



# **A floristic study on herbs and climbing plants at Puducherry, South India: an approach to biodiversity conservation and regeneration through eco-restoration**

Rémi Saint-Amant, Raja Ponnuchamy, Arunachalam Pragasam, Soupramanien Aravajy, Prakash Patel, Lipi Das, Krishnamurthy Anupama

## **► To cite this version:**

Rémi Saint-Amant, Raja Ponnuchamy, Arunachalam Pragasam, Soupramanien Aravajy, Prakash Patel, et al.. A floristic study on herbs and climbing plants at Puducherry, South India: an approach to biodiversity conservation and regeneration through eco-restoration. Check List, 2013, 9 (3), pp.555-600. 10.15560/9.3.555. hal-02883131

**HAL Id: hal-02883131**

**<https://hal.science/hal-02883131>**

Submitted on 31 May 2021

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

# A floristic study on herbs and climbing plants at Puducherry, South India: An approach to biodiversity conservation and regeneration through eco-restoration

Raja Ponnuchamy<sup>1,2\*</sup>, Arunachalam Pragasam<sup>2</sup>, Soupramanien Aravajy<sup>1</sup>, Prakash Patel<sup>3</sup>, Lipi Das<sup>3</sup> and Krishnamurthy Anupama<sup>1</sup>

<sup>1</sup> French Institute of Pondicherry, Department of Ecology. 605 001, Puducherry, India.

<sup>2</sup> Kanchi Mamunivar Centre for Postgraduate Studies, Department of Plant Science. 605 008, Puducherry, India.

<sup>3</sup> Sri Aurobindo International Centre of Education, Project Ecolake. 605 002, Puducherry, India.

\* Corresponding Author. E-mail: [ponnuchamy.r@ifpindia.org](mailto:ponnuchamy.r@ifpindia.org)

**ABSTRACT:** A qualitative floristic exploration with life form classifications and monitoring of flowering and fruiting phenology has been carried out at a restored site near Puducherry, South India in 2009 and 2010. The species were classified into three categories based on their occurrence status, namely, Naturally Occurring, Naturally Regenerated and Introduced. The present study focuses only on two life forms, the Herbaceous and the Climbing plants. The site selected for eco-restoration originally comprised of an eroded and severely degraded landscape with scattered remnant species. However, active human intervention over a thirty year period included the introduction of appropriate plant species and other physical measures to enhance soil fertility and ground water level, and regenerate and conserve the deteriorating typical Tropical dry evergreen forest (TDEF) vegetation. A large number of naturally occurring herbaceous, climbing species (172) and a consistent number of naturally regenerated species (44) are now observed as a result of eco-restoration. Lowland herbaceous species have also established themselves as a green cover at ground level. At present, parts of the area have fertile soils and rich floristic composition with the herbaceous life form represented by 165 species encompassed in 105 genera and 37 families, and the climbing plants represented by 68 species belonging to 54 genera and 25 families. 'Genus to family' and 'species to genus' ratios indicate the establishment of diverse vegetation in the study site. Nearly one third of the species have been observed flowering throughout the year and about half of the species were observed fruiting throughout the year. We emphasize that the two fold approach of land and vegetation reclamation has been very effective in helping restore the unique TDEF vegetation at the local level and the same may be extended to help regenerate and conserve the Coromandel Coastal vegetation at the regional scale.

## INTRODUCTION

India occupies only 2.4% of the world's geographical area, but is endowed with a variety of bedrocks, soils, climates, flora and fauna. It represents a wide range of ecological diversity (Gupta *et al.* 2006). Around 69% of India's total geographical area (about 328 million hectares, further abbreviated as mha) is classified as arid (15.8%), semi-arid (37.6%) or dry sub-humid (16.5%) (Ajai *et al.* 2009). The Ministry of Environment and Forests of the Government of India has reported that 107.4 mha of the total geographical area is affected by desertification (MOEF 2007). About 72.1% of existing forests have lost the capacity for natural regeneration (Rai and Saxena 1997). In India, waste lands account for nearly 55.6 mha while 32.8 mha forests are degraded or open, but could be made fertile again if treated properly through eco-restoration (MOEF 2007; National Remote Sensing Centre (NRSC) and Ministry of Rural Development 2010).

*'Eco-restoration is the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed'* (Society for Ecological Restoration International Science and Policy Working Group 2004). In the present scenario, land and vegetation have deteriorated severely by high anthropogenic pressure that has led to unpredictable changes in the environments, eventually increasing the socio-economic crises. Hence high priority is needed

for their conservation. The International Coordinating Council for Man and the Biosphere (MAB), a programme of UNESCO in 1986, approved four new research orientations as approaches to ecosystem rehabilitation (Schreckenberger *et al.* 1990): (1) Ecosystem functioning under different intensities of human impact, (2) Management and restoration of human-impacted resources, (3) Human investment and resource use and (4) Human response to environmental stress. In this context, we surveyed the vegetation cover in a site that has been restored through active human intervention during the past thirty years. The importance of herbaceous strata is all the more critical in a hitherto completely denuded landscape, and thus formed our primary focus, emphasized in this paper.

Herbaceous vegetation plays an important role in nutrient conservation and as a source of food for herbivores (Yadav and Gupta 2007). The traditional use of climbing herbs still continues by ethnic communities. The variation in the richness and diversity of lianas in tropical forests has been taken into account (Gentry and Dodson 1987; Muthuramkumar and Parthasarathy 2000, Balfour and Bond 1993) though the biological basis for this remains little or poorly understood (Caballe and Martin 2001). Various studies on liana diversity and distribution in different areas such as the Western Ghats, Eastern Ghats and Coromandel Coast of peninsular India



highlighted anthropogenic pressures as a severe causal factor and afforestation as a priority especially needed in the Tropical dry evergreen forest (TDEF) of Coromandel Coast (Parthasarathy and Karthikeyan 1997; Sridhar Reddy and Parthasarathy 2003; Selwyn and Parthasarathy 2006; Muthumperumal and Parthasarathy 2009). The fact that our restored study site currently consists of a mosaic vegetation highlights the uniqueness of this check list that also tabulates actual observed reproductive phenology during the two years study period.

Phenology, the study of relationship between climatic factors and periodic biological phenomena in organisms, provides knowledge on the pattern of plant growth and development and selective pressures on flowering and fruiting behaviour (Opler *et al.* 1980; Zhang *et al.* 2006). Flowering of many herbaceous plants is influenced by environmental stimuli, mainly photoperiod and low temperature. Rainfall variability also plays an important role in the induction and length of flowering phenology (Sivaraj and Krishnamurthy 1989; Rivera and Borchert 2001; Borchert *et al.* 2004). Kramer (1997) stated that phenology and climate relationship can reveal the potential impacts of climate changes.

Ecological (Champion and Seth 1968; Blasco and Legris 1973; Meher-Homji 1973, 1974; Parthasarathy and Karthikeyan 1997; Ramanujam and Kadamban 2001; Sridhar Reddy and Parthasarathy 2003), taxonomical (Kadavul *et al.* 2004a, b; Ramanujam *et al.* 2007; Udayakumar and Parthasarathy 2010) and ethno-botanical (Parthasarathy *et al.* 2008) studies have been carried out in the surroundings of the study area which comprises a rich and diversified vegetation, termed as TDEF showing high bio-resource values that are being fragmented severely by anthropogenic pressures and all these authors have emphasized conservation as a high priority. The added value of the floral checklist presented here stems from its uniqueness in representing a successful thirty year eco-restoration effort as well as the broad spectrum of vegetation types characterizing Puducherry and its surrounding areas.

## MATERIALS AND METHODS

### Study site

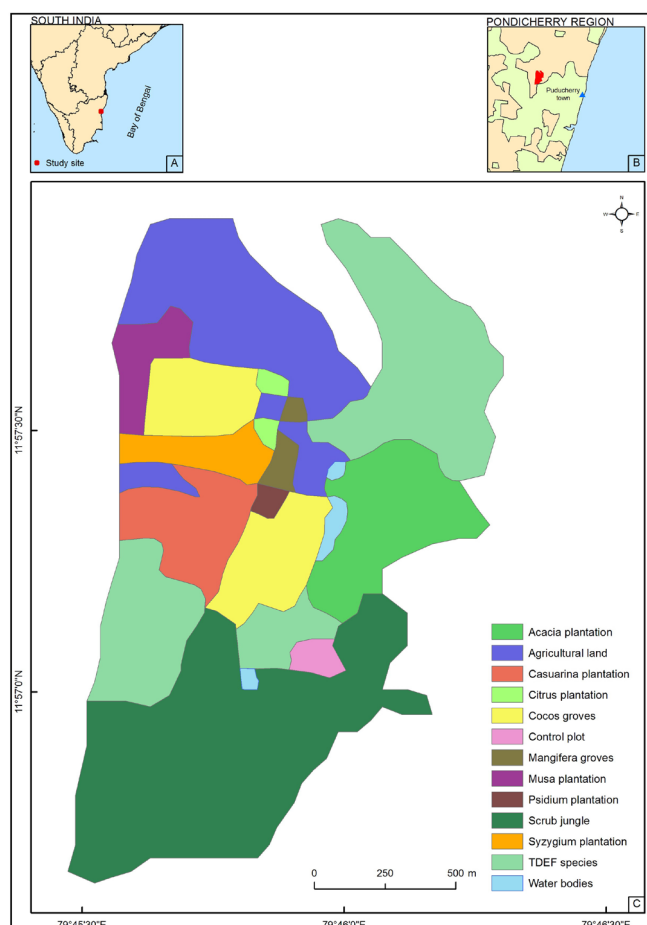
The studied site (11°57'8.3"N, 79°45'57.2"E, and 40-50 m a.s.l.) spreads over 160 ha on the Eastern shore of the fresh water Ousteri Lake and about 10 km West of Puducherry city (Figure 1). Of the total study area, 40 ha is characterized as Cuddalore sandstone formation with red ferralitic soil. This red terrain is highly eroded as evidenced by the stratified walls of gullies and pebbles of various sizes and shapes (Figure 2). The rest of the area is characterized by clay, sand and silt soils and a few places are alkaline in nature. In the last thirty years (1981 - 2010), total mean annual precipitation of  $1371 \pm 354$  mm (max= 2043, min= 845, median= 1333) and  $56 \pm 10$  rainy days (max= 82, min= 37, median= 56) have been recorded. The rainfall is highly seasonal, with 63% of total precipitation occurring between October and December. During the past 6 years, as per our field records, rains occurred mainly in the nights. The monthly mean maximum and minimum temperature were 36.4°C and 21.6°C in June and January respectively (Figure 3). Six to eight months of the year are

dry. Puducherry region has no major forest or hills, but has small patches of TDEF elements, deciduous forests, scrub jungles, sacred groves and mangroves. Coastal wetland species are also found here.

