

Review Paper

SELECTION OF PLANTS FOR VERTICAL GARDENING AND GREEN ROOF FARMING

Dr. A.N.Sarkar

Ex-Senior Professor (International Business) & Dean (Research), Asia-Pacific Institute of Management, 3& 4 Institutional Areas, Jasola (Sarita Vihar), New Delhi
E.mail: ansarkar1@gmail.com

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The choice of plant species for vertical gardens is strictly dependent on climate conditions and exposure of the wall. The plants should be light, their root system must be spreading and not of the pile form. It is also important to choose evergreen plants, so that a vertical garden will fulfill its role throughout the whole year. Life expectancy is an important factor while calculating the cost of green wall exploitation. It is recommended to choose mosses, ornamental grasses, perennials, shrubs which live a few to dozens of years with a high tolerance to environmental pollution. Aging and withered plants should be replaced during a garden maintaining process of minimum every half year. The use of different plant species including herbs, grasses, perennials and trees help to make the roof-scape a natural environment. Other factors that should be considered when selecting plants include: the rate of plant growth, nutrient needs, and sensitivity to pollution. The type of plant species and their location on the roofs also depend on the geographical location, the rate of air pollution, rooftop height, shade, growing medium depth and composition, accessibility of roof, run-off water management purposes, irrigation method, thermal insulation purposes, installation techniques and maintenance. A lot of plant species can be used for Vertical Gardens and Green Roof Farming purposes. For example there are 15000 plants from nearly 150 different species on the Caixa Forum Museum vertical garden who has designed Patrick Blanc (<http://www.greenroofs.com> 2013). In this case, impossible to give all the plants one by one so in this part some plants given used for Vertical Gardens and Green Roofs. The paper is dedicated on the selection principles and criteria while construction of Vertical Gardens and Green Roofs.

Key words: Plant species, Vertical Gardening, Green –Roof Farming, Caixa Forum Museum, shrubs

INTRODUCTION

Plant Species Selection Process

Since a large number of plant species exist in each region, selecting a suitable plant for green roofs is difficult. Each green roof should be survivable in the regional climate in addition to its own particular microclimate. With these limitations, information must be gathered from various conditions and climates to be able to propose the best plant species for the green roof. Each green roof designer, installer, contractor and owner must do their duties properly to prevent recognized problems. Use of research resources to perform a correct decision on a green roof project, can save time and resources drastically (http://www.frsb.upm.edu.my/dokumen/FKRSE_1_10-17.pdf). Plants selection in green roofs/vertical garden has many criteria which are interrelated. Climate

and micro-climate and environmental factors have a significant role in the selection of plant species. Especially, average low and high temperatures, extreme cold and hot temperatures, irradiance level, wind speed, and the distribution and amount of rainfall throughout the year will specify what species can survive in a specific region. Drought resistance is important as a high rate of irradiance and low soil moisture characteristics are integrated to shallow growing medium systems. Succulents like sedums, are usually selected in green roofs due to their capability to survive harsh conditions. More accurate maintenance and deeper growing medium allow to use plants that they show less resistance against drought. Appropriate selection of plant species guarantees the survival of each plant and stability of their population, which impacts the extent of advantages that

is received from a green roof (http://www.frsb.upm.edu.m-y/dokumen/FKRSE1_10-17.pdf).

Other determinant factors in plant selection process are the project purpose and the favourite roof appearance. If a more natural environment is the aim of the project, local species may be chosen. Irrigation is, however, typically important not only to use native plants on the roof, but for long term survival of individual plants and the plant community as a whole (Durhman, Rowe, & Rugh, 2006), leading to the need for further maintenance. Another factor that influences the plant selection process is the canopy structure of plant species. Plants should be selected that have mostly horizontal leaf distribution and/or an extensive foliage development, in order to reduce the transmission of solar radiation. It should be noted that the main role of canopy in green roofs is shading (Barrio, 1998). With a suitable green roof structure and sufficient depth of growing medium (with higher water supply, nutrients and root penetration volume) growing a variety of plant species in complex mixtures is possible.

The use of different plant species including herbs, grasses, perennials and trees help to make the roof-scape a natural environment. Other factors that should be considered when selecting plants include: the rate of plant growth, nutrient needs, and sensitivity to pollution. The type of plant species and their location on the roofs also depend on the geographical location, the rate of air pollution, rooftop height, shade, growing medium depth and composition, accessibility of roof, run-off water management purposes, irrigation method, thermal insulation purposes, installation techniques and maintenance. The capability of plants to survive in a roof-scape environment is directly related to the amount of budget and maintenance time allocated to the project, especially in the first two years when they are in growth stage and sensitive. Similarly, microclimates in the roof-scape must be considered. Roof orientation and slope may affect the intensity of the solar radiation and growing medium humidity, adjacent buildings may shade a part of the roof, air vents from air conditioning and heating units may dry the soil out, and industrial chimneys may stunt the plant growth by chemical pollution. Furthermore, installation technique may impact plant choice. They can be established on the ground as plugs or established on a mat, tray or blanket, and then positioned on the roof directly - or on the roof growing medium through seed, plugs, or cuttings seed. The availability of the plants in each of these forms may affect the selection of plant species. Additionally, the installation method may determine the amount of irrigation needed throughout the initial installation. The long-term need for irrigation is another important factor in plant selection process. And, the long-term need of individual species for irrigation will also be an issue in plant selection (Getter & Rowe, 2008). The following selection criteria and processes maybe employed while selecting suitable plants/species

for Vertical Gardening (https://www.digcorp.com/uploads/manual_file/file/153/26150_LivingWall_InstructionManual_121916.pdf).

First, look to growing vegetables and herbs. Most herbs can be cultivated, even some of the woody shrubs such as rosemary and lavender. Both of these plants need long hours of direct sunlight to succeed so an exposed east/west facing wall will be needed. Soft stemmed herbs such as parsley, mint, basil and coriander will do well in our Living Wall™ pots as long as their water needs are supplied. The idea of a vegetable wall is very appealing. This can be easily achieved with fast crops such as lettuce and the small oriental cabbages. Not all lettuces produce heads such as iceberg. Non-hearting lettuces can be harvested 'leaf by leaf' and there are plenty of varieties from which to choose.

Vegetables do best in high light situations. Flowering annuals can make a dramatic and welcoming splash of color with many annual flowers well suited to vertical gardens. Maximize your floral selection by choosing in-season blooms that provide a dazzling flower show for three or four months at a time. For a more permanent show where regular watering is required, consider succulents. There are many families of succulent plants where form and foliage color create interesting long term features. This is not to say that these plants don't flower; they do, and in many cases with great flair. Succulents are accustomed to getting by on little water and as a result have a tendency to rot if their roots are constantly wet. Use a cactus potting mix to fill the pots. In full sun you only need to water perhaps once every couple of weeks during summer so the plants experience dry soil in between drinks. Most succulents demand hot sunny locations to give their best show. Some of the most spectacular vertical gardens are located indoors where there is more control over the environment, particularly when it comes to watering. Choosing a range of different plant foliage makes it possible to paint living pictures. As a general rule, soft stem plants are among the most successful and are good choices for vertical indoor gardens. In a similar layout, patios and outdoor living areas can be decorated with living plants using the vertical format to create drama and effect. Tree growing orchids are groups of shade loving plants that are well suited to life in the air. It is also possible to grow plants in both hydroponic and aquaponics systems using DIG's Living Wall. If one of these systems is selected, fill the pots with expanded clay as the soil-less medium. It is a good practice to drain the water into a reservoir or pond and add nutrients to the pond. In the case of aquaponics, fish would supply the nutrient through their excreta. In both methods, use a small pond pump to push water up into DIG's Living Wall™ for recirculation.

