



Studies on floristic diversity and their seasonal appearance on the ancient walls of Kattathurai Panchayath, Kalkulam Taluk, Kanyakumari District

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Abstract

Wall flora is referred as, the flora grown on buildings, temples, house remains or their surrounding areas. Walls are manmade artificial habitats. The wall plants are the result of spontaneous colonization unassisted by human action. The objectives of the study are to analyze the seasonal appearance of angiosperm flora on the walls of the study area.

An extensive field survey was conducted from July 2012 to July 2014 to record the angiospermic flora growing on the walls in different parts of Kattathurai panchayath. One visit was made after every three months. Thus a total of six visits were made for the field observations in a year. During the process of observation visits were made to all the practically possible places in search of angiosperm wall flora. A total of 55 plant species are observed, out of which 47 plant species are dicotyledons and only 8 species are monocotyledons. Total 46 genera comprising 24 families are documented. Asteraceae, Amaranthaceae and Malvaceae are the dominant families of the wall flora. The plants found on walls of study area belonging to the families of Aizoaceae, Amaranthaceae, Solanaceae, Euphorbiaceae, Cappariaceae, Malvaceae, Poaceae, Nyctaginaceae, Cucurbitaceae, Moraceae, Rubiaceae, Acanthaceae, Caricaceae, Lamiaceae, Commelinaceae, Astraceae, Menispermaceae, Meliaceae, Magnoliaceae, Convolvulaceae, Anacardiaceae and Cyperaceae. Among the families, the higher genus was recorded mainly to the Asteraceae (7 taxa), Amaranthaceae (4 taxa), Malvaceae (5 taxa), Acanthaceae (3 taxa) and Poaceae (4). The largest number of species belongs to the genera is *Solanum* (3), *Ficus* (3), *Amaranthus* (3), *Andrographis* (2) and *Sida* (2). It can be concluded from the study that the study area is dominated by Angiosperms. Most of the flora on walls appears during the rainy and winter seasons of the year. One-fourth of the wall flora is represented by the alien species. The favourable climatic conditions and the composition of old historical walls, have contributed to high taxonomic diversity at species, genera and family levels.

Keywords: buildings, climatic, historical, panchayath and wall flora

Introduction

Wall flora is referred as, the flora grown on buildings, temples, house remains or their surrounding areas (Nedelcheva and Vesileva, 2009; Sankar Ganesh *et al.*, 2009 a) [18, 28]. Walls may be generally categorized into 5 types (i) brick cement wall (ii) stone cement wall (iii) brick mud wall (iv) stone mud wall and (v) mud wall. In the brick cement wall and stone cement wall, the cementing material used is cement, while in the brick mud wall and stone mud wall the cementing material used is mud. The mud wall is purely made of mud. Plants of herbaceous habits are the chief representatives of wall flora (Singh, 2011) [31]. The birds and animals disperse the seeds through their excreta on the temple walls and old house walls. When the conditions are favourable, the seeds germinate and become a plant on the same place. Thus, some plants are commonly grown on walls such as *Ficus glamorata*, *F. religiosa*, *F. benghalensis*, *Cynodon dactylon*, *Ionidium suffruticosum*, *Viola odorata*, *Acalypha indica*, *Phyllanthus niruri*, *Trianthema portulacastrum*, *Boerhavia diffusa* etc., (Sankar Ganesh *et al.*, 2013). The objectives of the study are to analyze the seasonal appearance of angiosperm flora on the walls of the study area.