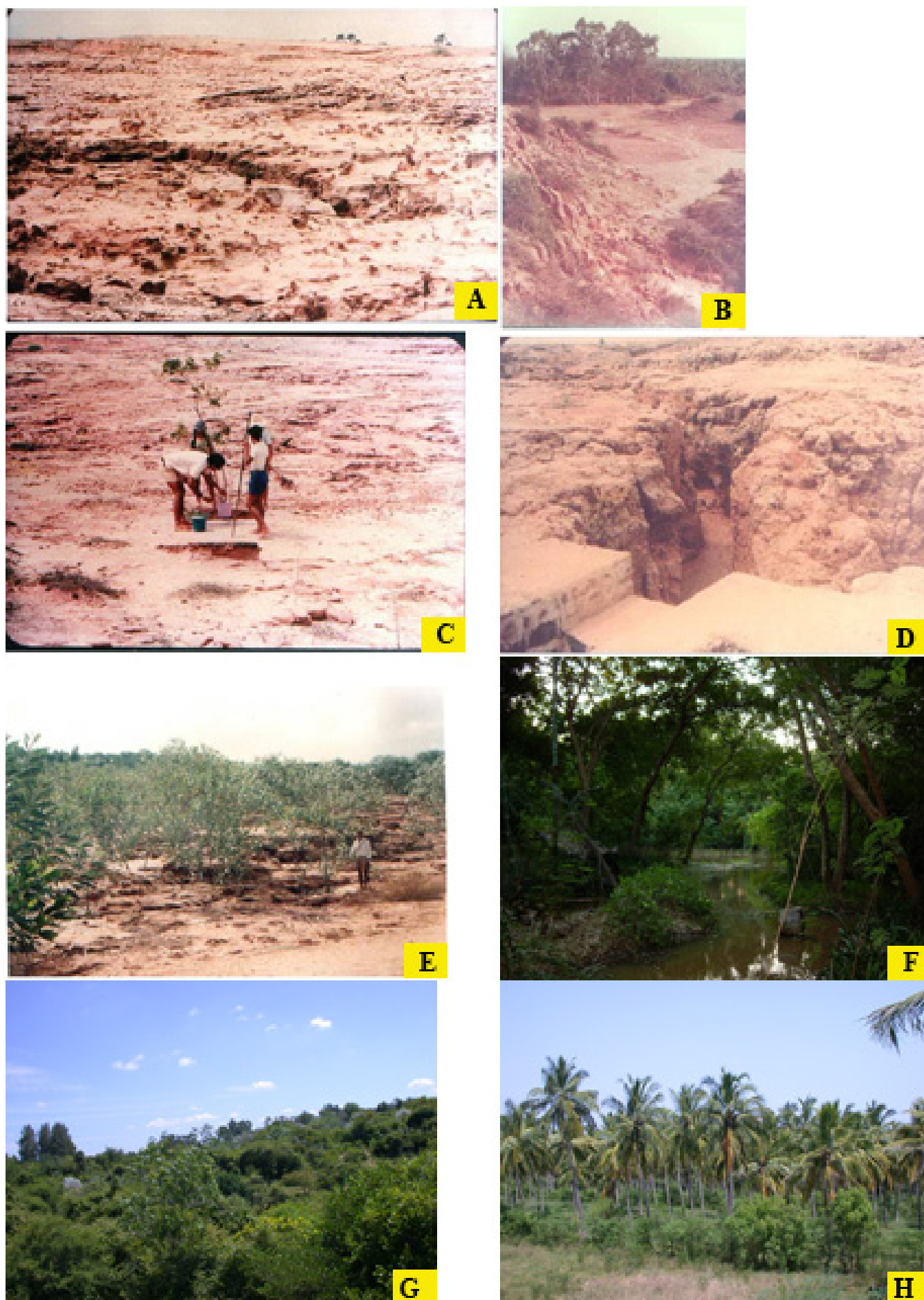
The original site comprising an eroded and severely degraded landscape with scattered remnant species was taken up for eco-restoration, maintaining a "control plot" reflecting the condition, thirty years back (Figure 2A - D). Eco-restoration comprised active human intervention through the introduction of drought tolerant soil nitrogen fixing species and TDEF elements; along with native pollinators, especially *Apis cerana* Fabricius that were found in the canyons of the original fragmented landscape; construction of check-dams along the gullies to prevent the soil erosion and conservation of rainwater to increase the soil fertility and ground water level; simultaneous development of nurseries for propagating the collected seeds and seedlings from various regions helped increase the diversity and richness of vegetation. As a result, the introduced TDEF species have established themselves and have naturally regenerated along the thickets in the past thirty years (Figure 2G). Lowland herbaceous species have also established themselves as a green cover at ground level, and soil texture has been transformed and the fertility increased.

### Data collection

A qualitative floristic exploration has been conducted in 2009 and 2010. Sampling was carried out on alternate



**FIGURE 1.** Study area, locating the site and its vegetation mosaic: A. south India; B. Pondicherry region highlighting study site and C. Vegetation of study site.



**FIGURE 2.** Land reclamation, conservation and regeneration of vegetation through eco-restoration: A. Degraded Landscape; B. Eroded Landscape; C. Planting of *Samanea saman*; D. Construction of check dam; E. Greening the landscape with *Acacia* spp.; F. Regenerated forest and rainwater harvesting; G. Established TDEF species in restored forest; H. Inter cropping in *Cocos nucifera* grove, photos by Project Ecolake.

days. All the species observed were collected and duly identified with the help of local floras (Bentham and Hooker 1862 - 1883; Gamble and Fischer 1915 - 1935; Matthew 1981 - 1983; Nair *et al.* 1983; Henry *et al.* 1987; Henry *et al.* 1989) and authentic herbaria. For all plant species documented, the binominal and author citation have been checked with International Plant Name Index (IPNI) in 2009. Voucher specimens were deposited in the Herbarium of the French Institute of Pondicherry (HIFP). Flowering and fruiting phenology were monitored and life forms were also categorized simultaneously according to their habits. The species were then classified, based upon their occurrence status (OS), into three categories namely 1. Naturally Occurring (NO), referring to species growing naturally thirty years back when the eco-restoration started; 2. Naturally Regenerated (NR), those species which established themselves during restoration and 3. Introduced (IN) are the species selected and planted for restoration. The list of NO plant species is based on a survey done beginning in 1979 with the help of botanists of the French Institute of Pondicherry (Prakash Patel 1999 - 2000). The binomial and author citations, life forms, occurrence status, reproductive phenology and available Tamil names of the species observed are presented in Table 1. For most of the species, a complete photographic documentation is also presented (Figures 4-35).

## RESULTS AND DISCUSSION

### Floristic composition

In the overall floristic survey, seven life forms, namely Herbs, Trees, Shrubs, Climbers, Grasses, Sedges and Epiphytes have been recorded. The present study focuses only on Herbaceous (H) including prostrate, procumbent, spreading herbs, sub-shrubs and under shrubs and

Climbing life forms (C) including tendril and non-tendril climbers, vines, runners, lianas, stragglers, ramblers and twiners. Altogether 233 species belonging to 157 genera and 56 families were enumerated (Table 1 and 2); this comprised 165 species belonging to 105 genera and 37 families under herbaceous life form and 68 species belonging to 54 genera and 25 families under climbing plants. The present study includes 56 of the 206 families proposed in Bentham and Hooker (1862 - 1883) system of classification with subsequent modifications as in the flora of Tamil Nadu (Nair *et al.* 1983; Henry *et al.* 1987; Henry *et al.* 1989). The high resolution photographic documentation of 190 species, arranged in alphabetical order of families then by species (Figures 4-35) will facilitate field identification, as such documentation, especially for herbs which are pictorially less represented so far. Tamil vernacular names are provided in this check list with a view to make this available to the non-specialist also.

The actual number of herbs and climbers recorded in the present study *vis à vis* their occurrence in Puducherry and the Southern Coromandel Coastal region have been systematically compiled and summarized in table 3 from published literatures (Parthasarathy and Karthikeyan 1997; Sridhar Reddy and Parthasarathy 2003; Kadavul *et al.* 2004a, b; Ramanujam *et al.* 2007; Parthasarathy *et al.* 2008; Padmavathy *et al.* 2010; Udayakumar and Parthasarathy 2010); the table also provides information on the actual numbers of species, genera and families reported in each of the studies and details the respective site detail. We have compiled this table in order to highlight the conservation value of the eco-restoration carried out in our study site at a regional level. About 50% of species listed in these earlier works, spread over

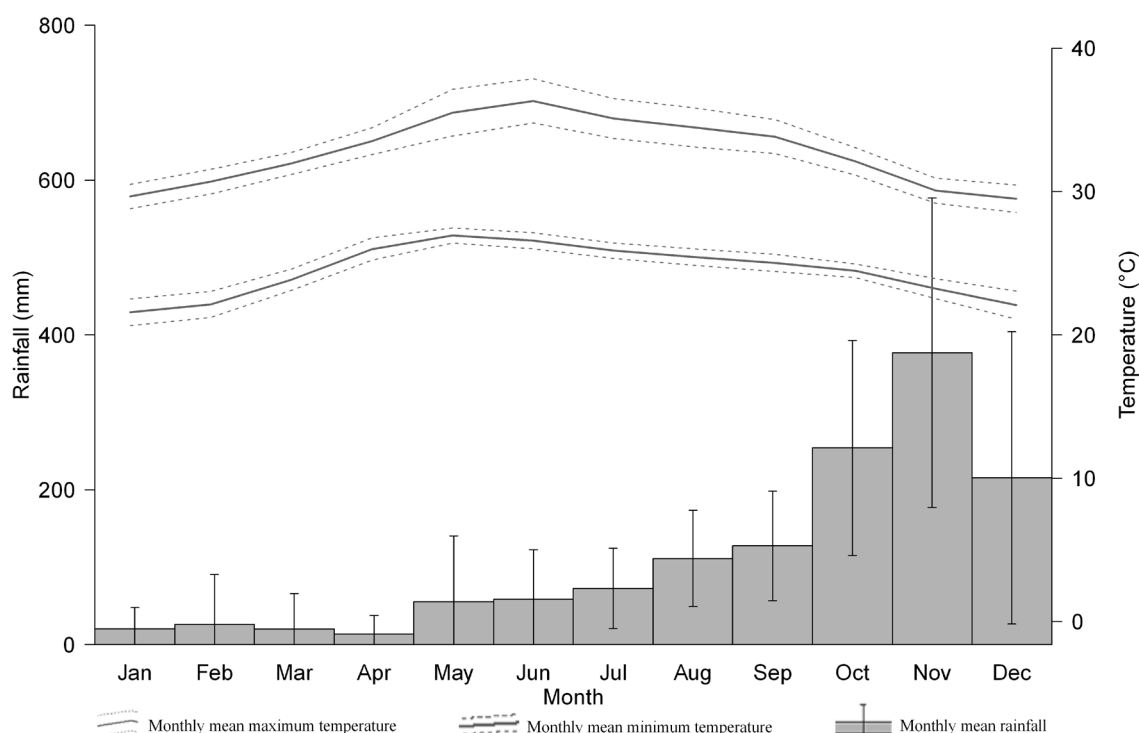


FIGURE 3. Pattern of thirty years (1981-2010) monthly total rainfall and monthly mean maximum and mean minimum temperature.

a wider geographic area, were enumerated in the present study site.

Out of the herbs and climbers observed, Fabaceae is well represented with the largest number of genera (19) and species (31), followed by Asteraceae (14, 17), Euphorbiaceae (7, 16), Amaranthaceae (11, 14), Acanthaceae (10, 12) and Convolvulaceae (6, 12); these six dominant families together comprise ~ 44% of the species in the two life forms reported here. The present study is in conformity with the earlier works of Ramanujam and Kadamban (2001), who have enumerated 169 angiosperms species around Puducherry and reported Fabaceae as the most speciose family in this area. Padmavathy et al. (2010) reported single species occurrence in 14 families. In our study, single species occurrence was found in 21 families and 116 genera. The three Monocotyledones families observed include 5 genera each with only one species per genus (Table 2).

The overall 'genus to family' (G/F) ratio in the present study is observed to be  $2.80 \pm 3.54$  (max= 19, min= 1, mean= 2.80 and median= 1), it is  $2.84 \pm 3.43$  (max= 14, min= 1, mean= 2.84 and median= 1) for herbaceous and  $2.16 \pm 2.08$  (max= 8, min= 1, mean= 2.16 and median= 1) for climbing life forms. Similarly the 'species to genus' ratio (S/G) is marked by  $1.48 \pm 0.97$  (max= 6, min= 1, mean= 1.48 and median= 1) for all species observed. It is observed to be  $1.57 \pm 1.05$  (max= 6, min= 1, mean= 1.57 and median= 1) for herbs and  $1.26 \pm 0.71$  (max= 4, min= 1, mean= 1.26 and median= 1) for climbing plants. It means that relatively diverse vegetation is established in the study site, as suggested by Pielou (1975) and Magurran (2004) who opine that, in intuitive terms, hierarchical (taxonomic) diversity will be higher in an area in which the species are divided amongst many genera as opposed to one in which most species belong to the same genus, and still higher as these genera are divided amongst many families as opposed to a few. The genus, *Euphorbia* is found here to be the one with the most species (6), followed by *Heliotropium* (5), *Cleome*, *Crotalaria*, *Hedyotis*, *Indigofera*, *Ipomoea*, *Jasminum*, *Leucas*, *Mollugo*, *Phyllanthus* and *Sida* (4 species each). According to occurrence status, 172 species were found to be NO, 44 NR and 17 IN (Table 1 and 2). Among these, a large number of NO herbaceous, climbing species and a consistent number of NR species are now observed as a result of eco-restoration. The relative family (RF), genus (RG) and species (RS) values obtained are higher for herbs as compared to the climbing life form. Therefore, these findings suggest that the prevailing environmental conditions of the present study site favour the herbaceous taxa.

