



# Taxonomic Identification of Plants Growing On and Deteriorating Buildings of Cultural Heritage Importance in Manipur

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**ABSTRACT:** The ethnic city, Manipur, was ruled by the Mughals, Marathas, Afghans and Nawabs in various time periods. Among them the Mughal and Nawabs influenced the culture of the city vastly. The music, dance, architecture, arts and crafts flourished under their rule. Hindu, Muslims, Jains, Buddhist, Christian and Sikhs were the principle communities residing in the city. Festivals are the lifeline for Manipur, which create oneness among the multi-caste and multi-religion people. The Hindu culture of joint family system was once adored in the city which has slowly disintegrated in the city due to the rapid industrial development, urban development, economic issues and social feature.

The growth of higher plants over monuments and historic buildings is one of the major problems faced by conservators especially in Manipur. These plants have been reported to cause physical as well as chemical damage. This paper reviews the present status of knowledge in this field with respect to the plant species generally found growing over the monuments, types and mechanism of damage and their control methods, in Manipur .

## I. INTRODUCTION

The rituals of the Vedic religion manifest themselves in the various festivals that are celebrated in this city. People usually do not consume non-vegetarian food on Thursdays. It's annual Janardhan Swami Temple, and Sivagiri Mutt festivals are a riot of colors and spiritual expression. These festivals that last for days on end attract locals and tourists alike by the thousands. The city has a lively appeal on Tuesdays, as it celebrates the birth day of Lord Hanuman. The devotees flock to the local temples to offer prayers and tourists should visit the temples on these days if they want to see the city come alive. The famous city fair is held at Sheetla Devi Temple in March or April because the nine days of worshipping the various avatars of Goddess Durga i.e. the Chaitra Navratri occurs sometime during these months. During these nine days, many of the locals also keep fasts where they eat only fruits during this period. And men do not even shave their beards or mustaches. Kangla (Palace) which is now garrisoned by the Assam Rifles, was the cosmic centre of the universe of the land and its people, a centre of dignity and pride of the state. The entire demographic and political engineering of the polity was organized from the ruler's seat in ancient times.[1]

Meitei architecture or Manipuri architecture is the architecture produced by the Meitei speaking people, whose culture flourished in the Kangleipak kingdom and its neighbouring kingdoms from the middle of the fifteenth century BC. The Meitei architecture is best known for its temples (Laishang, Kiyong, Thellon), found scattered in the Kangleipak (present day Manipur). Other architectural forms that are still in existence are the grand gates (Hojang), Traditional houses (Yumjao), Public houses (Sanglen), Official buildings (Loishang), etc. Due to the arrival of Hinduism in the kingdom of Kangleipak (present day Manipur), the form of architecture was greatly influenced during the 16-17th century AD. Hundreds of Vaishnava temples were built in the kingdom with a mixed architectural design of both the traditional Meitei architecture and Mainland Indian architecture. [2]

Some plants, not all, have the ability to grow on buildings. If you wonder how they got in there, the answer is seed dispersal agents (wind, animals, birds etc). Crows and pigeons are good examples. They eat fruits along with seeds but the seeds don't get digested easily and comes out when they excrete. When these excreta falls on buildings and if the conditions favor plant growth, the seed germinates. They generally grow on cracks and holes in buildings because water gets collected in it, keeping moisture intact for the roots and the soil in cracks is more penetrable than a newly painted wall. That's why you can such plants in old buildings and not in new ones.

When the roots grow deeper, they weaken the wall and result in destruction of the whole building. This happens mostly in uninhabited buildings where nobody cares to remove them. Plants are good, but when carelessly left can result in several consequences.