The Use of Native Plant Species

The origins of modern green roofs were in Europe, where they were primarily used for run-off water management. Generally, these roofs were planted with succulent, drought-tolerant, low-growing, plant species, particularly Sedum. In addition to sedum, native plants are used in green roofs. Nowadays, there is a great interest to use a variety of plant species, with a special focus on native plants in green roofs (Kephart, 2005; MacDonagh, Hallyn, & Rolph, 2006; Schroll, Lambrinos, & Sandrock, 2009). In Peck's (2008) book, Award Winning Green Roof Designs, 45% of green roofs that have been awarded used native plant species as vegetative layer. Green roofs covered by local plants include over half (59%) of the case studies about green roofs (Cantor, 2008). In traditional gardening, native plants are suggested due to lower cost. They typically do not need too much soil preparation, irrigation, fertilizers, or pruning. Native plants are also bring native fauna to the roof-scape and contribute to increase the urban biodiversity (Lockett, 2009). It is known that they have evolved to survive and grow in their regional meteorological conditions, diseases and pests (Dewey, Johnson, & Kjelgren, 2004; White & Snodgrass, 2003). Planning green roofs with native plant species, wherever possible in addition to decreasing the need for maintenance and irrigation, improves the pollination, habitat and food resources for local fauna (Brenneisen, 2006; Lundholm, 2006). Incentives or policies for nature and biodiversity conservation may support green roofs with native plant communities (Oberndorfer et al., 2007). However, the drought tolerance of selected species, depth of substrate, and management practices, should be considered in design and planning stage (Pledge, 2005). In recent years, interest in the production of vegetables and herbs on green roofs has been increasing (Pledge, 2005). Dvorak and Volder (2010) persuade study of local plant species since as ecologist Aldo Leopold points out, "The native plants and animals keep the energy circuit open; others may or may not (Leopold, 2009)"

Plant Species for Extensive Green Roofs/Vertical Gardens

Plant species in extensive green roofs have to survive drought, intense wind exposure, solar radiation, low nutrient supply, extreme temperatures, and limited root area (MacIvor & Lundholm, 2011). Qualified plant varieties are those growing in harsh geographical locations with restricted nutrient supply and inadequate moisture, like arid mountain environment, dry and semi desert meadows and coasts. The main varieties belong to the succulent plants. These plants have the potential to accumulate high quantities of water in their leaves, are stress tolerant and survive simply from drought periods. It is essential that plant species which are local be considered in order to improve biodiversity (MacIvor & Lundholm, 2011). Industry experience and long-term research have led professionals to suggest extensive

green roof vegetation be low-growing, fast-establishing, cushion forming or mat-forming with succulent leaves and capability to accumulate water, efficient reproduction and shallow spreading roots (Dunnett & Kingsbury, 2004; MacIvor & Lundholm, 2011; Snodgrass & Snodgrass, 2006; White & Snodgrass, 2003). Media depth and composition have a key effect on plant selection for roof-scape (Getter & Rowe, 2006). Plant species in extensive green roofs are typically restricted to grasses, moss, sedums, and herbs as a result of the shallow growing medium. Low height perennials are usually proper choices as they have shallow roots. Sedum plants with fibrous roots keep water, survive in droughts, and hold themselves in place throughout rain or wind. Similarly, Alpine plants have been chosen as they are very resistant to harsh weather conditions and have a similar condition to plants in roof-scape. Drought resistant plants are normally more tolerant to hostile climatic conditions and comply well with the low maintenance requirements of an extensive green roof. The ideal growing medium of an extensive green roof includes a balance of well-drained, lightweight, materials, has sufficient nutrient and water-holding capacity, and will not decompose over time. Shallow media depths available on extensive green roofs may drop the humidity level very fast and typically do not support deep-rooted grasses, woody species, and many perennial or annual flowering plants. On the other hand, shallow growing medium usually prevent the growth of many unwanted weeds, and many desirable plants naturally can grow under these shallow conditions (Getter & Rowe, 2006).

The plants in a Natural Wall are easy to maintain because they are chosen specifically to suit the conditions at the wall's location. One plant grows better under low-light conditions than another. The atmospheric humidity and the temperature in the office are also important factors which influence the growth of plants. In combination with the best possible selection of plants, the system practically looks after itself. It is sufficient to water it once every two to four weeks, depending on the location and the plants. Nutrients are automatically included in the water. If you already have a maintenance contract for the plants at your company or house, then you can leave the normal maintenance, such as regular pruning to retain the ornamental value of your wall or the replacement of a plant that does not thrive, to these specialists. If necessary – in the case of a catastrophe, perhaps – a unit or combination of units can be replaced, without the whole wall having to be dismantled. If you have a maintenance contract, you will, moreover, receive a full guarantee on the quality of your Natural Wall, subject to minimum climatic conditions. It could not be easier
(http://www.nieuwkoop-europe.com/downloads/NK_Living%20walls%20and%20vertical%20gardens.pdf).

Suitable Plant Species for Vertical Gardens

Greenwalls — also known as vertical planting systems, vertical gardens, plant walls or vegetated walls have been successfully implemented in several projects around the world over the past 17 years. European projects and Canadian projects have taken the lead in implementing these planting systems. Most greenwalls are simply planting system used for both interiors and exteriors of buildings. The basic greenwall system is created by providing a planting substrate into a vertical planting system (http://www.newenglandgrows.org/pdfs/ho_Anderson14HandoutFRI.pdf).

The components of most vertical planting systems include: Plants specifically selected to meet the particular design intent, interior greenwalls use tropical plants, mostly vining, climbing and fern varieties. Exterior greenwalls use sedums and other hardy vines and climbers. A modular panel system, in order to contain the roots and the growing medium, an integrated drip irrigation system and controls catch basin to control the water runoff, and a structural support system is required. Plants stay in place because they are rooted into the growing media which is held in place by the modular wall system and attached to the wall using a structural support system. When air is circulated through a greenwall, it becomes an active bio-wall air-filtration system. Basically all greenwall act as bio-filters, improving air quality by breaking down harmful VOC's (Volatile Organic Compounds) and creating clean oxygen. Greenwalls absorb carbon dioxide, releases oxygen and reduces greenhouse gases in the atmosphere. Exterior greenwalls reduce energy consumption by keeping the building cooler in summer via the plant's transpiration process, which reduces the need for air conditioning. Both interior and exterior greenwalls create sound absorption which reduces noise inside the building (http://www.newenglandgrows.org/pdfs/ho_Anderson14HandoutFRI.pdf).