Species communities generally vary along ecological conditions, such as soil type and moisture content (Sollins 1998). Past phytosociological studies within the Pondicherry region have revealed that the micro-geographic variation in species richness and abundance particularly determine the species composition (Dabholkar 1962; Marlange and Meher-Homji 1965; Antony 1982). In this study *Striga densiflora* was found to be established well in association with grasses especially *Chrysopogon fulvus* in the red ferrallitic soil. Dugje et al. (2006) stated that same

species occupied 27 - 60% of millet fields in the savanna zones of northeast Nigeria. In the present eco-restoration site, *Boerhavia diffusa* and *Trianthema portulacastrum* flourish in clay soil with coarse sand. Sharma (1981) stated both of the above species show similar distribution in the semi-arid regions of India. In our study *Ammannia baccifera*, *Biophytum sensitivum*, *Phyla nodiflora*, *Polygala erioptera* and *P. javana* are found in stagnant water bodies or moist shady places. Interestingly, these are also reported in different parts of India (Kumar and Narain 2010; Murty and Venkaiah 2011) and other countries (Chmaitelly et al. 2009 and Harun-or-Rashid et al. 2009) in coastal and wetland habitats. We found that sandy-silt soil favours species like *Crotalaria medicaginea*, *Evolvulus alsinodes*, *Hedyotis* spp., *Mollugo* spp., and *Polycarpaea corymbosa*; *Enicostema axillare* grows well in alkaline soil; *Euphorbia rosea* and *Tiliacora acuminata* are common in *Casuarina equisetifolia* plantations and *Mangifera indica* groves respectively. Similar observation was done in the broad spectrum survey from the region of Tamil Nadu (Gamble and Fischer 1915 - 1935; Matthew 1981 - 1983). The analysis of species distribution patterns along environmental gradients is important for understanding the diversity and ecology of plants and species response to climate change, but detailed information are surprisingly scarce for the tropics (Wong and Whitmore 1970; Sollins 1998; Chaturvedi et al. 2011; Toledo et al. 2012). However, small scale regional studies, continuously over a long period, are needed to understand the dynamics of species distribution with reference to spatial and temporal factors.

#### Flowering and fruiting phenology

Nearly one third of the total observed species were flowering through the year; with most flowering having peaked in November and December. More rainfall, a shorter photoperiod and lower (mean maximum 30°C) temperatures were recorded in this season. This study reveals that, of the observed species, most among the herbaceous life form do not show well defined vegetative and reproductive phenological phases. Although the peak flowering of most of the herbaceous species was observed after rainfall (personal observation), a considerable number of species did flower during the peak of summer. Several species initiated flowering from March onwards. Our findings on phenology are generally in agreement with those of Lang (1965); Sivaraj and Krishnamurthy (1989); Rivera and Borchert (2001); Ramirez (2002); Sridhar Reddy and Parthasarathy (2003). Climbing plants, mostly belonging to Asclepiadaceae, Menispermaceae and Vitaceae recorded flowering peak in the dry months between March and August. The results of the present study are in conformity with earlier ones obtained from other regions (Kephart 1987; Morellato and Leitao-Filho 1996). Seasonal variation in the availability of water and light should place physiological and thus evolutionary constraints on the phenologies of tropical forest plants (van Schaik et al. 1993; Wright 1996; Lieberman 1982; Borchert et al. 2004; Hamann 2004; Zimmerman et al. 2007).



**TABLE 1.** Binomials of Herbaceous (H) and Climbing (C) plants, their life forms (LF), occurrence status (OS), reproductive phenology and available Tamil vernacular names of the eco-restoration site. Note: 01-12 =January-December; Acc. No= Accession Number.

| FAMILY / BINOMIAL / AUTHOR CITATION   | ACC.NO | LF | OS | FLOWERING                  | FRUITING         | VERNACULAR NAME                      |
|---|--------|----|----|----------------------------|------------------|--------------------------------------|
| <b>Acanthaceae</b>  |        |    |    |                            |                  |                                      |
| <i>Andrographis paniculata</i> (Burm. f.) Wall. ex Nees                       | 25348  | H  | NR | 12 - 03; 07 - 09 (12 - 02) | 03 - 12          | Nila vaambu                          |
| <i>Asystasia gangetica</i> (L.) T. And.                                       | 25477  | H  | NR | 12 - 03; 07 - 09 (12 - 02) | 03 - 12          | -                                    |
| <i>Barleria prionitis</i> L.  | 25349  | H  | NO | 11 - 01                    | 12 - 03          | Kaattu kanagaambaram                 |
| <i>Blepharis maderaspatensis</i> (L.) Heyne ex Roth                           | 24869  | H  | NO | 01 - 05                    | 01 - 12          | Kozhimookkan, Kooravaalchedi         |
| <i>Dipteracanthus patulus</i> (Jacq.) Nees                                    | 25078  | H  | NO | 12 - 02                    | 12 - 03          | -                                    |
| <i>Dipteracanthus prostratus</i> (Poir.) Nees                                 | 25758  | H  | NR | 01 - 12                    | 01 - 12          | Vedichchedi, Pottakanchi             |
| <i>Dyschoriste madurensis</i> (Burm. f.) Kuntze                               | 25782  | H  | NO | 12 - 05 (03)               | 01 - 12          | -                                    |
| <i>Indoneesiella echinoides</i> (L.) Sreemadh.                                | 25017  | H  | NO | 06 - 08                    | 06 - 09          | Gopuranthaangi                       |
| <i>Justicia procumbens</i> L.   | 25378  | H  | NO | 01 - 12 (12 - 03)          | 03 - 09          | Ottu pillu                           |
| <i>Justicia prostrata</i> (C. B. Clarke) Gamble                               | 25133  | H  | NO | 01 - 06; 10 - 12 (11 & 12) | 01 - 06; 10 - 12 | -                                    |
| <i>Lepidagathis cristata</i> Willd.   | 25134  | H  | NO | 01 - 10 (01 - 02)          | 05 - 10          | Karappan poondu                      |
| <i>Ruellia tuberosa</i> L.  | 25141  | H  | NO | 01 - 12                    | 01 - 12          | -                                    |
| <b>Agaveaceae</b>   |        |    |    |                            |                  |                                      |
| <i>Sansevieria roxburghiana</i> Schultes & Schultes f.                        | 24890  | H  | NO | 07 - 09                    | 07 - 10          | Marul, Mottamanjji                   |
| <b>Aizoaceae</b>  |        |    |    |                            |                  |                                      |
| <i>Trianthema portulacastrum</i> L.   | 24928  | H  | NR | 03 - 11 (07 - 10)          | 05 - 12          | Mookaratai                           |
| <i>Trianthema triquetra</i> Rottl. ex Willd.                                  | 25778  | H  | NO | 11 - 03                    | 01 - 12          | Nilappasali                          |
| <b>Amaranthaceae</b>  |        |    |    |                            |                  |                                      |
| <i>Achyranthes aspera</i> L.  | 25761  | H  | NO | 01 - 12 (01 - 03)          | 01 - 12          | Naaiyuruvi                           |
| <i>Aerva lanata</i> (L.) Juss. ex Schultes                                    | 24851  | H  | NO | 01 - 12 (12 - 03)          | 01 - 12          | Koolappoo, Poolaippoo                |
| <i>Allmania nodiflora</i> (L.) R. Br. ex Wight var. <i>nodiflora</i> Hook. f. | 25194  | H  | NO | 01 - 12 (01 - 04)          | 01 - 12          | Vallikeerai, Kumuttikeerai           |
| <i>Alternanthera paronychioides</i> A. St.                                    | 25792  | H  | NO | 01 - 12 (11 - 01)          | 01 - 12          | -                                    |
| <i>Alternanthera pungens</i> Kunth.   | 25058  | H  | NO | 08 - 12                    | 08 - 12          | Thevadiyaal mul, Ottara mul          |
| <i>Alternanthera sessilis</i> (L.) R. Br. ex DC.                              | 25196  | H  | IN | 01 - 12 (11 - 01)          | 01 - 12          | Ponnaankannikkeerai                  |
| <i>Amaranthus spinosus</i> L.   | 24945  | H  | NO | 01 - 12 (11 & 12)          | 01 - 12          | Mullukkeerai                         |
| <i>Amaranthus viridis</i> L.  | 25793  | H  | NO | 01 - 12 (11 & 12)          | 01 - 12          | Kuppaikkeerai                        |
| <i>Celosia argentea</i> L.  | 25019  | H  | NO | 01 - 12                    | 01 - 12          | Makilikkeerai, Pannaippoo            |
| <i>Digera muricata</i> (L.) Mart.   | 24949  | H  | NR | 01 - 12 (11 - 03)          | 03 - 12          | Sunnaambukkeerai                     |
| <i>Gomphrena serrata</i> L.   | 25112  | H  | NR | 01 - 12 (01 - 03)          | 01 - 12          | Vaadaamalligai                       |
| <i>Psilotrichum nudum</i> (Heyne ex Wall.) Moq.                               | 25802  | H  | NO | 10 - 02                    | 01 - 12          | -                                    |
| <i>Pupalia lappacea</i> (L.) Juss   | 25092  | H  | NO | 11 - 02 (01)               | 12 - 03          | Adai-otti                            |
| <i>Trichurus monsoniae</i> (L. f.) Townsend                                   | 25162  | H  | NO | 11 - 03 (02)               | 03 - 04          | -                                    |
| <b>Apocynaceae</b>  |        |    |    |                            |                  |                                      |
| <i>Catharanthus pusillus</i> (Murr.) G. Don                                   | 25218  | H  | NO | 07 - 02 (11 - 01)          | 08 - 03          | Milagai poondu, Paalaich chethai     |
| <i>Catharanthus roseus</i> (L.) G. Don  | 24921  | H  | IN | 01 - 12                    | 01 - 12          | Sudukattu mallikai, Nithyakalyaani   |
| <i>Ichnocarpus frutescens</i> (L.) R. Br.                                     | 25104  | C  | NO | 06 - 10; 12 - 02 (02 & 12) | 06 - 10; 12 - 02 | Manipilaan kodi, Udarkodi, Paravalli |
| <b>Aristolochiaceae</b>   |        |    |    |                            |                  |                                      |
| <i>Aristolochia indica</i> L.   | 25043  | C  | NO | 12 - 02                    | 01 - 12          | Perumarunthukodi, Urikkalchedi       |
| <b>Asclepiadaceae</b>   |        |    |    |                            |                  |                                      |
| <i>Ceropegia juncea</i> Roxb.   | 25350  | C  | NO | 12 - 02                    | 01 - 03          | -                                    |

TABLE 1. CONTINUED.

