EDIPHYTES OF KARACHI

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Abstract

Ediphytes or "Building plants" are vascular plants growing out from the moist wall crevices and cracks caused by leaking sewage pipes of the neglected and dilapidated, multi storeyed buildings. *Ediphytes* have adapted themselves to live in the stress condition of crevices, their seeds are mostly inconspicuous and can reach the seed banks of the building material or through the rain or wind. They can also reach the crevices through biotic agents such as insects, birds, bats, rodents or human beings. The *Ediphytes* can cause cracks and damage to the facade of the building. A survey of ediphytic trees including woody climbers and herbs of Karachi was conducted during the years 2008-09 in the five districts of Karachi, covering1000 ediphytic plants belonging to 17 families and 25 species, most of the *Ediphytes* belong to trees of family *Moraceae* (genus *Ficus)*. Among them most common species is *Ficus rumphii*. The herbaceous *Ediphytes* include eleven species belonging to eight families; majority of herbaceous *Ediphytes* belong to family *Poaceae*. *Ediphytes* can prove to be dangerous for buildings so ways and means should be developed to remove them physically, so as to prolong the life of the constructions.

Introduction

The word Ediphyte is composed of two latin words *Edi*=Building, *Phytes* = Plants. Ediphytes are the vascular plants growing from the moist wall crevices, fissures and cracks of the neglected and dilapidated buildings as well as civic infrastructures such as ramps of the bridges and flyovers. Abiotic natural agents such as fluctuating temperature, rain, hail, flood, earthquake *etc*. reduce the buildings to rubbles. Anthropogenic effect of acid rains also damages the buildings. Biotic agents such as birds and some mammals also cause harm to the buildings.

These plants have waged their war of reclamation of their territories occupied by man for thousands of years. Tropical countries of south east Asia: like Thailand, Laos, Cambodia, Central and South American countries of Costa Rica, and Bolivia once supported Inca and Aztec civilizations which were long buried by the conquering ediphytic vegetation, where mosses, herbs, shrubs and trees have invaded old places, roofs and dilapidated buildings. In Pakistan remains of Taxila, Harrappa and Moenjodaro are witness of the encroachment by the ediphytic vegetation. *Ediphytes* are the vascular plants sprouting from the wall crevices, cracks and fissures of the buildings and civic structures such as ramps of the bridges and flyovers. They are the feature of neglected and dilapidated buildings.

Several workers (Chaudhry, 1961; Jafri, 1966 and Hussain, 1984) have described the vegetation of Karachi, but so far no work has been done on wall flora of Karachi. The main objective of the present study was to identify the *Ediphytic* species and to find where these plants are growing in the façade and to draw the attention of the authorities in particular and public in general to control the growth of these destructive plants so as to prolong the life of building structures.

Materials and Methods

Observation: In Karachi, the *Ediphytes* are mostly seen around leaking sewage pipes or where the place is moist due to the dripping water pipes. The bricks and blocks are constantly wet and moist, as a result, some crevices, cracks, fissures and hollow spaces are created between the bricks. There are only few stress tolerant plants or some ruderals which have adapted themselves to live in such a peculiar type of habitats. The urban settings of Karachi provide numerous opportunities for such plants. Building surface have niches for specialized blue green algae. Many Angiospemic plants such as herbs, shrubs climbers and trees, have also found these wall crevices as suitable habitat for their growth and development. They are also called **Crack flora** or **Wall flora**.

Survey of only vascular Ediphytes was carried in all the five districts of Karachi. The plants were collected, brought to the lab and their herbarium sheets were prepared, their location were marked and their serial numbers were tagged. The plants were identified at species, genus and family levels by the help of floras by Jafri, (1966), Stewart, (1972) and Ali & Qaiser (2007). The extent of damage to the building was also recorded. In all 1000 *Ediphytes* were observed, which were categorized into four broad categories i.e. trees, woody climbers, herbs and grasses. Relative Abundance D3 of each species was calculated according to the modified formula of Dombois & Ellenberg (1974) Ahmed & Shaukat (2012).

$$\%\text{Relative Abundance of a species} = \frac{\text{No. of Ediphytic plants of a species}}{\text{Total numer of Ediphytes of all species}} \times 100$$

Factors responsible for dispersal of Ediphytes were determined. After the study, recommendations would be made to control these Ediphytes for the better look and long life of the buildings.

Results and Discussion

A survey was carried out to observe the different species of vascular Ediphytes present in all the five districts of Karachi.