Foliage creates atmosphere in offices and houses, purifies the air and is highly decorative. A plant wall combines a natural ambience and a trendy finishing touch which suits every interior. What is more, a living wall or vertical garden of this kind is a piece of nature which shows to advantage in any office or living room — on a minimum of floor space. A green wall can be used both inside and outside to give a room that 'living' feeling. The advantages of a green wall inside are that you need little space to realise one, and, furthermore, the wall provides oxygen, filters the air and increases the atmospheric humidity, thus improving the quality of the living and working climate. The result is a stylish, pleasant and inspiring environment in which to work or relax. The wall can be planted up with various species of plants which are selected to suit the location. And, as a result of its modular construction, there are very few limitations to its application: it can be used as a stand-alone feature, as a green room divider or against a wall in

the room in question (http://www.nieuwkoop-europe.com/downloads/NK_Living%20walls%20and%20vertical%20gardens.pdf).

The Natural Wall is very flexible when it comes to the type of plants you can use. As an interior architect, you can therefore coordinate the wall perfectly with the colours of the interior or the required structure. Your supplier will be able to give you professional recommendations on the plant species that are suitable for the location in mind. Light and atmospheric humidity are important factors here. You can choose to have a single species of plant or a combination, either in groups or all mixed up. To ensure that the plants have a long life, the possible ranges which can be used have been divided into three groups, based on the amount of light present throughout the day.

Group 1: suitable for limited light conditions, 700-1500 lux.

Group 2: suitable for a light location, 1500-3000 lux.

Group 3: suitable for a sunny location, 3000 lux and more.

You can even decorate an area with very poor light conditions (450- 700 lux) by installing a Natural Wall. Discuss your wishes, so that your supplier can help you find a plant solution which is tailored specifically to suit your conditions. The Natural Wall makes use of a practical planting system. The plants used are cultivated in soil and subsequently planted in Seramis, a natural granulate, in the Natural Wall. There is a separate reservoir of water, which is sufficient for a certain period, at the bottom of every unit.

A lot of plant species can be used for Vertical Gardens. For example there are 15000 plants from nearly 150 different species on the Caixa Forum Museum vertical garden who has designed Patrick Blanc (<http://www.greenroofs.com> 2013). In this case, impossible to give all the plants one by one so in this part some plants given used for Vertical Gardens.

A total of Thirty-two species of ornamental plants, namely *Asplenium thunbergii*, *Alocasia sanderiana*, *Anthurium crystallinum*, *Anthurium andraeanum*, *Aeschynanthus radicans*, *Chlorophytum bichetii*, *Cercestis mirabilis*, *Caladium lindenii*, *Calathea makoyana*, *Dracaena surculosa*, *Echinodosus cordifolius*, *Geogenanthus undatus*, *Monstera obliqua*, *Monstera delicosa*, *Monstera karsteniana*, *Neoregelia carolinae*, *Nephrolepis biserrata*, *Nephrolepis exaltata*, *Ophiopogon jaburan*, *Ophiopogon japonicas*, *Philodendron erubescens*, *Phyllanthus myrtifolius*, *Philodendron moonlight*, *Philodendron cordatum*, *Philodendron moonshine*, *Philodendron Imperial Red*, *Peperomia caperata*, *Pseudorhaphis ramulosa*, *Scindapsus pictus*, *Selaginella wallichii*, *Syngonium podophyllum* and *Syngonium podophyllum*, are commonly planted in vertical gardens ([http://www.ijat-aatsea.com/pdf/v13_n1_%202017_January/11_IJAT_13\(1\)_2017_Phonpho%20Sarayut_%20Plant%20Science.pdf](http://www.ijat-aatsea.com/pdf/v13_n1_%202017_January/11_IJAT_13(1)_2017_Phonpho%20Sarayut_%20Plant%20Science.pdf)).



Figure 1: Green wall designing with Ferns, Flowers and Ornamentals

Adopted from vertical-garden-plant-species-guide (<https://wallgarden.com.au/vertical-garden-plant-species-guide>) the following boxes represent some of the prominent plant species (with special botanical characteristics) that can be suggested to be used in Vertical Gardens under varying designing and construction conditions:

The correct selection of plants plays an important role in the design and functioning of vertical living wall gardens. In this article, we show a selection of the best plants for vertical gardening.

Best Plants for Vertical Garden

Not all plants adapt well to vertical gardening. They must have certain important characteristics for proper development and growth. For instance a Green wall can be designed with Ferns, Flowers and Ornamentals (Figure 1)

Ferns

They are one of the garden plants that are preferred for their adaptability and humidity resistance. Ferns are easy to grow and they cover the area quickly. You can grow sword fern, blue star fern, bird's nest fern, they are easiest. Ferns will generally grow downward, so you'll need to grow other covering plants with them too.

Bromeliads

Most bromeliads have shallow roots and they need little space to grow this makes them ideal plants for vertical gardens. Their colorful leaves and long lasting flowers can be a good addition to your vertical garden.

Begonias

If you are hanging your living wall in a place that receives some sun then growing begonias is a good idea.

Hostas

This beautiful plant with variegated foliage is used as a groundcover in gardens. For a shady site, this evergreen plant is suitable for a vertical garden.

Lipstick Plant

Growing lipstick plant is easy. It does not require deep soil to grow so it can thrive in a vertical wall. You can also grow it indoors.

Must Read: [How to Make a Vertical Wall Planter](#)

Succulents

Succulents are the most used plants for vertical gardens due to their incredible adaptability and resistance to fluctuation in temperatures and climatic variations. Plants like the string of pearls, echeveria, crassula and sedum can be considered.

Air Plants (Epiphyte)

Such plants do not need soil to thrive, they grow naturally on other plants, which makes them perfect for growing in vertical wall gardens. Tillandsias, aechmea, vriesea are a few examples.

Vines

Low maintenance vines such as pothos, ivies, philodendrons, rosary vine and wandering jew can be grown vertical planters easily. They are low maintenance and even thrive in indirect sunlight.

Living walls or green walls are self sufficient vertical gardens that are attached to the exterior or interior of a building. They differ from green façades (e.g. ivy walls) in that the plants root in a structural support which is fastened to the wall itself. The plants receive water and nutrients from within the vertical support instead of from the ground.

Vertical Gardening can be done for Indoor as well as Outdoor Purposes.

For a Smaller size Vertical Gardens like below 100 sq ft you can manually water the area but for areas above 100 sq ft you can have drip irrigation System to Water the Vertical Gardens.

For Vertical Gardens you would require a simple MS Steel Structure if you have a Wall support however if the Wall is not there you are required to make a Strong Structure to Support the Weight of the Vertical Garden Modules and Panels

The Cost of Vertical Gardens varies between Rs.650 per sq ft to Rs.1600 per Sq ft depending upon a number of Factors such as the System you choose, Structure, Design, Plants, Irrigation System, Location etc.

You can grow whichever plants you like on the Vertical Gardens like herbs to make them as beautiful as you would like them to see.

There is a whole host of things to think about before planting your own vertical wall, including:

Is the wall positioned indoors or outdoors?