Walls represent a specific environment for growing plants, which is partly similar to rocks and rock fissures (Woodell, 1979) [42]. The flora of wall habitats has received little

attention in the past (Woodell and Rossiter, 1959 [53]; Segal, 1969 [29]; Payne, 1978 [23]; Karschon and Weinstein, 1985 [11]; Lisci and Paccini, 1993 [14]; Kolbek, 1997 [12]; Tripathy *et al.*, 1999 [38]; Wojcikowska and Galera, 2005 [41]; Pavlova and Tonkov, 2005 [22]; Iatrou *et al.*, 2007 [10]; Ezer *et al.*, 2008 [7]; Maxwell 2009 [17]; Altay *et al.*, 2010 [2] and Rajalakshmi and Shanthi., 2012) [24]. Walls are man - made artificial habitats. Generally the walls having cracks and crevices often favour the growth and development of plant species. The wall plants are the result of spontaneous colonization unassisted by human actions. Several studies have been conducted to analyze the floristic composition of the wall habitats in India and abroad (Singh, 2011a [32], Nadelcheva, 2011 [19] and Singh and Singh, 2014) [33]. In India, especially Tamil Nadu the study of wall floras is very meager.

Materials and Methods

Study Area

The study area Kattathurai panchayath is situated in Kalkulam taluk, Kanyakumari district Tamil Nadu, India. It is covered by three seas (Bay of Bengal, Pacific ocean and Arabian sea). In an average, the temperature is does not exceed 30^oc. The heat is very severe in May, but the nights are much cooler. In the late May and in June there are thunder storms. They are due to depressions coming over from the Bay of

Bengal and crossing the district. The rainfall is due to South West monsoons and also due to return monsoons and from the Bay of Bengal. It is obvious that the flora here is very rich containing dry deciduous, semi-evergreen and some moist evergreen species.

An extensive field survey was conducted from July 2012 to July 2014 to record the angiospermic flora growing on the walls in different parts of Katathurai panchayath. One visit was made after every three months. Thus a total of six visits were made for the field observations in a year. During the process of observation visits were made to all the practically possible places in search of angiospermic wall flora. The walls investigated for the flora included the main boundary walls surrounding the schools, colleges, hospitals, primary health centres, taluk and panchayath office, convents, temples, churches and police staff quarters, etc. The identification of plant species was done using taxonomic literatures and with the help of experts. The identified plant species were confirmed by using standard taxonomic floras proposed by Mathew (1991) and Gamble (1936) [9].

Results and Discussion

The plants found on walls of study area belonging to the families of Aizoaceae, Amaranthaceae, Solanaceae, Euphorbiaceae, Capparidaceae, Malvaceae, Poaceae, Nyctaginaceae, Cucurbitaceae, Moraceae, Rubiaceae, Acanthaceae, Caricaceae, Lamiaceae, Commelinaceae, Astraceae, Menispermaceae, Meliaceae, Magnoliaceae, Convolvulaceae, Anacardiaceae and Cyperaceae (Table-1). Among the families the higher genus was recorded mainly to the Asteraceae (7 taxa), Amaranthaceae (4 taxa), Malvaceae (5 taxa), Acanthaceae (3 taxa) and Poaceae (4). The largest number of species belongs to the genera is *Solanum* (3), *Ficus* (3) *Amaranthus* (3), *Andrographis* (2) and *Sida* (2). A total of 55 plant species are observed, out of which 47 plant species are dicotyledons and only 8 species are monocotyledons. Total 46 genera comprising 24 families are documented. The Asteraceae, Amaranthaceae and Malvaceae are the dominant families of the wall flora. Herb and Shrub habit is dominant on the walls whereas climbers and trees are least observed. Majority of the species were observed in winters and Monsoon of the year. Among the woody perennials *Ficus religiosa*, *Ficus benghalensis* and *Ficus racemosa*, are dominant species, whereas among annuals *Achyranthus aspera*, *Amaranthus spinosus*, *Parthenium hysterophorus*, *Commelina benghalensis*, *Tridax procumbens*, *Chenopodium album* and *Sida acuta* are profusely present.

No life can be expected on earth without vegetation but the growth of plants on historic buildings and monuments can cause serious problems. The problems can be quite serious in tropical countries like India, particularly in Tamil Nadu. Where, the climatic condition is quite favorable to plant growth.

