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# Enhancing Biodiversity Conservation through Pollinator Gardens: A Comprehensive Approach

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## ABSTRACT

Pollinator gardens have emerged as a promising strategy for enhancing biodiversity conservation by providing essential habitat and resources for pollinators. This article examines the establishment of pollinator gardens as a practical and effective means of promoting biodiversity conservation. Drawing from over a decade of experience, we have developed a proven approach to establishing pollinator for local biodiversity conservation. This method can be seamlessly adapted to various settings such as schools, colleges, parks, gardens, and zoos. The basic concept revolves around:1. Identifying locally available floral checklists. 2. Selecting throughout-the-year flowering plants, herbs, shrubs, and climbers. Based on our experience, we have compiled a list of commonly available flora suitable for adoption in most places in Tamil Nadu. This approach has already been successfully implemented in schools, colleges, and corporate sectors in Coimbatore, Chennai, and Bangalore. Through a multidisciplinary lens, this article aims to provide insights and recommendations for researchers, practitioners, and policymakers interested in promoting biodiversity conservation through pollinator-friendly landscaping practices.

**Keywords:** Biodiversity, Butterflies, Conservation, Landscaping, Pollinator gardens

## INTRODUCTION

Pollinators play a crucial role in maintaining ecosystem functioning and supporting global food production. However, habitat loss, pesticide use, and climate change have led to declines in pollinator populations worldwide, threatening biodiversity and agricultural sustainability. In response to these challenges, the establishment of pollinator gardens has gained traction as a nature-based solution for enhancing pollinator habitat and fostering biodiversity conservation. By creating landscapes rich in flowering plants and nesting sites, pollinator gardens can provide vital resources for bees, butterflies, birds, and other pollinating insects. Moreover, these green spaces offer educational opportunities and aesthetic benefits, making them valuable assets for communities and urban environments. In this article, we examine the scientific basis and practical considerations for establishing pollinator gardens as a conservation strategy.

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## REVIEW OF LITERATURE

Butterflies are one of the dominant groups of insects with colorful diversity and pollinating agents. India supports nearly 1800 species of butterflies and predominant diversity is from Himalayas and Southern peninsular India. In Tamil Nadu butterflies have been extensively studied. The literature reviews from Tamil Nadu shows that the Nilgiri Biosphere supports nearly 300 species of butterflies (Larsen 1998) which is highest in Southern India. Eastern Ghats supports 150 species (Gunathilagaraj *et al.,* 1998), 75 species from Siruvani Reserved Forests (Arun 2003), 49 and 75 species from Anaikatty, Coimbatore region (Rathinasabapathy *et al.*,1998 ; Eswaran and Pramod 2005), and occurrence of *Neptis soma kallaura* Moore (1881) at Anaikatty (Daniel,B.A., and B. Rathinasabapathy 1998);

### Pollinator Garden

- Bees and butterflies are the major pollinating insects
- Butterflies are attractive much because of its beautiful colors
- Butterflies are known as winged birds
- Butterflies require open area for basking
- Butterflies require some kind of shelter against wind and rains
- During the normal, warm sunny summer days the butterflies prefer wide open areas like lawn and will seek soft soil i.e. sandy and like to have small puddles of water.
- Host plants for its larval stage
- Certain larvae are harmful and so care should be taken before planting host plants

## METHODS

To investigate the establishment of pollinator gardens for biodiversity conservation, we conducted a comprehensive review of existing literature from ecological, horticultural, and conservation science disciplines. We synthesized key findings and recommendations regarding garden design, plant selection, management practices, and community engagement strategies. Additionally, we analyzed case studies and empirical research on the ecological outcomes and societal impacts of pollinator garden initiatives across diverse landscapes and geographic regions. Through this interdisciplinary approach, we aimed to provide evidence-based guidance for planning and implementing successful pollinator garden projects.

## RESULTS AND DISCUSSION

Our analysis highlights several important factors to consider when establishing pollinator gardens for biodiversity conservation. Firstly, garden design should prioritize native plant species adapted to local environmental conditions, as they are more likely to support native pollinators and enhance ecological resilience. Additionally, incorporating a diverse array of flowering plants with staggered bloom times can ensure a continuous supply of nectar and pollen throughout the growing season, supporting pollinator populations year-round. Furthermore, providing nesting habitat such as bare ground, brush piles, and insect hotels can enhance the reproductive success of bees and other pollinators.