How much sunlight will it receive?

Are the plants creepers or drapers?

Where should plants be positioned depending on how large they are and how they grow?

A vertical garden is a great addition to the home and adds just that extra bit of colour and life to the living space, whether it's a large feature wall or a small and easy-to-maintain plant project.

Great plants for a Vertical Wall/ Garden may include:

Epipremnum aureum or the Australian Native Monstera

These plants grow really well indoors and are perfect for those who don't quite have a green thumb because they don't require too much care. It is a creeper and can grow up to 20 metres, digging its roots into trees, or whatever is close by, and growing upwards. Keep this one off the floor and away from the dog or cat though, as it can be toxic to furry friends.

Aeschynanthus or the Lipstick Plant

This is a subtropical flowering plant which prefers a warm and humid environment. It is called the lipstick plant because of the bright red flowering buds which look great

among the green foliage on a vertical wall. These work well either indoors or out and grow best with a moist soil and good lighting. Make sure the soil doesn't become too moist though, and keep them in good light for optimum flowering. Place these plants at about mid-range on your vertical wall because their shiny green leaves cascade beautifully, but they also climb too, so give them room for some movement.

Hoya carnosa or the wax flower

The wax flower is the perfect plant for a smaller vertical wall project. They creep along walls, ladders and other objects easily and work well outside. Simply use some chicken wire to encourage the vines to grow along your fence or wall.

Adiantum aethiopicum or maidenhair fern

Position these at the edges of your vertical wall, or scattered throughout and these will cascade and give your wall a lush and soft look. In Australia, these plants are found near creeks or in open forest so they love water.

Acacia cognata or limelight bower wattle

This is the plant that is going to add that wow factor to your vertical garden. It's luscious and is sure to fill in all those gaps on your wall. It needs good drainage though and can survive with little water and in colder climates.

Herbs and Vegies

You could always turn your vertical garden into a Vegie patch too, using sprouts, lettuce and even herbs to grow and then use in your lunch. Spinach, peas, lavender and rosemary work particularly well.

Other helpful tips to remember

Keep irrigation, drainage and lighting in mind when thinking about building your own vertical garden.

Water your vertical wall by hand.

Choose plants which suit the size of your space and climate.

Keep up the maintenance of your plants by trimming and pruning when required

Vertical gardens allow you grow veggies at several levels, so you can get more out of less space, a definite advantage if your growing area is limited. That is not to say that vertical gardening is just for those with space constraints.

Concentrating your food generation to a limited area frees up space for other uses while the veggies get more attention and care. You don't have to walk around too much to care for your plants, a great plus in foul weather.

Vertical gardening changes the old notion that gardening is back-breaking work. Even the mobility-challenged can enjoy growing food and ornamentals at a convenient height.

Plants grown vertically are more accessible, and gardening chores like planting, weeding, feeding and harvesting are much easier. Diseases and pests get noticed earlier on plants growing at eye level, so remedial actions can be taken right away. No more escape for pests hiding under leaves.

Almost any vegetable that can adapt to containers can be accommodated in a vertical garden, but some veggies seem to do better than others. Grow more of them to get the best out of your efforts.

Climbing Vines

Vines that have a climbing habit are nature's own attempt at vertical gardening. These sun lovers climb towards the light on any available support, be it another plant, a trellis, fence or wall. They will happily thrive in a vertical garden whether you grow them in containers or bury their roots in the ground, with the aerial parts scaling the vertical frame or trellis. Here are some tasty ones to grow.

Pole beans

Sow the seeds in small mounds in the ground close to the vertical garden stand, or in large bags kept on the lowest rung. Start them only when the temperature is around 60F or more. Rich soil, plenty of sun and regular watering results in vigorous growth and good crop. Train them on strings to help them reach the top of the stand as quickly as possible.

Peas

Sow shelling peas and snap peas in separate containers and allow them to climb separate trellises to make harvesting easier. Snip off the growing tips (use them in stir fries) to promote branching.

Asparagus beans

Sow seeds in rich, moist soil in large bags and train the vines up and away from the shelves in the vertical garden. Prop trellises at the sides prevent its vigorous growth smothering other plants and to make harvesting the pods easier. Keep picking the pods when they are tender to promote continuous flowering.

Cucumbers

Sow the seeds in rich, well-draining soil in a large pot when the temperature is above 70F. Stake the plants early and give them a trellis to grow on. Pick the tender cucumbers frequently to get a continuous crop.

Malabar spinach

Sow the seeds of this quick-growing climbing green in spring to get a tasty spinach substitute all through summer. Use the leaves as greens and the fleshy stem in a vegetable stir-fry.

TRAILING VINES

There are some vines that grow along the ground, but most of them can be adapted to growing on trellises that are strong enough to support their weight. Some of them have heavy fruit that requires additional support, but keeping them off the ground has definite advantages. It prevents them rotting at the point where they touch the soil. It also makes it easier to track their growth and to harvest them when they are ready.

Watermelon

Plant smaller varieties in the ground but train the vine on a strong trellis or other sturdy support. Make small hammocks of nylon netting tied to an overhead structure to support the heavy fruit.

Pumpkins

Smaller-sized pumpkins can be grown in 10-20 gallon pots and grow bags. Train them onto a trellis early, and provide extra support for the fruit with plastic netting.

Butternut squash

Use large pots for this vigorous vines, or grow them in the ground, directing them to a sturdy trellis when the plants start spreading. Regular feeding is essential for a good crop.

Sweet potato

Many gardeners avoid growing sweet potatoes in the garden because of the sprawling habit of the vine. You can grow them in large bags or in the ground and allow the vine to climb on the sides of the shelves or on a trellis to keep it off the ground.

Brassica Family Vegetables

These cruciferous vegetables are highly susceptible to pests, especially the caterpillars of the cabbage butterflies that do tremendous damage to all members of this family. The pupae of these worms often overwinter in the soil debris, making the areas unsuitable for subsequent crops.

Pest control is much more effective when these vegetables are grown vertically because infestations are easily noticed, starting with the eggs that are hidden under the leaves and the young caterpillars that emerge.

You can even use nets to cover the vertical arrangement, preventing the cabbage butterflies from laying eggs. Slug attacks are rarely a problem when these vegetables are grown vertically and high above the soil line. They are easily controlled with traps rather than spraying of chemicals.

Cabbage

Get cabbage transplants from the garden center and plant just one in each medium-sized pot. Keep the soil moist, but not soggy. Feed with a nitrogen-rich fertilizer or top-dress with well-rotted manure when the heads start to form.

Broccoli

It is better to start early in spring from transplants. Plant in rich soil, one to a pot and keep the soil evenly moist. Use early-maturing varieties in warmer areas because broccoli bolts early if the temperature climbs above 75F.

Cauliflower

Grow cauliflower from transplants unless you can start the seeds indoors 12 weeks before spring. When the flower heads are 2-3 inches across, cover them with the leaves to keep the heads white.

Kale

Plain-leaved kale can be grown several plants to a pot, but the curly-leaved ones look best and grow most vigorously in individual pots. Temperatures above 80F make the leaves bitter, so plant them early enough in spring or go for fall planting.