One of the principal stages in the evolution of civilization has been the construction of buildings and their decoration with sculptures. Kanyakumari district becoming a hub of many beautiful and amazing monuments, and temples, which attracts tourists from all over the world. These monuments and forts speak volumes about the artistic skills and excellence of the sculptors and architects of that period. But now a day these

archeological monuments and temples are loss their original structure day by day. Because, the floras grown on the walls and towers of temples. These floras are classified under herb, shrub, climbers and sometimes trees. These plants are rooted well in the gap of the walls. After a long time we cannot consider these plants, they are collapse the original structure of the temples, buildings etc. The birds and animals disperse the seeds through their excreta on the temple walls and old house walls. When the conditions are favourable, the seeds germinate and become a plant on the same place. The cracks and crevices in the wall provide anchorage to the plant roots thus supporting the growth of the plants (Duchoslav, (2002) [6]; Nedelcheva (2011) [19]. Colonization of plants on vertical wall surfaces depends on the level of disintegration of mortar, concrete or any other type of binding material while the colonization of plant species is determined by the disintegration of material on the wall tops (Varshney, 1971) [40]. Several studies on the wall flora reports adequate representation by the exotic species (Singh (2011b) [34]; Singh (2015a) [32] and Simonová (2005) [30]. In the present study analysis on the origin status of the plants reveals that of total woody plants recorded from the walls of study area, 11 were represented by the native species while 3 were represented by the exotic species. Several studies have been conducted to analyze the floristic composition of the wall habitats in India and abroad.

Plants can live in aquatic, terrestrial and organic environments. Their growth in these environments is influenced by many parameters. There are habitats in which the extreme conditions lead to the selection of species with morphological and physiological adaptations enabling them to survive. Walls constitute a specialized microhabitats, since there are built by man, they are restricted to inhabitant for plants their dampness & aspects are of great importance of the plants upon them (Lisci and Paccini - 1993) [14]. Walls of buildings and of their constructions made of bricks, stones or concreted belongs to specific, polyhemerobic habitats, which can be a substitute habitats for rock plants. They are common but rarely colonized, because of their vertical and even surface, characterized by unfavorable water and temperature regimes and recurrent concentration of the walls (Francis, 2011) [8]. This insufficient inflow of Diasporas can also be a reason for slow colonization of walls, especially in centers of large agglomerations. Vascular plants can normally grow on sites where at least a small amount of humus has accumulated. This kind of substrate is formed in calcium containing mortar or slits and fissures of the walls, previously colonized by lichens and mosses (Boratynski *et al.*, 2003) [3].

Plant growth on monuments is responsible for the widening of gaps between adjoining blocks or increasing the dimensions of the cracks already present on the surface. Plant growth can increase the load on the surface thus resulting in the dislocation of the surface. Besides causing such type at physical damage to the monuments, it can also affect chemically with the surface. There is evidence that marble and limestone in contact with roots develop root marble due to the etching effect of the slightly acidic sap of the root cells. Rotting roots can also stain calcareous stones and they produce humic substances (Agrawal *et al* - 1995) [1]. In my long observation, most of our old buildings are

constructed with unbaked bricks. This unbaked bricks are enriched with microorganism. This microorganism favors the growth of the plants. While plants starts to grow on the walls, it creates the cracks in less way latter it leads to deep break in

the wall, as a results walls are damaged. The cracks and crevices in the wall provide anchorage to the plant roots thus supporting the growth of the plants (Rishbeth, (1948 ^[25]; Varshney, (1967) ^[39] and Varshney, (1971) ^[40]).

Table 1: Floristic Diversity and Their Seasonal Appearance on the Ancient Walls of Kattathurai Panchayath, Kalkulam Taluk, Kanyakimari District