| FAMILY / BINOMIAL / AUTHOR CITATION                 | ACC.NO | LF | OS | FLOWERING                  | FRUITING         | VERNACULAR NAME                            |
|---|--------|----|----|----------------------------|------------------|--|
| <i>Gymnema sylvestre</i> (Retz.) R. Br. ex Schultes | 25787  | C  | NO | 08 - 03                    | 10 - 03          | Kannu minnayam kodi, Pasaani, Shirukurinja |
| <i>Leptadenia reticulata</i> (Retz.) Wight & Arn.   | 25784  | C  | NO | 05 - 08                    | 07 - 09          | Palaikkodi, Paalai keeral                  |
| <i>Pentatropis capensis</i> (L. f.) Bullock         | 25777  | C  | NO | 04 - 07                    | 06 - 10          | Uppili                                     |
| <i>Pergularia daemia</i> (Forssk.) Chiov.           | 25755  | C  | NO | 11 - 06 (01 - 03)          | 01 - 12          | Vaelipparuthi                              |
| <i>Sarcostemma intermedium</i> Decne.               | 25128  | C  | NO | 03 - 04; 09 - 12 (04 & 09) | 03 - 04; 09 - 12 | Kodikhalli                                 |
| <i>Tylophora indica</i> (Burm. f.) Merr.            | 25030  | C  | NO | 08 - 09 (08)               | 08 - 09          | Nanglaippirattai                           |
| <i>Wattakaka volubilis</i> (L. f.) Stapf            | 24931  | C  | NO | 03 - 04                    | 04 - 06          | Kurinjaa                                   |
| Asteraceae  |        |    |    |                            |                  |  |
| <i>Acanthospermum hispidum</i> DC.                  | 25090  | H  | NO | 12 - 03 (12 - 02)          | 12 - 06          | Kombumul, Mullichedi                       |
| <i>Ageratum conyzoides</i> L.                       | 25763  | H  | NO | 08 - 03 (01)               | 01 - 12          | Vaadaichedi                                |
| <i>Blainvillea acmella</i> (L.) Philipson           | 24859  | H  | NR | 12 - 01                    | 01 - 05          | -  |
| <i>Blumea lacera</i> (Burm. f.) DC.                 | 24971  | H  | NR | 11 - 04 (01)               | 03 - 06          | Thaevuppula, Navakkarandai                 |
| <i>Blumea obliqua</i> (L.) Druce                    | 24904  | H  | NR | 12 - 04 (01)               | 03 - 05          | -  |
| <i>Eclipta prostrata</i> (L.) L.                    | 24872  | H  | NO | 07 - 12 (11)               | 08 - 01          | Karisilaanganni                            |
| <i>Emilia sonchifolia</i> (L.) DC.                  | 25766  | H  | NO | 10 - 04 (12 - 02)          | 02 - 05          | -  |
| <i>Epaltes divaricata</i> (L.) Cass.                | 24901  | H  | NR | 12 - 03 (12 & 01)          | 03 - 05          | -  |
| <i>Helianthus annuus</i> L.                         | 25086  | H  | IN | Cultivated                 | Cultivated       | Sooriaganthi                               |
| <i>Parthenium hysterophorus</i> L.                  | 25206  | H  | NO | 01 - 12                    | 01 - 12          | -  |
| <i>Sphaeranthus indicus</i> L.                      | 25595  | H  | NO | 12 - 03                    | 03 - 06          | Kottaikaranthai                            |
| <i>Tridax procumbens</i> L.                         | 25137  | H  | NO | 01 - 12                    | 01 - 12          | Kenathuppoondu, Vettukkaaya-thalai         |
| <i>Vernonia albicans</i> DC.                        | 25479  | H  | NO | 01 - 05; 07 - 08 (01)      | 03 - 05; 08 - 11 | -  |
| <i>Vernonia cinerea</i> (L.) Less.                  | 25158  | H  | NO | 01 - 12 (01)               | 01 - 12          | Mukuttipundu                               |
| <i>Vernonia elaeagnifolia</i> DC.                   | 25786  | C  | IN | 12 - 03                    | 03 - 04          | -  |
| <i>Vicoa indica</i> (L.) DC.                        | 25012  | H  | NO | 05 - 09 (06)               | 06 - 10          | -  |
| <i>Xanthium indicum</i> Koen.                       | 24996  | H  | NO | 03 - 04                    | 01 - 12          | Ottarachedi                                |
| Bignoniaceae  |        |    |    |                            |                  |  |
| <i>Tecomaria capensis</i> (Thunb.) Spach            | 25803  | C  | IN | 03 - 06                    | 03 - 06          | -  |
| Boraginaceae  |        |    |    |                            |                  |  |
| <i>Goldenia procumbens</i> L.                       | 25159  | H  | NO | 04 - 08 (08)               | 04 - 08          | Seruppada                                  |
| <i>Heliotropium bracteatum</i> R. Br.               | 24923  | H  | NO | 02 - 03; 07 - 08           | 03 - 09          | -  |
| <i>Heliotropium indicum</i> L.                      | 24963  | H  | NO | 12 - 03; 07 - 09           | 01 - 12          | Thael kodukku poond                        |
| <i>Heliotropium marifolium</i> Retz.                | 24970  | H  | NO | 04 - 09                    | 04 - 09          | -  |
| <i>Heliotropium supinum</i> L.                      | 24898  | H  | NO | 03 - 04; 09 - 10 (09)      | 03 - 04; 09 - 10 | -  |
| <i>Heliotropium zeylanicum</i> (Burm. f.) Lam.      | 24979  | H  | NO | 12 - 02; 08 - 09           | 01 - 12          | -  |
| <i>Trichodesma indicum</i> (L.) R. Br.              | 25474  | H  | NO | 03 - 12                    | 05 - 12          | Kali thumbai, Kaasitthumbai                |
| Caesalpiniaceae                                     |        |    |    |                            |                  |  |
| <i>Cassia mimosoides</i> L.                         | 25772  | H  | NO | 02 - 06                    | 04 - 09          | -  |
| <i>Cassia tora</i> L.                               | 25191  | H  | NR | 11 - 02; 06 - 08           | 03; 06 - 08      | Tagarai                                    |
| Capparidaceae                                       |        |    |    |                            |                  |  |
| <i>Capparis sepiaria</i> L.                         | 24990  | C  | NO | 03 - 05                    | 04 - 08          | Thoratti, Karunjurai                       |
| <i>Capparis zeylanica</i> L.                        | 25353  | C  | NO | 02 - 04                    | 04 - 06          | Suduthorati, Adondai                       |
| <i>Maerua oblongifolia</i> (Forssk.) A. Rich.       | 25002  | C  | NO | 06 - 08                    | 06 - 09          | Mochukkodi                                 |



TABLE 1. CONTINUED.

| FAMILY / BINOMIAL / AUTHOR CITATION                     | ACC.NO | LF | OS | FLOWERING             | FRUITING         | VERNACULAR NAME          |
|---|--------|----|----|-----------------------|------------------|--------------------------|
| <b>Caryophyllaceae</b>                                  |        |    |    |                       |                  |                          |
| <i>Polycarpha corymbosa</i> (L.) Lam.                   | 25472  | H  | NR | 01 - 03               | 01 - 04          | Palli poondu             |
| <b>Celastraceae</b>                                     |        |    |    |                       |                  |                          |
| <i>Reissantia indica</i> (Willd.) Halle                 | 25152  | C  | NO | 09 - 03; 05 - 07 (06) | 09 - 03; 05 - 07 | Odankodi, Morasarakodi   |
| <b>Cleomaceae</b>                                       |        |    |    |                       |                  |                          |
| <i>Cleome aspera</i> Koen. ex DC.                       | 25774  | H  | NO | 01 - 12               | 01 - 12          | -                        |
| <i>Cleome chelidonii</i> L. f.                          | 25759  | H  | NO | 02 - 05               | 03 - 06          | -                        |
| <i>Cleome gynandra</i> L.                               | 24943  | H  | NR | 03 - 09               | 03 - 09          | Nalla velai              |
| <i>Cleome viscosa</i> L.                                | 25741  | H  | NO | 01 - 12               | 01 - 12          | Naivelai, Naikadugu      |
| <b>Combretaceae</b>                                     |        |    |    |                       |                  |                          |
| <i>Combretum albidum</i> G. Don                         | 25789  | C  | NO | 03 - 05               | 05 - 07          | Odaikodi                 |
| <i>Quisqualis indica</i> L.                             | 24918  | C  | IN | 01 - 12               | 01 - 12          | Irangoon mallikai        |
| <b>Commelinaceae</b>                                    |        |    |    |                       |                  |                          |
| <i>Amischophacelus axillaris</i> (L.) R. Rao & Kamm.    | 25773  | H  | NO | 11 - 01 (12)          | 01               | -                        |
| <i>Commelina benghalensis</i> L.                        | 25740  | H  | NO | 01 - 12 (08)          | 01 - 12          | Kanavaazhai              |
| <i>Cyanotis tuberosa</i> (Roxb.) Schultes & Schultes f. | 25744  | H  | NO | 01 - 12 (11 & 12)     | 01 - 12          | -                        |
| <b>Convolvulaceae</b>                                   |        |    |    |                       |                  |                          |
| <i>Evolvulus alsinoides</i> (L.) L.                     | 25508  | H  | NO | 01 - 12 (01 - 03)     | 06 - 12          | Vishnukiranthi           |
| <i>Evolvulus nummularius</i> (L.) L.                    | 25788  | H  | NO | 01 - 12 (11 - 01)     | 01 - 12          | -                        |
| <i>Hewittia sublobata</i> (L. f.) Kuntze                | 25754  | C  | NR | 12 - 03               | 01 - 05          | -                        |
| <i>Ipomoea indica</i> (Burm. f.) Merr.                  | 24914  | C  | IN | 11 - 04               | 01 - 09          | -                        |
| <i>Ipomoea obscura</i> (L.) Ker-Gawl.                   | 25126  | C  | NR | 01 - 12 (02 - 06)     | 01 - 12          | Sirutalai                |
| <i>Ipomoea pes-tigridis</i> L.                          | 25106  | C  | NR | 01 - 12 (11 - 03)     | 01 - 12          | Pulichovadi, Punaikkirai |
| <i>Ipomoea sepiaria</i> Koen. ex Roxb.                  | 25140  | C  | NR | 01 - 12 (11 - 03)     | 01 - 12          | Thazhakkodi              |
| <i>Jacquemontia paniculata</i> (Burm. f.) Hall. f.      | 25798  | C  | IN | 10 - 04 (12 - 02)     | 01 - 12          | -                        |
| <i>Merremia aegyptia</i> (L.) Urban                     | 25764  | C  | NO | 03 - 07               | 04 - 08          | -                        |
| <i>Merremia emarginata</i> (Burm. f.) Hall. f.          | 25116  | C  | NO | 03 - 07               | 03 - 07          | Yelikkaadhu Keerai       |
| <i>Merremia tridentata</i> (L.) Hall. f.                | 24867  | C  | NO | 01 - 12               | 01 - 12          | -                        |
| <i>Porana paniculata</i> Roxb.                          | 25202  | C  | IN | 11 - 01 (12)          | 01 - 03          | -                        |
| <b>Cucurbitaceae</b>                                    |        |    |    |                       |                  |                          |
| <i>Coccinia grandis</i> (L.) Voigt                      | 25339  | C  | NO | 09 - 05 (12 - 03)     | 11 - 05          | Kovai                    |
| <i>Ctenolepis garcinii</i> (Burm. f.) Clarke            | 24951  | C  | NO | 11 - 02 (12)          | 01 - 04          | -                        |
| <i>Cucumis melo</i> L.                                  | 25077  | C  | NO | 09 - 03               | 02 - 07          | -                        |
| <i>Diplocyclos palmatus</i> (L.) Jeffrey                | 25781  | C  | NO | 01 - 03 (01)          | 03 - 05          | -                        |
| <i>Mukia maderaspatana</i> (L.) M. Roem.                | 25122  | C  | NO | 05 - 12               | 05 - 02          | Mosumosukkal             |
| <b>Euphorbiaceae</b>                                    |        |    |    |                       |                  |                          |
| <i>Acalypha indica</i> L.                               | 25199  | H  | NO | 01 - 12               | 01 - 12          | Kuppaimaeni              |
| <i>Acalypha lanceolata</i> Willd.                       | 25036  | H  | NO | 01 - 04; 08           | 01 - 12          | -                        |
| <i>Croton bonplandianus</i> Bail.                       | 24858  | H  | NO | 01 - 12 (04 - 06)     | 01 - 12          | Reil Poondu              |
| <i>Euphorbia cyathophora</i> Murr.                      | 25795  | H  | NR | 01 - 12               | 01 - 12          | -                        |
| <i>Euphorbia heyneana</i> Spreng.                       | 25779  | H  | NO | 01 - 12               | 01 - 12          | -                        |
| <i>Euphorbia hirta</i> L.                               | 25605  | H  | NO | 01 - 12               | 01 - 12          | Amampatchairisi          |

TABLE 1. CONTINUED.

