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Ethnobotanical studies in select parks of Chennai city

Dr. P. Sudhakar*

Abstract

A survey was carried out to collect information of ethno botanical use of the medicinal plants in Select Parks of Chennai city, Tamil Nadu. A total of 60 plant species from 54 genera belonging to 37 families were enumerated to treat various diseases. The plants include herbs (25 species, 42%), trees (20 species, 33%), Climbers (9 species, 15%) and shrubs (6 species, 10%). The dominant families are Euphorbiaceae, Lamiaceae, Solanaceae, Amaranthaceae, Caesalpiaceae, Malvaceae, Acanthaceae, Asclepiadaceae, Asteraceae, Combretaceae, Meliaceae, Moraceae, Umbelliferaceae etc. The documented medicinal plants were used mostly to cure diseases like Urinary disorder, skin diseases, ear problems, fever, cough, cold, menstrual problem, inflammation, malaria, liver problem, piles, eczema, diabetes, asthma and poison bites, etc. This paper illustrates that the people even in Metro cities still continue to depend on medicinal plants to first aid and treatment of primary ailments.

Key words: *Medicinal plants, parks, diseases, treatment*

Introduction

Over three-quarters of the world population relies mainly on plants and plant extracts for health care. The Indian subcontinent is a vast repository of medicinal plants that are used in traditional medical treatments, around 20,000 medicinal plants have been recorded (Dev, 1997)¹, but only 7,000 - 7,500 plants are being used by traditional

communities to cure different diseases (Samy and Ignacimuthu, 1998², Kamboj 2000)³. The medicinal plants are listed in various indigenous medicinal systems such as *Siddha* (600 species), *Ayurveda* (700 species), *Amchi* (600 species) and *Unani* (700 species) (Rabe and Staden 1997)⁴. Major pharmaceutical industries depend on the plant products for the preparation of medicines (Anbarashan and Padmavathy, 2010)⁵.

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In Tamil Nadu, the local rural people have an indigenous knowledge on developing the groves for their culture and recreation and these groves are rich in biodiversity. About 60% of the plants present in groves are having medicinal values, of which nearly 28% serves as folk medicines.

Cities like Chennai does not have major Groves instead there are several urban parks. The urban parks apart from providing green and open space to recreational purposes also provide a number of ecosystem services. Ecosystem services are defined as “the benefits, human populations derive, directly or indirectly, from ecosystem functions” (Costanza *et al.* 1997)⁶. According to Bolund and Hunhammar (1999)⁷, trees in urban areas offer a variety of ecosystem services like air and water purification, rain water recharge, noise filtering, health, microclimate stabilization and biodiversity conservation. This article, provides information on the ethnobotanical importance of the plants in the select parks of Chennai city.

Methodology

Total geographical area of Chennai is 174 Sq. Kms, constituting just 0.13% of the area of the State. Chennai is situated on the north-east end of Tamil Nadu on the coast of Bay of Bengal. It lies between 12° 9' and 13° 9' of the northern latitude and 80° 12' and 80° 19' of the southern longitude on a ‘sandy shelving breaker swept beach’. It stretches nearly 25.60 kms, along the Bay coast from Thiruvanmiyur in the south to

Thiruvottiyur in the north and runs inland in a rugged semi-circular fashion. It is bounded on the east by the Bay of Bengal and on the remaining three sides by Kanchipuram and Thiruvallur Districts.

Data collection

The survey was carried out during the year 2015 and 2016 in the major parks which are well maintained and to mention a few are the Napier park, my Lady’s park, Nageswara Rao park, Independence park, Anna park, Natesan and Panagal park. Plants were collected and identified by using the standard literature such as *The Flora of Madras Presidency* by Gamble, 1915-1936⁸; *Further Illustrations on the Flora of the Tamil Nadu and Carnatic* by Matthew, 1982-1988⁹, have also been referred to the correct botanical names for the specimens identified. The indigenous medical practitioners and the local medicine man (*Maruthuvar*) were interviewed, and the medicinal plants of Chennai parks were documented. The details of the plants, including their vernacular name, useful parts of the plants and medicinal uses were tabulated.

Fig. 2: Medicinal usage of dominant life form in Select Chennai Parks

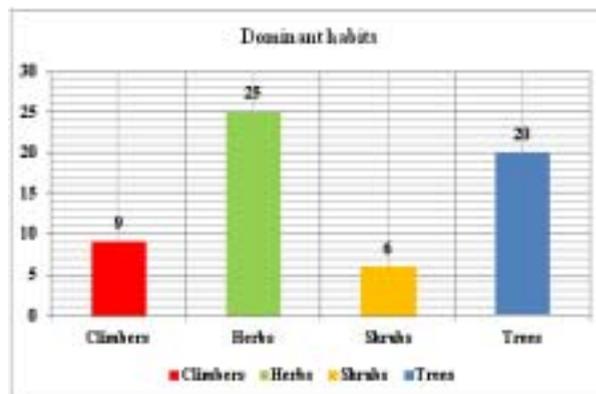
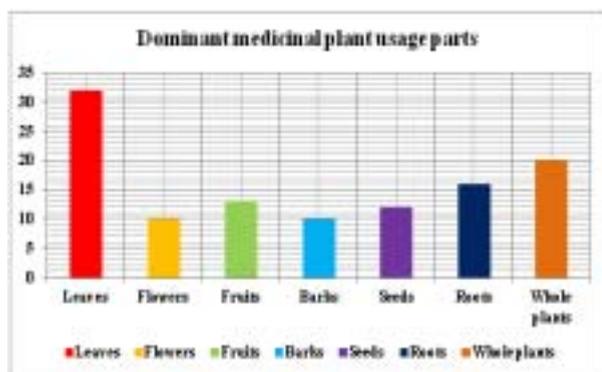


Fig. 3: Dominant medicinal plant usage parts



Result and discussion

The results of the survey are presented in Table 1 and the families of the plants are arranged in alphabetical order. The present investigation comprises 60 species of ethno medicinal plants distributed among 54 genera belonging to 37 families. For each species botanical name, family name, local name, parts used, methods of preparation and administration for treatment are provided. Herbs (25 species, 42%) were found to be the most used plants (Figure 2) followed by trees (20 species, 33%), climbers (9 species, 15%) and shrubs (6 species, 10%). The dominant families include Euphorbiaceae, Lamiaceae, Solanaceae, Amaranthaceae, Caesalpiniaceae, Malvaceae, Acanthaceae, Asclepiadaceae, Asteraceae, Combretaceae, Meliaceae and Moraceae, Umbelliferaceae

The most used plant part for medicinal purpose is the leaves (28%) followed by whole plant (18%), roots

(14%), fruits (12%), seeds (11%), flowers and barks (9%) (Figure1). According to Karthik et al 2016¹⁰, leaves are the major plant part used as medicine to various diseases.

Apart from the aesthetic value of the parks, medicinal value can be ascribed as an important value. Nearly 45% of the plants, both cultivated and weeds are reported to be of medicinal value. Plants such as *Acalypha indica* and *Phyllanthus niruri* are harvested by the local people from the parks for medicinal uses. *Pongamia pinnata* is used by the gardeners' and other workers of the parks as an antiseptic and the blood coagulant to cuts and wounds. A number of edible greens such as, *Cardiospermum halicacabum*, *Moringa oleifera*, *Solanum indicum*, and *Solanum nigrum*. Some of the greens collected are used as medicinal greens. *Cardiospermum halicacabum* is used for treating joint pains. Similarly, the leaves of *Solanum americanum* are cooked and eaten to cure mouth ulcers. The juice of *Cynodon dactylon* has become a popular health product in Chennai which is sold fresh. Leaves of *Lawsonia inermis* are harvested for cosmetic purposes. Fallen flowers of *Hibiscus rosa-sinensis* are collected from the parks for cosmetic purposes as well as for health drink. In fact parks are the major habitats for these plants, as most of the open spaces and other habitats have been largely urbanized. List of herbs with their medicinal properties and parts used is given in table.

Table 1: Medicinal plants used by traditional healers from Chennai district of Tamil Nadu

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
1	<i>Abutilon indicum</i> (L.) Sweet	H	Malvaceae	Thuthi	Indian mallow	Whole plant	The leaf decoction is used as mouth wash for toothache and tender gums. Decoction of the root is used in the treatment of diabetes. The leaves are roasted in castor oil and applied to cure piles, itching of anus, fistula.	Diabetes, tooth ache, Piles, and itching of anus.
2	<i>Acalypha indica</i> L.	H	Euphorbiaceae	Kuppaimeni	Indian Acalypha	Whole plant	The plant is used to cure chronic bronchitis, asthma. The leaf decoction is used as laxative. The leaves are made into a paste and applied for syphilitic ulcers, bed-sores and wounds. The leaf extract is mixed with lime juice and used as an antitode for scorpion sting and rat bites	Bronchitis, ashma, Laxative, scorpion sting and rat bites

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
3	<i>Achyranthes aspera</i> L.	H	Amaranthaceae	Nayuruvi	Pricklychaff-flower plant	Whole plant	The leaf paste, pepper and garlic is dried and taken to cure fever. Leaf paste mixed with turmeric is applied to cure piles. It cures constipation when leaf is taken with water. The decoction cures stomach pain, indigestion, acidity.	Fever, stomach pain, indigestion and piles
4	<i>Aegle marmelos</i> (L.) Correa	T	Rutaceae	Vilvam	Bengal Quince	Leaf, fruit and root	The leaf is heated over low flame and gently massaged over the eyes to cure eye pain, redness in eyes. The root soaked in water ginger and fennel seeds is consumed to cure piles. Decoction prepared with fruit pulp and sugar gives strength to the body.	Eye problems, energy drink piles
5	<i>Aerva lanata</i> (L.) Juss.	H	Amaranthaceae	Sirukanpeelai	Aerva	Whole plant	Leaf juice cures urinary infections and controls excessive bleeding during	Urinary infection, menstrual disorder

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
6	<i>Aloe vera</i> (L.) Burm.f.	H	Liliaceae	Sotrukatalai	Indian Aloe	Whole plant	menstruation. Gruel made with this root gives strength to pregnant woman. The gel of the plant mixed with gingelly oil in equal proportion and boiled and applied as hair tonic for hair growth and to stop hair fall. The strained juice and rose water is mixed and used for cleaning the eyes. Leaves are dried, powdered and consumed regularly to keep young and fit	Hair fall, eye problems, body fit
7	<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	H	Amaranthaceae	Pomnanganni	Sessile Joy weed	Leaf	The green has the properties of gold and when consumed with salt, pepper and tamarind, it gives long and healthy life. When cooked and consumed without salt for 40	Eye problems and mouth ulcer

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
8	<i>Andrographis paniculata</i> (Burm.f.) Nees	H	Acanthaceae	Nilavembu	The Creat	Whole plant	days, it cures several eye problems. Mouth ulcers, mouth odour are cured. The decoction of the dried sticks and leaf is given to children to cure stomach pain and fever. The leaf juice is given to cure bowel complaints of children. It cures rheumatic fever, flatulence and liver disorders.	Stomach pain, fever and liver disorder
9	<i>Annona squamosa</i> L.	T	Annonaceae	Seetha	Custard apple	Leaf and fruit	The fruits and leaves are made into a paste without adding water and is applied to cure skin ulcers and eczema. Leaf juice is used as nasal drops to cure unconsciousness.	Ulcer, eczema and Unconsciousness
10	<i>Anthocephalus cadamba</i> (Roxb.) Miq.	T	Rubiaceae	Kadambu	Wild chincona	Fruit, leaf and bark	A decoction is made out of the bark and is given to cure fever. The juice of the fruit	Fever, gastric problems, coolant and laxative

