

Vertical gardening for enlivening the ambiance

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ABSTRACT

Illustration of the word 'Vertical Gardening' reveals the way of employing wide range of plants allowed to extend upwardly in lieu of growing them along the soil surface. It is the way to implant a patch of gardening both in extramural and interior segment of urban dwelling areas. Equivocality of having own garden at open premises and hasty expansion of concrete structures are the root cause of owning this contemporary style of gardening in modern era. The development of 'Green Wall' at office premises or corporate places will fetch a chic look as graceful adornments along with an enlivened ambiance being created enriched microclimate supplemented with oxygen offering good health for workers. Presently in market availability of its variegated designs for both aesthetic and creative gardens upgrading its popularity and versatility gingerly. So it is easy to mount at apartment balconies or any other apartment place receive least care and maintenance Thus, anyone suffering from encroachment of spaces year after year can rescue from the captivity being implemented this 'horizontal garden' form will surely add a height to their life styles.

Keywords : Ambiance, contemporary, encroachment, enliven, urban, versatile.

Gardening considered as an ancestral categories of art, interlaces a bond of green and art from the level between material and spirit (Thompson and Sorvig, 2000). Keeping global warming in consideration eradication of air pollutants to make healthier air to breath becomes mandatory with aid of plants as they have immense contribution on human life and environment. Side by side, the increase in the urban living and lifestyle has raised the number of apartments in India ultimately led to the infringement of spaces all over the city. Limited scope for developing vegetation surface in urban environment although a troublesome job to get accessible surfaces lastly bound decision-makers to adopt the concept of 'Vertical Gardening' build with assist of wide range of vegetations may be a viable option to renew our climate (Bisgrove, 2010). The term 'Vertical Gardening' is self-explanatory. It alludes to different forms of vegetated wall surfaces, synonymously familiarized with the term 'Green Wall' globally (Green roof organization, 2008). Green walls not only fetch a picturesque effect but also make livelier environment being imbibed green house gases ultimately lower both indoor and outdoor heat along with healthier interior air quality as well as more beautiful space by its assistance (Yeh, 2012). Few small herbaceous species such as ivy-leaved toadflax, wallflower and others such as mosses, lichens and grasses can grow on walls itself by its root although climbers and twinners naturally adapted to climb up over obstacles such as rock faces, trees and shrubs are most apposite (Johnston and Newton, 2004). Collaterally, little bit of technical knowledge in search of appropriate position for installation is essential also, for example narrow corridors with heavy traffic may not serve the intention. In fine, 'Vertical Gardening' is the blend of green and art promote the city quality.

A concise background of 'GREEN WALLS'

The ancient concept of 'Green wall' was built in Babylon about 2500 years ago. In ancient Babylon, King Nebuchadnezzar II built the Hanging Gardens of Babylon: a wonder of the ancient world, and ancestor of the modern green wall. The actual inventor is Stanley Hart White, a Professor of Landscape Architecture at the University of Illinois who patented a green wall system in 1938. But it was the legendary botanist Patrick Blanc who experimented with this concept and made it popular (Blanc, 2008). In India, Anuradha and Pradeep Barpande, Directors of Elevated Landscape Technologies (ELT) had drawn inspiration from Blanc's work and had created absolute stunners on the Indian walls too, such as vertical gardening in Mughal garden, adjacent to the Rashtrapati Bhavan at New Delhi. They started their business in 2013 with a small nursery called 'Nandini Garden' at Manjri, Pune (Times Property, 2010).

Elevated Landscape Technologies (ELT) introduced a Canadian modular system made of high-density polyethylene (HDPE) to the Indian market. The first vertical garden was installed in five places of India viz. Delhi, Bengaluru, Chennai, Mumbai and Pune. After observing the impact of weather on the green plants, they gained confidence and sold this new concept to patrons with one-year warranty (El-Zoklah, 2016).