1.	<i>Justicia diffusa</i>	Acanthaceae	Herb	Winter
2.	<i>Amaranthus viridis</i>	Amaranthaceae	Herb	Rainy
3.	<i>Justicia diffusa</i>	Asteraceae	Herb	Summer
4.	<i>Amaranthus viridis</i>	Asteraceae	Herb	Winter
5.	<i>Parthenium hysterophorus</i>	Asteraceae	Herb	Winter
6.	<i>Peristrophe bicalyculata</i>	Acanthaceae	Herb	Rainy
7.	<i>Spilanthes acmella</i>	Asteraceae	Herb	Summer
8.	<i>Tridax procumbens</i>	Asteraceae	Herb	Winter
9.	<i>Vernonia cinerea</i>	Asteraceae	Herb	Winter
10.	<i>Xanthium strumarium</i>	Asteraceae	Herb	Rainy
11.	<i>Heliotropium indicum</i>	Boraginaceae	Herb	Summer
12.	<i>Cleome viscosa</i>	Capparidaceae	Herb	Winter
13.	<i>Chenopodium album</i>	Chenopodiaceae	Herb	Winter
14.	<i>Commelina benghalensis</i>	Commelinaceae	Herb	Rainy
15.	<i>Convolvulus pluricaulis</i>	Convolvulaceae	Herb	Summer
16.	<i>Rungia parviflora</i>	Acanthaceae	Herb	Winter
17.	<i>Evolvulus nummularius</i>	Convolvulaceae	Herb	Rainy
18.	<i>Coccinia grandis</i>	Cucurbitaceae	Herb	Winter
19.	<i>Cyperus compressus</i>	Cyperaceae	Herb	Rainy
20.	<i>Cyperus difformis</i>	Cyperaceae	Herb	Rainy
21.	<i>Cyperus iria</i>	Cyperaceae	Herb	Rainy
22.	<i>Acalypha indica</i>	Euphorbiaceae	Herb	Rainy
23.	<i>Euphorbia hirta</i>	Euphorbiaceae	Herb	Rainy & Winter
24.	<i>Euphorbia heterophylla</i>	Euphorbiaceae	Herb	Rainy & Winter
25.	<i>Phyllanthus niruri</i>	Euphorbiaceae	Herb	Rainy & Winter
26.	<i>Cassia tora</i>	Fabaceae	Herb	Rainy
27.	<i>Trianthema portulacastrum</i>	Aizoaceae	Herb	Rainy
28.	<i>Mimosa pudica</i>	Fabaceae	Undershrub	Winter
29.	<i>Abutilon indicum</i>	Malvaceae	Herb	Rainy
30.	<i>Malvastrum tricuspidatum</i>	Malvaceae	Undershrub	Rainy
31.	<i>Sida acuta</i>	Malvaceae	Undershrub	Rainy
32.	<i>Sida rhombifolia</i>	Malvaceae	Undershrub	Rainy
33.	<i>Urena lobata</i>	Malvaceae	Undershrub	Rainy
34.	<i>Achyranthes aspera</i>	Amaranthaceae	Herb	Whole year
35.	<i>Azadirachta indica</i>	Meliaceae	Tree	Whole year
36.	<i>Ficus benghalensis</i>	Moraceae	Tree	Whole year
37.	<i>Ficus racemosa</i>	Moraceae	Tree	Whole year
38.	<i>Ficus racemosa</i>	Moraceae	Tree	Whole year
39.	<i>Ficus religiosa</i>	Moraceae	Tree	Whole year
40.	<i>Boerhavia diffusa</i>	Nyctaginaceae	Herb	Rainy & Winter
41.	<i>Oxalis corniculata</i>	Oxalidaceae	Herb	Rainy & Winter
42.	<i>Argemone mexicana</i>	Papaveraceae	Herb	Winter
43.	<i>Alternanthera sessilis</i>	Amaranthaceae	Herb	Rainy & Winter
44.	<i>Cynodon dactylon</i>	Poaceae	Herb	Whole year
45.	<i>Dichanthium annulatum</i>	Poaceae	Herb	Rainy
46.	<i>Digitaria marginata</i>	Poaceae	Herb	Rainy
47.	<i>Eleusine indica</i>	Poaceae	Herb	Summer
48.	<i>Oldenlandia corymbosa</i>	Rubiaceae	Herb	Winter
49.	<i>Scoparia dulcis</i>	Scrophulariaceae	Herb	Summer
50.	<i>Datura metel</i>	Solanaceae	Undershrub	Rainy
51.	<i>Datura innoxia</i>	Solanaceae	Herb	Rainy
52.	<i>Solanum nigrum</i>	Solanaceae	Herb	Winter
53.	<i>Lantana camara</i>	Verbenaceae	Shrub	Whole year
54.	<i>Amaranthus spinosus</i>	Amaranthaceae	Herb	Rainy & Summer
55.	<i>Amaranthus tenuifolius</i>	Amaranthaceae	Herb	Summer