Nightshade Family Vegetables

Nightshades are edible vegetables belonging to Family Solanaceae, which also includes the deadly nightshade and many other highly poisonous plants. Interestingly, some of our most commonly used vegetables such as tomatoes (*Solanum lycopersicum*), potato (*S. tuberosum*), eggplant (*S. melongena*) and peppers (*Capsicum annuum*) have inedible parts that contain high amounts of the poisonous substance solanine. However, these popular plants are well-adapted to vertical growing.

Tomatoes

These high-light plants thrive in full sun and plenty of warmth. Indeterminate type of tomatoes requires trellises to grow on while the determinate types can do with some staking. In a vertical garden, you have the choice to grow the plants at a lower level, allowing them to grow

upwards. Or you can plant tomatoes at a high level or in a hanging basket and let the plants hang down.

Tomatillos

Grow tomatillos in large pots and use a wire cage to stem in the sprawling branches and provide some support. Although they are drought tolerant, regular watering keeps them healthy.

Peppers

A variety of peppers from sweet bell peppers to fiery jalapeno peppers can be grown in a vertical fashion. Give rich soil and plenty of light.

Potatoes

Potato tubers growing close to the soil surface develop solanine, so gardeners have to mound soil at the base of the plants to prevent this. In vertical gardens, this can be easily done by growing them in opaque containers and adding a thick layer of mulch on top.

ROOT AND BULB VEGETABLES

Root and bulb veggies have compact top growth and medium light requirement, so they adapt very well to vertical gardening as long as you provide sufficient amount of growing medium for their root growth. You can grow them in individual pots or grow bags, or in long rows if you can find rain gutters deep enough.

Radish

You can grow several batches of this fast-growing vegetable in containers that are just 6 inches deep. Sow seeds every two weeks and thin out the seedlings.

Carrots

Use pots that are at least 10 -12 inches tall and use a loose, well-draining medium to get evenly shaped carrots.

Beets

Grow beets in wide pots that are 6-8 inches deep. Avoid using nitrogen-rich fertilizers.

Turnip

Sow turnip seeds in 12' wide pots and thin them to 2-3 per pot. You can harvest the leaves, but it may result in smaller tubers.

Garlic

Plant garlic cloves in fall. Use light soil and provide just enough moisture to keep them growing. Use the flower

stalks of hard-neck garlic in stir fries and dig up the pods when the leaves have died down.

Shallots

Use wide pots to grow shallots. Spring-planted shallots give a all crop and fall-planted ones give a late summer crop.

Onions

Grow onions from seeds or sets, but they need containers that are at least 10-12 inches deep.

Leeks

Start leeks in early spring from 6" transplants. Use medium-sized deep pots, planting just 3 per pot, and then harvesting two of them when they are still young.

Greens

Greens are the perfect plants for growing in a vertical garden, especially those with a low growing habit. They appreciate their raised position which allows more air circulation and prevents the lower leaves from touching the ground and decaying. You will find them having fewer diseases and attacks from pests since soil is the main reservoir of many of the fungal spores and insect larvae. Vertical gardening prevents greens like spinach from getting smothered by weeds. Harvesting is much easier too. Instead of pulling up the entire plant, you can pick mature leaves for the kitchen as and when required, allowing the plants to continue growing for a longer period.

Lettuce

Loose-leaf lettuce varieties are best for vertical gardening. They do very well in shallow pots and can be grown closer together than in the ground. Sow seeds every two weeks to ensure a steady supply.

Spinach

This green seems to be specially made for vertical gardens. Sow a liberal amount of seeds and thin out the seedlings as they grow bigger. Start planting from early spring and continue until it becomes too warm. Resume in fall and continue until just 6 weeks before first expected frost date.

Swiss chard

This rainbow-colored vegetable will brighten up your vertical garden. Use large pots to grow chard, sowing

seeds liberally and then thinning out the seedlings until just one remains in each pot.

Red amaranth

This warm season greens needs rich, moist soil. Sow seeds in mid-spring and thin out the seedlings as and when you can use them for cooking. Pinch the growing tips to prevent the plants from flowering too early.

MICRO GREENS AND BABY GREENS

These are different stages of edible seedlings. They are nutritionally superior to their mature counterparts, but unlike sprouts, they are leafy plants requiring good light. Perhaps they would give you the maximum nutritional output from the minimum possible space, whether you grow them vertically or not. That's because they get ready in a matter of days or weeks, and you can have subsequent batches back to back all through the season, or even all year in sheltered areas.

Vertical garden shelves are ideal for a growing micro-greens and baby greens because they require frequent sowing and harvesting. Only the top growth is harvested, and that is usually done by snipping off with scissors as and when required, so you can see how advantageous it is to have them growing at a convenient height. You can sow almost any type of edible seed to grow micro-greens, but some favorites are:

- Red amaranth
- Cabbage
- Broccoli
- Sunflower
- Beet
- Daikon radish
- Tatsoi
- Basil
- Mustards
- Kohlrabi

Buy different seeds of your choice or get pre-packaged selections like rainbow mix, spice mix, Asian greens mix, fiery mix etc.

Herbs

Herbs are typically used in very small quantities, so allowing them a lot of real estate in a garden does not make sense. By growing them in a vertical arrangement of 3-4 levels, your herb garden can be limited to a single stand. Besides, you will have them all in one place, and as close to the kitchen as you want.

Chives

Sow the seeds in well-draining soil in small pots, or plant divisions. Chives multiply fast, so you need only a few. Snip off the leaves close to their bases.

Basil

Grow several types for a wider variety of flavors. Grow in rich soil in medium-sized pots.

Oregano

Grow either Mexican or Mediterranean oregano, or both, in light soil and keep them on the drier side. A few small pots may provide enough fresh herb, but have more if you intend to dry them.

Sage

Grow this perennial herb from cuttings taken in spring. Prune it occasionally to promote new growth.

Mint

You can grow a large selection of mints in small pots if you'd be using only a few leaves at a time. Pinch off the growing tips to keep the plants bushy.

Parsley

Grow parsley as an annual by starting them every spring. Sow several seeds in rich, moist soil in medium-sized pots and thin out as necessary, leaving only a few large plants to ensure a regular supply.

Cilantro

Sow several coriander seeds in medium sized pots and keep the soil moist to prevent premature bolting.

VERTICAL GARDEN ORIENTATION

Most vegetables need full sun, or at least 5-6 hours of bright light to do their best. Unless they have sufficient light for photosynthesis, they cannot manage to make food themselves and for us. The orientation of your vertical garden determines the amount of light each plant receives (<http://www.naturallivingideas.com/46-best-veggies-herbs-and-microgreens-for-vertical-lanting/>).

An A-frame vertical garden set up in full sun out in the garden helps you grow maximum food in minimum space since you can grow plants all around the frame.

It should look like two wide ladders propped against each other, the steps of the ladder supporting different levels of planting.

If you are arranging the garden against a wall, choose south or southwestern exposure to grow high-light plants. The abundant morning light received in eastern exposure may be good enough for root vegetables, herbs, and greens.