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
11	<i>Argemone mexicana</i> L.	H	Papavaraceae	Bramhadhandi	Mexican Poppy	Whole Plant	<p>mixed with cumin cures gastric problems among children. The root is slightly bitter and acts as a coolant and laxative.</p> <p>The oil obtained from the seed is purgative. A decoction made from the root is used to wash eyes and used as a lotion for inflammatory swellings. The juice of the plant is diuretic and is given to cure jaundice and skin diseases The oil is locally applied over skin diseases.</p>	Inflammation, jaundice, skin disease
12	<i>Azadirachta indica</i> A.Juss.	T	Meliaceae	Vembu	Neem	Leaf, bark and seed	<p>Fresh juice is mixed with salt and given for intestinal worms. A decoction of the fresh leaves is consumed for malarial fever. Leaves are made into a paste</p>	Intestinal worm, malaria, skin diseases and urinary disorders

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
13	<i>Basella alba</i> L.	C	Chenopodia -ceae	Pasalai	Malabar Spinach	Leaf	and applied over skin diseases. The tender twigs are used as tooth brush to keep the teeth and gums healthy. Fruit is used for urinary disorders. Fresh leaves are more nutritious than cooked leaves. The water become viscose when the leaves are soaked which is applied on the forehead to induce sleep. The leaf juice is mixed with sugar candy and given to cure phlegm and cold. It is a good laxative and cures urinary infections.	Induce sleep, cures phlegm, cold and urinary infection
14	<i>Cardiospermum halicacabum</i> L.	C	Sapindaceae	Mudakkatran	Baloon vine	Leaf and root	2 drops of leaf juice is administered in the ear to cure ear ache. Water soaked with leaf and root may be taken thrice to cure prolonged cough. The dried root	Ear ache, cough, piles and knee pain

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
15	<i>Carica papaya</i> L.	T	Caricaceae	Pappali	Papaya	Fruit	soaked in water may be taken in to cure piles. Knee pain is cured when the leaf is boiled in oil and applied. Fruit and milk extract kills worms in the intestine and a good appetizer. The fruit cures urinary infection and strengthens the body. Fruit cures prolonged piles and constipation. Fruit cures diabetes when consumed with jamun fruit. It is good for eyesight.	Appetizer, piles, constipation, diabetes and eye problems
16	<i>Carissa spinarum</i> L.	S	Apocynaceae	Sirukala	Carissa	Fruit and root	The root is useful in treating uterus problems after delivery. The fruit is an appetizer and reduces body pain. The fruit is eaten to reduce ear block. The unripe fruits are used a pickles.	Uterus problem, body pain and reduce ear block

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
17	<i>Cassia auriculata</i> L.	S	Caesalpinia -ceae	Avaram	Tanner's cassia	Flower, leaf and seed	Flowers are dried under shade and made into a powder, the powder is mixed in boiled water and consumed to control diabetes. Flowers, seeds and leaves are used to cure skin diseases	Diabetes, Skin diseases
18	<i>Cassia tora</i> L.	H	Caesalpinia -ceae	Thagarai	Foetid Cassia	Leaf, seed and root	The decoction of leaves is given to children having intestinal disorders. Ringworms can be cured by applying a paste of the root made with lime juice. The seed is powdered and mixed with butter and used for skin ulcers	Intestinal disorders, ring worm and ulcers
19	<i>Centella asiatica</i> (L.) Urb.	H	Umbellifera -ceae	Vallaarai	Indian Pennywort	Leaf	It cures mouth ulcers. When it is consumed regularly it increases resistance power in body and prevents any diseases. It can cure certain skin diseases including leprosy	Mouth ulcer

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
20	<i>Cissus quadrangularis</i> L.	C	Vitaceae	Pirandai	Edible-stemmed vine	Root	It is a good appetizer. Cures indigestion when powdered and consumed with pepper and ginger. Dried root powder is consumed to fasten bones in case of accidents. In case of sprains, wounds and inflammation, the juice with tamarind and salt is heartened and applied for fast relief.	Appetizer, Indigestion, sprain, wound and inflammation
21	<i>Clitoria ternatea</i> L.	C	Fabaceae	Sangu Pushpam	Butterfly Pea	Leaf and root	The leaf juice is mixed with ginger and given to check fever. The roots are used in treating indigestion, constipation and irritation of the bladder and urethra. The leaf juice is given with cold milk for chronic bronchitis.	Fever, indigestion and bronchitis
22	<i>Coleus amboinicus</i> Lour.	H	Lamiaceae	Karpooravalli	Indian Borage	Leaf	The juice extracted from the leaves are mixed with sugar	Cough, head ache and inflammation of lungs

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
23	<i>Coriandrum sativum</i> L.	H	Umbellifera -ceae	Kothamalli	Coriander	Whole plant	candy and given to children to cure prolonged cough. For head ache fresh leaves are squeezed and applied on the forehead. The leaf juice can cure inflammation of lungs. The leaf paste is mixed with milk and sugar is given for treating bleeding piles. The paste of the seed is applied for chronic ulcers of the throat. The seeds can be chewed to get rid of tooth ache and gum inflammation.	Bleeding piles, throat pain and tooth ache
24	<i>Cynodon dactylon</i> (L.) Pers.	H	Poaceae	Arugampul	Bermuda grass	Whole plant	The juice obtained from the plant is used to stop bleeding of cuts and wounds. The grass mixed with milk is prescribed for bleeding piles, irritation of the urinary organs and vomiting. The juice of	Stop bleeding, vomiting, diarrhea, dysentery

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
25	<i>Delonix elata</i> (L.) Gamble	T	Caesalpinia -ceae	Vadha -narayanan	White Gulmohur	Leaf	the plant is given in chronic diarrrhea and dysentery. It clears constipation when leaf juice and castor oil is boiled and consumed and clears gastric trouble. Body rashes and eczema are cured when paste of the plant's leaf, kuppaimeni and turmeric is applied and washed later.	Gastric trouble and eczema
26	<i>Eclipta alba</i> (L.) Hassk.	H	Asteraceae	Karisalai	Trailing Eclipta	Whole plant	The fresh plant is used as a liver tonic. 2 drops of the leaf juice is mixed with few drops of honey and given to cure cough and watering of nose among children. The fresh juice of the leaves is applied over the shaven scalp for good hair growth	Running nose and hair growth

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
27	<i>Eclipta prostrata</i> (L.) L.	H	Asteraceae	Manjal-karisalai	False daisy	Whole plant	2 to 3 drops of the leaf juice is administered in the ear to cure ear problems. The leaf juice mixed with gingelly oil and heated and applied as hair tonic. The root powder is used to cure ulcers, spleen and liver disorders.	Ear problems, hair tonic, ulcer, spleen and liver disorder
28	<i>Embllica officinalis</i> Gaertn.	T	Euphorbiaceae	Peru Nelli	Indian Gooseberry	Leaf, bark, fruit and flower	It cures vomiting, indigestion, acidity. The juice is consumed with honey to cure chronic bronchitis. The leaf and root are given to cure jaundice. The fruit is applied on hair to prevent early graying and hair fall.	Vomiting, indigestion, bronchitis, jaundice and hair fall
29	<i>Euphorbia hirta</i>	H L.	Euphorbiaceae	Ammaan Pacharisi	Asthma weed	Whole plant	The milky latex is applied directly to cure pimples and acne. This plant is used as a supplement medicine for cough, asthma and mouth ulcers	Acne, cough, asthma and mouth ulcer

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
30	<i>Ficus glomerata</i> Roxb.	T	Moraceae	Athi	Indian fig	Fruit	The unripe fruits are cooked and consumed to cure stomach ache, tonic obtained from the fruit used in the treatment of piles. The dried fruits improves the hemoglobin content in the blood	Stomach ache, piles, Increase hemoglobin in blood
31	<i>Ficus religiosa</i> L.	T	Moraceae	Arasam	Peepal	Leaf, bark and seed	Leaves are used to cure ear aches, wounds, burns, nausea and inflammation. The juice of the bark relieves toothache and strengthens the gum. The powder made from the fig is given for asthma.	Ear aches, wounds, tooth ache and asthma
32	<i>Gymnema sylvestre</i> (Retz.) R.Br. ex Sm.	C	Asclepiada -ceae	Sirukurinjan	Gymnema	Leaf and root	Dried leaves are mixed with equal quantity of jamun seeds and powdered and is taken for 40days with warm water to cure diabetes. It is an appetizer and coolant. The roots are	Diabetes, appetizer, coolant and antitode

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
33	<i>Heliotropium indicum</i> L.	H	Boraginaceae	Thelkodukki	Indian Turnsole	Leaf and flower	used as antitode for poisonous bites. The leaf is made into a paste with turmeric and applied over boils and bruises. The leaf juice is an antitode for scorpion sting. The infusion of the leaves and flowers is used as a mouth wash to relieve throat pain and throat ulcers. The juice of the leaves cures pimples.	Bruises, antitode for scorpion king, throat pain, reduce pimples
34	<i>Hemidesmus indicus</i> (L.) R. Br. ex Schult.	C	Asclepiada -ceae	Nannaari	Indian Sarasaparila	Root	Dried and powdered roots are consumed with milk to cure urinary infections. Powdered roots are mixed with aloe vera and consumed to prevent after effects of poisonous bites. The root immersed in 100 ml. water is consumed thrice to cure indigestion.	Urinary infection and indigestion

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
35	<i>Hibiscus rosa-sinensis</i> L.	S	Malvaceae	Chembaruthi	Shoe flower	Leaf and flower	The leaf paste is applied over the head and taken bath to cure dandruff. The flowers are roasted in ghee and given to control excessive bleeding during menstruation. The flower is soaked in water and consumed to cure urinary tract diseases.	Dandruff, Urinary disorder and Menstruation, problems
36	<i>Justicia adhatoda</i> L.	S	Acanthaceae	Adathoda	Adathoda	Leaf and root	Juice taken from the leaves is mixed with honey or with ginger juice and consumed to cure chronic bronchitis, equal amount of leaf extract and root can cure asthma.	Chronic bronchitis, Asthma
37	<i>Lawsonia inermis</i> L.	T	Lythraceae	Marudhani	Henna	Leaf, bark, fruit, seed and root	It is an antiseptic and cures fungal infections in fingers when the paste is applied. The paste may be applied to cure prolonged rashes and skin diseases. The leaf	Fungal infection, skin diseases, eye problems

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
38	<i>Leucas aspera</i> (Willd.) Link	H	Lamiaceae	Thumbai	White Dead nettle	Leaf and flower	is made into a paste and bandaged over the feet to protect the eyes during measles. 1 to 2 drops of leaf juice is administered in nostrils to clear phlegm. Leaf paste is applied and washed after some time to cure rashes and other skin diseases. Leaf juice cures common cold and cough. 2 to 3 drops are administered in nostrils to cures severe headache.	Phlegm, rashes, skin diseases, cold, cough and head ache.
39	<i>Melia azadirachta</i> L.	T	Meliaceae	Malaivembu	Persian lialac	Leaf, flower, seed and root	It is used to cure piles and also to expel worms. The leaf poultice is used for nervous disorders. The leaves and bark are used to cure leprosy.	Nervous disorders and Leprosy
40	<i>Mimosa pudica</i> L.	H	Mimosaceae	Thottarsurungi	Sensitive plant	Leaf and root	The juice of the leaves and roots are applied	Piles, bruises, inflammation, knee