| FAMILY / BINOMIAL / AUTHOR CITATION                          | ACC.NO | LF | OS | FLOWERING                  | FRUITING   | VERNACULAR NAME                        |
|--|--------|----|----|----------------------------|------------|--|
| <i>Euphorbia rosea</i> Retz.                                 | 24998  | H  | NO | 03 - 05                    | 05 - 06    | -                                      |
| <i>Euphorbia serpens</i> H. B. K.                            | 24905  | H  | NR | 03 - 05                    | 05 - 06    | -                                      |
| <i>Euphorbia thymifolia</i> L.                               | 25776  | H  | NO | 04 - 06                    | 05 - 07    | Chinnaman pacharisi                    |
| <i>Phyllanthus amarus</i> Schum. & Thonn.                    | 25743  | H  | NO | 01 - 12 (11 - 02)          | 01 - 12    | Kizhaa nelli                           |
| <i>Phyllanthus debilis</i> Klein ex Willd.                   | 24954  | H  | NO | 01 - 12 (11 - 02)          | 01 - 12    | -                                      |
| <i>Phyllanthus maderaspatensis</i> L.                        | 25475  | H  | NO | 01 - 12 (11 - 02)          | 01 - 12    | -                                      |
| <i>Phyllanthus virgatus</i> Forst. f.                        | 24876  | H  | NO | 06 - 11                    | 01 - 12    | -                                      |
| <i>Sauropus bacciformis</i> (L.) Airy Shaw                   | 25216  | H  | NO | 03 - 08 (05 - 06)          | 01 - 12    | -                                      |
| <i>Sebastiania chamaelea</i> (L.) Muell.-Arg.                | 24880  | H  | NO | 01 - 12 (11 - 01)          | 01 - 12    | -                                      |
| <i>Tragia involucreta</i> L.                                 | 25074  | C  | NO | 01 - 12                    | 01 - 12    | Chenthatti                             |
| Fabaceae   |        |    |    |                            |            |  |
| <i>Abrus precatorius</i> L.                                  | 25145  | C  | NO | 11 - 05 (12)               | 01 - 12    | Kundumani                              |
| <i>Aeschynomene indica</i> L.                                | 25088  | H  | NR | 01 - 03 (02)               | 01 - 12    | Netti, Thakkapundu                     |
| <i>Alysicarpus monilifer</i> (L.) DC.                        | 24973  | H  | NR | 12 - 02                    | 01 - 12    | Kaasukkodi                             |
| <i>Alysicarpus vaginalis</i> (L.) DC.                        | 25091  | H  | NR | 11 - 02                    | 11 - 03    | -                                      |
| <i>Canavalia virosa</i> (Roxb.) Wight & Arn.                 | 25114  | C  | NO | 01 - 12                    | 01 - 12    | Kaattu kizhi avarai, Kaattu thammattai |
| <i>Clitoria ternatea</i> L.                                  | 24975  | C  | NO | 01 - 12                    | 01 - 12    | Sankupushpam                           |
| <i>Crotalaria medicaginea</i> Lam.                           | 25738  | H  | NO | 01 - 12 (12 & 01)          | 01 - 12    | -                                      |
| <i>Crotalaria paniculata</i> Willd.                          | 25450  | H  | NR | 01 - 07                    | 01 - 08    | -                                      |
| <i>Crotalaria retusa</i> L.                                  | 24893  | H  | NR | 08 - 03                    | 08 - 03    | -                                      |
| <i>Crotalaria verrucosa</i> L.                               | 25371  | H  | NR | 01 - 12                    | 01 - 12    | Salangaichedi                          |
| <i>Derris ovalifolia</i> Benth.                              | 24967  | C  | NO | 04                         | 05 - 07    | -                                      |
| <i>Derris scandens</i> (Roxb.) Benth.                        | 25213  | C  | NO | 09 - 10 (09)               | 09 - 11    | Thekil                                 |
| <i>Desmodium dichotomum</i> (Willd.) DC.                     | 25756  | H  | NR | 09 - 04                    | 09 - 04    | -                                      |
| <i>Desmodium laxiflorum</i> DC.                              | 24879  | H  | NR | 12 - 04                    | 01 - 06    | Aadotti                                |
| <i>Desmodium triflorum</i> (L.) DC.                          | 24994  | H  | NR | 01 - 03; 08 - 12 (12 & 01) | 01 - 05    | -                                      |
| <i>Dicerma biarticulatum</i> DC. subsp. <i>biarticulatum</i> | 25768  | H  | NO | 12 - 03                    | 01 - 04    | -                                      |
| <i>Dunbaria ferruginea</i> Wight & Arn.                      | 25794  | C  | NR | 11 - 03                    | 12 - 03    | Masukkodi                              |
| <i>Eleiotis monophylla</i> (Burm. f.) DC.                    | 25769  | H  | NO | 09 - 01 (10 - 12)          | 01 - 12    | -                                      |
| <i>Indigofera aspalathoides</i> Vahl                         | 25747  | H  | NR | 10 - 05 (01)               | 10 - 07    | Korandi, Sivanar vembu                 |
| <i>Indigofera astragalina</i> DC.                            | 24884  | H  | NO | 08 - 12                    | 08 - 12    | -                                      |
| <i>Indigofera linnaei</i> Ali                                | 25749  | H  | NR | 01 - 12                    | 01 - 12    | Seppu nerinji                          |
| <i>Indigofera trita</i> L. f.                                | 25748  | H  | NR | 09 - 12                    | 10 - 04    | -                                      |
| <i>Macroptilium lathyroides</i> (L.) Urban                   | 25799  | H  | NO | 03 - 07 (04)               | 04 - 10    | -                                      |
| <i>Pseudarthria viscida</i> (L.) Wight & Arn.                | 25742  | C  | NR | 01 - 12                    | 01 - 12    | Kodi ottai                             |
| <i>Rothia indica</i> (L.) Druce                              | 25343  | H  | NO | 11 - 02 (12)               | 01 - 06    | -                                      |
| <i>Stylosanthes fruticosa</i> (Retz.) Alston                 | 24870  | H  | NO | 01 - 12 (12)               | 01 - 12    | -                                      |
| <i>Tephrosia maxima</i> Pers.                                | 25101  | H  | NO | 01 - 03; 08 - 09           | 03; 08     | -                                      |
| <i>Vigna mungo</i> (L.) Hepper                               | 24864  | C  | NR | Cultivated                 | Cultivated | Ulundu                                 |
| <i>Vigna radiata</i> (L.) Wilczek                            | 25085  | C  | NR | Cultivated                 | Cultivated | -                                      |
| <i>Vigna trilobata</i> (L.) Verdc.                           | 25375  | C  | NR | 11 - 04                    | 11 - 04    | Panipayir                              |
| <i>Zornia diphylla</i> (L.) Pers.                            | 24857  | H  | NO | 09 - 01 (10 - 12)          | 10 - 03    | Pori karappaan thalai                  |

TABLE 1. CONTINUED.

| FAMILY / BINOMIAL / AUTHOR CITATION  | ACC.NO | LF | OS | FLOWERING                           | FRUITING         | VERNACULAR NAME                   |
|--|--------|----|----|-------------------------------------|------------------|-----------------------------------|
| Gentianaceae   |        |    |    |                                     |                  |                                   |
| <i>Enticostema axillare</i> (Lam.) Raynal                                    | 24906  | H  | NO | 03 - 10 (03)                        | 03 - 10          | Vellaragu                         |
| Lamiaceae  |        |    |    |                                     |                  |                                   |
| <i>Anisomeles indica</i> (L.) Kuntze   | 24972  | H  | NR | 01 - 12 (11 - 02)                   | 01 - 12          | -                                 |
| <i>Geniosporum tenuiflorum</i> (L.) Merr.                                    | 25770  | H  | NO | 03 - 05                             | 04 - 05          | Nazel-nagai                       |
| <i>Hyptis suaveolens</i> (L.) Poit.  | 25751  | H  | NO | 01 - 12 (02)                        | 01 - 12          | -                                 |
| <i>Leucas aspera</i> (Willd.) Link   | 25115  | H  | NO | 01 - 10 (06)                        | 08 - 11          | Thumbai                           |
| <i>Leucas biflora</i> (Vahl) R. Br.  | 25760  | H  | NO | 01 - 07                             | 01 - 12          | -                                 |
| <i>Leucas indica</i> (L.) R. Br. ex Vatke                                    | 24995  | H  | NO | 08 - 11                             | 08 - 11          | Mosappullu                        |
| <i>Leucas nutans</i> Spreng.   | 25785  | H  | NO | 09 - 03 (11)                        | 01 - 12          | -                                 |
| <i>Ocimum americanum</i> L.  | 25110  | H  | NO | 01 - 12 (01)                        | 01 - 12          | Naai thulasi                      |
| <i>Ocimum tenuiflorum</i> L.   | 25063  | H  | NO | 03 - 11 (01)                        | 08 - 11          | Nalla thulasi                     |
| <i>Orthosiphon thymiflorus</i> (Roth) Sleensen                               | 24968  | H  | NO | 04 - 08 (05 - 06)                   | 07 - 08          | -                                 |
| Liliaceae  |        |    |    |                                     |                  |                                   |
| <i>Gloriosa superba</i> L.   | 25073  | C  | NO | 10 - 11                             | 11 - 03          | Kalappai kizhangu, Kannuvalikkodi |
| Linaceae   |        |    |    |                                     |                  |                                   |
| <i>Hugonia mystax</i> L.   | 25149  | C  | NO | 01 - 06; 08 - 12 (04 - 05; 09 & 12) | 05 - 07; 09 - 12 | Mothirakanni                      |
| Loganiaceae  |        |    |    |                                     |                  |                                   |
| <i>Strychnos minor</i> Dennst.   | 25765  | C  | NO | 01 - 02                             | 02 - 06          | -                                 |
| Lythraceae   |        |    |    |                                     |                  |                                   |
| <i>Ammannia baccifera</i> L.   | 24903  | H  | NO | 03                                  | 03 - 04          | Kalluruvi, Nirumel neruppu        |
| Malvaceae  |        |    |    |                                     |                  |                                   |
| <i>Hibiscus vitifolius</i> L.  | 25144  | H  | NO | 01 - 12 (04)                        | 01 - 12          | Manjal thutti                     |
| <i>Malvastrum coromandelianum</i> (L.) Garcke                                | 24882  | H  | NO | 01 - 12                             | 01 - 12          | -                                 |
| <i>Pavonia odorata</i> Willd.  | 24852  | H  | NO | 01 - 12                             | 01 - 12          | Peramutti                         |
| <i>Pavonia procumbens</i> (Wall. ex Wight & Arn.) Walp.                      | 25800  | H  | NO | 01 - 12                             | 01 - 12          | -                                 |
| <i>Pavonia zeylanica</i> (L.) Cav.   | 25117  | H  | NO | 01 - 03; 07 - 12                    | 01 - 12          | Thengai poondu                    |
| <i>Sida acuta</i> Burm. f.   | 25762  | H  | NO | 01 - 12 (12)                        | 01 - 12          | Ariva-mooku Keerai                |
| <i>Sida cordata</i> (Burm. f.) Borssum                                       | 25146  | H  | NO | 01 - 12                             | 01 - 12          | Pazhampasi                        |
| <i>Sida cordifolia</i> L.  | 24875  | H  | NO | 01 - 12                             | 01 - 12          | Nilatutti                         |
| <i>Sida rhombifolia</i> L.   | 25221  | H  | NO | 01 - 12                             | 01 - 12          | Chithamutti                       |
| Menispermaceae   |        |    |    |                                     |                  |                                   |
| <i>Cissampelos pareira</i> L. var. <i>hirsuta</i> (Buch.-Ham. ex DC.) Forman | 25087  | C  | NO | 11 - 03                             | 12 - 04          | Appatta, Urikkakodi               |
| <i>Cocculus hirsutus</i> (L.) Diels  | 24924  | C  | NO | 03 - 05                             | 04 - 06          | Sirungattukodi                    |
| <i>Cyclea peltata</i> (Lam.) Hook. f. & Thoms.                               | 25780  | C  | NO | 03 - 06                             | 04 - 07          | Paachi                            |
| <i>Tiliacora acuminata</i> (Lam.) Hook. f. & Thoms.                          | 25061  | C  | NO | 07 - 08; 11 - 01                    | 08; 11 & 12      | Perungattukodi                    |
| <i>Tinospora cordifolia</i> (Willd.) Miers ex Hook. f. & Thoms.              | 25783  | C  | NO | 03 - 06                             | 01 - 12          | Chintil                           |
| Mimosaceae   |        |    |    |                                     |                  |                                   |
| <i>Mimosa pudica</i> L.  | 25468  | H  | IN | 02 - 11                             | 07 - 12          | Thottaar sinungi                  |
| Molluginaceae  |        |    |    |                                     |                  |                                   |
| <i>Gisekia pharmacoides</i> L.   | 25796  | H  | NO | 01 - 12 (04 - 06)                   | 01 - 12          | Manal keerai                      |
| <i>Mollugo disticha</i> Ser.   | 25032  | H  | NO | 01 - 12 (01 - 04)                   | 01 - 12          | -                                 |

TABLE 1. CONTINUED.