Conclusion

The favourable climatic conditions and the composition of old historical walls, have contributed to high taxonomic diversity at species, genera and family levels. The walls are situated within urban and rural landscape, so the composition of the wall flora is strongly influenced by the surrounding vegetation type. The wall flora plants in almost all the studied sites create an additional decorative effect on the walls.

References

1. Agrawal OP, Mishra AK, Jain KK. Removal of plants and trees from historic buildings, INTECH – Lucknow, 1995.
2. Altay VI Ozyigit, Yarci C. Urban ecological characteristics and vascular wall flora on the Anatolian side of Istanbul, Turkey, *Int J Sci. Technol.* 2010; 4(3):483-495.
3. Boratynski A, Ratynska C, Waldon B, Bartczak A. Flora and vegetation of walls in the town of Krosno Odrzanskie (Poland). *Collect. Bot. Barcelona.* 2003; 26:129.
4. Brandes D. Flora of old town centres in Europe. In: Skupp H, Numata M, Huber A (Eds). *Urban Ecology as the Basis of Urban Planning*, SPB Academic Publishing, Amsterdam, 1995, 49-58.
5. Chhetri RB. Study on wall vegetation in Kavrepalanchowk district, Nepal. *Indian J For.* 2008; 31(4):553-558.
6. Duchoslav M. Flora and vegetation of stony walls in East Bohemia (Czech Republic). *Preslia.* 2002; 74:1-25.
7. Ezer TR, Kara H Cakan, Duzenli A. Bryophytes on the Archaeological site of Tilmer Hoyiik, Turkey, *International. J Botany.* 2008; 4(3):293-302.
8. Francis RA. Wall ecology: A frontier for urban biodiversity and ecological engineering. *Progress in physical Geography.* 2011; 35(1):43-63.
9. Gamble JS. Flora of presidency of Madras, Vols. 1-3. Authority of Secretary of State for India in Council. Dehra Dun, India, 1915-1936, 5-1597.
10. Iatrou G, Trigas P, Pettas N. The vascular flora of Akrokorinthos castle and its surrounding area Greece. *Phytologia Balcanica.* 2007; 13:83-93.
11. Karschon R, Weinstein A. Wall flora and vegetation of Qal at Nimrudi, the castle Banyas. *Israel J Bot.* 1985; 34:59.
12. Kolbek J. Plant communities on walls in the Czech Republic; Preliminary notes. *Zpr. Ces. Bot. Spolec. Praha.* 1997; 32:9.
13. Krigas N, Lagiou E, Hanlidou E, Kokkini S. The vascular flora of the Byzantine walls of Thessaloniki (N Greece). *Willdenowia.* 1999; 29:77-94.
14. Lisci M, Paccini E. Plants growing on the walls of Italian towns. I. Sites and Distribution. *Phyton.* 1993; 33:27.
15. Lisci M, Pacini E. Plants growing on the walls of Italian towns 1. Sites and distribution. *Phyton.* 1993a; 33:15-26.
16. Lisci M, Pacini E. Plants growing on the walls of Italian towns 2. Reproductive ecology. *Giorn. Botan. Italia.* 1993b; 127:1053-1078.
17. Maxwell JF. Vascular flora of the Emerald Pool area, Krabi province, southern Thailand, Maejo *Int J Sci Technol.* 2009; 3:1-25.
18. Nedelcheva A, Vasileva A. Vascular plants from the old walls in kyustendil, Bulgaria, *Biotechnol & Biotechnol Equipment.* 2009; 23(2):154-157.
19. Nedelcheva A. Observations on the wall flora of Kyustendil Bulgaria. *Euras. J Biosci.* 2011; 5:80-90.