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
41	<i>Momordica charantia</i> L.	C	Cucurbitaceae	Paagal	Bitter Gourd	leaf, fruit and seed	externally to cure piles, fistula, boils and bruises. Leaves are made into a fine paste and applied to cure inflammation of the testicles, joints and knee pain. Hot decoction of the leaves is applied on the hips to relieve pain. It is a good appetizer and controls constipation. The Leaf juice kills the worms in the stomach. Fruit juice with sugar is consumed by women to cure stomach pain during periods. It is a good medicine for diabetes. It also cures rheumatic pains.	pain and hip pain. Stomach problems, diabetes and rheumatic pains
42	<i>Moringa oleifera</i> Lam.	T	Moringaceae	Murungai	Drumstick	Leaf	Leaf juice mixed with lemon juice clears pimples. Leaf paste is applied to reduce	Inflammation, headache and eczema

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
43	<i>Nyctanthes arbor-tristis</i> L.	T	Oleaceae	Pavazhamalli	Coral jasmine	Leaf, flower and bark	inflammation. Leaf juice with pepper is applied on the forehead to cure headache. Oil from the seed helps in reducing rheumatic pain. Rashes and eczema is cured when leaf extraction along with extraction of kuppaimeni leaf and coconut oil. The tender leaves are mixed with ginger juice and given for periodic fever. The leaves are soaked in hot water and consumed twice daily to cure back pain. The leaf juice is mixed with salt and honey to children to de-worm. The bark is eaten with betel.	Fever, back pain, de-worm
44	<i>Ocimum basilicum</i> L.	H	Lamiaceae	Thiruneetru-pachilai	Common Basil	Whole plant	2 to 3 drops of leaf juice is administered in the ear to cure ear ache,	Ear ache, ring worm, skin diseases

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
45	<i>Ocimum sanctum</i> L.	H	Lamiaceae	Thulasi	Sacred Basil	Whole plant	The juice obtained from the leaves is used to cure ringworms and other skin diseases. Mixture of sweet flag (Vasambu) powder and the leaf juice is applied to cure pimples.	Malaria, liver disorder, ring worm, skin diseases and dandruff
46	<i>Phyllanthus niruri</i> L.	H	Euphorbiaceae	Keelanelli	Stonebreaker	Whole plant	The decoction is given to cure malaria, gastric diseases of children and liver disorders. The leaf juice is used for ringworms and other skin diseases. To prevent lice and dandruff, leaf juice mixed with lemon juice may be applied on the hair and washed after 1 hr.	Jaundice and skin disease

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
47	<i>Pongamia pinnata</i> (L.) Pierre	T	Papilionaceae	Pungam	Indian beech	Leaf, flower, seed and root	check hiccup. A poultice of leaves mixed with salt is used in the treatment of itch and scaly skin diseases. It is an antiseptic and strengthens the body. The milk extract from the plant is applied on wounds for fast relief. Seed powder mixed with honey is given to Children with whooping cough. The oil from the seed is applied to cure eczema, ring worms and rashes.	Antiseptic, pain relief, cough, eczema, ring worm and rashes
48	<i>Punica granatum</i> L.	T	Punicaceae	Madhulai	Pomegranate	Whole plant	The flower and un ripened fruit may be dried and powdered and taken to cure cough. Children may be given powder of dried flowers to cure dysentery. Fruit provides cure from piles at an early stage. The fruit juice along	Cough, dysentery, reduce body heat and worm

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
49	<i>Ricinus communis</i> L.	S	Euphorbiaceae	Amanakku	Castor oil plant	Leaf and seed	with sugar granules reduces body heat. Root barks and clove extraction kills ring worm in the intestine. The leaves of the plant is warmed over fire and applied to the breasts of nursing mothers as a lactagogue. Leaves are applied on the abdomen to promote menstrual flow. The oil obtained from the seed is laxative.	promote menstrual flow, laxative
50	<i>Solanum indicum</i> L.	S	Solanaceae	Sundakkai	Devil's Fig	Fruit and root	The fruits are cooked and eaten. The dried fruit is roasted in ghee and powdered and mixed with rice and eaten to kill worms in the stomach. The root bark is made into a powder and inhaled for head ache and cold.	Headache and cold
51	<i>Solanum nigrum</i> L.	H	Solanaceae	Manathakkali	Black Nightshade	Leaf and fruit	The leaf juice may be consumed thrice daily to cure body heat, mouth ulcers. When cooked with dhal cures	Body heat, mouth ulcer, urinary infection, stomach ulcers and worm

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
52	<i>Solanum trilobatum</i> L.	C	Solanaceae	Thoodhuvalai	Purple-fruited pea eggplant	Whole plant	constipation and phlegm. The fruits are soaked in buttermilk and dried and consumed. It cures several urinary infections, stomach ulcers, kills worms. The leaf decoction is given to children to cure fever with phlegm. 1 to 2 drops of leaf juice is administered in the ear to cure ear ache	Fever and ear ache
53	<i>Solanum xanthocarpum</i> Wendl. Schrad. & H.	H	Solanaceae	Kandankathiri	Indian solanum	Whole plant	The leaves are powdered and mixed with coconut oil, boiled, filtered and applied over the body to get rid of body odour. The decoction of the root is given for coughs, asthma and fever.	Coughs, asthma and fever
54	<i>Syzygium cumini</i> (L.) Skeels	T	Myrtaceae	Naaval	Black Plum	Bark and seed	Good appetizer and reduces diabetes when the seed is powdered	Appetizer, stop bleeding, relief pain

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
55	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	T	Combretaceae	Marudha -maram	Arjun	Leaf, fruit, bark and seed	and consumed every day. Bark is powdered and mixed with butter milk and consumed to stop over bleeding. The bark paste is applied on wounds and inflamed parts for relief.	Cracks in th feet and bone fracture
56	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	T	Combretaceae	Thandri	Beleric Myrobalan	Fruit	The fruit is bitter and purgative. The pulp of the fruit is mixed with salt, long pepper and honey is used to cure cough, sore throat. The kernel is made into a paste and applied over the wounds. The oil extracted from the	Cough, throat pain, wound and hair tonic

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
57	<i>Thespesia populnea</i> (L.) Sol. ex Correa	T	Malvaceae	Poovarasu	Portia Tree	Leaf, flower, bark, seed and root	kernel is used as a hair tonic It kills the worms in our body. The extracted oil is applied on venomous bites for relief. Dried bark of 100 year old tree is powdered and consumed to cure leprosy. The bark is washed and the extracted oil is mixed with coconut oil and applied to cure all types of skin problems.	Venomous bite, leprosy and skin diseases
58	<i>Tinospora cordifolia</i> (Willd.) Miers	C	Menispermaceae	Seendhilkodi	Heart-leaved Moonseed	Whole plant	The fresh plant is more effective than dried ones. To cure wounds castor oil is applied over the leaves and heated over fire and used as bandage. The leaf paste is consumed in empty stomach for 60 days to control diabetes. The fresh juice is mixed with milk and used as general tonic.	Wound and diabetes

S. No	Botanical name	Habit	Family	Vernacular name	Common name	Plant part uses	Administration and mode of preparation of medicines	Medicinal use(diseases)
59	<i>Tribulus terrestris</i> L.	H	Zygophyll -aceae	Nerunjil	Land calthrops	Whole plant	Controls body heat and provides strength. It also cures urinary infections. The seeds are given daily in impotence, and incontinence of urine. It is a good medicine for scorpion bite	Control body heat, urinary infection and scorpion bite
60	<i>Vitex negundo</i> L.	T	Verbenaceae	Nochi	Indian Privet	Leaf, flower, bark and root	It removes phlegm and worms in the stomach and strengthens the body. It is given to children with stomach problems. It cures rheumatic pains when juice is consumed with pepper and ghee. Paste of leaf with ginger is applied on forehead to cure headaches. Fever and phlegm is cured when the leaf is added to hot water and vapour is inhaled.	Stomach problems, rheumatic pains, forehead and fever

Conclusion

The present study was explored for the medicinal value of important plants which is found in the parks of Chennai which are used for simple and complicated diseases. Such parks were destroyed by the Vardha cyclone. Many trees were uprooted and because of that the under storey plants were also affected. However, it is an urgent need to restore the parks by planting native trees which already existed in the respective parks. If this is carried out in war footing, the parks would be getting their previous status and can be more useful for the people and also maintain the local floral and ethnobotanical values.

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Biodiversity of the Grove

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Abstract

*The campus of the C.P. Ramaswami Aiyar Foundation (CPRAF) is named as "The Grove". It is located in Eldams Road, Alwarpet, a thickly populated area of south Chennai. In spite of its location, the heritage building is surrounded by a number of plants the species and the tree cover is high. The study was conducted during April 2015 to document the plant species and the associated animals. Even in hot summer months, 102 plant species belonging to 94 genera in 45 families were recorded in the campus. The most abundant family is Fabaceae with 16 plant species followed by Araceae (5), Euphorbiaceae (4), Lamiaceae (3) and Cucurbitaceae (3) by Angiosperm phylogeny group III classification. Introduction The forest types of the Coromandel coast include tropical dry evergreen forests (TDEFs), dry evergreen scrubs and mangroves (Champion and Seth 1968). This forest type is supporting rich biodiversity. The Chennai city is located on the Coromandel Coast; the biodiversity of this heritage city is documented by various authors (Uthyakumar et al. 2011¹; 2005a²). Guindy National Park, Indian Institute of Technology (IIT) campus and Theosophical Society campus in which florists studies were reported by Amirthalingam, 2004. Based on the previous study, the present study on the biodiversity richness of the grove was carried out. The grove was established in 1885-86. It derives its name from the fact that the area contains a large number of trees. There are many old trees in the grove (Amirthalingam 2004³). Amirthalingam, 2004 reported five tree species which are considered as heritage trees since they are more than a hundred years old. They are pipal (*Ficus religiosa*), canon-ball tree (*Couroupita guianensis*), divi-divi (*Caesalpinia coriaria*), sausage tree (*Kigelia pinnata*) and rain tree (*Samanea saman*).*

Key words: *The grove, biodiversity, heritage trees, ecology, birds and animals.*

Methodology

The qualitative survey of angiosperm plant species was carried out in the C. P. Ramaswami Aiyar Foundation campus (13.0380° N, 80.2556° E). It is

one of the oldest and famous historical places in Chennai. Plants either with flowers or fruits were collected and identified or confirmed with available regional flora with the help of Gamble (1915-1936⁴) and Matthew (1982⁵,

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1983⁶ and 1988⁷) have also been referred to the correct botanical names for the specimens identified. Bird species of the campus were identified by referring to Alis (1996⁸) and Thirumalai and Krishnan (2005⁹).

Result and discussion

The qualitative floristic survey revealed the presence of 102 plant species belonging to 94 genera in 45 families which were recorded in the campus. The plant scientific name, vernacular name, family and life form are provided Table 3. Whereas, compared with other study site of Pachaiyappai's College, Chennai, Uthyakumar et al. 2011 reported 256 species which were enumerated in the college campus. Mayuranathan (1994¹⁰) reported 1039 species of flowering plants from the entire Chennai district. Giles Lal and Livingstone (1978¹¹) have documented 458 (256 woody plants and 202 herbs) flowering plant species from ca. 151 ha campus of an age-old Madras Christian College (MCC), Chennai. Fabaceae is the dominant family in the Chennai district, MCC as well as PC

with 87, 59 and 31 species respectively. The present study revealed that the dominant family is Fabaceae with 16 plant species followed by Araceae (5), Euphorbiaceae (4), Lamiaceae (3) and Cucurbitaceae (3) the most abundant family in the campus. Among habit wise distribution, trees were the dominant species represented by 54% with 55 species and herb (34 species 33%), Climber (9 species, 9%), Shrubs (4 species, 4%) (Fig. 1).