| FAMILY / BINOMIAL / AUTHOR CITATION  | ACC.NO | LF | OS | FLOWERING         | FRUITING | VERNACULAR NAME         |
|--|--------|----|----|-------------------|----------|-------------------------|
| <i>Mollugo nudicaulis</i> Lam.   | 25016  | H  | NO | 01 - 12 (08 - 12) | 01 - 12  | Parpaadagam             |
| <i>Mollugo oppositifolia</i> L.  | 25160  | H  | NO | 01 - 12 (11 - 03) | 01 - 12  | Theruppoondu            |
| <i>Mollugo pentaphylla</i> L.  | 25033  | H  | NO | 01 - 12 (12 & 01) | 01 - 12  | Seerakappoondu          |
| Nyctaginaceae  |        |    |    |                   |          |                         |
| <i>Boerhavia diffusa</i> L.  | 25120  | H  | NO | 01 - 12 (11 - 01) | 01 - 12  | Mookkaratti             |
| <i>Boerhavia erecta</i> L.   | 25059  | H  | NO | 01 - 12 (11 & 12) | 01 - 12  | -                       |
| Nymphaeaceae   |        |    |    |                   |          |                         |
| <i>Nelumbo nucifera</i> Gaertn.  | 24997  | H  | IN | 01 - 12           | 01 - 12  | Chenthanarai            |
| Oleaceae   |        |    |    |                   |          |                         |
| <i>Jasminum angustifolium</i> (L.) Willd. var. <i>angustifolium</i> Wight              | 25064  | C  | NO | 10 - 12 (10)      | 01 - 12  | Kaattumalligai          |
| <i>Jasminum angustifolium</i> (L.) Willd. var. <i>sessiliflorum</i> (Vahl) P. S. Green | 25192  | C  | NO | 04 - 12 (04 - 08) | 01 - 12  | Kuruwilaangkodi         |
| <i>Jasminum auriculatum</i> Vahl   | 24961  | C  | NO | 07 - 11 (07)      | 01 - 12  | Usimalligai, Mullai     |
| <i>Jasminum multiflorum</i> (Burm. f.) Andr.   | 25757  | C  | NO | 03 - 05           | 03 - 06  | Malligai                |
| Onagraceae   |        |    |    |                   |          |                         |
| <i>Ludwigia perennis</i> L.  | 25222  | H  | NO | 11 - 04           | 03 - 06  | -                       |
| Oxalidaceae  |        |    |    |                   |          |                         |
| <i>Biophytum sensitivum</i> (L.) DC.   | 25093  | H  | NO | 11 - 12           | 12 - 01  | -                       |
| Passifloraceae   |        |    |    |                   |          |                         |
| <i>Passiflora edulis</i> Sims  | 24911  | C  | IN | 02 - 06           | 04 - 06  | Thuraipadalai           |
| <i>Passiflora foetida</i> L.   | 25345  | C  | NO | 01 - 12           | 01 - 12  | Mosukattaa              |
| Pedaliaceae  |        |    |    |                   |          |                         |
| <i>Sesamum indicum</i> L.  | 25014  | H  | IN | 06 - 08           | 07 - 12  | Yellu                   |
| Periplocaceae  |        |    |    |                   |          |                         |
| <i>Hemidesmus indicus</i> (L.) R. Br.  | 25124  | C  | NO | 12 - 02           | 03 - 05  | Nannaari                |
| Polygalaceae   |        |    |    |                   |          |                         |
| <i>Polygala arvensis</i> Willd.  | 25013  | H  | NO | 01 - 12           | 01 - 12  | -                       |
| <i>Polygala erioptera</i> DC.  | 25801  | H  | NO | 03 - 07           | 06 - 11  | Paruppu chedi           |
| Polygonaceae   |        |    |    |                   |          |                         |
| <i>Antigonon leptopus</i> Hook. & Arn.   | 24981  | C  | IN | 01 - 12 (01 & 10) | 01 - 12  | Kodi rose               |
| Portulacaceae  |        |    |    |                   |          |                         |
| <i>Portulaca oleracea</i> L.   | 25223  | H  | NO | 11 - 03           | 03 - 05  | Vazhukkaikerai          |
| <i>Portulaca pilosa</i> L.   | 24974  | H  | NR | 09 - 12           | 09 - 02  | -                       |
| <i>Portulaca quadrifida</i> L.   | 25015  | H  | NR | 01 - 08           | 01 - 08  | Tharai pasalai          |
| Rhamnaceae   |        |    |    |                   |          |                         |
| <i>Scutia myrtina</i> (Burm. f.) Kurz  | 24912  | C  | NO | 03 - 06           | 01 - 12  | Kokkimullu, Thuvadi     |
| <i>Ventilago madraspatana</i> Gaertn.  | 25358  | C  | NO | 12 - 03; 07 - 11  | 01 - 12  | Veppanaangodi, Vempadam |
| Rubiaceae  |        |    |    |                   |          |                         |
| <i>Hedyotis biflora</i> L.   | 25771  | H  | NO | 05 - 02           | 01 - 12  | -                       |
| <i>Hedyotis graminifolia</i> L. f.   | 25797  | H  | NO | 01 - 12 (01)      | 01 - 12  | -                       |
| <i>Hedyotis herbacea</i> L.  | 25745  | H  | NO | 01 - 12 (09)      | 01 - 12  | Kattukothamalli         |
| <i>Hedyotis puberula</i> (G. Don) Arn. Pugill.   | 25470  | H  | NO | 01 - 12 (01 - 12) | 01 - 12  | Saayavaer               |
| <i>Spermacoce hispida</i> L.   | 25111  | H  | NO | 01 - 12 (01)      | 01 - 12  | Nathai choori           |

TABLE 1. CONTINUED.

| FAMILY / BINOMIAL / AUTHOR CITATION                               | ACC.NO | LF | OS | FLOWERING         | FRUITING | VERNACULAR NAME  |
|---|--------|----|----|-------------------|----------|------------------|
| <i>Spermacoe ocymoides</i> Burm. f.                               | 25753  | H  | NO | 01 - 12 (11 - 01) | 01 - 12  | -                |
| <i>Spermacoe pusilla</i> Wall.                                    | 25775  | H  | NO | 01 - 12 (11 - 01) | 01 - 12  | -                |
| Rutaceae  |        |    |    |                   |          |                  |
| <i>Toddalia asiatica</i> (L.) Lam. var. <i>gracilis</i> Gamble    | 25205  | C  | NO | 07 - 02 (11 - 01) | 01 - 12  | Sirusoori        |
| Sapindaceae   |        |    |    |                   |          |                  |
| <i>Cardiospermum halicacabum</i> L. var. <i>microcarpum</i> Kunth | 25750  | C  | NO | 01 - 12           | 01 - 12  | Mudukottan       |
| Scrophulariaceae  |        |    |    |                   |          |                  |
| <i>Lindernia ciliata</i> (Colsm.) Pennell                         | 25790  | H  | NR | 06 - 08           | 07 - 09  | -                |
| <i>Scoparia dulcis</i> L.   | 24861  | H  | NO | 05 - 11           | 01 - 12  | Sarakotthini     |
| <i>Striga densiflora</i> (Benth.) Benth.                          | 25767  | H  | NO | 11 - 04           | 03 - 06  | -                |
| Solanaceae  |        |    |    |                   |          |                  |
| <i>Physalis minima</i> L.   | 25480  | H  | NR | 01 - 12           | 01 - 12  | -                |
| <i>Solanum surattense</i> Burm. f.                                | 24989  | H  | NR | 01 - 12           | 01 - 12  | Kandankathiri    |
| <i>Solanum trilobatum</i> L.                                      | 25204  | C  | NR | 10 - 03 (12)      | 10 - 05  | Thudhuvaelai     |
| Sterculiaceae   |        |    |    |                   |          |                  |
| <i>Melochia corchorifolia</i> L.                                  | 24862  | H  | IN | 12 - 04 (12 & 01) | 12 - 05  | Punnakku thazhai |
| <i>Melochia nodiflora</i> Sw.                                     | 25746  | H  | NO | 10 - 03 (11 - 12) | 01 - 12  | -                |
| <i>Waltheria indica</i> L.  | 25739  | H  | NO | 01 - 12 (11 - 01) | 01 - 12  | Sengalipoundu    |
| Thunbergiaceae  |        |    |    |                   |          |                  |
| <i>Thunbergia erecta</i> (Benth.) T. And.                         | 25069  | H  | IN | 08 - 12           | 12 - 02  | -                |
| Tiliaceae   |        |    |    |                   |          |                  |
| <i>Corchorus aestuans</i> L.                                      | 24836  | H  | NO | 01 - 06 (01)      | 03 - 06  | -                |
| <i>Corchorus trilocularis</i> L.                                  | 25075  | H  | NO | 11 - 12 (12)      | 12 - 03  | -                |
| <i>Triumfetta rhomboidea</i> Jacq.                                | 25752  | H  | NO | 12 - 02           | 12 - 04  | Ottarai          |
| <i>Triumfetta rotundifolia</i> Lam.                               | 25094  | H  | NO | 12 - 03           | 12 - 04  | Adayoti          |
| Turneraceae   |        |    |    |                   |          |                  |
| <i>Turnera ulmifolia</i> L.                                       | 25224  | H  | IN | 01 - 12           | 01 - 12  | -                |
| Verbenaceae   |        |    |    |                   |          |                  |
| <i>Phyla nodiflora</i> (L.) Greene                                | 25109  | H  | NO | 03 - 06 (05 - 06) | 05 - 07  | Poduthalai       |
| <i>Stachytarpheta jamaicensis</i> (L.) Vahl                       | 25737  | H  | NR | 01 - 12           | 01 - 12  | Seemainaayuruvi  |
| Violaceae   |        |    |    |                   |          |                  |
| <i>Hybanthus enneaspermus</i> (L.) F. V. Muell.                   | 24902  | H  | NO | 01 - 12 (03 & 08) | 01 - 12  | Orilai thamarai  |
| Vitaceae  |        |    |    |                   |          |                  |
| <i>Ampelocissus tomentosa</i> (Heyne ex Roth) Planch.             | 25210  | C  | NO | 10 - 12 (11)      | 11 - 01  | -                |
| <i>Cissus quadrangularis</i> L.                                   | 25181  | C  | NO | 05 - 09           | 01 - 12  | Pirandai         |
| <i>Cissus vitiginea</i> L.  | 24992  | C  | NO | 05 - 09 (06 - 07) | 06 - 11  | -                |
| Zygophyllaceae  |        |    |    |                   |          |                  |
| <i>Tribulus terrestris</i> L.                                     | 25138  | H  | NO | 01 - 12           | 03 - 12  | Nerunji          |

**TABLE 2.** A summary of the floristic distribution with reference to the life forms in the eco-restoration site..

| Life form                    | Number of families (F) | Relative family | Number of genus (G) | Relative genus | Number of species (S) | Relative species | Genus/ Family ratio | Species/ Genus ratio | Dicot |     |     | Monocot |   |   | Occurrence status |    |    |
|------------------------------|------------------------|-----------------|---------------------|----------------|-----------------------|------------------|---------------------|----------------------|-------|-----|-----|---------|---|---|-------------------|----|----|
|                              |                        |                 |                     |                |                       |                  |                     |                      |       |     |     |         |   |   |                   |    |    |
|                              |                        |                 |                     |                |                       |                  |                     |                      | F     | G   | S   | F       | G | S | NO                | NR | IN |
| Herbaceous & Climbing plants | 56                     | -               | 157                 | -              | 233                   | -                | 2.80                | 1.48                 | 53    | 152 | 228 | 3       | 5 | 5 | 172               | 44 | 17 |
| Herbaceous                   | 37                     | 0.66            | 105                 | 0.67           | 165                   | 0.71             | 2.84                | 1.57                 | 35    | 101 | 161 | 2       | 4 | 4 | 122               | 34 | 9  |
| Climbing plants              | 25                     | 0.45            | 54                  | 0.34           | 68                    | 0.29             | 2.16                | 1.26                 | 24    | 53  | 67  | 1       | 1 | 1 | 50                | 10 | 8  |

Note: NO= Naturally Occurring, NR= Naturally Regenerated and IN= Introduced

**TABLE 3.** A comparative compilation of various vegetation studies in the Puducherry and southern Coromandel Coastal region. Note: Numbers in bold within bracket refer to species found in the present study, where overall G/F= 2.80 and S/G= 1.48

| Author and published Year            | Total number of species explored        | Taxonomic Diversity | Number of Herbaceous life form | Number of Climbing life form | Study site   |
|--------------------------------------|---|---------------------|--------------------------------|------------------------------|--|
| Parthasarathy and Karthikeyan 1997   | 54 species, 47 genera and 31 families   | G/F=1.52, S/G=1.15  | -                              | 20 (9)                       | TDEF (Kuzhanthaikuppam and Thirumanikkuzhi)                |
| Sridhar Reddy and Parthasarathy 2003 | 39 species, 34 genera and 24 families   | G/F=1.42, S/G=1.15  | -                              | 39 (17)                      | TDEF (Oorani, Arasdikuppam, Kuzhanthaikuppam and Puthupet) |
| Kadavul et al. 2004a                 | 332 species, 261 genera and 79 families | G/F=3.30, S/G=1.27  | 147 (131)                      | 57 (36)                      | Puducherry surroundings                                    |
| Kadavul et al. 2004b                 | 184 species, 135 genera and 48 families | G/F=2.81, S/G=1.36  | 184 (94)                       | -                            | Puducherry surroundings                                    |
| Ramanujam et al. 2007                | 423 species, 322 genera and 93 families | G/F=3.46, S/G=1.31  | 146 (87)                       | 80 (46)                      | 37 Sacred Groves   |
| Parthasarathy et al. 2008            | 149 species, 122 genera and 49 families | G/F=2.49, S/G=1.22  | -                              | 47 (23)                      | 75 TDEF sites  |
| Padmavathy et al. 2010               | 41 species, 35 genera and 20 families   | G/F=1.75, S/G=1.17  | 17 (13)                        | 3                            | Nallavadu Village (Coastal Sand Dune)                      |
| Udayakumar and Parthasarathy 2010    | 312 species, 251 genera and 80 families | G/F=3.14, S/G=1.24  | 105 (58)                       | 56 (26)                      | 75 TDEF sites  |

Long term surface data and remote sensing measurements indicated that plant phenology has been advanced by 2 - 3 days in spring and delayed by 0.3 - 1.6 days in autumn per decade in the past 30 - 80 years, resulting in extension of the growing season (Parmesan and Yohe 2003). In our two year study, it was observed that some species were flowering twice a year. *Andrographis paniculata*, *Heliotropium bracteatum*, *H. indicum*, *H. zeylanicum* and *Ventilago maderaspatana* were blooming in July - November and December - March. The studies of Yadav and Yadav (2008) reported a similar observation. The peak flowering season of *Capparis sepiaria*, *Cissus quadrangularis*, *C. vitiginea*, *Cocculus hirsutus*, *Derris ovalifolia*, *Enicostema axillare*, *Euphorbia rosea*, *E. serpens*, *Indoneesiella echiodides*, *Leucas aspera*, *Merremia emarginata*, *Orthosiphon thymiflorus*, *Phyla nodiflora*, *Polygala eriopetra*, and *Wattakaka volubilis* was found to be summer (April - June). Selwyn and Parthasarathy (2006) Kumar and Narain (2010) reported similar phenology in low land areas; whereas it was winter (November - January) for *Abrus precatorius*, *Biophytum sensitivum*, *Cissampelos pareira*, *Crotalaria medicaginea*, *Cyanotis tuberosa* and *Desmodium triflorum* (Table 1). Morellato and Leitao-Filho (1996) and Selwyn and Parthasarathy (2006) also found parallel findings. Long-term monitoring and studies are essential to validate the extent of the growing season for individual species. About 50% of the species studied were found to be fruiting through the year. Demarcation between flowering and fruiting phenology is more obscure in the herbaceous than the climbing life form. Further studies on fruits and seed dispersal are proposed to be carried out.