Moreover, community involvement and outreach are critical for the long-term success of pollinator garden projects. Citizen science programs, educational workshops, and volunteer opportunities can empower individuals to contribute to pollinator conservation efforts while fostering a sense of stewardship and environmental literacy. By engaging diverse stakeholders, including homeowners, schools, businesses, and local governments, pollinator gardens can serve as focal points for collective action and environmental advocacy.

Creating a pollinator garden involves establishing an environment that attracts butterflies, moths, bees, and wasps, often with the aim of encouraging butterfly and moth egg-laying. Butterflies primarily feed on flower nectar, and the selection of plants to attract them varies based on location, time of year, and environmental conditions. Numerous plant species are known to attract butterflies, are of low-maintenance, and add

beauty to the garden. Including "Host Plants" is crucial to provide a habitat for butterfly larvae (caterpillars), while "Nectar Plants" offer sustenance for adult butterflies.

The following plant list in Table 1 is based on field experience in and around Chennai, with potential adjustments needed based on specific landscapes. In Chennai, many local herbaceous and shrub plants support butterflies, but the insects particularly rely on flowering plants with diverse colors. To provide butterflies with shelter from predators and wind, hedges are ideal, although a combination of small trees, shrubs, climbers, and ground cover can offer a more comprehensive habitat. Interestingly, the plant species list suitable for butterfly environments is also conducive to lake restoration programs.

## Purpose of doing:

Establishing pollinator gardens can have numerous benefits for both the environment and local communities. Pollinator gardens are designed to attract and support a variety of pollinating insects such as bees, butterflies, moths, and birds. Here are some key benefits of establishing pollinator gardens.

**Biodiversity Conservation:**

Pollinator gardens help support a diverse range of insect and bird species, contributing to overall biodiversity conservation efforts. Many native pollinator species play crucial roles in ecosystem functions such as pollination and seed dispersal.

**Pollination of Crops:**

Pollinators such as bees are essential for the pollination of many crops grown in South India, including fruits, vegetables, and nuts. Establishing pollinator gardens nearby can increase the abundance and diversity of pollinators, leading to improved crop yields through enhanced pollination services.

**Improved Crop Quality:**

Pollination by bees and other pollinators can improve the quality of fruits and vegetables by ensuring more uniform fruit shape, size, and sweetness. This can benefit local farmers and contribute to better livelihoods.

**Ecosystem Services:**

Pollinator gardens provide various ecosystem services such as soil fertility, water retention, and carbon sequestration. These services are crucial for maintaining healthy ecosystems and supporting sustainable agriculture practices in South India.

**Educational Opportunities:**

Pollinator gardens can serve as outdoor classrooms where students and community members can learn about the importance of pollinators, native plant species, and ecosystem conservation. Education and awareness-raising initiatives can help foster a greater appreciation for the natural world and encourage conservation efforts.

**Aesthetic Value:**

Pollinator gardens can enhance the aesthetic appeal of urban and rural landscapes, providing colorful displays of flowers and attracting wildlife such as butterflies and birds. Well-designed gardens can also serve as peaceful retreats for people to relax and enjoy nature.

**Mitigation of Pollinator Decline:**

Globally, pollinator populations are facing decline due to habitat loss, pesticide use, and climate change. Establishing pollinator gardens in South India can help mitigate these declines by providing additional food and habitat resources for pollinators, contributing to their conservation.

To establish effective pollinator gardens it's important to prioritize native plant species that are well-adapted to the local climate and soil conditions (Table 1 and 2). Additionally, efforts should be made to minimize the use of pesticides and herbicides in and around the garden area to protect pollinators and other beneficial insects. Collaboration between government agencies, NGOs, local communities, and educational institutions can help support the establishment and maintenance of pollinator gardens across the region.