Apart from heritage tree species the campus is having ecologically important species such as *Mimusops elengi* (spanish cherry), *Couroupita guianensis* (canon-ball tree), *Samanea saman* (rain tree), *Thespisia populnea* (Indian tulip tree), *Ficus religiosa* (pipal), *Ficus benghalensis* (banyan), *Ficus racemosa* (cluster fig), *Delonix regia* (flame of forest tree) *Pongamia pinnata* (pungam), *Erythrina variegata* (Indian coral tree) *Pithecellobium dulce* (Manila tamarind), *Holoptelea integrifolia* (Indian elm) and *Azadirachta indica* (neem). There are about eighteen plant species and its role in ecosystem services (Provisioning and supporting) are given in Table 1.

Fig. 1: Dominant life form in the campus



Table 1: Ecologically important trees

S.No.	Botanical name	Common Name	Intrrelationship between plants and animals	Ecological service
1.	<i>Kigelia pinnata</i> (Lam.) Benth.	Sausage Tree	Flower attract bats and insects	Pollination service
2.	<i>Carica papaya</i> L.	Papaya	Food for birds and squirrels	Provisioning service
3	<i>Samanea saman</i> (Jacq.) Merr.	Rain tree	Serves as a nesting place for birds and as a shelter for squirrels	Provisioning service
4.	<i>Delonix regia</i> (Bojer) Raf.	Flame tree	Nectar, flowers and fruits are food for birds. Seeds are dispersed by birds	Provisioning service
5.	<i>Pongamia pinnata</i> (L.) Pierre	Pongam	Nectar is food for insects.	Provisioning service
6.	<i>Gliricidia sepium</i> (Jacq.) Kunth	Quickstick	Nectar is food for insects.	Provisioning service
7.	<i>Erythrina variegata</i> L.	Indian coral tree	Nectar is food for insects.	Provisioning service
8.	<i>Pithecellobium dulce</i> (Roxb.) Benth	Manila Tamarind	The fruits are food for birds	Provisioning service
9.	<i>Tamarindus indica</i> L.	Tamarind	It is food for squirrels. The tree acts as a shelter for small animals and birds	Provisioning service
10.	<i>Couroupita guianensis</i> Aubl.	Cannon ball tree	Nectar is food for insects.	Provisioning service
11.	<i>Azadirachta indica</i> A. Juss.	Neem	Fruits are a food for birds	Provisioning service
12.	<i>Ficus religiosa</i> L.	Peepal	Fruits are a food for birds	Provisioning service
13.	<i>Ficus benghalensis</i> L.	Banyan	Fruits are a food for birds	Provisioning service
14.	<i>Ficus racemosa</i> L.	Cluster fig	Fruits are a food for birds	Provisioning service
15.	<i>Psidium guajava</i> L.	Guava	Fruits are a food for birds and animals	Provisioning service
16.	<i>Syzygium cumini</i> (L.) Skeels	Java plum	Fruits are a food for birds and animals	Provisioning service
17.	<i>Achras sapota</i> L.	Chikoo	Fruits are a food for birds and animals	Provisioning service
18.	<i>Mimusops elengi</i> L.	Spanish cherry	Fruits are a food for birds and animals	Provisioning service

Table 2: List of Birds

S. No.	Scientific name	Common name
1.	<i>Hierococcyx varius</i>	Brainfever birds
2.	<i>Dendrocitta vagabunda</i>	Indian treepie
3.	<i>Accipiter badius</i>	Shirka
4.	<i>Psittacula krameri</i>	Parrot
5.	<i>Corvus splendens</i>	House crow
6.	<i>Passer domesticus</i>	Sparrow
7.	<i>Tyto alba</i>	Barn owl
8.	<i>Upupa epops</i>	Common hoopoe
9.	<i>Coracias benghalensis</i>	Indian roller
10.	<i>Cuculus canorus</i>	Common cuckoo
11.	<i>Turdoides caudatus</i>	Common babbler
12.	<i>Nectarinia asiatica</i>	Purple sun bird
13.	<i>Dicrurus macrocercus</i>	Black drongo
14.	<i>Saxicoloides fulicatus</i>	Indian Robin
15.	<i>Columba livia</i>	Blue rock pigeon
16.	<i>Eudynamys scolopacea</i>	Asian Koel
17.	<i>Acridotheres trisis</i>	Common myna
18.	<i>Psilopogon haemacephala</i>	Coppersmith Barbet
19.	<i>Centropus sinensis</i>	Crow- pheasant
20.	<i>Merops orientalis</i>	Green bee- eater
21.	<i>Orthotomus sutorius</i>	Common tailorbird
22.	<i>Streptopelia chinensis</i>	Spotted dove
23.	<i>Streptopelia senegalensis</i>	Little brown dove
24.	<i>Pycnonotous cafer</i>	Red-vented bulbul
25.	<i>Turdoides striatus</i>	Jungle babbler

There are about 25 bird species recorded in the grove, of which species such as parakeet, koel, house sparrow, house crow and shikra could be seen throughout the year (Table 2). The parakeet, myna lay eggs in the tree holes of the rain tree and breeds there. The large trees of the campus serve as

a roosting place for some of the birds also. Within a one kilometer radius there are half a dozen parks situated. All these parks are not having very big trees; the birds which are using these places also roost in the campus. Apart from plants and birds, the campus supports insects, squirrels and dogs.

Table 3: Details of plant diversity in the Grove

S.No.	Family	Botanical name	Habit	Tamil name	Common name
1	<i>Acanthaceae</i>	<i>Andrographis echioides</i> (L.) Nees	H	Gopuram tangi	False waterwillow
2		<i>Pseuderanthemum reticulatum</i>	H		Golden Pseuderan-themum
3		<i>Ruellia prostrata</i> Poir.	H	Pottakanchi	Bell weed
4	<i>Amaranthaceae</i>	<i>Amaranthus viridis</i> L.	H	Kuppaikeerai	Pigweed
5		<i>Amaranthus spinosus</i> L.	H	Mullukkeerai	Edlebur
6	<i>Anacardiaceae</i>	<i>Mangifera indica</i> L.	T	Ma	Mango
7		<i>Lanea coromandelica</i> (Houtt.) Merr.	T	Uthiyamaram	Indian ash tree
8	<i>Annonaceae</i>	<i>Polyalthia longifolia</i> (Sonn.) Thwaites	T	Nettilingam	False ashok
9	<i>Apocynaceae</i>	<i>Nerium oleander</i> L.	T	Arali	Oleander
10	<i>Araceae</i>	<i>Aglaonema crispum</i> (Pitcher & R. F. Manda) Nicolson	H	Sempu	Cocoyam
11		<i>Caladium</i> spp.*	H	—	—
12		<i>Colocasia esculenta</i> (L.) Schott	H	—	Dumb cane
13		<i>Dieffenbachia amoena</i> Hort.	S	—	—
14		<i>Epipremnum pinnatum</i> (L.) Engl.	C	—	—
15	<i>Araliaceae</i>	<i>Polyscias</i> spp.*	H	—	—

S.No.	Family	Botanical name	Habit	Tamil name	Common name
16	Araucariaceae	<i>Araucaria columnaris</i> (G. Forst.) Hook.	T	Christmas Tree	Christmas Tree
17	Areaceae	<i>Caryota urens</i> L.	T	Kunthal pannai	Fishtail Palm
18		<i>Cocos nucifera</i> L.	T	Thenkayi	Coconut
19		<i>Dypsis lutescens</i> (H. Wendl.) Beentje & J. Dransf.	T	—	Golden cane palm
20	Asparagaceae	<i>Pritchardia</i> spp.*	T	—	Palm tree
21		<i>Sansevieria roxburghiana</i> Schult. & Schult. F.	H	Maruvam	Bowstring-hemp
22	Asteraceae	<i>Wedelia trilobata</i> (L.) Hitchc. karichalankanni	H	Machal	yellow dots
23	Bignoniaceae	<i>Kigelia africana</i> (Lam.) Benth.	T	Yannai pudukai	Sausage Tree
24		<i>Millingtonia hortensis</i> L. F.	T	Maramalli	Indian cork tree
25		<i>Tecoma stans</i> (L.) Juss. Ex kunth	T	Sonnapatti	Yellow beels
26	Brassicaceae	<i>Brassica oleracea</i> var. <i>Botrytis</i>	H	Cauliflower	Cauliflower
27	Calophyllaceae	<i>Raphanus sativus</i> L.	H	Muillangi	Radish
28		<i>Calophyllum inophyllum</i> L.	T	Punnai	Alexandrian laurel
29	Caricaceae	<i>Carica papaya</i> L.	T	Pappali	Papaya
30	Combretaceae	<i>Quisqualis indica</i> L.	C	Irangun malli	Rangoon creeper
31		<i>Terminalia catappa</i> L.	T	Vadumai	Indian almond
32	Commelinaceae	<i>Tradescantia Spathacea</i> Sw.	H	—	Moses in the cradle
33	Cucurbitaceae	<i>Cucurbita pepo</i> L.	C	Kaliyana-pushinik -kay	Pumpkin

S.No.	Family	Botanical name	Habit	Tamil name	Common name	
34	Euphorbiaceae	<i>Coccinia grandis</i> (L.) Voigt	C	Kovai	Ivy gourd	
35		<i>Momordica</i>	C	Pavakkai	Bitter gourd <i>charantia</i> L.	
36		<i>Acalypha indica</i> L.	H	Kuppaimeni Indian	copperleaf	
37		<i>Euphorbia hirta</i> L.	H	Amman pacharisi	Asthma weed	
38		<i>Pedilanthus tithymaloides</i> (L.) Poit.	H	Kannatikkalli	Christmas candle	
39		<i>Euphorbia milii</i> Des moult.	H	Ainkôna kalli	kiss me not	
40		Fabaceae	<i>Samanea saman</i> (Jacq.) Merr.	T	Thungumunchi	Rain tree
41			<i>Delonix regia</i> (Bojer) Raf.	T	Vathanarayan	Flame tree,
42	<i>Bauhinia</i>		T	Nilattiruvatti	Butterfly tree <i>purpurea</i> L.	
43	<i>Pongamia pinnata</i> (L.) Pierre		T	Punnai	Pongam	
44	<i>Gliricidia sepium</i> (Jacq.) Kunth		T	Seemai akathi	Quickstick	
45	<i>Lablab purpurens</i> L		C	Avarai	Lablab bean	
46	<i>Sesbania grandiflora</i> (L.) Poir.		H	Agathikeerai	Agati	
47	<i>Caesalpinia coriaria</i> (Jacq.) Willd.		T	Ingimaram	Divi-divi	
48	<i>Peltophorum pterocarpum</i> (Dc.) Backer ex k. Heyne		T	Iyalvakai	Copperpod	
49	<i>Erythrina variegata</i> L.		T	Kalyanamuringai	Indian coral tree	
50	<i>Adenanthera pavonina</i> L.		T	Sivakundalam	Coral-wood	
51	<i>Pithecellobium dulce</i> (Roxb.) Benth.		T	Kodukkapuli	Manila tamarind	
52	<i>Bauhinia racemosa</i> Lam.		T	Atthi	Bidi leaf tree	
53	<i>Cassia fistula</i> L.		T	Sarakonrai	Golden shower tree	