- Seeds dispersed through air, animals etc o land in the cracks and crevices of buildings and establish there. These range from ephemeral (quick grow reproduce and die) types to perennials visible up there all the time.
- Water is essential for plant survival and their requirements are met by intermittent rainfalls, episodes of dew or leaking plumbing/drainage.
- Some of these plants have an awful ability to survive through prolonged intermittent droughts and hence seem to carry on.
- *Ficus* species (*F. religiosa*) is one such notorious species. If established in the vicinity of a leaking drain it manages very well with the available moisture. Gets all its nutrition from traces of soil and concrete mineralization Over a period of time its root system may rip apart the brick and mortar walls and result in serious damage to the buildings[3]

## II. RESULTS

A study of wall flora was carried out to understand the urban environment, floral diversity and their impact on historical buildings, University of Lucknow, King Goerge Medical College, High court, Immambada, Residency, Dilkusha Garden, Sikandarabagh etc is the main buildings taken under study sites. The main problems associated with the conservation of historic and non-historic building is the growing of the vascular plants on their walls and roofs responsible for the deterioration. The continuous maintenance of the buildings creates conditions for the development of optimal wall flora which has an ornamental character and does not negatively affect their structure and appearance. But when the buildings are not properly cared the plants are grows on their wall and roofs creating cracks and destroying roof materials. The roofs are particularly vulnerable because of their horizontal placement, causing the deposition of sediments in the cracks and unevenness of the surface. This habitat is suitable for catching the fruits and seeds from the surrounding wild and ornamental vegetation. The other factors favoring colonization of plants on walls are the age of wall, the presence of lime mortar, exposure to rain and such aspect as south and verticality. Isolated walls and roofs generally believe to be more affected from the plants invasion. This also applies to the emergence of more significant cracks and niches in the vertical part of the walls. These parts of the walls need particular attention and care. The study of wall flora provides a better understanding of the urban environment.[4,5]

## III. DISCUSSION

A total number of 103 vascular plant species were observed of which only two species was represented to pteridophyte while the remaining 101 plant species represents to angiosperms. Out of the total Angiospermic flora recorded, the maximum number of species, that is 13 (12.87%) belongs to Poaceae family, 12 (11.88%) to Asteraceae family, 8 (7.92%) species to Amaranthaceae family, whereas 7 (6.93%) species were represented by Fabaceae. This study suggested that Asteraceae, Poaceae, Amaranthaceae and Fabaceae are the dominant families observed on walls and roofs. On the basis of habitat, herb were represented by 81 (78.64%) of the total plant species while tree, shrubs and under shrub were represented by 8(7.76%), 9(8.73%) and 5(4.85%) respectively, while on seasonal basis, most of the plant species was appear in the rainy season then winter, whole year and summer season. These include about 46% rainy, 27% winter, 18% whole year and 9% plant species was appear in the summer season. Several of the tree species occurs the on the buildings such as *Ficus benghalensis*, *F. religiosa*, *F. racemosa*, *F. hispida*, *F. glomerata*, *Holoptelea integrifolia*, *Azadirachta indica*, *Punica granatum*. These tree species have been observed to grow throughout the year and believe to be most dangerous for walls, roofs and boundary's texture and matrix. This study also reveals that 31(30%) flora on the buildings of Manipur were represented by alien (exotic) plants species. That includes: *Ageratum conyzoides*, *Alternanthera sessilis*, *Amaranthus spinosus*, *Anagallis arvensis*, *Argemone mexicana*, *Cassia tora*, *Chenopodium album*, *Corchorus acutangulus*, *Cynodon dactylon*, *Datura metel*, *Eclipta alba*, *Eclipta prostrate*, *Eragrostis tenella*, *Eragrostis iscosa*, *Heliotropium indicum*, *Heliotropium strigosum*, *Euphorbia hirta*, *Euphorbia thymifolia*, *Lantana camara*, *Melilotus alba*, *Melilotus indica*, *Nicotiana plumbaginifolia*, *Physalis minima*, *Parthenium hysterophorus*, *Oxalis corniculata*, *Portulaca quadrifida*, *Sporobolus diander*, *Sonchus arvensis*, *Sonchus oleraceus*, *Punica granatum*, *Urena lobata*.[6]