## Table-1, List of plants species suitable for the Pollinator Garden

| S.N | Species Name | Vernacular name | Type / Description |
|---|---|---|---|
| 1 | *Albizia lebbek* | Vaagai | Tree (Nectar / Food Source) |
| 2 | *Asclepias curassavica* | | Groundcover (Food Source, Resting spot) |
| 3 | *Butea monosperma* | Purasu | Tree (Nectar / Food Source) |
| 4 | *Caesalpinia corearia* | Diwi-divi | Tree (Food Source) |
| 5 | *Clerodendrum inerme* | Pee naari | Shrub (Food Source) |
| 6 | *Combretum albidum* | Odaikodi | Climber (Food Source) |
| 7 | *Canavalia virosa* | Esakottai | Climber (Food Source) |
| 8 | *Canthium coromandelicum* | Kaara mullu | Shrub (Nectar / Food Source) |
| 9 | *Capparis zeylanica* | Adondai | Climber (Food Source) |
| 10 | *Capparis sepiaria* | Karindu | Climber (Food Source) |
| 11 | *Cassia alata* | Semaiagathi | Shrub (Nectar /Food Source, Egg laying) |
| 12 | *Cassia tora* | | Shrub (Nectar / Food Source) |
| 13 | *Calliandra haematocephala* | | Shrub (Food Source) |
| 14 | *Courouptia guianensis* | Nagalingam | Tree (Food Source, Resting spot, Shelter) |
| 15 | *Crotalaria verrucosa* | Salangaisedi | Sub-shrub (Food Source, Resting spot) |
| 16 | *Delonix regia* | Mayilkoonai | Tree (Food Source) |
| 17 | *Derris ovalifolia* | Yannaikodi | Climber (Food Source) |
| 18 | *Derris scandens* | Nanchupattai | Climber (Food Source) |
| 19 | *Glycosmis mauritiana* | Konji | Shrub (Nectar /Food Source) |
| 20 | *Hibiscus rosa-sinensis* | Semburathi | Shrub (Food Source) |
| 21 | *Helicteres isora* | Vadampir | Tree (Food Source) |

| S.N | Species Name | Vernacular name | Type / Description |
|---|---|---|---|
| 22 | *Ixora arborea* | Koran | Shrub (Nectar /Food Source, Egg laying) |
| 23 | *Justicia adhatoda* | Adathodai | Shrub (Food Source) |
| 24 | *Lanata camara* | Unnichedi | Shrub (Food Source, Shelter) |
| 25 | *Lecas aspera* | Thumbai | Herb (Food Source) |
| 26 | *Maeura oblongifolia* | Mochukodi | Sub-shrub (Food Source, Resting spot) |
| 27 | *Murraya paniculata* | Alari | Shrub (Nectar / Food Source) |
| 28 | *Nerium oleander* | Kattu | Shrub (Nectar / Food Source) |
| 29 | *Ocimum basilicum* | Thulasi | Shrub (Food Source) |
| 30 | *Pavetta indica* | Pavettai | Tree (Nectar /Food Source) |
| 31 | *Pertocarpus marsupium* | Vengai | Tree (Food Source) |
| 32 | *Pertocarpus santalinus* | Santhanavengai | Tree (Food Source) |
| 33 | *Plumbago zeylanica* | Chittra moolam | Herb (Nectar / Food Source) |
| 34 | *Pongamia pinnata* | Pungan | Tree (Nectar / Food Source) |
| 35 | *Polyalthia longifolia* | Nettilingam | Tree (Food Source) |
| 36 | *Premna serratifolia* | Nalapinnai | Shrub (Food Source, Egg laying) |
| 37 | *Suregada angustifolia* | Padabattai | Tree (Food Source, Shelter) |
| 38 | *Senna auriculata* | Aavaram | Shrub (Nectar /Food Source) |
| 39 | *Ravolfia tetraphylla* | Pambukala | Shrub (Food Source) |
| 40 | *Tecoma smithii* | Sonnapatti | Shrub (Food Source) |
| 41 | *Toddalia asiatica* | Milagaranai | Shrub (Nectar / Food Source) |
| 42 | *Thunbergia grandiflora* | | Climber (Food Source) |
| 43 | *Woodfordia fruticosa* | Velakkai | Shrub (Food Source) |
| 44 | *Wrightia tinctoria* | Paalai | Shrub (Food Source) |
| 45 | *Ziziphus mauritiana* | Ilandhai | Tree (Nectar / Food Source) |