S.No.	Family	Botanical name	Habit	Tamil name	Common name
54	Lamiaceae	<i>Tamarindus indica</i> L	T	Puli	Tamarind
55		<i>Leucaena leucocephala</i> (Lam.) De wit	T	Savundal	White babool
56		<i>Ocimum sanctum</i> L.	H	Tulasi	Holy basil
57		<i>Tectona grandis</i> L. F.	T	Thekku	Teak
58		<i>Vitex negundo</i> L.	T	Nochi Chaste tree	Dusky leaved-fire brand teak
59	<i>Premna latifolia</i> Roxb.	T	Erumai-munnai		
60	Lecythidaceae	<i>Couropita guianensis</i> Aubl.	T	Nagalingam	Cannon ball tree
61	Malvaceae	<i>Thespesia populnea</i> (L.) Sol. Ex corrêa	T	Puvarasu	Indian tulip tree
62	Meliaceae	<i>Hibiscus rosa-sinensis</i> L.	S	Chem-paruthi	China rose
63		<i>Abelmoschus esculentus</i> (L.) Moench	H	Vendai	Ladies finger
64		<i>Guazuma ulmifolia</i> Lam.	T	Kattu utharacham	Bastard ceda
65	Moraceae	<i>Azadirachta indica</i> A. Juss.	T	Vembu	Neem
66	Moringaceae	<i>Ficus religiosa</i> L.	T	Arasu	Peepal
67		<i>Ficus benghalensis</i> L.	T	Aal	Banyan
68		<i>Ficus racemosa</i> L.	T	Athi	Cluster fig
69		<i>Streblus asper</i> Lour.	T	Parayi	Sand paper tree
70	Musaceae	<i>Moringa oleifera</i> Lam.	T	Murungai	Drumstick tree
71	Myrtaceae	<i>Musa paradisiaca</i> L.	H	Vazhai	Banana
72	Myrtaceae	<i>Psidium guajava</i> L.	T	Koyya	Guava
73		<i>Eucalyptus tereticornis</i> Sm.	T	Thailamaram	Bastard box

S.No.	Family	Botanical name	Habit	Tamil name	Common name
74	<i>Nyctaginaceae</i>	<i>Syzygium cumini</i> (L.) Skeels	T	Naval	Java plum
75		<i>Boerhavia diffusa</i>	H	Mukkurattai	Punarnava L.
76		<i>Bougainvillea spectabilis</i> Willd	C	Kagitha poo	Great bougainvillea
77	<i>Ochnaceae</i>	<i>Pisonia grandis</i> R. Br.	T	Ellachakottaikeerai	Lettuce tree
78		<i>Ochna jabotapita</i> L.	S	Kalkuruvi	Golden champak
79	<i>Oleaceae</i>	<i>Nyctanthes arbor-tristis</i> L.	T	Pavalamalli	Coral jasmine
80	<i>Phyllanthaceae</i>	<i>Phyllanthus amarus</i> Schumach.	H	Keelanelli	Carry me seed
81	<i>Piperaceae</i>	<i>Piper betle</i> L.	C	Vettilai	Betel pepper
82	<i>Poaceae</i>	<i>Cynodon dactylon</i> (L.) Pers.	H	Arugam pul	Bermuda grass
83		<i>Saccharum officinarum</i> L.	H	Karumpu	Sugarcane
84	<i>Portulacaceae</i>	<i>Bambusa bambos</i> (L.) Voss	T	Moongil	Indian thorny bamboo
85		<i>Talinum fruticosum</i>	H	-	Ceylon spinach
86	<i>Proteaceae</i>	<i>Grevillea robusta</i> A. Cunn. Ex R. Br.	T	Savukku-maram	Silky oak
87	<i>Rubiaceae</i>	<i>Ixora pavetta</i> Andrews	T	Koran	Torchwood tree
88		<i>Ixora coccinea</i> L.	S	Vedchi	Ixora
89	<i>Rutaceae</i>	<i>Aegle marmelos</i> (L.) Correa	T	Vilvam	Bel
90	<i>Santalaceae</i>	<i>Murraya koenigii</i> (L.) Spr.	T	Karrivep-pilai	Curry
91		<i>Santalum album</i> L.	T	Santhanam	Sandal wood
92	<i>Sapindaceae</i>	<i>Cardiospermum halicacabum</i> L.	C	Matakaran	Balloon vine

S.No.	Family	Botanical name	Habit	Tamil name	Common name
93	<i>Sapotaceae</i>	<i>Madhuca longifolia</i> (L.) J. F. Macbr.	T	Iluppai	Mahwa
94		<i>Achras sapota</i> L.	H	Sapotta	Chikoo
95		<i>Mimusops elengi</i> L.	T	Mahizham	Spanish cherry
96	<i>Solanaceae</i>	<i>Solanum torvum</i> Sw.	H	Sundakayi	Turkey berry
97		<i>Solanum melongena</i> L.	H	Kathirikayi	Brinjal
98		<i>Capsicum annuum</i> L.	H	Milakai	Capsicum
99		<i>Solanum nigrum</i> L.	H	Mana-thakkali	Yellow nightshade
100	<i>Ulmaceae</i>	<i>Holoptelea integrifolia</i> (Roxb.) Planch.	T	Aya	Indian elm
101	<i>Xanthorrhoeaceae</i>	<i>Haworthia angustifolia</i> Haw.	H	Zebra	Haworthia
102	<i>Zingiberaceae</i>	<i>Zingiber officinale</i> Roscoe	H	Engichi	Ginger

H-herb; C- climber; S- shrub; T- tree

Conclusion

Heritage trees are important for biodiversity conservation and habitat restoration. Recently, the cyclone Vardah destroyed as many as one lakh trees in the city of Chennai alone. Within the campus, many ancient and beautiful trees have been destroyed due to the cyclone. Due to this factor, the campus is now open to direct sunlight. In addition, Chennai city has lost many of its age old trees due to the development of highways and other construction activities. Therefore, the need of the hour is to preserve and maintain the existing trees by procedures such as watering, inspection and pruning. We can also

plant more hardy and endemic trees that are suitable for the tropical climate of Chennai. This will enable future generations to enjoy the shade, fruits and flowers of these trees.

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Tiruvannamalai Hill: Historical and Ecological Perspectives

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Abstract

Sacred mountains are a prominent feature of many cultures. These are often linked to natural objects such as trees, groves, gardens, water bodies, caves and sites. These mountains are sources of fresh water and medicinal plants. They are thus the repository of rich biodiversity and the natural and cultural heritage site. There are many references to sacred mountains in history, literature and art and they have played a vital role in the conservation of the environment and local ecology. Sacred mountains are also associated with the traditional value system and intimately linked to identities of societies that venerate them. The natural resources available in this mountain have been jealously preserved and maintained by the local communities. The present paper attempts to explore environmental studies on the Tiruvannamalai hill of Tamil Nadu in the Eastern Ghats. This site is noted for its unique natural elements of flora and fauna and cultural elements like sacred ponds. The paper, therefore, highlights the threat to the sacred mountain, namely increasing population pressure, encroachment and other anthropomorphic factors.

Keywords: *Tiruvannamalai, history and mythology, cultural heritage, sacred ponds, biodiversity.*

Introduction

India is the land of many mountains such as the mighty Himalayan range and the Eastern and Western Ghats. These mountains are endowed with a personality of their own which gives them a one-pointed-ness of character, harmony and consistency. If these qualities are present in a mountain they become an emblem of cosmic power and we call it a sacred mountain.

Sacred mountains are a prominent feature of different cultures all over the world. In most cases, it can be shown that the sacredness of a place is linked in some way or the other to natural objects such as trees, groves, gardens, water bodies, caves and landscapes. These sacred forms and shapes that are derived from natural objects and features often become symbolic or emblematic. These sacred places are indeed a rich source of cultural heritage.

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Mountains loom large in any landscape and have long been invested with sacredness by many cultures around the world. The vertical axis of the mountain drawn from its peak down to its base links it with the world axis and is identified as the centre of the world. This is believed of Mount Meru of the Hindus. In Tibet, Mount Kailas, one of the tallest peaks in the Himalayas, near the source of the Ganga, is venerated by and is a pilgrimage site for Hindus, Jains, and Buddhists. Buddhists regard this mountain as a *mandala*. Sacred mountains played a vital role in the conservation of local ecology and the environment. A variety of themes are often found within sacred mountain traditions. The beliefs demonstrate an important link between the community's cultural identity and traditional patterns of land conservation. Sacred mountains are distinguished from other sacred sites as being exceptionally comprehensive ecosystems.

Sacred mountains and sacred sites within mountains have resulted in communities maintaining and preserving their natural resources in often-pristine conditions. Indigenous communities have long realized the value of the high diversity and natural resources within mountains and these mountains are resources of nature which nurture. The sacred mountain is protected due to cultural beliefs and has resulted in precious water, timber, flora, fauna, and other natural resources being maintained and preserved for future generations.

Tiruvannamalai

Tiruvannamalai is very sacred site and is the home of Annamalayaar or Arunachaleswarar. Shiva is worshipped here as a Shiva Linga and his consort is Unnamalaiyaal (Apitakuchambaal - Parvati). It is one of the largest temples in India. It occupies a special place in the Saivaite realm and is regarded as one of the *pancha bhoota sthalams* - one of the five temples associated with the five basic elements - associated with the element of fire, the other four being Tiruvanaikkaval (water), Chidambaram (space), Kanchipuram (earth) and Sri Kalahasti (air) respectively. Shiva is said to have manifested himself in the form of a massive column of fire, whose crown and feet as Brahma and Vishnu respectively attempted to reach, but in vain. The hill is the form of Lord Shiva and people circumambulate it (*pradhakshina*). The circumference is 13 kilometers and there is a road around the mountain for the *pradhakshina*. The mountain rises up to an elevation of 2665 feet (800 M). The road encircling the hill where devotees circumambulate is 8 ¼ miles (13 kms) long.

History & Mythology

Tiruvannamalai is one of the most venerated places in Tamil Nadu. In ancient times, the term 'Annamalai' meant an inaccessible mountain. The word 'Tiru' was prefixed to signify its greatness, and coupled with the two terms, it is called Tiruvannamalai.

The mountain in Annamalai *sthala* has an evolving history. It is said that in *Krita yuga*, the Lord stood in the form of fire, hence it became the fire mountain. In *Tretha yuga*, it was a mountain of precious gems (ratna).

In *Dvapara yuga* it stood in the form of bronze and now in *Kali yuga* it has become a stone hill. This is mentioned in the Arunachala purana. It is said that while Kailasa is a place where Lord Shiva resides, this mountain is Shiva himself. It is customary to install Nandi in front of Lord Siva. Several images of Nandi are found around the hill.

There is an air of deep mysticism around the temple, the hill and its environs, while the town itself has been known for its long association with yogis, *siddhas*, the well known spiritual savant Ramana Maharishi and several others. The origin of this temple dates way back in time, although much of the temple structure as seen today is a result of building activity over the last one thousand years. Seventh century Tamil poetry glorifies this temple. All the four Shaivite Saints- Appar, Sambandar, Manikkavacakar and Sundarar - have sung the glory of this temple and it was at this temple that Arunagiri - nathar began composing his immortal work Tiruppugazh. Muthuswamy Deekshitar's composition Arunachala -natham pays tribute to the presiding deity of Tiruvannamalai. In the late Chola period, this district was ruled by Cholan Sambuvarayar, whose headquarters were at Padavedu near Arani. We can still find the fort and Shiva temple, namely Kailasanathar in Arani town.