### Conclusion

The present study reports the diversity and reproductive phenology of herbs and climbing plants of an eco-restoration site. 233 species belonging to 157 genera and 56 families were enumerated. It reveals that 172 species are NO and 44 are NR. Among them, *Aristolochia indica*, *Derris ovalifolia* and *Sarcostemma intermedium* are rare and endangered. The rare medicinal plants, *Enicostema axillare* and *Gloriosa superba* are well established in the site. *Cyclea peltata*, *Digera muricata*, *Euphorbia serpens*, *Gisekia pharnaceoides*, *Heliotropium zeylanicum*, *Leucas biflora*, *Spermacoce pusilla* and *Trianthema triquetra* are reported for the first time in this area. About 50% of the total species reported by earlier works from the Southern Coromandel Coastal vegetation occur in our study site. Phenologically, the distinction between flowering and fruiting phenomena remained less in herbs as compared to climbers. This check list provides important baseline information on the successful plants that may be introduced in a damaged ecosystem or barren area for expanding the green cover in comparable regions. It will serve as a genetic resource for future references since there is a threat of genetic erosion due to global warming and climate change. As nearly 50% of the dry lands of India are devoid of forest, they can be reclaimed if treated properly by eco-restoration to develop a sustainable ecosystem and help to deal with the environmental crisis and enhance natural resources.





*Andrographis paniculata*



*Asystasia gangetica*



*Barleria prionitis*



*Blepharis maderaspatensis*



*Dipteracanthus patulus*



*Dipteracanthus prostratus*

FIGURE 4. Species belonging to Acanthaceae, photos by R. Ponnuchamy.





*Dyschoriste madurensis*



*Indoneesiella echioides*



*Lepidagathis cristata*



*Ruellia tuberosa*



*Sansevieria roxburghiana*



*Trianthema portulacastrum*

**FIGURE 5.** Species belonging to Acanthaceae, Agavaceae and Aizoaceae, photos by R. Ponnuchamy.





*Trianthema triquetra*



*Achyranthes aspera*



*Aerva lanata*



*Allmania nodiflora* var. *nodiflora*



*Alternanthera paronychioides*



*Alternanthera pungens*

**FIGURE 6.** Species belonging to Aizoaceae and Amaranthaceae, photos by R. Ponnuchamy.





*Alternanthera sessilis*



*Amaranthus spinosus*



*Amaranthus viridis*



*Celosia argentea*



*Digera muricata*



*Gomphrena serrata*

FIGURE 7. Species belonging to Amaranthaceae, photos by R. Ponnuchamy.





*Pupalia lappacea*



*Trichurus monsoniae*



*Catharanthus pusillus*



*Catharanthus roseus*



*Ichnocarpus frutescens*



*Aristolochia indica*

**FIGURE 8.** Species belonging to Amaranthaceae, Apocynaceae and Aristolochiaceae, photos by R. Ponnuchamy.





*Leptadenia reticulata*



*Pentatropis capensis*



*Pergularia daemia*



*Sarcostemma intermedium*



*Tylophora indica*



*Wattakaka volubilis*

FIGURE 9. Species belonging to Asclepiadaceae, photos by R. Ponnuchamy.





*Acanthospermum hispidum*



*Ageratum conyzoides*



*Blainvillea acmella*



*Blumea obliqua*



*Eclipta prostrata*



*Emilia sonchifolia*

FIGURE 10. Species belonging to Asteraceae, photos by R. Ponnuchamy.





*Epaltes divaricata*



*Helianthus annuus*



*Parthenium hysterophorus*



*Tridax procumbens*



*Vernonia albicans*



*Vernonia cinerea*

**FIGURE 11.** Species belonging to Asteraceae, photos by R. Ponnuchamy.





*Vernonia elaeagnifolia*



*Vicoa indica*



*Xanthium indicum*



*Tecomaria capensis*



*Coldenia procumbens*



*Heliotropium indicum*

**FIGURE 12.** Species belonging to Asteraceae, Bignoniaceae and Boraginaceae, photos by R. Ponnuchamy.





*Heliotropium marifolium*



*Heliotropium supinum*



*Heliotropium zeylanicum*



*Trichodesma indicum*



*Cassia mimosoides*



*Cassia tora*

**FIGURE 13.** Species belonging to Boraginaceae and Caesalpiniaceae, photos by R. Ponnuchamy.





*Capparis sepiaria*



*Capparis zeylanica*



*Maerua oblongifolia*



*Polycarpaea corymbosa*



*Reissantia indica*



*Cleome aspera*

**FIGURE 14.** Species belonging to Capparidaceae, Caryophyllaceae, Celastraceae and Cleomaceae, photos by R. Ponnuchamy.





*Cleome chelidonii*



*Cleome gynandra*



*Cleome viscosa*



*Combretum albidum*



*Quisqualis indica*



*Amischophacelus axillaris*

**FIGURE 15.** Species belonging to Cleomaceae, Combretaceae and Commelinaceae, photos by R. Ponnuchamy.





*Commelina benghalensis*



*Cyanotis tuberosa*



*Evolvulus alsinoides*



*Evolvulus nummularius*



*Hewittia sublobata*



*Ipomoea indica*

**FIGURE 16.** Species belonging to Commelinaceae and Convolvulaceae, photos by R. Ponnuchamy.





*Ipomoea obscura*



*Ipomoea pes-tigridis*



*Ipomoea sepiaria*



*Jacquemontia paniculata*



*Merremia emarginata*



*Merremia tridentata*

FIGURE 17. Species belonging to Convolvulaceae, photos by R. Ponnuchamy.





*Porana paniculata*



*Coccinia grandis*



*Cucumis melo*



*Diplocyclos palmatus*



*Mukia maderaspatana*



*Acalypha indica*

**FIGURE 18.** Species belonging to Convolvulaceae, Cucurbitaceae and Euphorbiaceae, photos by R. Ponnuchamy.





*Acalypha lanceolata*



*Croton bonplandianus*



*Euphorbia cyathophora*



*Euphorbia hirta*



*Euphorbia rosea*



*Euphorbia serpens*

FIGURE 19. Species belonging to Euphorbiaceae, photos by R. Ponnuchamy.





*Euphorbia thymifolia*



*Phyllanthus amarus*



*Phyllanthus debilis*



*Phyllanthus maderaspatensis*



*Phyllanthus virgatus*



*Sauropus bacciformis*

FIGURE 20. Species belonging to Euphorbiaceae, photos by R. Ponnuchamy.





*Sebastiania chamaelea*



*Tragia involucrata*



*Abrus precatorius*



*Aeschynomene indica*



*Alysicarpus monilifer*



*Canavalia virosa*

**FIGURE 21.** Species belonging to Euphorbiaceae and Fabaceae, photos by R. Ponnuchamy.





*Clitoria ternatea*



*Crotalaria medicaginea*



*Crotalaria retusa*



*Crotalaria verrucosa*



*Derris ovalifolia*



*Derris scandens*

**FIGURE 22.** Species belonging to Fabaceae, photos by R. Ponnuchamy.





*Desmodium laxiflorum*



*Desmodium triflorum*



*Dicerma biarticulatum* subsp. *biarticulatum*



*Eleiotis monophylla*



*Indigofera aspalathoides*



*Indigofera astragalina*

FIGURE 23. Species belonging to Fabaceae, photos by R. Ponnuchamy.





*Indigofera linnaei*



*Indigofera trita*



*Pseudarthria viscida*



*Rothia indica*



*Stylosanthes fruticosa*



*Tephrosia maxima*

FIGURE 24. Species belonging to Fabaceae, photos by R. Ponnuchamy.





*Zornia diphylla*



*Enicostema axillare*



*Anisomeles indica*



*Geniosporum tenuiflorum*



*Hyptis suaveolens*



*Leucas aspera*

**FIGURE 25.** Species belonging to Fabaceae, Gentianaceae and Lamiaceae, photos by R. Ponnuchamy.





*Leucas indica*



*Leucas nutans*



*Ocimum americanum*



*Ocimum tenuiflorum*



*Orthosiphon thymiflorus*



*Gloriosa superba*

**FIGURE 26.** Species belonging to Lamiaceae and Liliaceae, photos by R. Ponnuchamy.





*Hugonia mystax*



*Strychnos minor*



*Ammannia baccifera*



*Hibiscus vitifolius*



*Pavonia odorata*



*Pavonia procumbens*

**FIGURE 27.** Species belonging to Linaceae, Loganiaceae, Lythraceae and Malvaceae, photos by R. Ponnuchamy.





*Pavonia zeylanica*



*Sida acuta*



*Sida cordata*



*Sida cordifolia*



*Sida rhombifolia*



*Cissampelos pareira* var. *hirsuta*

**FIGURE 28.** Species belonging to Malvaceae and Menispermaceae, photos by R. Ponnuchamy.





*Cocculus hirsutus*



*Cyclea peltata*



*Tiliacora acuminata*



*Tinospora cordifolia*



*Mimosa pudica*



*Gisekia pharnaceoides*

**FIGURE 29.** Species belonging to Menispermaceae, Mimosaceae and Molluginaceae, photos by R. Ponnuchamy.





*Mollugo disticha*



*Mollugo nudicaulis*



*Mollugo oppositifolia*



*Mollugo pentaphylla*



*Boerhavia diffusa*



*Nelumbo nucifera*

**FIGURE 30.** Species belonging to Molluginaceae, Nyctaginaceae and Nymphaeaceae, photos by R. Ponnuchamy.





*Biophytum sensitivum*



*Passiflora foetida*



*Sesamum indicum*



*Hemidesmus indicus*



*Antigonon leptopus*



*Scutia myrtina*

**FIGURE 31.** Species belonging to Oxalidaceae, Passifloraceae, Pedaliaceae, Periplocaceae, Polygonaceae and Rhamnaceae, photos by R. Ponnuchamy.





*Hedyotis biflora*



*Hedyotis puberula*



*Spermacoce hispida*



*Spermacoce ocymoides*



*Spermacoce pusilla*



*Toddalia asiatica*

FIGURE 32. Species belonging to Rubiaceae and Rutaceae, photos by R. Ponnuchamy.





*Cardiospermum halicacabum* var. *microcarpum*



*Scoparia dulcis*



*Striga densiflora*



*Physalis minima*



*Solanum surattense*



*Solanum trilobatum*

**FIGURE 33.** Species belonging to Sapindaceae, Scrophulariaceae and Solanaceae, photos by R. Ponnuchamy.





*Melochia corchorifolia*



*Melochia nodiflora*



*Waltheria indica*



*Phyla nodiflora*



*Stachytarpheta jamaicensis*



*Hybanthus enneaspermus*

FIGURE 34. Species belonging to Sterculiaceae, Verbenaceae and Violaceae, photos by R. Ponnuchamy.



*Ampelocissus tomentosa**Cissus quadrangularis**Cissus vitifolia**Tribulus terrestris***FIGURE 35.** Species belonging to Vitaceae and Zygophyllaceae, photos by R. Ponnuchamy.

**ACKNOWLEDGMENTS:** Our sincere thanks to Mrs Sieglind D'Arcy for providing financial support through a PhD fellowship to R. Ponnuchamy. We are thankful to Mr S. Prasad and Drs B. R. Ramesh, Vincent Bonhomme and A. Stephen for taking time to give valuable suggestions on the first draft of this manuscript. We are thankful to Mr Barathan Ravi for helping with the herbarium specimens and Mr R. Sivarajan for preparing the study area map. We acknowledge Mr. G. Jayapalan for helping with proof reading the manuscript. We are grateful to the two reviewers for their feedback and suggestions to improve the manuscript.