20. Nedelcheva A. Observations on the wall flora of Kyustendil Bulgaria. *Eurasia J Biosci.* 2011; 5:80-90.
21. Pangtey YPS, Rawat GS. Studies on the wall flora of Nainital. *J Econ. Taxon. Bot.* 1987; 9(1):209-229.
22. Pavlova D, Tonkov S. The wall flora of the Nepet Tepe Architectural Reserve in the city of Plovdiv Bulgaria. *Acta Bot. Croat.* 2005; 64:357-368.
23. Payne RM. The flora of walls in South - Eastern Essex, *Watsonia.* 1978; 12:41.
24. Rajalakshmi S, Shanthi K. Survey of wall flora in Gingee fort and uncared gopuras in Gingee taluke, villupuram district, *International. J Ayur & Herbal medicine.* 2012; 2(5):810-816.
25. Rishbeth J. The flora of Cambridge wall. *J Ecol.* 1948; 36:136-148.
26. Sahu TR. Studies on the wall flora of man-made habitats of Sagar. *Indian J For.* 1984; 7:232-238.
27. Salisbury EJ. The significance of calcicolous habitat *J Ecol.* 1920; 8:202-225.
28. Sankar Ganesh K, Sivagamasundari A, Subramani A. Wall flora of Gingee fort and its medicinal uses, Abstract 77, National Conference on Recent Trends in Bioethics, 2009a.
29. Segal S. Ecological notes on wall vegetation, *Dr. W. Junk Publ.* 1969, 25.
30. Simonová D. Alien species on walls in southern and western Moravia. In: B. Tokarska-Guzik, J. H. Brock, G. Brundu L. Child, C. C. Daehler and P. Pyšek (Eds). *Plant Invasions: Human Perception, Ecological Impacts and Management.* Backhuys Publishers, Leiden, 2005, 317-332.
31. Singh A. Natural vascular floristic composition of Banaras Hindu University, India: An overview. *Int J Peace .Develop Stud.* 2011; 2(1):13-25.
32. Singh A. Natural vascular floristic composition of Banaras Hindu University, India: An overview. *Int J Peace Develop. Stud.* 2011a; 2(1):13-25.
33. Singh DK, Singh R. Study of angiospermic wall floristic composition of city Buxar, (Bihar) India, *J Pharmacognosy and Phytochemistry.* 2014; 2(5):52-54
34. Singh A. Observations on vascular wall flora of Banaras Hindu University Campus, India. *Bullet. Environ. Pharmacol. Life Sci.* 2011b; 1(1):33-39.
35. Singh A. Observations on the woody wall flora of Varanasi city, India. *Int J Scient. Res. Sci. Technol.* 2015a; 1(4):192-196.
36. Singh CS, Choudhary RL. Seasonal distribution of the wall vegetation of Ayodhya. *The Botanique.* 1975; 4:87-92.
37. Singh SK, Dixit SN, Srivastava AK, Singh SD. Wall flora of Gorakhpur. *Environ. India.* 1979; 2(1):5-14.
38. Tripathy P, Roy A, Anand N, Adhikary SP. Blue green flora on the rock surface of temples and monuments of India, *Feddes Report.* 1999; 110:133-134.
39. Varshney CK. Seasonal aspects of the wall vegetation of Varanasi. *Trop. Ecol.* 1967; 8:22-29.
40. Varshney CK. Observations on the Varanasi wall flora.

Vegetatio. 1971; 22(6):355-372.

41. Wojcikowska SB, Galera H. Floristic differences in some authropogenic habitats in Warsaw. *Ann. Bot. Fennici*. 2005; 42:185.
42. Woodell S. The flora of walls and pavings. In: Laurie, I.C. *Nature in Cities*, 1979, 135.
43. Woodell SRJ, Rossiter J. The flora of Durham walls. *Bot. Sci. British Islands*. 1959; 3:253.