Tiruvannamalai is traditionally rich in history and spirituality, but lacks industrial growth. A few Pandya milestones, which remain along the route inscribed with the division to which they belong, have made it possible to reconstruct the division of this circuit into nine stages, each corresponding to one unit of time/ distance called a *nazhi* (24 minutes),

equivalent to 1.5 kms (The Hindu, Aug. 14, 1994). The iconographic representation is a later development, specific to Tiruvannamalai, where Siva and Parvati are figured on a stele covered with semi-circular incisions to represent the mountain; the rear face of this stele is a *lingam*, which is visible from the rear of the sanctuary. This representation is known locally as *adi mudi*, the high and the low, after the same words in poems by Sambandar and Sundarar referring to the directions in which Brahma and Vishnu sought the extremities of the pillar of fire.

The mountain itself, a cone standing alone in the midst of the plains, appears on the boundary-slabs of lands dedicated to the deity of Tiruvannamalai in the form of a triangle covered with semi-circular incisions, set either above the dynastic emblem of *gandabherunda*, the two-headed bird, or above the *kalasha*, the vase of plenty. The mountain symbolically defines different spaces. It is the wild, uncultivated place (*kaadu*) as opposed to the cultivated area. This contrast is marked in the festival of Tiruvudal, when Siva has his jewels stolen on the mountain in the west, and finds them again in the east in the locality where, according to legend, the palace of King Ballala used to stand.

There are lots of small temples around the mountain. The *ashtadikh-palakas* (lords of the eight sides of the world) are on the sides. There are eight old temples on the eight sides of the mountain - the Indra Lingam, Agni Lingam, Yama Lingam, Nirutthi Lingam, Varuna Lingam, Vaayu Lingam, Kubera Lingam and Esaanya Lingam. Daily worship is conducted for some, but

not all. Some of them have *vimana* (spire), *antarala* (varandah) and a sanctum.

Several festivals are performed in Tiruvannamalai temple such as the *arudra darshanam* in the month of Margazhi (December 15 to January 15); Tai *poosam* festival which occurs in the month of Tai (January 15 to February 15) and in the month of *Maasi*, (February 15 to March 15). The festival of Kartikai *deepam* (light) marks the conclusion of the ten day *Brahmotsavam* (festival) in the month of *Kartikai* (Nov 15 to December 15). *Kartikai deepam* is preceded by the *Bharani deepam* when a lamp is lit in the main shrine of the temple following a fire sacrifice before the shrine of Surya. A small bowl of ghee lit at this fire is used to light five other lamps representing the five aspects of Shiva. A group of fishermen carry a portion of this fire inside a container of baked earth to the summit of the mountain where a large copper utensil filled with offerings of ghee and pieces of cloth has been placed.

The crowd waits to catch a glimpse of the *deepam* which is brought out of the inner shrine towards the *utsavar* Annamalaiyaar, simultaneously; the lamp on the hill is lit, continuing the age old belief that it is a representation of Shiva himself who appeared in the form of a flame. Keeping with tradition, the inner sanctum doors close with the arrival of the *deepam*

outside, and it is believed that Annamalaiyaar is to be worshipped only as the beacon until the next morning when the shrine is reopened.

On full moon days doing *pradhakshina* (circumambulation) is considered very auspicious and very important. Every month on full moon day about five lakh people do the *pradhakshina*. Religious devotees bathe and walk with bare feet, repeating sacred hymns and meditating on Annamalaiyaar. This is the traditional ritual for making a circuit of the hill. Around the hill many Lingas, eight Nandis, more than 360 holy tanks, *mandapas* and ashrams are found.

Sacred groves

There are seven sacred groves reported in and around the Thiruvannamalai hills. The deities associated with these sacred groves are Kattushiva, Neithikoil, Vedyappar, Angalaparameswari, Kanni and Tiruvothamman and they are housed amidst a rich variety of flora and fauna and represent past landscapes of the region (Amirthalingam, 1998). The vegetation types of the sacred groves are southern thorn forest and tropical dry evergreen forest and scattered forests. The common plants are the trees such as rusty acacia, white-bark acacia, Indian gum Arabic tree, sage-leaved alangium, bitter albizia, lebbek tree, axlewood, bur flower-tree, neem, bamboo, flame of the forests, golden rain tree, scrambled egg bush, east Indian satinwood, Turk's turban moon, hill mango, glue berry, black rosewood, sickle bush, Indian gooseberry, Indian black berry, banyan, cluster fig, hairy fig, devil fig, anjan, Indian butter tree, mango, Ceylon iron wood, pride of India,

champak, Indian cork tree, Spanish cherry, Indian mulberry, temple tree, Indian beech, Manila tamarind, Indian kino tree, red sandal wood, sandalwood, Siamese rough bush, poison nut tree, clearing-nut tree, tamarind, teak, arjun tree, myrobalans, chebulic myrobalan, pala indigo, Indian jujube, wild jujube and jackal jujube.

Shrubs such as Mexican poppy, wild lime, Indian *atalantia*, carray cheddie karir, Indian caper, karanda, tanners cassia, mountain pomegranate, candle wood, broad leaf hop bush, triangular spurge, Indian coffee plum, governor's plum, gin berry, goomar teak, bush mint, bellyache bush, wild-sage, ironwood tree, oleander, prickly pear, matara tea, Asiatic tarenna, emetic swallow-wory and five-leaved chaste tree and herbs such as mountain knot grass, common leucas, swollen finger grass, Bermuda grass, ban tulsii, cheese weed, potato weed, liquorices weed and true indigo and the climbers such as devil's backbone, glory lily, heart-leaved moonseed, stinking passion flower and love vine.

Sacred Tanks

The major *tirthas* were in the eight cardinal directions, with minor ones in between. Charged by underground springs, these *tirthas* were also the catchment area for the many streams from the water-sheds of the broad-based hill. Sri, Seyar, Punya and Sona were rivers flowing respectively to the north, north-west, west and south of the hill. The presence of forest cover ensured the stability of these water-systems. The puranas also speaks of

the residents of Arunachala taking pride and initiative in maintaining the wealth given gratis by the thickly forested hill. The Sivanganga tank is situated to the south of Kambatthu Ilayanar *mandapam*. This tank is used for bathing before performing the rituals. The tank is also maintained properly. According to inscriptions, the water used to come from a canal called Tiruvannamalai Amman Devi Samuthram. At present, rainwater is the main source of water for the tank. Another tank named Brahma *tirtha* is situated in front of the Kalabhairava *Sannidhi* inside the temple complex. Even though devotees are allowed to bathe, the tank is maintained well. Fish breeding is also carried out. Chakra *tirtha* is situated opposite to the temple and now it is serves as a dumping yard. Isani tank and Singa tank are situated on the path of the *girivalam*. Water from the hillock drains into the tank and even though the public use it for bathing, the quality is average. The name Singa kulam has been acquired from the statue of the lion present at the entrance to the tank. Madhu *tirtha* is situated in the Adi Annamalai temple and it is fed by the water draining from the hill (Krishna and Amirthalingam (ed.), 2015).

Sona *tirtham* is a sacred tank situated of the outer *girivalam* path. It is situated in a very picturesque spot on the border of the inner paths of the forests. Hence, there is plenty of greenery all around. The *tirtham* has two Nandi statues flanking the entrance steps which lead down to it. There is also a small Ganesha shrine nearby.

On the same side, a few metres after Sona *tirtham* can be found a little

Krishna shrine. The pond has fallen into disuse and badly needs cleaning. This would make it a clean natural source of water for animals and birds which flock here to drink the water and enjoy the cool shade of the trees.

Due to the presence of numerous trees, this spot always remains cool even in the hottest of summers. Another reason could be the presence of numerous water sources. As a matter of fact, one can feel the perceptible drop in temperature when one enters the vicinity.

Ecological threats

The Thiruvannamalai mountain is believed to be sacred and lakhs of devotees undertake the *pradhakshina* on full moon and other days. Uncontrolled population growth and political interference have forced people to encroach into the mountain slopes. Buildings and huts have been built on the mountain, thereby disrespecting the faith of the people, besides creating problems for the environment.

In the 1940s the British Government passed an order stating that the eastern side of the mountain belongs to the temple and the rest belongs to the Forest Department. This order is being followed till now (<http://tiruvannamalai.tripod.com/hollym.htm>).

Recently, there was a major uproar by the general public against the Archaeological Survey of India (ASI) for declaring Tiruvannamalai as a heritage site that restricted construction of buildings within the

first 100-metre radius. Any such activities in the next 200-metre radius need the approval of the Archaeological Survey of India (The Hindu, Nov.8, 2002; Nov 15, 2002; Feb. 04, 2003; Subramanian, 2002).

Conclusion

Today, the ecological balance and natural environment of Annamalai hill, which was once covered with vegetation, now looks barren and severely affected by soil erosion. The rapid development of the town has given way to mushrooming commercial activities and encroachments. Many water bodies deemed holy, apart from having been useful in maintaining the water table are now completely polluted due to misuse and mixing with sewage. Several of the tanks have been encroached upon and the water contaminated. The situation requires strict action by the authorities in order to improve the physical and the natural environment of the holy hill and town.

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Check list of plants growing in the campus of Government Arts College for Men (Autonomous) Nandanam, Chennai.

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Abstract

A survey was conducted between January 2016 and December 2016 to record the flowering plants of the college campus. This study revealed the presence of 164 plant species. Among these 162 were angiosperms and 2 belong to Gymnosperms. Dicotyledons represented 46 families with 133 species and 113 genera. Monocotyledons represented 29 species with 25 genera belonging to 10 families. Fabaceae is found to be the largest family with 21 species. Similarly, family Poaceae represented highest number of species among Monocotyledons.

Key words: *Angiosperms, Gymnosperms, Fabaceae, Poaceae*

Introduction

Plants are known to mankind from time immemorial as they are twinned with the human civilization and are vital component for the existence of ecosystem. The plants not only supply nutrients to all living things on earth but provide the oxygen the respiratory molecule and utilize carbon-di-oxide for photosynthesis, thus the plants could minimize and address the problem of global warming. There are mysteries and wonders in plant world in terms of size, shape, habit, habitat, reproduction etc., Although plants are all made up of cells there exists high diversity

in form and structure. About 7,000 species of plants have been cultivated for consumption in human history (Khoshbakht and Hammer, 2008). The great diversity of varieties resulting from human and ecosystem interaction guaranteed food for the survival and development of human populations throughout the world in spite of pests, diseases, climate fluctuations, droughts and other unexpected natural calamities. Green belts in urban areas include avenue trees, parks, colleges, schools which play important role in conservation of plants and environment. Trees in urban areas are known to reduce heat effect

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(Chow and Roth, 2006) storm water run-off and flooding (Mc Person et al., 1997); Sinks for air pollutants (Kudzus and Ramteke, 2015) and filters noise pollution (Mc Person, 1997). The rapid increase in urbanization needs more trees for healthy environment. Inventory work on plants is important for planning and conservation of important plant species (Cy, 2006). Government Arts College for Men (Autonomous) in its present location (i.e. Annasalai) functions from 1969 and caters higher education for student population settled in central regions of the Metropolis and also draws students from neighboring districts. This college is located in the hot spot of Chennai urban and is earmarked with 11 acres of land with trees, weeds and alien plants. A survey was conducted to document the checklist of flowering plants growing in the campus.

Materials and Methods

Study area and documentation of plants

As a part of floristic survey, plants growing in the campus of Government Arts College for Men (Autonomous) Nandanam, located in Annasalai, Chennai, Tamil Nadu (13.0301° N, 80.2414° E) was documented for a period of one year (January 2016 to December 2016). The plants were identified using standard identification manuals (Gamble and Fischer, 1957; Matthew 1983; Mayuranathan, 1994). The binomial and author citation of the plant species was compared and checked with plant list (<http://www.theplantlist.org/>). The check list of the plant species was prepared and arranged in alphabetical order of the taxa.

