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RESEARCH ARTICLE

PREDATOPHILY- A NEW POLLINATION MECHANISM REPORTED IN WESTERN GHATS

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ABSTRACT

Predatophily – a new pollination mechanism has been described from *Impatiens*, *Sonerila* and *Strobilanthes* species in the Western Ghats of India.

Keywords: Predatophily, pollination, *Impatiens*, *Sonerila*, *Strobilanthes*, Western Ghats.

1. INTRODUCTION

The term pollination refers to transfer of pollen grains from anther to stigma. Pollen grains from most flowering plants are transported by various means and deposited on the receptive surface of the stigma of same flower or on the different flower of the same plant (self pollination) or on a different individual (cross-pollination). Forest vegetation with different flora and vegetation types harbor various assemblages of flower visitors, and thus the properties of plant – pollinator interactions are greatly affected by the composition of regional biota (1). Changes in pollinator regimes are thought to be of critical importance in speciation and diversification of the flowering plants. Such changes include qualitative shifts from one type of pollinator to another, quantitative shifts in the relative proportions of major types, and overall reductions in visits by animal pollinators that select for wind pollination or self fertilization. In the past few decades, biologists have made considerable progress in testing the role of pollinator shifts in fundamental aspects of the origin of species: diversification of floral traits and development of reproductive barriers between incipient species (2). They have also begun to evaluate the role played by recent changes in pollinator regime for the potential loss of species. In this context, study on the pollination mechanism of flowering plants and interaction of pollinators in reproductive biology of plants are most important. The present study observed the comparative pollination systems in three endemic flowering plants of Western Ghats. The study noticed a new pollination mechanism operated in the succession of plant life which has been described herewith.

2. MATERIALS AND METHODS

The pollination biology of *I. parasitica* carried out in about 50 flowering individuals growing in Munnar ranges of Western Ghats (N $10^0$02.097'- E $77^0$08.492', altitude 1300-1500 M msl) during 2009-2011. Whereas, observation of breeding systems in *Sonerila pulneyensis* were carried out from the Megamalai Wildlife Sanctuary (N $9^0$40.769' – E $77^0$24.119', altitude 1250-1350 M, msl) during 2012-2013. Floral visitors of *Strobilanthes kunthianus* were observed from the Megamalai ranges (N $9^0$39.999' – E $77^0$21.819', altitude 1150-1450 M, msl) during the month of August 2014. All the three plants observed breeding systems, floral traits, pollination patterns, floral visitors, and fruit setting frequency, ovule pollen ratio and seed setting frequency for studying reproductive success of the selected species (3). There has been observed a special pollen transfer mechanism by the non-nectar consuming agencies like toads and spiders which are acting as indirect pollen transfer agencies by the activity of predation. Hence it has been described here as a new pollination mechanism from the Western Ghats.

3. RESULTS AND DISCUSSION

Most species of *Impatiens* have conspicuous and specialized flowers providing a large amount of floral nectar and attracting nectar-feeding insects, bees, hawk moths_and butterflies for pollination (4); however, I have discovered a new mechanism of pollination in the flowers of an epiphytic perennial balsam (*Impatiens parasitica* Wight) which is restricted to southern Western Ghat ranges, in which the pollens are transported from the anther to stigma by the predatory activity of the toad (*Philautus jayarami*). Anthesis occurs (at 0750 to 0150) with mild odor and anthers dehisce at the same time. Flower secretes floral nectar in the base of inner petals and inflated spur (± 8-14µL/flower). The odor is released only up to noon, gradually getting weaker and none in night. The flowers usually wither up to 72 hours. The floral visitor (small tiny Dipterans, Hemipterans and Coleopterans) enters into the wide mouth of flower and touches their wings and head to anther and

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stigma. Another vertebrate pollinator (toad- *P. jayarami*) is waiting in front of the floral mouth for prey the floral visitors (Fig. 1). After foraging activity, flies return back to mouth of the flower. The toad is ready to catch the flies with its long rolling tongue. When catching the prey, tongue and nose of the toad touches the anthers and stigma of the flower and some amount of pollen carried on them. Sometimes tiny flies escape from the toads and starts foraging to next flower. Toad is also jumping to next flower to catch the fly and doing same activity several times for several flowers which transfer amount of pollen load and deposited on the other flower in the same plant or another individual. It leads a new mechanism of Predatophily, which is to the knowledge of science the first report of pollination of its own kind in angiosperms.

Fig. 1. *Philautus jayarami* – a toad is waiting for insects in front of the *Impatiens* flower.

Fig. 2. A tiny toad is predate on the flower petal of *Sonerila pulnyensis* Gamble.

Fig. 3. Spider predating inside the corolla tube of *Strobilanthes kunthianus.*

Similar observation was noticed in *Sonerila pulnyensis* Gamble, an endemic herb from the southern Western Ghats (Fig. 2). *S. pulnyensis* is blooming in the month of December; flower attracts several pollinators by their colour and pollen nectar. Many tiny insects are regular pollinators for this species. During this observation a small toad species frequently jumped on the flower petals and doing their rapacious activity. The same time pollen grains are dusted on the body of toads (12.5 ± 2.1 per visit) which transfer to another flowers stigma when continuing its predatory processes. This predatory mechanism leads to the transfer of pollen grains from one flower to another receptive part of the same individual or another individual. This is the very interesting and the first report of pollination mechanism in angiosperms for coining the term 'Predatophily'.

However in the tubular corolla of *Strobilanthes kunthianus* consists of many small spiders inside for predation of their prey as floral visitors (Fig. 3). While movement of spiders inside the corolla tube facilitates the pollen transfer to the other flowers stigma and its own. Considerable pollen load has been observed (10.2 ± 1.8 per visit) on the spider body which has been loaded on the receptive parts of the flower. *S. kunthianus* is a self-compatible floral species and also providing rich nectar resources to foraging agencies (3). Earlier studies it was not noticed the activity of non-nectar consuming agencies for pollination mechanisms. A few studies mentioned the nectar robberies which the small predating agencies act as a pseudopollinators in flowering plants.

4. CONCLUSION

All the above mentioned reports evidenced the new pollination mechanism operated in the succession of flowering plant reproduction. It has been reported first time the new pollination mechanism and has termed 'predatophily' due to

the activity of small animals such as toads and spiders.

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