Original Research Paper

Volume - 7 | Issue - 8 | August - 2017 | ISSN - 2249-555X | IF : 4.894 | IC Value : 79.96

Botany

PLANT POLLINATORS AND FUNCTIONING OF ECOSYSTEM

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ABSTRACT Pollinators are important organisms that play a key role in propagation of plants. Within an assemblage their interaction is termed as "heterogeneity". They are also ecologically important in food web. Pollinators are of in different functional groups such as bees, moths, butterflies, squirrels etc. Their nectar source plants are categorized into different functional groups on the basis of their flower structure. A kind of correlation exists between the flower structure and the type of pollinator. In certain cases the presence of a nectar flower determines the existence of a specific pollinator in that ecosystem. Hence there exists a balancing mechanism between the pollinator and its nectar plant sources in an ecosystem.

KEYWORDS : Pollinator, Heterogeneity, Functional group, Nectar flower.

Introduction:

Insects take part in natural processes as pollination of flowers, decomposition of dead organisms and form important links in the food chains and thus play an ethereal and almost invisible role, but nevertheless one which is very real in the maintenance of the balance of nature. As part of man's environment, this component requires smart management both to hold down harmful species and to conserve and boost beneficial species.

The present study is aimed on role of plant pollinators in functioning of ecosystem. The plants attracting a particular type of pollinator to its flower for their successful reproduction. The pollinator adapted to a particular flower type and will be able to find and access important food resources – nectar and pollen. The higher resource diversity and abundance promote greater consumer species diversity in flower-visitor community. They normally appear in their largest numbers when there is plenty of green vegetation serving as foliar and floral hosts and when the prevailing weather conditions are advantageous for their growth and survival.

Study site:

In order to observe the difference in insect composition between disturbed and undisturbed vegetation, two areas with differing ecology were chosen for the present study. They are (1) one site which enjoys both natural and artificial flora and (2) a protected forest area.

Method of Study:

Field trips are conducted at regular intervals to observe different types of pollinators and their behavior at flowers. Flowers that are visited by different pollinators are collected. Their shape, orientation and position of essential organs relative to other floral parts are observed. On basis of these observations pollinators and their floral hosts are categorized into different functional groups. Insect pollinators are identified with the help of Bombay Natural History Society.

Results & Discussion:

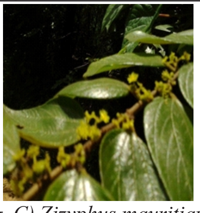
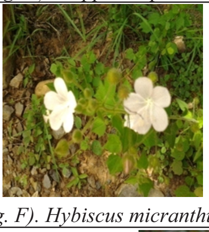
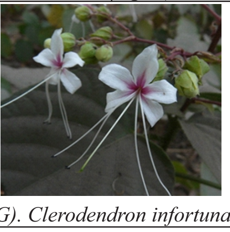
The study revealed more number of insects in site I where there is plenty of diverse resource availability and less number of insects in site II where there is less diversity in resource availability.

The floral structures reflect convergent evolution towards forms that limit the number of species of pollinators visiting the plant. They increase the specific pollination of a plant. The floral characters such as flower orientation, shape and color were found to affect visitation rates and efficiency of pollination. Thus the flowers are categorized into different functional groups on the basis of the position of essential organs relative to the other floral parts as – (A). Flowers zygomorphic with the essential organs placed adjacent to or lying on the lower corolla lip, eg: *Cleome viscosa, Ocimum basillicum, Hyptis suaveolens* etc. (B). Flowers zygomorphic with the essential organs oriented towards the upper lip, eg: *Adathoda vasica, Justicia procumbens* etc. (C). Flowers open with the essential organs centrally positioned, eg: *Sida cardifolia, Zizyphus mauritiana, Antigonon leptopus, Jatropha gossypifolia, Murraya koenigii* etc. (D). Flowers open with exposed numerous stamens, eg: *Capparis spinosa, Albizzia lebbeck, Syzyzium jambolanum*, *Enterolobium saman* etc. (E). Flowers tubular with the essential organs exserted, eg: *Asystasia gangetica, Ixora arborea, Hamelia patens, Catharantus roseus, Duranta repens, Lantana camara, Tectona grandis, Vitex negundo* etc. (F). Flowers tubular with the essential organs exserted, eg: *Wrightia tinctoria, Borreria hispida, Merremia tridentata* etc. and (G). Flowers with the essential organs rather elongated and oriented horizontally, eg: *Cadaba fruticosa, Caesalpinia pulcherrima, Clerodendron phlomidis* and *C.infortunatum* etc.