Results and Discussion

During the study period a total of 164 plant species belonging to 140 genera in 58 families could be recorded. Among these 2 species (1.3%) were Gymnosperms. Angiosperms represented 162 species (98.7%) with 133 dicots and 29 monocots (Fig. 1 & 2).

Fig. 1 Number of different groups of plants in the college campus.

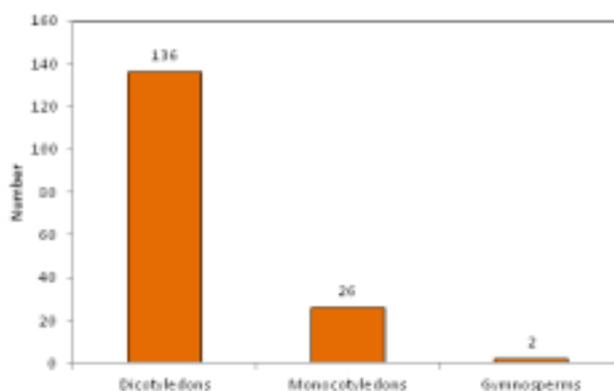
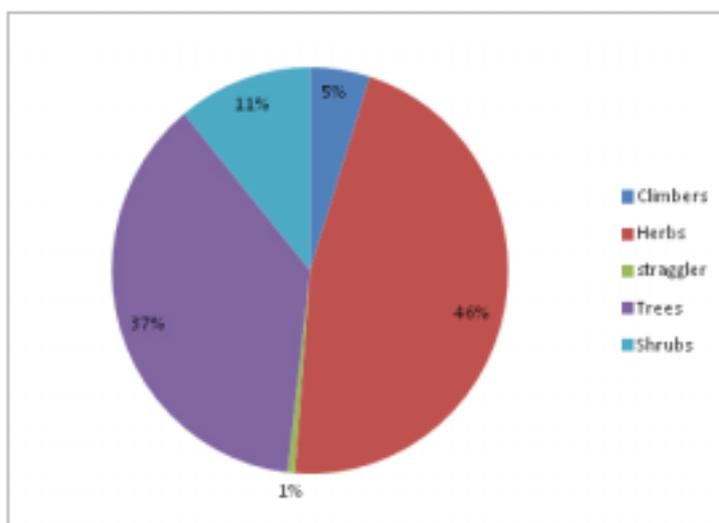


Fig. 2 Percentage of different life forms in the college campus.



Fabaceae dominated the assemblage with 21 species. It is followed by Malvaceae (10 species). Among the Monocotyledons, Poaceae accounted for more number of species. Dicotyledons accounted for 82% of the angiosperms followed by Monocotyledons (18 %). 28 families of angiosperms were represented by single species (Table 1). Our results corroborates with the results of previous work on flora of Chennai district, Madras Christian College campus and Pachaiyappa's college campus (Mayuranathan, 1994; Giles Lal and Livingstone, 1978; Udayakumar *et al.*, 2011, Gaikward, *et al.*, 2014) where dicots dominated the assemblage and Fabaceae is reported as the most speciose family.

Table 1

Check List of plants growing in the campus of Government Arts College, Nandanam, Chennai

S.No.	Name of the Plant	Family
Gymnosperms		
1	<i>Cycas circinalis</i> L.	Cycadaceae
2	<i>Platycladus orientalis</i> (L.) Franco	Cupressaceae
Angiosperms		
Dicotyledons		
3	<i>Abutilon hirtum</i> (Lam.) Sweet	Malvaceae
4	<i>Abutilon indicum</i> (L.) Sweet.	Malvaceae
5	<i>Acacia auriculiformis</i> Benth.	Fabaceae
6	<i>Acalypha indica</i> L.	Euphorbiaceae

S.No.	Name of the Plant	Family
7	<i>Acalypha wilkesiana</i> Mull.Arg.	Euphorbiaceae
8	<i>Achyranthes aspera</i> L.	Amaranthaceae
9	<i>Albizia lebbbeck</i> (L.)Benth.	Fabaceae
10	<i>Albizia saman</i> (Jacq.)Merr.	Fabaceae
11	<i>Alternanthera ficoidea</i> (L.)Sm.	Amaranthaceae
12	<i>Amaranthus viridis</i> L.	Amaranthaceae
13	<i>Ammannia baccifera</i> L.	Lythraceae
14	<i>Annona squamosa</i> L.	Annonaceae
15	<i>Antigonon leptopus</i> Hook.&Arn.	Polygonaceae
16	<i>Artocarpus heterophyllus</i> Lam.	Moraceae
17	<i>Asystasia gangetica</i> (l.)T.Anderson	Acanthaceae
18	<i>Azadirachta indica</i> A.Juss	Meliaceae
19	<i>Basella alba</i> L.	Basellaceae
20	<i>Bauhinia acuminata</i> L.	Fabaceae
21	<i>Bauhinia purpurea</i> L.	Fabaceae
22	<i>Boerhavia diffusa</i> L.	Nyctaginaceae
23	<i>Boerhavia erecta</i> L	Nyctaginaceae
24	<i>Caesalpinia pulcherrima</i> (L.)Sw.	Fabaceae
25	<i>Calotropis gigantea</i> L.Dryand.	Apocynaceae
26	<i>Capparis zeylanica</i> L.	Capparaceae
27	<i>Cardiospermum halicacabum</i> L.	Sapindaceae
28	<i>Carica papaya</i> L.	Caricaceae
29	<i>Cassia fistula</i> L.	Fabaceae
30	<i>Cassia siamea</i> Lam.	Fabaceae
31	<i>Catharanthus roseus</i> (L.)G.Don.	Apocynaceae
32	<i>Ceiba pentandra</i> (L.)Gaertn.	Bombacaceae
33	<i>Chrysanthemum morifolium</i> Ramat.	Asteraceae
34	<i>Cissus quadrangularis</i> L.	Vitaceae
35	<i>Citrus aurantifolia</i> (Christm.)Swingle.	Rutaceae
36	<i>Citrus medica</i> L.	Rutaceae
37	<i>Cleome viscosa</i> L.	Cleomaceae
38	<i>Coccinia grandis</i> (L.)Voigt.	Cucurbitaceae
39	<i>Codiaeum variegatum</i> (L.)Rumph.ex.A Juss.	Euphorbiaceae
40	<i>Crotalaria verrucosa</i> L.	Fabaceae
41	<i>Delonix regia</i> (Boj. Ex Hook.)Rafin	Fabaceae
42	<i>Desmodium gangeticum</i> L.(DC.)	Fabaceae
43	<i>Desmodium triflorum</i> (L.)DC.	Fabaceae
44	<i>Enterolobium cyclocarpum</i> (Jacq.) Griseb.	Fabaceae
45	<i>Eucalyptus tereticornis</i> Sm.	Myrtaceae
46	<i>Euphorbia hirta</i> L.	Euphorbiaceae
47	<i>Ficus amplissima</i> Sm.	Moraceae
48	<i>Ficus benghalensis</i> L.	Moraceae

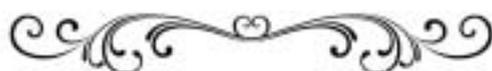
S.No.	Name of the Plant	Family
49	<i>Ficus hispida</i> L.f.	Moraceae
50	<i>Ficus racemosa</i> L.	Moraceae
51	<i>Ficus religiosa</i> L.	Moraceae
52	<i>Gardenia jasminoides</i> J.Ellis	Rubiaceae
53	<i>Glinus oppositifolius</i> L.(Aug.)DC.	Molluginaceae
54	<i>Gomphrena serrata</i> L.	Amaranthaceae
55	<i>Gossypium hirsutum</i> L.	Malvaceae
56	<i>Guazuma ulmifolia</i> Wall. Ex.G.Don..	Malvaceae
57	<i>Heliotropium indicum</i> L.	Boraginaceae
58	<i>Hibiscus rosa-sinensis</i> L.	Malvaceae
59	<i>Holoptelea integrifolia</i> Planch.	Ulmaceae
60	<i>Hybanthus enneaspermus</i> (L.)F.Muell	Violaceae
61	<i>Impatiens balsamina</i> L.	Balsaminaceae
62	<i>Ixora coccinea</i> L.	Rubiaceae
63	<i>Kigelia pinnata</i> (Jacq.)DC.	Bignoniaceae
64	<i>Lannea coromandelica</i> (Houtt.)Merr.	Anacardiaceae
65	<i>Lantana camara</i> L.	Verbenaceae
66	<i>Lawsonia inermis</i> L.	Lythraceae
67	<i>Leucaena leucocephala</i> (Lam.)de Wit	Fabaceae
68	<i>Leucas aspera</i> (Willd.)Link.	Lamiaceae
69	<i>Limonia acidissima</i> Groff.	Rutaceae
70	<i>Madhuca longifolia</i> (J.Koenig. Ex L.) J.F.Macbr.	Sapotaceae
71	<i>Mangifera indica</i> L.	Anacardiaceae
72	<i>Markhamia lutea</i> (Benth.)K.Schum.	Bignoniaceae
73	<i>Melia azedarach</i> L.	Meliaceae
74	<i>Melochia corchorifolia</i> L.	Malvaceae
75	<i>Micrococca mercurialis</i> (L.)Benth.	Euphorbiaceae
76	<i>Mimuspos elengi</i> L.	Sapotaceae
77	<i>Mirabilis jalapa</i> L.	Nyctaginaceae
78	<i>Morinda pubescens</i> J.E. Smith	Rubiaceae
79	<i>Moringa oleifera</i> Lam.	Moringaceae
80	<i>Muntingia calabura</i> L.	Muntingiaceae
81	<i>Nerium oleander</i> L.	Apocynaceae
82	<i>Nyctanthes arbo-tristis</i> L.	Oleaceae
83	<i>Ocimum basilicum</i> L.	Lamiaceae
84	<i>Ocimum canum</i> Sims.	Lamiaceae
85	<i>Oldenlandia corymbosa</i> L.	Rubiaceae
86	<i>Parthenium hysterophorus</i> L.	Asteraceae
87	<i>Passiflora caerulea</i> L.	Passifloraceae
88	<i>Pedilanthus tithymaloides</i> (L.)Poit.	Euphorbiaceae
89	<i>Peltophorum pterocarpum</i> (DC)K.Heyne	Fabaceae