If your vertical garden does not get sufficient natural light, supplement with artificial lighting. When using overhead

lighting, arrange high-light veggies on the top shelves and the others at lower levels according to their light requirements.

TOP 10 ORNAMENTAL PLANTS FOR VERTICAL GARDEN

In a vertical garden, we can grow a wide range of plants; some are edible, some strictly for beautifying purposes, while some are for both. Vertical gardens are a green solution to urban gardening problems within a limited space. Ornamental plants not only add to the aesthetic sense of the place but also help in making the space eco-friendly. In this write up we will discuss the various ornamental plants including both foliage and flowering plants.

Foliage:

Sword Fern:

They are most common vertical garden plants used, nowadays; often grown in hanging baskets on green walls (Figure .

Botanical name: *Nephrolepis exaltata*

Light and temperature: light to heavy shade; most ferns like an average temperature of 65-75 degrees F

Soil: pH should be around 7-8

Water: regular watering and never let the soil get completely dry.

Height: up to 4-5 feet

Golden Pothos or Money Plant:

It is a vining plant that is super easy to care for. They easily grow and spread over a wide length of the wall.

Botanical name: *Epipremnum aureum*

Light and temperature: money plant prefers indirect light and will tolerate low light; thrives better in humid areas such as bathroom walls

Soil: grows best in fertile loamy soil of pH range 6.0-7.5;

Water: needs watering every 7 to 10 days when the top 2 inches of soil is dry

Height: grows up to a length of 20 feet

English Ivy:

Ivy is a hardy, evergreen vine. It attaches itself by aerial rootlets to the walls and other surfaces. Grown primarily for its lush foliage, which forms a cool green cover on walls or whichever vertical surface they're grown on.

Botanical name: *Hedera helix*

Light and temperature: full to partial sun; 50-70 degrees F

Soil: well-drained loamy soil, acidic, neutral or alkaline

Water: average watering is required

Height: 20-90 feet

Giant lilyturf:

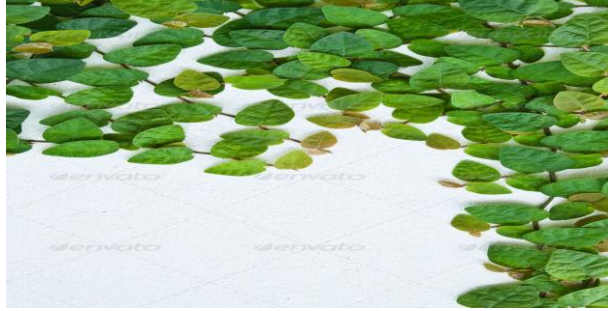


Figure 2: Sword Fern grown as Hanging baskets on Green walls Plant



Figure 3: English Ivy grown as a hardy, evergreen vine

They have dense spreading strap-like leaves that are glossy and dark green. Though it is grown for its dense green foliage, it does bloom in summer and its flowers are quite showy.

Botanical name: *Liriope gigantea*

Light and temperature: full-sun to full-shade; 60-70 degrees F

Soil: well-drained loamy or clayey soil with pH ranging from neutral to acidic

Water: needs regular watering throughout the growing season.

Height: up to 4 feet tall.

Philodendron:

It is easy to take care of, because if you watch the signals, the plant will tell you exactly what it needs. They are comfortable both as indoor and outdoor plants.

Botanical name: *Philodendron scandens*

Light and temperature: bright indirect sunlight; 75-85 degrees F

Soil: a soil of pH 6.0-6.5 is ideal for philodendron

Water: while watering philodendron plants, allow the top inch of the soil to dry out between watering.

Height: grows up to a length of 10-20 feet

FLOWERS:

Geranium varieties:

They bloom in burst of deep reds, scarlet, pinks, white, purple etc. with flowers lasting the entire gardening season.

Botanical name: *Geranium dissectum*

Light and temperature: bright to medium light is needed along with 60-70 degrees F.

Soil: well-drained potting soil of pH range 6.0-7.5

Water: known to be drought tolerant, occasional watering can be carried out

Height: grows up to 12 inches tall

Flower colours: pink, blue, orange, white, red.

Wedding vines:

Wedding vine derives its name from the decoration purpose it serves at weddings. It's grown vertically widely for its pure white, waxy, intensely fragrant flowers.



Figure 4: Philodendron grown both as an indoor and outdoor ornamental



Figure 5: Geranium in red, pink and purple colours



Figure 6: Peace lily is used in a vertical garden

Botanical name: *Stephanotis floribunda*
Light and temperature: 70-90 degrees F
Soil: high content of loam and peat moss.
Water: water until the soil mixture is drenched; the mixture should drain freely
Height: grows up to 6 feet or more

Flower colours: pure white

Peace lily is used in a vertical garden owing to its quickly growing ability. Easy to grow as they are tolerant to lower light and low humidity.



Figure 7: Star jasmine an Evergreen plant and can be easily trained on trellis



Figure 8: English Lavender: an Evergreen Garden herb



Figure 9: Vertical garden in Blackburn, Melbourne
Design Phillip Withers Landscape Design

Botanical name: *Spathiphyllum wallisii*

Light and temperature: bright to medium light; 65-80 degrees F temperature

Water: water at least once a week and spritz the leaves with distilled water throughout the summer growing season.

Height: up to 2 feet (60 cm)

Flowers: white

Star jasmine:

Evergreen plant and can be easily trained on trellis.

Botanical name: *Trachelospermum jasminoides*

Light and temperature: full to partial sun

Water: average watering is needed.

Height: 3-9 metres

Flowers: white

English Lavender:

Evergreen garden herb thrives in summer heat and dry weather. They are also grown for its medicinal and culinary uses.

Botanical name: *Lavandula*

Light and temperature: full sun; 70-75 degrees F

Soil: neutral to alkaline soil

Water: regular watering is not required

Height: 1-2 metres



Figure 10: Vertical garden in Malvern East, Melbourne. Design Phillip Withers Landscape Design



Figure 11: *Liriope muscari* or liriopelily turf – a solid and luscious fine leaf grass-like plant from Asia



Figure 12: *Opiopogon japonicus* or mondo grass – A fine dark-leaved grassy plant from Asia

Flowers: lavender in colour

THE FILLERS

Let us start with a couple of plants for vertical gardens that I like to think of as the plants that you can rest your eye on. These are mostly plants that you would not describe as ‘hard hitters’ or feature plants and they’re all grassy type plants that grow into small clumps or mounds. But you need to start with a good background of these filler plants in your vertical garden as they are what will create a soft, cool, calm and generally ‘green’ feeling. They’re all easy to find in a local nursery or even the big box store, and easy to grow. In fact many of them grow easily from division or, in the case of spider plant, from the new plantlets that form after it flowers.

Dianella

variegated form (there is a few different types) or variegated flax lily – a variegated and tough strappy leaf plant with pale creamy stripes.

The Texture Contrasts

The next group of plants for a vertical garden is accent plants with larger leaves used to bring some texture contrasts to the plant palette. When you put these plants in a vertical garden against your background of grassy plants, they keep the green theme going but create bigger and bolder shapes within the composition. *Philodendron ‘Xanadu’* – An evergreen shrub with attractive tropical-looking leaves from Brazil.