Among all the 1000 vascular Ediphytes (Trees, shrubs, woody climbers, herbs and grasses) studied (Table.1) covers 25 species belonging to 17 families, out of these 508 plants or 50.8% belong to trees. Most of these trees i.e.45% belong to genus *Ficus* of family *Moraceae***.** This genus can be considered as the most successful plants of the crevices and cracks of the buildings. After studying the attached table of ediphytic plants, we can conveniently conclude that *Ficus rumphii* Blume (Pilkan) covering 30% of the ediphytic flora, is the most stress tolerant and successful ediphyte.invading the buildings and other infrastructures present in the city. Remaining four ediphytic trees include *Ficus religiosa* L (Peepal). (65 plants or 6.5%), *Ficus bengalenses* L (.Bargad) (45 plants or 4.5%, *Ficus racemosa* L.(Gular) (25 plants or 2.5%) and *Ficus johannis* Boiss. (Injeer) (15 plants or 1.5%) of *Phoenix sylvestris* (khajoor) Among the remaining 6.5% of the ediphytic woody plants, (15 plants or 1.5%) belong to *Phoenix sylvestris* Roxb (,Khajoor) . (7 plants or 0.7% belong to *Prosopis juliflora Swartz* (5 plants or 0.5%) to *Salvadora persica* L,(Peelu) *Clerodendron phlomoides* (5 plants or .5%), is a shrubby species while among woody climbers *Cocculus pendulus* J.R.and G.Forst (10 plants or 1%) *Cocculus hirsutus* L. (5 plants or 0.5% of *Cryptostegia grandiflora* which is a naturalized species. *Eucalyptus citriodora* Hook. is an invasive species. There was one tree species of *Zizyphus mauritiana* propping out from one of the ramp of flyover near Liaquatabad.

There were 492 different types of herbaceous Ediphytes observed, belonging to 11 species and 8 families, growing near very moist and damp places under the leaking drainage pipes. Among the 1000 ediphytes studied, 492 plants belong to various categories of herbs and grasses. The most common herbaceous species was *Amaranthus viridis* L., which included 197 plants or 19.7 of the total ediphytes, followed by *Chrysopogon aucheri (Boiss)Stapf* ,and *Dactyloctaenium aegyptium* (L.*)* which include 143 plants or 14.3% belong to family *Poaceae* and (74 plants or 7.4%) belong to family *Cyperaceae*, rest of the other 418 or 42% plants belong to families *Nyctaginaceae, Amaranthaceae, Malvaceae, Portulacacae, Euphorbiaceae* and *Compositae.* (Table 1).

Factors responsible for dispersal of Ediphytes: Seeds of these plants are light, very small and inconspicuous. They find their way in the seed banks of building material such as clay, silt, sand and gravels used in the making of bricks, blocks and plaster.

Dispersal of the seeds, can take place through *frugivorous* bats (*Chiropterochory*) that are fond of eating fig fruits, their seeds pass washed and undigested through their gastro-intestinal tract and their faecal material are dropped in the wall crevices. These seeds can also be dropped in the crevices through the plumage, beaks or faeces of birds (*Ornithochory*) such as crow, pigeon, mynah, parrots, sparrow etc, and through the body of rodents (*Rodentochory or squirrels Lagomorphochory*). These seeds settle in the crevices and fissures which prove to be a suitable abode to collect water nutrients and to expose their leaves to light. Seeds of these plants can also reach the wall crevices through human faecal material (*Homo-sapienochory*) flowing out of domestic sewage system and damaged drainage pipes. The seeds of these plants can also be dispersed through wind (*Anemochory*). Their seeds germinate in the crevices, sprout roots and absorb water from the moist surroundings, caused by seepage of the damaged sewage line and water pipes. They obtain nutrients from the surrounding bricks or accumulated soil. Sunlight is not a problem for these highly exposed plants. For building-plants the most destructive weapons are their roots, which find their way into cracks and crevices and develop tremendous mechanical and hydraulic pressure that separates bricks, plaster and lifts the concrete to create larger cracks in the buildings. With the passage of time the abandoned and dilapidated buildings can be toppled and their man-made materials are disintegrated to rubbles. In this way the plants can reclaim their lost territory invaded by man long ago.