In another way, flowers are categorized on basis of their shape as – (a) Regular, bowl shaped in bat pollinating flowers. Eg. *Ceiba pentandra.* (b). Shallow with landing platform, small tubular in bee pollinating flowers. Eg.*Cleome viscosa, Adathoda vasica* etc. (c). Large bowl-like in beetle pollinating flowers. Eg. *Sterculia*. (d). Large funnel like or cups with strong perch support in bird pollinating flowers. Eg.*Erythrina indica*. (e). Narrow tube with spur and wide landing pad in butterfly pollinating flowers. Eg.*Caesalpinia pulcherrima*. (f). Shallow funnel like or complex and trap like in fly pollinating flowers. Eg. *Tagetus* (g). Regular, tubular without a lip in moth pollinating flowers. Eg. *Sansaveria.* (h). Small inconspicuous flowers in ant pollinating flowers. Eg. *Zizypus*

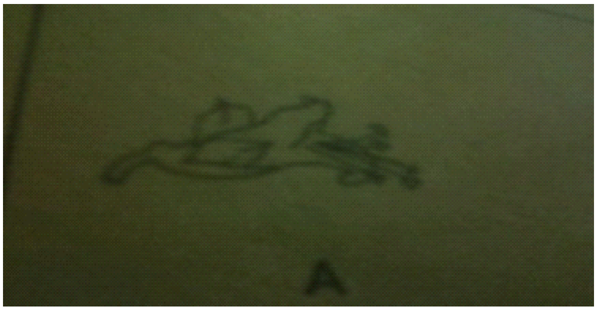
It is important to categorize the pollinators by their function how they collect pollen and nectar and how they find flowers. Analyzing flower traits and visitation, it is concluded that the pollinators could categorized into different functional groups such as bees, flies, birds, bats, beetles, moths, butterflies, ants, wasps, squirrels etc. quite well, but it could not easy to separate different types of bees or butterflies or wasps visitation. These functional groups of pollinators exert different selection pressures on floral traits and maintaining the ecosystem in a balancing way. Pollinator focuses on one species of plant, ignoring other species causes effective pollination. Many pollinator species exhibit constancy, passing up available flowers to focus on one plant species because they can only efficiently gather rewards from one type of flower. This kind of limiting of pollination or nectar source partners may create a niche to discourage other species. Thus some of the pollinators are specialists and others are generalists. Presence of certain plants determining the existence of some specific pollinators in the ecosystem. This plant-pollinator assemblage is a kind of mutualism that we found in the nature. The specialists are co-evolved to each other. The role of coevolution in shaping the relationships between plants with food-rewarding flowers and their pollinators is more controversial (Schemske1983; Nilsson1998). The role of plant – pollinator shifts versus co evolution in shaping traits and the disagreement over the level of specialization in this plant – pollinator interactions are the main basis for controversy (Wasserthal 1997; Whittall and Hodges 2007). The four pollination systems – *Cadaba fruiticosa* (L.), Druce, *Caesalpinia pulcherrima* Swartz, *Clerodendron infortunatum* L. and *C.phlomidis* L. were good entrant systems to study coevolution because the plants in all the four species were dependent on a single pollinator species i.e. butterflies in each population, and the pollinators were all profoundly dependent on these abundant plants as a source of food. The process of reciprocal selection can be imagined as the operating system in all. (Meerabai, 2014). Coevolution can operate alongside other one-sided evolutionary processes to shape the traits of interacting species (Johnson, S.D., 2010). In nineteenth century French paleontologist Gaston de Saporta was the first who argued that "insects and plants have therefore been simultaneously cause and effect through their connection with each other" (Friedman, 2009).