Generally plants are boon for our life because they provide food, clean air, fuel, voluble wood and ruins may be charming but it is also one of the main reasons for their deterioration act as slow poison for buildings when grown on its roof and walls. Plants growing on the building reach on them through wind, animals mostly by birds and by stolon fragments and grow their randomly. Once plants grow on the surface of the buildings, because of well developed vascular system and secondary growth, the roots of plants deeply inserted in the wall and roof as a result cracks are created such as *Ficus benghalensis*, *F. religiosa*, *Azadirachta indica*, *Punica granatum* trees. The roots may penetrate deep into the structure and grow to a large size, causing physical and chemical damage. The secretions of roots contain substances that attack building materials, and their mechanical force opens cracks, causes crumbling and loosens stones



and large fragments of wall. The damage is not limited to that which the plant causes to the building, but also includes the consequences of falling stones. The damage varies according to whether the plant grows as a climbing plant from the soil or actually germinates and grows in the wall. In this case, the damage is due to the weight of the aerial part; in the second, there is additionally the destructive action of the roots. If it grows on a stucco wall, it may cause the plaster to fall away. Although their roots are weak at beginning of growth, they become stronger in time and causes widening of cracks.[7]

The roots and the aerial both part of the plants damage the structure of the walls. The branches and leaves hide of the building so that it cannot be appreciated, and cause static damage due to their weight, which may cause stones or large portions of wall to fall. During rainy season these cracks imbibe water and moistened the building inside. Although wall plants are often appealing, the local municipalities occasionally clean up the walls to prevent damage by the plants. But partial removal of the pavement to the front of the building is a temporary and insufficient measure. Because the root is living inside the wall and new bud at cut point emerges and if the aerial part is completely destroyed then root act as substrate for microbial activity. Along with microbes, microbial product also injurious for the texture and cementation of the building material. After decaying of the roots space remain occupied by many insect like ants, termite, etc. These insect further increases the volume of the cracks that lead to disturbance in the matrix of the wall or roof. This moistened environment of walls, support the growth of many other algal and fungal floras that also helps in the degradation of the wall plaster. Grasses of Poaceae family were found to most dominant on the boundary of roof and roof.[8]

#### IV. CONCLUSION

Methods of control vary according to the type of plant, the structure of the building, its state of conservation and its location. The study site of historical buildings made of classical materials should be checked to prevent the formation of substrate and the growth of pioneer plants. The speed of colonization depends on building structure and materials. The state of conservation of a building is very important in determining the appropriate method of control. For carcass, interrupted clearing of plants should be performed to prevent plant growth between the stones and crumbling of the remains. Large buildings of historical interest in towns should be checked for visual reasons, in the interests of their conservation and for the safety of inhabitants and visitors. The surest method of control with long term advantages is total removal of the plants, including their roots. After this the cracks are filled so that other seeds do not germinate in them. This method works well for herbaceous plants but the roots of ligneous plants are difficult to remove, and pieces remaining may give rise to new growth. Other difficulties are encountered when the walls are impervious or very high. The surface may be damaged if tools such as saws, chisels and drills are used. Manual weeding is useful for preventing the establishment of herbaceous plants, but as we already mentioned, they are only the first colonizers. When the wall already hosts luxuriant vegetation in which the herbaceous plants have been replaced by ligneous ones, manual weeding is no longer effective, and more complex methods must be used. These may include killing the plant with chemicals, or if the position of the plant in the building permits, removing stones, extirpating the roots and rebuilding. Chemical herbicides are much faster and more efficient than manual weeding, but certain environmental (climate, chemical and physical properties of the building materials, analysis of the vegetation in the area where the chemical is to be applied) and toxicological (toxicity, volatility, biodegradability) aspects need to be established before they are used. Today herbicides with specific properties and different mechanisms of action are available. Their careful use can help greatly in the maintenance and protection of buildings and monuments. Contact and systemic herbicides belong to the latest generation and are especially indicated because of their reduced environmental impact. They may be applied sporadically or repeatedly, up to three times. [9]

The same product may be used or others may be alternated to exploit their different possibilities. The most commonly applied herbicidal methods are: (I) total elimination of all vegetation (bare ground) which has a long term effect; (II) temporary (short term) weeding; (III) selective weeding of herbaceous plants; (IV) brush control, consisting in removing shrubs and trees and leaving herbaceous vegetation. The last two methods are the most frequent in archaeological sites, whereas total and temporary weeding are used for historical buildings and monuments in towns. These parts of the walls need particular attention and care. After the restoration or reconstruction, complete maintenance of the buildings and the surrounding area is necessary. Ruderal species in the opposite part of the building are a potential source of diaspores. Investigation of the wall flora in the urban environments in terms of flora structure, dynamics and patterns of development provides valuable information for maintenance, sustainable development, and prediction of the urban environment.



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