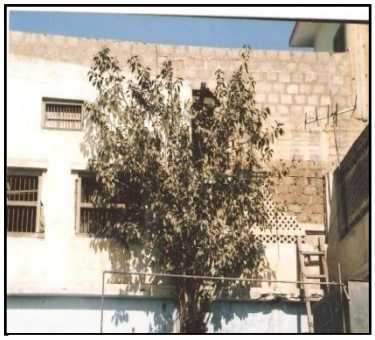

Fig.1. ***Ficus rumphii Blume*** **(Pilkun) growing anchored in a cracked sewage pipe.**

Fig.2. ***Ficus rumphii Blume*** **growing from a crack of the Adamjee Govt. Sci. College caused by a leaking sewage pipe.**

Fig.3. ***Ficus rumphii Blume*** **is propping from the crevices of the Adamjee G.S.C. building near the damaged sewage line.**

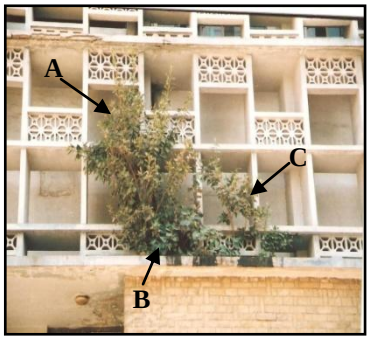

Fig.4. A. ***Ficus rumphii Blume*** **B.** ***Ficus religiosa*** **L. and C.** ***Clerodendron phlomoides*** **L.F. growing in moist crevices of Adamjee G.S.C. building.**

Fig.5. ***Ficus religiosa*** **L. growing above while** ***Ficus rumphii*** **Blume below has gained ground from the damaged and leaking sewage pipe. These ediphytes were later removed during repairs and renovation.**

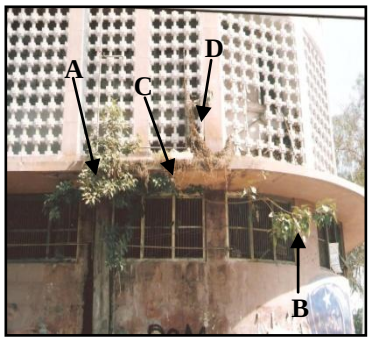

Fig.6. A. ***Ficus rumphii Blume*** **B.** ***Ficus religiosa*** **L., C.** ***Cocculus pendulus*** **(J.R. & Forst.) Diels and D.** ***Clerodendron phlomoides*** **L.F., growing from a damaged and cracked wall caused by leaking sewage line. Islamia College building.**

Fig.7. ***Ficus bengalensis*** **L. (Burgad) growing near leaking sewage line. Islamia College building.**

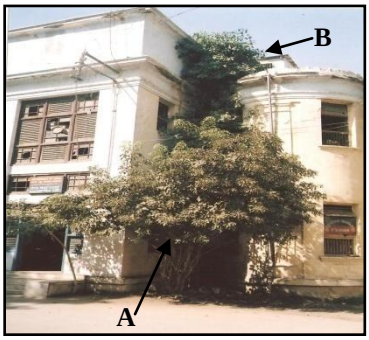

Fig.8. ***Ediphytes*** **invade neglected and dilapidated buildings and turns them to rubbles. A.** ***Crataeva adansonii*** **D.C. a** ***Chasmophyte*** **growing at the base while, B.** ***Ficus rumphii*** **Blume has invaded the upper storey of a Govt. office building, Garden West.**

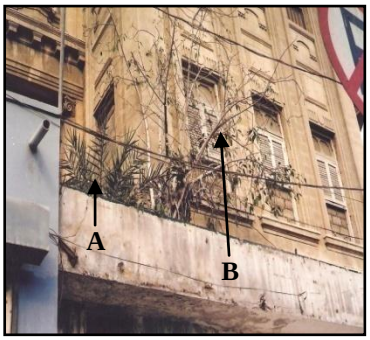

Fig.9. A. ***Phoenix sylvestris*** **Roxb. And B.** ***Ficus rumphii*** **Blume growing as an ediphyte in the surroundings of damaged sewage line near Burns Road.**

Fig.10. A. *Eucalyptus citriodora* Hook left and B. *Salvadora persica* L. (Peelu) right, growing from the damaged leaking sewage pipe of a Govt. office building, Gulshan-e-Iqbal.

Fig.11. *Ficus religiosa* L. (Pipal) growing from a leaking and damaged sewage line of Islamia College building.

Fig.12. *Ficus johannis* Boiss growing from the damaged sewage line of a residential building.

