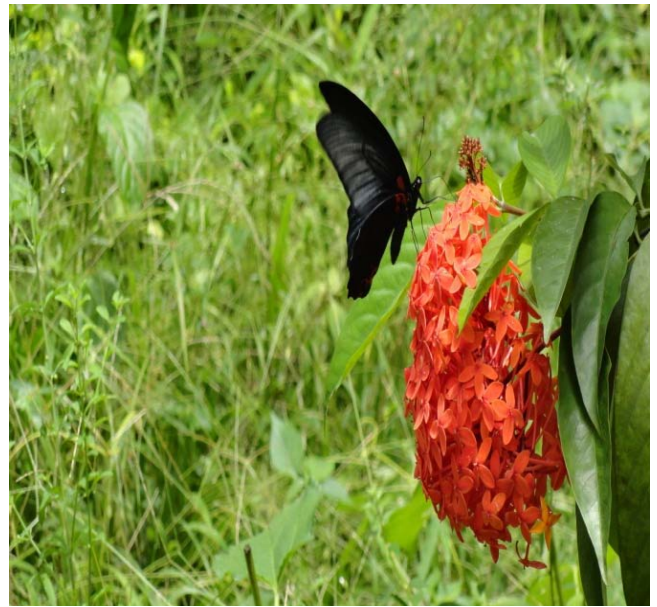


Table 2 : Total species of insect visitor in time blocks for 12 month observation

Time block (h)	Family	Species	
7.00-8.00	2	3	
8.00-9.00	1	4	
9.00-10.00	2	5	
10.00-11.00	2	7	
11.00-12.00	3	8	
12.00-13.00	2	8	
13.00-14.00	1	5	
14.00-15.00	2	2	

Table 3 : Temperature and Rainfall of the study area during the study period

Month	Minimum Temperature(degree celcius)	Maximum Temperature(degree celcius)	Rainfall
January	10	24	1 cm
February	15	30	2 cm
March	15	30	5 cm
April	20	30.5	15 cm
May	21	31	23 cm
June	25	31	30 cm
July	25	32 c	30 cm
August	24	31.5	25 cm
September	24	30	15 cm
October	21	29.5	5 cm
November	15	26	2 cm
December	11	25.5	2 cm

Discussion: Butterflies are the most frequent pollinators of *I.coccinea*. Similar findings were reported by S.V.A.Hameed(2012). Bees, wasps, moths and other insect groups were also observed visiting *I.coccinea* flowers, but were less frequent pollinators,so the study was conducted mainly on butterflies as pollinating insect. The family of Butterfly that act as pollinators of *I.coccinea* are Papilionidae(6 species),Pieridae(3 species) and Nymphalidae(2 species).

Ixora are tubular and bloom in dense rounded clusters about 2 to 5 inches across. The tubular shape of Fragrant *ixora* flowers prevents many insects from gaining access to the nectar that is stored at the base of the floral tube. The nectar is only accessible to insects, such as hawkmoths, whose mouthparts are long enough to reach to the base of the floral tube. As these insects reach into the floral tube to obtain the nectar they touch the pollen producing structures, or stamens, and transport that pollen to other flowers they visit to obtain more nectar. But when the suitable insect is absent then the pollination mechanism is brought about by the insect that is available in the surrounding. As the body of butterfly is large enough so pollen stuck to it and help in transfer of pollen. Without the specialist

insect pollinators to move pollen between flowers, fruit, which only develop following fertilization (of the ovule by the pollen), are not produced.

Data obtained in the present study showed that the flowering season of *I.coccinea* is mainly summer. Earlier research showed that warmth is essential. These plants cannot tolerate temperatures below 15°C (59°F). The present study also report similar findings (Table 4). Temperature has a profound effect on pollination particularly in poikilothermic insects. Butterflies are mainly diurnal and are mostly active in bright sunshine with relatively low humidity. Butterflies are deriving most of their heat from the sun (Owen, 1971). and are inactive early in the morning, late in the evening, at night, and during cold and wet weather (Larsen, 1991). According to our observations the frequency of butterflies visited the flowers was high during 09:00-13.00 hour (table 2) and month of april to august.

REFERENCES RÉFÉRENCES REFERENCIAS

1. Berenbaum, M. (1995), Bugs in the system: Insects and their impact on human affairs. Helix Books, Addison Wesley Publishing Company.
2. Bhattacharya, D.P. (1985a). Insects: Lepidoptera, Part II. Nymphalidae. Rec. Zool Sur. India Vol: 82 (1-4): 83-97.
3. Bhattacharya, D.P. (1985 b). Insects: Lepidoptera, Part III. Pieridae, Panidae, Satyridae and Lycanidae, Rec. Zool. Surv. India Vol: 82 (1-4): 99-110.
4. Dafni, A., 1992. Pollination Ecology, a Practical Approach. Oxford University Press, Oxford, United Kingdom: Cambridge University press
5. Evans, W.H. (1932). Identification of Indian butterflies Croom Halm Ltd. Kent. (BI).
6. Larsen, T.B (1991). The butterflies of Kenya and their natural history, Oxford University Press, New York.
7. Mark, E. Kraemer., Francoise, D., (2005) Flower Phenology and Pollen Choice of *Osmia lignaria* (Hymenoptera : Megachilidae) in central Virginia. Environ Entomol 34 (6), 1593- 1605.
8. Martin P, Bateson P (1993). Measuring Behaviour: An Introductory guide. (2nd edition). United Kingdom: Cambridge University press.
9. Owen, D.F (1971) Tropical butterflies: The ecology and behaviour of butterflies in the tropics with special reference to Africa species, Clarendon press, Oxford.