Green facades

It can be anchored to existing walls or structures viz. fences/columns and it involves climbing plants or cascading vegetation (Gonchar, 2009).

a. Modular trellis panel system

The building block of this modular system is a rigid, light weight, three-dimensional panel made from a powder coated galvanized and welded steel wire that supports plants like *Asparagus* sp., *Pilea microphylla*, *Alternanthera* sp., *Mentha* sp., Jade plant, *Sedum morganianum*, *Portulaca* sp., *Dusty miller*, *Cuphea* sp., *Ophiophogon* sp., *Dianella tasmanica*, *Baby's tear*,

Categories of 'VERTICAL GARDEN'

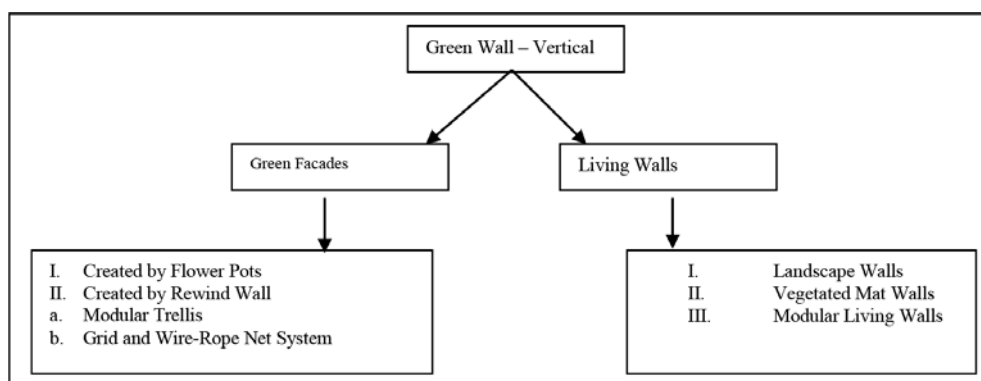


Fig. 1 : Schematic form of various types of vertical garden (Yeh, 2012).

b. Grid and wire-rope net system

It involves cables and wires. Grids are employed on green facades that are designed to support faster growing climbing plants like Ivy, Trumpet vine, *Clematis* sp., *Wisteria chinensis*, Star jasmine, *Bougainvillea* sp., Climbing rose, *Trachelospermum jasminoides*, *Vitis vinifera* etc. with denser foliage. Wire-nets are often used to support slower growing plants that need added support provided by this system at closer intervals. Both systems use high tensile steel cables, anchors and supplementary equipment (Wong *et al.*, 2010). Various sizes and patterns can be accommodated as flexible vertical and horizontal wire-ropes connected through cross clamps.

I. Landscape wall

These walls are an evolution of landscape 'berms' and a strategic tool in an approach to 'living' architecture (Jacobs, 2008b). Landscape walls are typically sloped as opposed to vertical and have the primary function of noise reduction and slope stabilization (Sahu and Sahu, 2014). They usually are structured from some form of stacking material made of plastic or concrete with room for growing media and plants *viz.* *Lonicera japonica*, *Nephrolepis* sp., *Parthenocissus tricuspidata*, *P. quinquefolia*, *P. inserta*, *Vitis berlandieri*, *V. riparia*, *Polygonum auberti*, *Pyracantha* sp., *Selaginella* sp., *Wisteria chinensis* etc.

II. Vegetated mat walls

The 'Mur Vegetal' is a unique form of green wall pioneered by Patrick Blanc (Green roofs for healthy

Callisia repens etc with both a face grid and a panel depth (Erdogan and Khabbazi, 2013). This system is designed to hold a green facade off the wall surface so that plant materials don't attach to the building provides a 'captive' growing environment for the plant with multiple supports for the tendrils, and helps to maintain the integrity of a building membrane.

cities, 2008). It is composed of two layers of synthetic fabric with pockets that physically support plants *viz.* *Actinidia* sp., *Akebia quinata*, *Aristolochia* sp., *Campsis* sp., *Celastrus* sp., *Clematis* sp., *Cotoneaster* sp., *Euonymus fortune*, *Hedera helix*, *Heuchera* sp., *Humulus lupulus*, *Hydrangea petiolaris* etc. and growing media. The fabric walls are supported by a frame and backed by a waterproof membrane against the building wall because of its high moisture content (Shiah and Kim, 2011; Jacobs, 2008a). Nutrients are primarily distributed through an irrigation system that cycles water from the top of the system to down.

III. Modular living walls

A modular living wall system emerged in part from the use of module for green roof applications, with a number of technological innovations. Modular systems consist of square or rectangular panels that hold growing media to support plant material (Ottele *et al.*, 2010, Ba°dogan and Çig, 2016). *Pepromia* sp., *Syngonium* sp., *Philodendron* sp., *Epipremnum* sp., *Begonia* sp., *Anthurium* sp., *Chlorophytum* sp., *Pilea* sp., *Rheo discolor*, *Fittonia* sp., *Spathiphyllum* sp., *Schefflera* sp., *Zebrina pendula*, *Setcreasea purpurea*, *Nephrolepis* sp. etc. are apposite for this.