Figure 13: *Chlorophytum comosum* or spider plant – An evergreen strappy leaf plant native to Africa.



Figure 14: The Family Love Tree vertical garden. Design Phillip Withers Landscape Design



Figure 15: Indoor Vertical Gardening Model



Figure 16: *Philodendron* 'Xanadu' – An evergreen shrub with attractive tropical-looking leaves from Brazil



Figure 17: *Monstera deliciosa* or Swiss cheese plant – an evergreen shrubby climber with oversized and very attractive tropical leaves, native to Mexico

Monstera deliciosa or Swiss cheese plant – an evergreen shrubby climber with oversized and very attractive tropical leaves, native to Mexico

Aspidistra elatior or cast iron plant – an evergreen plant with long, wide leaves that's native to Japan and Taiwan

The Pops!

The last group of plants you will need to make a stunning vertical garden are used to create what one may like to call 'pop'. They bring in some coloured foliage colour that attracts the eye. You don't want too many of them though, or the 'pop' effect becomes way too loud.

Sedum 'Gold Mound' – golden sedum – an evergreen soft yellow-foliaged succulent



Figure 18: *Aspidistra elatior* or cast iron plant – an evergreen plant with long, wide leaves that is native to Japan and Taiwan



Figure 19: *Sedum* 'Gold Mound' – golden sedum – an evergreen soft yellow-foliaged succulent



Figure 20: *Epipremnum aureum* or devil's ivy – an evergreen variegated weeping climber native to French Polynesia



Figure 21: The Block TV Garden. Design Phillip Withers Landscape Design

There are many more plants that can be worked into a vertical or wall garden palette but these plants are a really solid and reliable starting point to any garden situation, so get planning...

BEST AND SUITABLE PLANTS FOR VERTICAL GARDEN

When you want to indulge in building a living wall for yourself, you want to pull out all stops. Each and every aspect that goes into building a beautiful garden needs to be just perfect for the result you want, especially the vertical gardening plants. And of course, the correct selection of plants plays a major role in achieving this feat for a vertical garden planter. And it depends on so many parameters, that some homework goes a long way to get it just right. Here are some great options for choosing the

best plants for Vertical Gardening (<https://theselfsufficientliving.com/10-best-and-suitable-plants-for-vertical-garden/>).

Aeschynanthus radicans

Also known as the '*lipstick plant*', it is one of the best plants for a vertical garden due to the fact that it works great for indoor gardening, and even outdoors. Even though it is supposed bloom at the optimum high in a warm and humid environment, with moist soils and great lighting, practically it stays healthy even in dry conditions and poor light. This plant looks beautiful with red flower buds and shiny green leaves. The vertical garden gives or Imparts a new look to your house. The selection of a right or best plant for the vertical garden is very important. The vertical garden should consist of best variety plants.



Figure 21: *Aeschynanthus radicans*: A Lip-stick plant



Figure 22: *Nephrolepis exaltata*-Also known as a 'Sword Fern'



Figure 23: *Acacia Cognata*- also called the 'limelight bower wattle'



Figure 24: *Epipremnum*: plant is commonly known as 'Pothos'



Figure 25: *Dracaena*-Designed as a pot plant

Nephrolepis exaltata

Also known as a 'Sword Fern', the best part about this plant is that it is very easy to take care to sustain the health and beauty of this plant. It works great in a humid environment; hence it is a great choice for an outdoor garden in areas with good amount of humidity. It is a

good plant for garden. It keeps the temperature moderate and controlled.

Acacia Cognata

The reason this plant is also called the 'limelight bower wattle' is that it gives a distinct appeal to your wall. It fills



Figure 26: *Hoya Carnosa*: Popularly known as the 'wax flower'



Figure 27: *Stephanotis floribunda*: This plant is widely known as the 'Wedding Vine'



Figure 28: *Epipremnum aureum* - known as the 'Australian native monster'



Figure 29: *Spathiphyllum wallisii* - most common home plants and are known as 'peace lilies'



Figure 30: *Codiaeum variegatum pictum* - Also known as a 'Croton'

up the spaces in the wall, giving it a fuller look. So, even after your whole wall is complete, and you still need a finishing touch, this is the best choice. Such plants are easily available for the plant lovers or fans. It may be due to occurrence of best conditions. This kind of plant is available in the world with ease.

Epipremnum

This plant is commonly known as '*Pothos*'. If you have a patch where the access to light is low, this plant is your best bet. Apart from this, the plant can easily be arranged to hang or climb, and hence it is a great choice for

decoration. This plant is best for decoration. People love to buy this *kind of plant for decoration or other purposes*.

Dracaena

This plant makes it in the vertical garden plants lists majorly because of its popularity. The major reason for it being a popular choice is the leaf color. You can expect hues of white, yellow, red and cream on your wall with this plant.

Hoya Carnosa

Popularly known as the 'wax flower', it is a great choice for a smaller garden. They are great for an outdoor garden and can be easily coaxed into growing along a definite direction on your wall

Stephanotis floribunda

This plant is widely known as the 'Wedding Vine', as it is a popular choice in wedding decorations. It has large white flowers and gives a great fragrance to your vertical garden. It sustains almost all conditions.

Epipremnum aureum

It is known as the 'Australian native monstera' and as it requires minimum care, it is great for someone who is just at the threshold of becoming an enthusiast. It also makes up for the lack of vertical gardening ideas if it is an experimental project.

Spathiphyllum wallisii

These are the most common home plans and are known as '*peace lilies*'. These too don't require much care and hence are easy to maintain even in low light or low humidity. Even the aging flowers of this plant just turn green so still look appealing.

Codiaeum variegatum pictum

Also known as a '*Croton*', this shrub is great if you have access to bright light. It puts a lot of color on your wall, making it look beautiful.

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Boston fern, sword fern

Nephrolepis sp

The quintessential fern, the Boston variety is the more commonly known, is easy to grow and typically found in containers and hanging baskets. Like most ferns it grows best in full to partial shade, but will withstand partial sun. Hailing from tropical climates of the Americas it prefers warmth and humidity, and will require being indoors in winter in temperate climates. It will thrive when well watered and in rich soils. It prefers a neutral to acidic soil and will grow slowly and steadily. It may outgrow vertical garden containers in which case simply split up the rhizome (roots) and replant.



Bird's nest fern

Asplenium nidus

This is another fern that lives successfully in containers, requiring the same conditions as the Boston fern. Bird's nest ferns have broader and more fragile leaves, which may damage easily, so it is best to leave them with a bit of room to grow. The yellow-green leaves offer bright contrast against darker greens in a wall composition. *Asplenium Floralee* is a cold resistant version option that needs perhaps a bit more humidity. It has more detailed, delicate fronds. And let's not forget the famous hen and chicken fern (*Asplenium bulbiferum*), well known for its hardiness in cool and even drier climates (it is still shade loving, though).