S.No.	Name of the Plant	Family
90	<i>Phyllanthus maderaspatensis</i> L.	Phyllanthaceae
91	<i>Phyllanthus niruri</i> L.	Phyllanthaceae
92	<i>Phyllanthus reticulatus</i> Poir.	Phyllanthaceae
93	<i>Physalis minima</i> L.	Solanaceae
94	<i>Pisonia alba</i> Span.	Nyctaginaceae
95	<i>Pithecellobium dulce</i> (Roxb.)Benth.	Fabaceae
96	<i>Plectranthus amboinicus</i> (Lour.)Spreng.	Lamiaceae
97	<i>Plumeria obtusa</i> L.	Apocynaceae
98	<i>Plumeria rubra</i> L.	Apocynaceae
99	<i>Polyalthia longifolia</i> (Sonn.)Thwaites.	Annonaceae
100	<i>Pongamia pinnata</i> (L.)Pierre.	Fabaceae
101	<i>Portulaca grandiflora</i> Hook.	Portulacaceae
102	<i>Portulaca oleraceae</i> L.	Portulacaceae
103	<i>Psidium guajava</i> L.	Myrtaceae
104	<i>Rauvolfia tetraphylla</i> L.	Apocynaceae
105	<i>Rivina humilis</i> L.	Phytolaccaceae
106	<i>Ruellia prostrata</i> Poir.	Acanthaceae
107	<i>Ruellia tuberosa</i> L.	Acanthaceae
108	<i>Sauropus androgynus</i> (L.)Merr.	Phyllanthaceae
109	<i>Scoparia dulcis</i> L..	Plantaginaceae
110	<i>Senna occidentalis</i> (L.)Link.	Fabaceae
111	<i>Senna tora</i> (L)Roxb..	Fabaceae
112	<i>Sida acuta</i> Burm.f.	Malvaceae
113	<i>Sida rhombifolia</i> L.	Malvaceae
114	<i>Solanum torvum</i> Sw.	Solanaceae
115	<i>Solanum trilobatum</i> L.	Solanaceae
116	<i>Spathodea campanulata</i> P Beauv.	Bignoniaceae
117	<i>Sphagneticola trilobata</i> (L.)Pruski	Asteraceae
118	<i>Sterculia foetida</i> L.	Malvaceae
119	<i>Swietenia mahagoni</i> (L).Jacq.	Meliaceae
120	<i>Syzygium cumini</i> (L.)Skeels.	Myrtaceae
121	<i>Tabernaemontana divaricata</i> (L.) R.Br.ex Roem.& Schult.	Apocynaceae
122	<i>Talinum portulacifolium</i> (Forssk.) Asch. ex Schweinf.	Portulacaceae
123	<i>Tamarindus indica</i> L.	Fabaceae
124	<i>Tecoma stans</i> (L.)Juss. ex Kunth.	Bignoniaceae
125	<i>Tectona grandis</i> L.f.	Lamiaceae
126	<i>Tephrosia purpurea</i> (L.)Pers.	Fabaceae
127	<i>Terminalia catappa</i> L.	Combretaceae
128	<i>Thespesia populnea</i> (L)Sol.ex Correa.	Malvaceae
129	<i>Tinospora cordifolia</i> (Willd.)Miers.	Menispermaceae

S.No.	Name of the Plant	Family
130	<i>Trianthema portulacastrum</i> L.	Aizoaceae
131	<i>Tribulus terrestris</i> Linn.	Zygophyllaceae
132	<i>Tridax procumbens</i> (L.)L.	Asteraceae
133	<i>Vernonia cinerea</i> (L.)Less	Asteraceae
134	<i>Wrightia tinctoria</i> (Roxb.)R.Br.	Rubiaceae
135	<i>Ziziphus jujuba</i> Mill.	Rhamnaceae
Monocotyledons		
136	<i>Areca catechu</i> L.	Arecaceae
137	<i>Asparagus densiflorus</i> (Kunth) Jessop	Asparagaceae
138	<i>Asparagus racemosus</i> Willd.	Asparagaceae
139	<i>Borassus flabellifer</i> L.	Arecaceae
140	<i>Brachiaria ramosa</i> (Linn.)Stapf.	Poaceae
141	<i>Canna indica</i> L.	Cannaceae
142	<i>Chloris barbata</i> Sw.	Poaceae
143	<i>Chrysalidocarpus lutescens</i> H.Wendl.	Arecaceae
144	<i>Cocos nucifera</i> L.	Arecaceae
145	<i>Commelina benghalensis</i> L.	Commelinaceae
146	<i>Cordyline fruticosa</i> L.A.Chev.	Agavaceae
147	<i>Crinum asiaticum</i> L.	Amaryllidaceae
148	<i>Cynodon dactylon</i> (L.)Pers.	Poaceae
149	<i>Cyperus rotundus</i> L.	Cyperaceae
150	<i>Dactyloctenium aegyptium</i> (L.)Willd.	Poaceae
151	<i>Dracaena braunii</i> Engl.	Asparagaceae
152	<i>Dracaena marginata</i> Hort.	Asparagaceae
153	<i>Dieffenbachia seguine</i> (Jacq.) Schott	Araceae
154	<i>Eleusine indica</i> (L.) Gaertn	Poaceae
155	<i>Epipremnum aureum</i> (Linden.& Andre.) G.S.Bunding	Araceae
156	<i>Eragrostis gangetica</i> (Roxb.) Steud.	Poaceae
157	<i>Isachne kunthiana</i> (Wight & Arn. ex.Steud) Miq..	Poaceae
158	<i>Kyllinga odorata</i> Vahl.	Cyperaceae
159	<i>Musa paradisiaca</i> L.	Musaceae
160	<i>Philodendron hastatum</i> .K. Koch. & Sello	Araceae
161	<i>Sansevieria cylindrica</i> Bojer ex Hook.	Asparagaceae
162	<i>Sansevieria trifasciata</i> Prain	Asparagaceae
163	<i>Sansevieria roxburghiana</i> L.	Asparagaceae
164	<i>Setaria verticillata</i> (L.) P.Beauv.	Poaceae

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Life without Birds is a Nightmare

Dr. S. Sandilyan*

New reports are surfacing every day from ornithologists about the alarming decline of birds and assorted reasons which are pointed out by the researchers for this steep decline. For instance, habitat loss, global climate change, increasing salinity in marine environment, disease, poaching, pollution and installation of new cell phone towers and wind mills in and around important bird habitats are found to be a major survival threat for birds. Mounting evidence suggests that the repercussions of human intervention in major habitats put several species of birds close to the precipice of extinction. Obviously, the bird population plummeted in an incredible way in recent decades.

Pertaining to India, recent findings disclosed that resident and migratory bird species have declined alarmingly even in IBA (Important Bird Areas). This is mainly because of hunting pressure, inappropriate use of water, increased salinity, habitat destruction, ecotourism, pesticides and creation of new shrimp ponds and other ill-conceived plans by local people in and around important bird habitats. For example, due to inappropriate use of water the number of birds migrating to

the Keoladeo National Park (UNESCO Heritage site and Ramsar site) in Bharatpur and Rajasthan has declined from thousands to hundreds. In fact, the current conservation programs in India are not up to sniff; most of them are abysmal. Globally, researchers register their concern about this kind of alarming decline of common birds in well-known IBA. Now we are in a position to pursue bird conservation with stupendous efforts. It is high time for us to answer the question “why should we conserve birds?” .

Birds are one of the important vertebrate classes providing immense benefits to mankind and indispensable services to the system and also help to maintain the floral genetic and species diversity by dispersing wild seeds. From the economical point of view too, birds serve as bio-controlling agents for the liquidation of agricultural pests and, in turn, they help in the augmentation of GDP.

A number of studies are available about the tremendous role of birds in dispersing wild seeds, pest controlling efficiency and their pivotal services in the smooth functioning of the ecosystem. In recent days, all the

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unostentatious services offered by the birds are termed as ecological services. Pollination and seed dispersal is one of the top indispensable ecological services. Interestingly, experiments related with seed germination revealed that the seeds which pass through the bird's digestive system which reach the ground through droppings are shown to have high germination potential more than the rest.

Birds' role in pollination and seed dispersal

Well acclaimed reports concluded that nearly 90-95% seed dispersal of tropical woody plants is carried out by birds. It is pertinent to state here that seed dispersal is a crucial and complex process in a plant's life. Interestingly, the seed dispersed by birds has several advantages. For instance, the birds help the plant species to escape from species-specific fungi, pathogens and other natural predators. Moreover, it paves the way for forming new colonies away from the plants' traditional habitats and avoids intra-species competition for space.

Dr. Balasubramanian, a senior ornithologist of SACON, Coimbatore disclosed that one-third ($n=292$) of the Indian forest bird species is incessantly and effectively involved in pollination and seed dispersal services. From his two decades of research on this topic in the Indian forest system, he concluded that hornbills and fruit pigeons are the principal seed

dispersers in the wet evergreen forest and bulbuls and Koel in the dry forests. He found that the common crow is also doing the job in an appraisable manner in different Indian terrains. The above statements will clearly emphasize the role of birds in maintaining Indian plant diversity, density and distribution. To strengthen this, a study by Haldre Rogers, Rice University, USA, revealed that bird loss acts as a harbinger of ecological imbalance in the forests of Guam, the southernmost part of the Mariana Islands of the Pacific Ocean. The other shining example, is the extinction of the Dodo bird (*Raphus cucullatus*) of Mauritius and the near extinction of the Mauritian 'calvaria' tree.

Birds as Bio-control agents

Another stupendous service offered by birds is insect control. Obviously, birds are the natural bio-control agents. According to Bereczki, Szent István University, Hungary, the insectivorous birds play a pivotal role by consuming insects, most of which are pests in the forest system. Further, he added that caterpillars are the major defoliators in the temperate deciduous forests. During the season of the outbreak, leaf-consumption rate by caterpillars is higher and will result in the decreasing of the density of the canopy besides weakening the trees' health, inhibiting regeneration rate of young plants and diminishing the overall productivity of the forest system. The natural efficiency of birds to prey on insects will result in the significant reduction of the

caterpillar population and considerably the birds reduce the degree of devastation and they maintain the richness of tree species.

In agriculture too, the insectivorous birds play an important role consuming pests of standing crops and stored grains. In India, the annual crop losses due to insect pests and diseases are estimated to be 18 % of the overall agricultural output. During 1983, the losses due to insect pests were estimated around Rs 6,000 crores, which increased to Rs 20,000 crores in 1993 and to 29,000 crores in 1996. It is needless to state that controlling the insect pests in agriculture is a major concern of our nation. Several studies disclosed that a major proportion of birds (60-80%) which visit the agricultural lands of India are insectivores and carnivores (e.g. black drongo, pittas, larks, swallows, Indian roller, common myna, common hoopoe, tree pie, pond heron, cattle egret, red wattled lapwing. Barn owl, spotted owl, kites). Ironically, recent reports indicate the decline of common bird species throughout India.

Cattle egrets stand as a good example to understand the pest control efficiency of birds. A study in Africa revealed that, cattle egret, mainly feed on the orthopterans (51.1%), isopterans (19.9%), other invertebrates (15.3%), Acarina (0.4%) and vertebrates (2.0%). Interestingly all the major preys of Cattle Egrets were identified as serious pests in the agricultural lands with 88.7% pest

status. Moreover, it was estimated that every 100 preys consumed by Cattle Egrets, could save 1,58,361.54 ha of farmlands in one season and the above said study has amply elucidated the pest control efficiency of birds.

Maintaining of healthy habitats

Mangroves are extraordinary ecosystems, providing incalculable goods and services to society. Mangroves are identified as a primary nursery area for commercially important fish and shrimp species. It was also reported that 80 % of the global fish catch directly or indirectly depends on the healthy status of tropical mangroves. Moreover, mangrove forests are known for coastal protection against natural calamities such as cyclones and tsunamis. In addition, carbon sequestration potential of the mangroves is 50 times greater than the tropical forests. Besides, mangroves are endowed with immense floral and faunal wealth. For instance, the Indian mangroves alone support 4,011 species.

The availability of nitrogen and phosphorus in adequate quantity is one of the key factors which determine the health of mangroves. Ironically, tropical mangroves do not have a sufficient amount of these nutrients. Amazingly, the excrement (guano) of water birds is a good source of nutrients. In particular, it is rich in nitrogen and phosphorus. Ultimately, congregation of water birds in mangroves will help to retain this health. Hence the decline of water birds

in the mangrove ecosystem has triggered a cascading effect on coastal diversity and fisheries resources.

Obviously, it is the time for ending our perpetual war against birds and to

adopt a road map to conserve birds. It is a must to disseminate the importance of bird conservation to the younger generation. If not, we will lose the ecological and other essential services provided by birds.



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