How plants enhance livelihood security

'Vertical Gardening' is a most effective tool for creating healthy microclimate increasing oxygen level. Plants furnish a natural solution to clean indoor air, create

Table 1: List of plants fit for ‘Vertical Gardening’

Name of plants	Deciduous(D) Evergreen (E) Annual (A)	Growth rate	Soil
<i>Hedera helix</i> (Self-clinging climber)	E	Slow	Rich
<i>Parthenocissus quinquefolia</i> (Self-clinging climber)	D	Average	Any
<i>Hydrangia petiolaris</i> (Self-clinging climber)	D	Average	Loamy
<i>Euonymus fortunei</i> (Self-clinging climber)	E	Slow	Any
<i>Lonicera periclymenum</i> (Twining climber)	D	Average	Good loam
<i>Clematis vitalba</i> (Twining climber)	D	Fast	Prefer alkaline
<i>Aristolochia</i> sp. (Twining climber)	D	Average	Rich moist
<i>Jasminum officinale</i> (Twining climber)	D	Fast	Well drained
<i>Passiflora caerulea</i> (Twining climber)	D	Fast	Any
<i>Lathyrus odoratus</i> (Twining climber)	A	Fast	Rich, well drained

cool interiors via shading (allowing for natural views) being reduced existing greenhouse gases (Dunnet and Kingsbury, 2008), make us less stressed and more productive around them, act as natural insulation for hot and cold air and save energy for building (Auld, 2003), lower background noise and also contribute a healthy lifestyle. It also facilitates the aesthetics of a place.

Factors to keep in mind for successful establishment of vertical structures inside

Before planning, few vital indoor conditions have to be evaluated carefully such as

Irrigation

Hard water like fluorinated, chlorinated or treated water can cause foliar or other structural damage to the plants, so the quality of water enacted a crucial job to flourish ‘green walls’ (Sahu and Sahu, 2014). Hand-watering by a hose initially and later drip irrigation system is most apt while sprinklers are ideal for larger perennial beds (Dufour and Guérin, 2005) which don’t need frequent watering as well as cover large area using minimal water since much of the water is often lost by evaporation (Mukherjee, 2000). So, judicious watering is the key for its victorious establishment.

Selection of soil

An organic soil mix from nursery, local topsoil straight out of ground or the mixture of both of these can be used as a growing medium for vertical gardens.

Light

No matter how many windows and skylights are designed into a building, the light intensity inside will never equal that of outside. Plants need light to survive and grow, so light intensity, quality and duration has to be taken into account.

Light intensity

10 to 10,000fc by day and as few as 5fc by night are required for average residential living room whereas 20 to 30fc of light in pedestrian circulation area and upto 100fc in sales area are sufficient for shopping plazas (Salasa et al., 2012).

Light quality

Plants like blue and red bands of light spectrum. Now-a-days artificial lights (fluorescent lights) can be used to compensate the natural light.

Light duration

Duration of light, a prime factor for photoperiodism depending on employed plant’s photoperiodic responses as growth, development and blooming inclined by it.

Temperature and humidity

For most of the tropical indoor plants optimum temperature and humidity are 20-35°C and 50-55 percent respectively as they thrive and survive best at these conditions.

Another item to evaluate is space utilization and foot traffic since placing of any sprawling plants near an entryway may seem like an obvious mistake to many, so right plan in right place is mandatory (Roy Chowdhury, 2002).

Stumbling blocks of vertical gardening

The cost of creating such concept i.e construction of apt structure favorable for interior state, control of environment regarding the humidity, temperature and arrangement of plants will not be a cheap exercise. It sounds as if it would cost far more than what anybody could expect to pay for conventionally grown food.

Actually ‘Vertical Garden’ might be translated to ‘conjunction of green and art’, which plays an extraordinary role for improving city quality effectively

(Wuzhong, 2013). They are key component of living architecture and become increasingly an important fixture in our cities in the years to come. Based on the view of 3A (Agriculture, Architecture, Art) philosophy and practice, it provides a motive to make agriculturist including horticulturist, architects including landscape designers and artists including scholars of humanities get together in a unlimited broad sense. The composition of forces will support promoting the quality of a city, building perfect human settlements, and finally, creating the artistic design of a city (Wuzhong, 2011). Vertical gardening is still in its nascent stage, so critical collaboration will facilitate propagation of new innovations for environmental protection issues.

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