Today, ecologists are concerned that climate change may cause the change in synchrony of inter-dependent organisms. Loss of natural pollinator communities may cause dramatic changes in ecosystems and biodiversity. Our current knowledge is too limited to extend to natural systems. Thus there is an urgent need for networking among researchers, and for more fundamental and applied research toward improving our knowledge of pollination services. A new and better understanding will allow for active, effective management of pollinators for crop production and for the conservation and maintenance of biodiversity of terrestrial ecosystems worldwide.

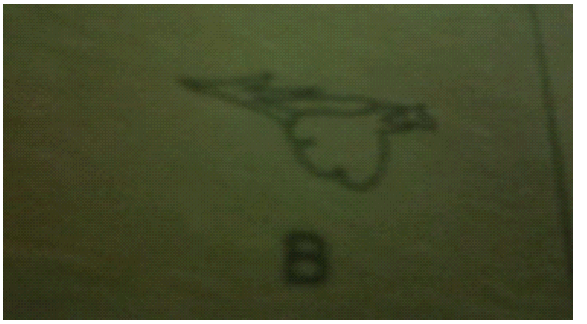
 *Eg. A). Cleome viscosa*	 *Eg.B). Adathoda vasica*
 *Eg. C). Antigonon leptopus,*	 *Eg. C).Zizyphus mauritiana,*
 *Eg. D). Capparis spinosa,*	 *Eg. E).Lantana camara*
 *Eg. F). Hybiscus micranthus*	 *Eg. G). Caesalpinia pulcherrima*
 *Eg. G). Clerodendron infortunatum*	

Hand drawings:

A).Zygomorphic flower with upper side placed essential organs



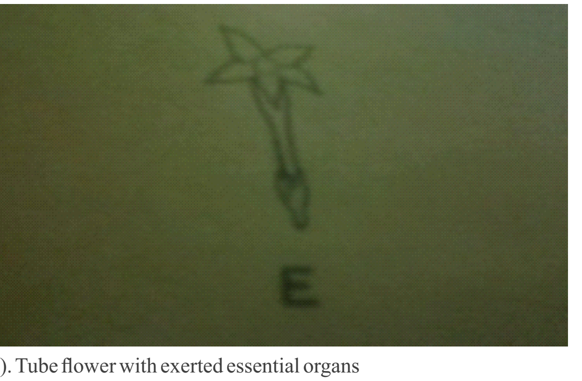
B).zygomorphic flower with lower side placed essential organs



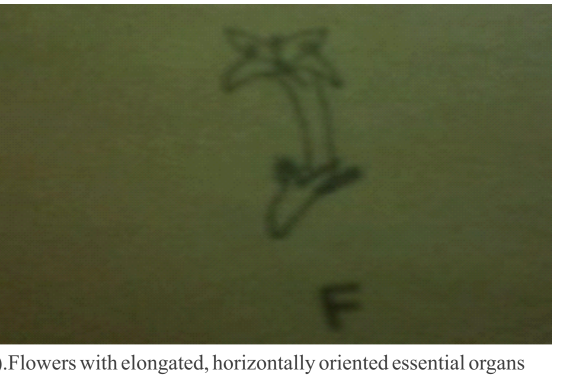
C).Open flower with centrally placed essential organs

D).Flowers with exposed, elongated essential organs

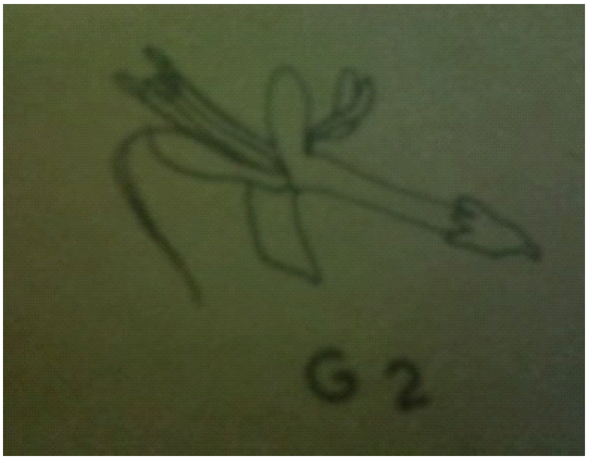
E). Tube flower with inserted essential organs



F). Tube flower with exerted essential organs



G).Flowers with elongated, horizontally oriented essential organs



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