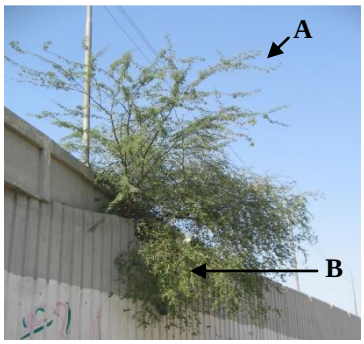

Fig.13. Showing A. *Prosopis juliflora* on the left and B. *Zizyphus mauritiana* on the right side growing from the ramp of the Liaquatabad flyover.

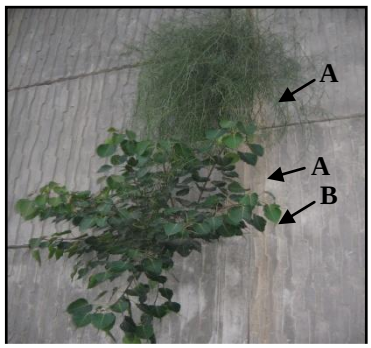

Fig.14. A. *Cocculus hirsutus* L. growing above & B. *Ficus religiosa* L. growing below from the crevices of newly constructed Lyari Express Way Ramp.

Fig.15. Group of ediphytes growing from the ramp crevices of newly constructed Lyari Express Way A-B = refer to Fig.14.

Table 1. Showing Relative abundance of ediphytes

S.No	Species	Family	Habit	No. of Plants	R. Abundance (D_3%)
1	*Ficus rumphii Blume*	*Moraceae*	Tree	300	30
2	*Amaranthus viridus L.*	*Amaranthaceae*	Herb	100	25
3	*Chrysopogon aucherii (Boiss)Stapf*	*Poaceae*	Grass	100	20
4	*Ficus religiosa L.*	*Moraceae*	Tree	65	6.5
5	*Ficus bengalensis L.*	*Moraceae*	Tree	45	4.5
6	*Dactyloctaenium aegyptium (L.)P.Beauv.*	*Poaceae*	Grass	50	10
7	*Cyperus rotundus L.*	*Cyperaceae*	Grass	40	08
8	*Euphorbia hirta L.*	*Euphorbiaceae*	Herb	25	05
9	*Cyperus arenarius Retz.*	*Cyperaceae*	Grass	40	08
10	*Ficus racemosa L.*	*Moraceae*	Tree	25	2.5
11	*Ficus johannis Boiss*	*Moraceae*	Tree	15	1.5
12	*Phoenix sylvestris Roxb.*	*Palmae*	Tree	15	1.5
13	*Boerhaavia verticillata Poir*	*Nyctaginaceae*	Herbaceous Climber	25	05
14	*Malvastrum coromandialum L.*	*Malvaceae*	Herb	25	05
15	*Fimbrystylis dichotoma (L.)*	*Cyperaceae*	Grass	20	04
16	*Launea nudicaulis L.*	*Compositae*	Herb	25	05
17	*Cocculus pendulus (J.R. and G. Forst)*	*Menispermaceae*	Woody climber	10	02
18	*Portulaca quadrifida L.*	*Portulacaceae*	Herb	25	05
19	*Prosopis juliflora Swartz*	*Mimosaceae*	Tree	07	.7
20	*Salvadora persica L.*	*Salvadoraceae*	Tree	05	.5
21	*Cocculus hirsutus L.*	*Menispermaceae*	Woody Climber	05	01
22	*Eucalyptus citriodora Hook*	*Myrtaceae*	Tree	05	.5
23	*Cryptostegia grandiflora R.Br.*	*Asclepiadaceae*	Woody Climber	05	01
24	*Clerodendron phlomoides L.f*	*Verbenaceae*	Shrub	05	01
25	*Zizyphus nummularia* (Burm.f) wt and Arn.	*Rhamnaceae*	Tree	01	.1

These Ediphytes have not only occupied the crevices and cracks of neglected or hamshackled buildings but they even invaded the crevices of the newly build Lyari Express Way in Karachi.

Authorities in Karachi Building Control City District Government and other authorities should look into the menace of Ediphytes seriously and should not consider these plants as sacred or venerable. Instead the general public, contractors, builders and civil engineers should take care of the dripping pipes, damage sewage system, crevices and cracks present in the buildings and the Ediphytes sprouting from there should be removed otherwise with the passage of time they will topple down the whole structures to rubbles.

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