#### LITERATURE CITED

- Ajai, A.S., P.S. Arya, S.K. Dhinwa, Pathan and K. Ganesh Raj. 2009. Desertification/Land degradation status mapping in India. *Current Science* 97(10): 1478-1483.
- Antony, F.C. 1982. *Gazetteer of India, Union Territory of Pondicherry Vol. I*. City: The Government Press 922 p.
- Balfour, D.A. and W.J. Bond. 1993. Factors limiting climber distribution and abundance in Southern African forest. *Journal of Ecology* 81: 93-99.
- Bentham, G. and J.D. Hooker. 1862-1883. *Genera Plantarum*. Volumes I to III. London: L. Reeve and Co. Ltd. 3577 p.
- Blasco, F. and P. Legris. 1973. Dry evergreen forest of Point Calimere and Marakanam. *Journal of the Bombay Natural History Society* 70(2): 279-294.
- Borchert, R., S.A. Meyer, R.S. Felger and L. Porter-Bolland. 2004. Environmental control of flowering periodicity in Costa Rican and Mexican tropical dry forests. *Global Ecology and Biogeography* 13: 409-425.
- Caballe, G. and A. Martin. 2001. Thirteen years of change in trees and lianas in a Gabonese rainforest. *Plant Ecology* 152: 167-173.
- Champion, H.G. and S.K. Seth. 1968. *A revised survey of the Forest types of India*. Delhi: Manager of Publication. 404 p.
- Chaturvedi, R.K., A.S. Raghubanshi and J.S. Singh. 2011. Effect of small scale variations in environmental factors on the distribution of woody species in tropical deciduous forests in Visdhyan Highlands. *Journal of Botany* 2011: 1-10.
- Chmaitelly, H., S. Talhouk and J. Makhzoumi. 2009. Landscape approach to the conservation of floral diversity in Mediterranean urban coastal landscapes: Beirut seafront. *International Journal of Environmental studies* 66(2): 167-177.
- Dabholkar, M.V. 1962. The mapping of the natural vegetation of South Arcot District and Pondicherry at 1: 253440 scale according to the method of Gaussen. *Journal of biological Sciences* 5: 40-50.
- Dugje, I.Y., A.Y. Kamara and L.O. Omoigui. 2006. Infestation of crop fields by *Striga* species in the savanna zones of northeast Nigeria. *Agriculture, Ecosystems and Environment* 116(3-4): 251-254.
- Gamble, J.S. and C.E.C. Fischer. 1915-1935. *Flora of the Presidency of Madras*. London: Adlard and Son Limited. Vols. I. to III. 2017 p.
- Gentry, A. H. and C. Dodson. 1987. Contribution of non trees to species richness of a tropical rainforest. *Biotropica* 19(2): 149-156.
- Gupta, N., A. Anthwal and A. Bahuguna. 2006. Biodiversity of Mothronwala Swamp, Doon Valley, Uttaranchal. *The Journal of American Science* 2(3): 33-40.
- Hamann, A. 2004. Flowering and fruiting phenology of a Philippine submontane rain forest: climate factors as proximate and ultimate causes. *Journal of Ecology* 92: 24-31.
- Harun-or-Rashid, S., S.R. Biswas, R. Bocker and M. Kruse. 2009. Mangrove community recovery potential after catastrophic disturbances in Bangladesh. *Forest Ecology and Management* 257: 923-930.
- Henry, A.N., G.R. Kumari and V. Chithra. 1987. *Flora of Tamil Nadu, India*. Coimbatore: Botanical Survey of India, Southern circle. Vol. II. 258 p.
- Henry, A.N., V. Chithra and N.P. Balakrishnan. 1989. *Flora of Tamil Nadu, India*. Coimbatore: Botanical Survey of India, Southern circle. Vol. III. 171 p.



- IPNI. 2009. *International plant name index*. Electronic database accessible at <http://www.ipni.org/ipni/plantnamesearchpage.do>. Captured on 16 July 2009.
- Kadavul, K., T. Ganesan and J. Presena. 2004a. A survey of angiospermous climbers, lianas and woody plant species of Pondicherry and its nearby area. *Journal of Economic and Taxonomic Botany* 28(2): 355-365.
- Kadavul, K., T. Ganesan and J. Presena. 2004b. Check list of herbaceous flowering plant species of Pondicherry region. *Geobios* 31: 193-196.
- Kephart, S.R. 1987. Phenological variation in flowering and fruiting of *Asclepias*. *American Midland Naturalist* 118(1): 64-76.
- Kramer, K. 1997. Phenology and growth of European trees in relation to climate change. *Phenology and Seasonality* 1: 39-50.
- Kumar, S. and S. Narain. 2010. Growth forms of macrophytes in salina tal and its adjoining wetlands of Uttar Pradesh. *International Journal of Pharma and Biosciences* 1(2): 1-12.
- Lang, A. 1965. *Physiology of flower initiation*; p. 1380-1536 In W. Ruhland (ed.). *Encyclopedia of Plant Physiology*, Vol. XV, Part 1. Berlin: Springer-Verlag.
- Lieberman, D. 1982. Seasonality and phenology in a dry tropical forest in Ghana. *Journal of Ecology* 70: 791-806.
- Magurran, A.E. 2004. *Measuring Biological Diversity*. Blackwell Science Ltd., a Blackwell Publishing company 256pp.
- Marlange, M. and V.M. Meher-Homji. 1965. Phytosociological studies in the Pondicherry region. *The Journal of the Indian Botanical Society* 44(2): 167-182.
- Matthew, K.M. 1981-1983. *The flora of the Tamilnadu Carnatic*. Tiruchirappalli: The Rapinat Herbarium, St. Joseph's College. Vol. I. and II. 2154 p.
- Meher-Homji, V. M. 1973. A Phytosociological study of the *Albizia amara* community of India. *Phytocoenologia* 1(1): 114-129.
- Meher-Homji, V. M. 1974. On the origin of the Tropical Dry Evergreen Forest of South India. *Journal of Ecology and Environmental Sciences* 1: 19-39.
- MOEF. 2007. *United Nations convention to combat desertification in India*. New Delhi: IRIS Publication Pvt. Ltd. 35 p.
- Morelato, P.C. and H.F. Leitao-Filho. 1996. Reproductive phenology of climbers in a Southeastern Brazilian forest. *Biotropica* 28(2): 180-191.
- Murty, P.P. and M. Venkaiah. 2011. Biodiversity of weed species in crop fields of north coastal Andhra Pradesh, India. *Indian Journal of Fundamental and Applied Sciences* 1(2): 59-67.
- Muthumperumal, C. and N. Parthasarathy. 2009. Angiosperms, Climbing plants in tropical forests of southern Eastern Ghats, Tamil Nadu, India. *Check List* 5(1): 92-111.
- Muthuramkumar, S. and N. Parthasarathy. 2000. Alpha diversity of lianas in a tropical evergreen forest in the Anamalais, Western Ghats, India. *Diversity and Distributions* 6: 1-14.
- Nair, N.C., A.N. Henry, G.R. Kumari and V. Chithra. 1983. *Flora of Tamil Nadu, India*. Coimbatore: Botanical Survey of India, Southern circle. Vol. I. 184 p.
- National Remote Sensing Centre and Ministry of Rural Development. 2010. *Waste Land Atlas of India*. Hyderabad: Land Use Division, Land Resources Group RS & GIS Applications area. 47 p.
- Opler, P.A., G.W. Frankie and H.G. Baker. 1980. Comparative phenological studies of tree let and shrub species in tropical wet and dry forest in the lowlands of Costa Rica. *Journal of Ecology* 68: 167-188.
- Padmavathy, K., G. Poyyamoli and N. Balachandran. 2010. Coastal Dune Flora, Nallavadu Village, Puducherry, India. *Check List* 6(2): 198-200.
- Parmesan, C. and G. Yohe. 2003. A globally coherent fingerprint of climate changing impacts across natural systems. *Nature* 421: 37-42.
- Parthasarathy, N. and R. Karthikeyan. 1997. Plant biodiversity inventory and conservation of two tropical dry evergreen forests on the Coromandel Coast, South India. *Biodiversity and Conservation* 6: 1063-1083.
- Parthasarathy, N., M.A. Selwyn and M. Udayakumar. 2008. Tropical Dry Evergreen Forest of Peninsular India: ecology and conservation significance. *Tropical Conservation Science* 1(2): 89-110.
- Pielou, E. C. 1975. New York: *Ecological diversity*. Wiley Publications. 165 p.
- Prakash Patel. 1999-2000. *Afforestation and wasteland reclamation - Project Ecolake* 23-38p in Annual report of Research activities. 1999-2000. Pondicherry: Sri Aurobindo Ashram Trust. 50 p.
- Rai, S.N. and A. Saxena. 1997. The extend of forest fire, grazing and regeneration status in inventoried forest areas in India. *Indian Forester* 123: 689-701.
- Ramanujam, M.P. and D. Kadamban. 2001. Plant biodiversity of two tropical dry evergreen forests in the Puducherry region of south India and the role of belief systems in their conservation. *Biodiversity and Conservation* 10: 1203-1217.
- Ramanujam, M.P., T. Ganesan, D. Kadamban, G. Kumaravelu and P. Devaraj. 2007. *Flora of sacred groves of Puducherry region (Pictorial Guide)*. Puducherry: Department of Forest and Wild Life, Govt. of Puducherry 186 p.
- Ramirez, N. 2002. Reproductive phenology, life-forms and habitats of the Venezuelan Central Plain. *American Journal of Botany* 89: 836-842.
- Rivera, G. and R. Borchert. 2001. Induction of flowering in tropical trees by a 30-min reduction in photoperiod: evidence from field observations and herbarium specimens. *Tree Physiology* 21: 201-212.
- Schreckenber, K., M. Hadley and M.I. Dyer. 1990. *Management and restoration of human-impacted resources-Approaches to Ecosystem rehabilitation*. Vendome : Imprimerie des Presses Universitaires de France. 90 p.
- Selwyn, M.A. and N. Parthasarathy. 2006. Reproductive traits and phenology of plants in tropical dry evergreen forest on the coromandel coast of India. *Biodiversity and conservation* 15: 3207-3234.
- Sharma, B.M. 1981. A phytosociological study of a weed community in fallow land in the semi arid zone of India. *Weed Science* 29(3): 287-291.
- Sivaraj, N. and K.V. Krishnamurthy. 1989. Flowering phenology in the vegetation of shervaroys, south India. *Vegetatio* 79: 85-88.
- Society for Ecological Restoration International Science and Policy Working Group. 2004. *The SER International Primer on Ecological Restoration*. Available at <http://www.ser.org> & Tucson: Society for Ecological Restoration International. Captured on October 2004.
- Sollins, P. 1998. Factors influencing species composition in tropical low land rain forest: Does soil matter? *Ecology* 79(1): 23-30.
- Sridhar Reddy, M. and N. Parthasarathy. 2003. Liana diversity and distribution in four tropical dry evergreen forests on the coromandel coast of south India. *Biodiversity and Conservation* 12: 1609-1627.
- Toledo, M., M. Pena-Claros, F. Bongers, A. Alarcon, J. Balcazar, J. Chuvina, C. Leano, J. C. Licona and L. Poorter. 2012. Distribution patterns of tropical woody species in response to climate and edaphic gradients. *Journal of Ecology* 100: 253-263.
- Udayakumar, M. and N. Parthasarathy. 2010. Angiosperms, tropical dry evergreen forests of southern Coromandel coast, India. *Check List* 6(3): 368-381.
- Van Schaik, C.P., S.J. Wright and J.W. Terborgh. 1993. The phenology of tropical forests: adaptive significance and consequences for primary consumers. *Annual Review of Ecology and systematics* 24: 353-377.
- Wong, Y.K. and T.C. Whitmore. 1970. On the influence of soil properties on species distribution in a Malayan low land dipterocarp rain forest. *Malaysian Forester* 33: 42-54.
- Wright, S.J. 1996. Phenological patterns of tropical forest plants; p. 187-216 In S.S. Mulkey, R.L. Chazdon and A.P. Smith (ed.). *Tropical Forest Plant Ecophysiology*. New York: Chapman and Hall.
- Yadav, A.S. and S.K. Gupta. 2007. Effect of micro-environment and human disturbance on the diversity of herbaceous species in Sariska Tiger Project. *Tropical Ecology* 48(1): 125-128.
- Yadav, R.K. and A.S. Yadav. 2008. Phenology of selected woody species in a tropical dry deciduous forest in Rajasthan, India. *Tropical Ecology* 49(1): 25-34.
- Zhang, J., T.J. Griffis and T.M. Baker. 2006. Using continuous stable isotope measurements to partition net ecosystem CO<sub>2</sub> exchange. *Plant Cell Environment* 29: 483-496.
- Zimmerman, J.K., S.J. Wright, O. Calderon, M.A. Pagan and S. Paton. 2007. Flowering and fruiting phenologies of seasonal and aseasonal neotropical forests: the role of annual changes in irradiance. *Journal of Tropical Ecology* 23: 231-251.

RECEIVED: February 2012

ACCEPTED: December 2012

PUBLISHED ONLINE: June 2013

EDITORIAL RESPONSIBILITY: Paul A. Egan