**Table: 2. Host plant of few butterfly species at the Adyar Eco Park**

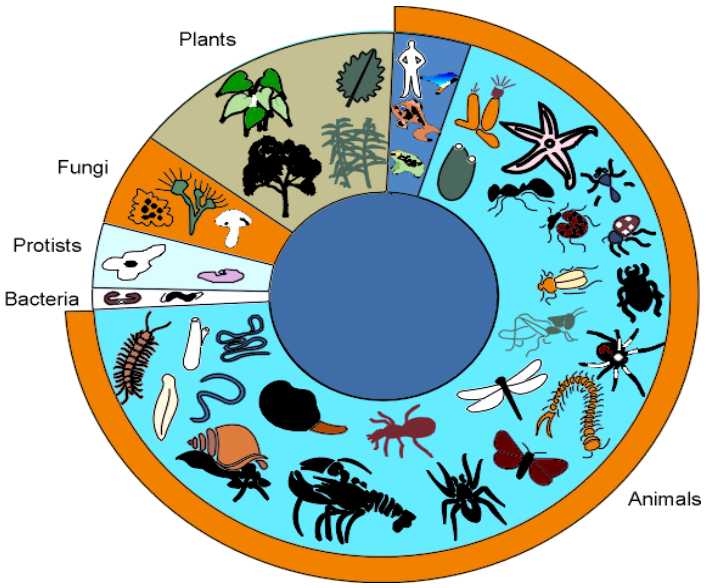
| S.No. | Host plant | Butterfly Species name | Remarks |
|---|---|---|---|
| 1 | *Aegle marmelos* | Lime butterfly (*Papilio demoleus*)<br>Common mormon ( P. Polytes) | Tree (Nectar / Food Source) |
| 2 | *Abutilon indicum* | African marbled skipper (*Gomalia elma_* | Shrub ( Nectar / Food Source |
| 3 | *Atlantia monophylla* | Lime butterfly (*Papilio demoleus*) | Tree (Nectar /Food Source) |
| 4 | *Butea monosperma* | Common emigrant (*Catopsilia Pomona* | Tree (Nectar / Food Source) |
| 5 | *Glycosmis mauritiana* | Common mormon ( *Papilio polytes)* | Shrub (Nectar /Food Source) |
| 6 | *Mitragyna parvifolia* | Common crow (*Euploea core*)<br>Blue tiger (*Tirumala limniace*)<br>Stirped tiger (*Danaus genutia*)<br>Lime butterfly (*Papilio demoleus*) | Tree (Nectar /Food Source) |
| 7 | *Pavetta indica* | Crimson rose (*Pachiopta hector*)<br>Common rose | Tree (Nectar /Food Source) |
| 8 | *Salvadora persica* | Small salmon Arab (*Colotis amata*) | Woody climber (Nectar /Food Source) |
| 9 | *Terminalia bellirica* | Brown awl (*Badamia exclamationis*) | Tree (Nectar /Food Source) |
| 10 | *Wrightia tinctoria* | Blue tiger (*Tirumala limniace*)<br>Common crow (*Euploea core*) | Tree (Nectar /Food Source) |
| 11 | *Turnea subulata* | Tawny coster (*Acraea terpiscore*) | Herb (Food, larval host plant) |
| 12 | *Asystasia gangetica* | Plain tiger (*Danaus chrysippus)*<br>Blue tiger (*Tirumala limniace*)<br>Lime butterfly (*Papilio demoleus*) | Herb (Nectar /Food Source) |

## Signages

The effective way of communication is to convey the message in a short and simple way. Few ideas we tried at different locations, which are working well. Example customized Art work on Steel, stone painting, carving, and plywood signages.

**Wall mount Butterfly (Steel)**

**Butterfly (Plywood model)**




98% of all animals are invertebrates
only 2% are vertebrates which include mammals, reptiles, birds, amphibians and fishes

**-Edwin O. Wilson.**

**Plate1. Some common butterflies observed**

Blue Pansy

Blue Tiger

Cholet Pansy

Common Caster

Common Grass Yellow

Common Gull

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