Rabbit's foot fern

Davallia fejeensis

The rabbit's foot fern takes its name from the fuzzy exposed feet (rhizomes, roots or creeping stems) that stick out from its base. These rhizomes can be broken off and planted to establish new plants. Native to tropical Polynesia, this fern requires similar growing conditions to the above ferns (warmth, bright shade), but may not require quite as much watering.



Pothos, golden pothos, devil's ivy

Epipremnum sp

Pothos, especially golden pothos (*Epipremnum pinnatum Aureum*) is a classic houseplant the world over for good reason. It is one of the more forgiving indoor plants, tolerating low-light or bright light, watering or dry spells, rich soils or poor soils, neutral, alkaline or acid environments. It is hard to get it wrong. As a trailing vine it is a smart choice for a vertical garden as it can be encouraged to spread and fill any gaps. Pothos is considered an aggressive grower and care should be taken if planted outdoors: it grows fast and will need liberal pruning. It is native to Solomon Islands and other parts of the Pacific. Golden pothos is ranked highly in the list of plants that remove VOCs from the air. It has attractive bright green leaves with yellow and gold variegation. Care should be taken with Australian native monstera (*Epipremnum aureum*), as it can be toxic to pets.



Lipstick plant

Aeschynanthus sp

This is a beautiful cascading plant often found in hanging baskets and very suitable for a vertical garden. It will trail downwards and climb upwards. Vibrant red flowers emerge from its sprawling stems and deep green leaves, flowering sporadically year-round to stunning effect on a wall. It does prefer warmth (sub-tropical) and humidity, so as with the aforementioned plants, unless you are in a warm, even tropical climate, indoors is best. It likes bright indirect light and a neutral to acid environment.



Staghorn fern

Platycerium sp

This striking epiphyte latches onto tree trunk and branches, so it is well suited to vertical gardens with limited growth media. As their name suggests, staghorn ferns are unique looking and will stand out in a garden. They do enjoy a warm, shady, tropical environment and plenty of moisture, however this must be very well drained.



Baby's tears

Soleirolia soleirolii

This is a lovely ground covering with tiny, bright green leaves that give a delicate and soft appearance to a wall garden. It will flourish in bright light and even do all right in full sun so long as the sun is not too harsh and the plant is watered. Baby's tears prefers well-drained soil of a range of pH levels in a temperate climate. Mild frosts will set its growth back a little but it will rebound in warmer weather, or will be fine indoors.



English ivy

Hedera helix

This good old-fashioned plant is a hardy evergreen vine (or ground cover) found flourishing in cities around the world. It is also well regarded for removing VOCs from the air. English ivy is easy to grow and with its lush foliage it can look dramatic on a living wall. Do not be afraid to prune it back, as it can become a little invasive and aggressive. The vine enjoys a reasonably fertile soil with moderate watering and good drainage. It will handle a range of pH levels.



Purple waffle plant, red ivy, red flame ivy

Hemigraphis alternata

Another excellent VOC remover, the purple waffle plant is an elegantly trailing evergreen perennial in warm to tropical climates. Its purple and silver foliage makes a nice accent plant on a wall garden; it is also used as a fast growing ground cover. Tiny white flowers bloom in spring and summer. The purple waffle plant loves warm, fertile and wet, but well-drained, conditions. It can handle a range of pH levels.



Dichondra, silver falls

Dichondra argentea

A full to partial sun lover, silver falls fills gardens swiftly with its pretty heart-shaped leaves. It is a trailing plant that looks fantastic in a wall garden and is a perennial evergreen in warm climates. In cooler climates it is frost-sensitive and will grow as an annual: if planted as part of a larger evergreen wall garden its best to be in a suitable climate. Silver falls is comfortable in alkaline, neutral or acidic soils. Though it likes to be watered moderately, it is recognized as a heat and drought resistant plant.



Party time, Mai Tai, Cognac, Crème de Menthe

Alternanthera sp

Eye-catching colors accompany these vividly named varieties of alternanthera. Generally bushy and exceptionally heat resistant, these varieties are evergreen and will need to be planted on an indoor wall in cold climates. Being heat resistant does not make alternanthera drought resistant though and they enjoy moderate watering in well-drained media. They grow well in acidic, neutral or alkaline environments.



Wax flower

Hoya carnosa

The wax flower is a creeping vine suited to sunny indoor walls or outdoors in particularly warm and humid areas. It has intensely fragrant and eye catching flower clusters, which bloom repeatedly. The wax flower likes a lot of sun and water, but will prefer well-drained soil and to be dry between waterings. It requires a little less attention when not in flower in winter. It will survive in varying pH. Wax flower has one of the highest VOC removal rates.



Limelight, bower wattle

Acacia cognata

Endemic to Australia, a dwarf bower wattle is an attractive emerald green grass. Unlike most Acacia species that have fluffy clusters of bright yellow flower heads, the bower bottle does not flower. Bushy, low growing and compact, the bower wattle requires little maintenance, save the occasional watering. It prefers well-drained soil and can handle a range of pH levels, from alkaline to acidic. While it does well in full sun, the bower wattle will also cope with partial shade.



Geranium

Geranium sp

Geraniums are low growing herbaceous perennials recognized for their versatility, fleshy leaves and often-bright flowers. The most widely distributed geranium has to be the big red ivy variety that copes in very hot, sunny situations. Another popular geranium is cranesbill, which features distinctive leaves and white, blue and pink flowers. Most geraniums enjoy reasonably fertile and well-drained soils in a range of pH levels. They definitely enjoy being dry between waterings, but will not fare well in desert-like conditions.

Flowering



Petunias

Petunia sp

A garden classic and easy to grow, there are myriad colors and cultivars of petunias for every garden and every climate. Opt for petunias suitable for hanging baskets, as these are ground covering in habit and will grow bushy, falling over a vertical garden's structure. With relatively small root systems, petunias are a good choice for containers as well. Petunias enjoy hot sun, fertile conditions, a neutral pH, moderate watering and good drainage. In warmer climates some varieties may bloom year-round.



Verbena, Canadian vervain, rose mock vervain

Verbena canadensis

There are over 250 species of verbena to pick from, but species such as Canadian vervain suit vertical gardens for their mounding and floriferous habits since other species may be less herbaceous and more upright. They are also easy to grow, heat and drought tolerant. To stay bushy and flowering, Canadian vervain really needs to grow in full sun. It also likes a neutral to acidic pH and particularly well-drained media.



Sweet alyssum

Lobularia maritima

Alyssum is best known for its heat and drought hardiness. It is low growing and produces small clusters of pretty and fragrant flowers, often white but also in an array of other colors. It requires very little maintenance, so long as it is positioned in a partial sun to sunny spot, with adequate moisture and drainage. Alyssum does not require much feeding and is happy in a neutral to slightly alkaline medium. Look for an alyssum local to your region; some, though not many, will tolerate a light frost.



Nasturtium

Tropaeolum majus

Known in South Africa as Kappertjies, nasturtiums are another easy to grow companion plant that is edible too – their petals and leaves offer a peppery flavor and kick to a garden salad. Used to lure aphids away from other plants in the garden, Nasturtiums are also a spiller plant and will sprawl over a vertical garden, their bright flowers adding a bit of spark. Provide nasturtiums with a fertile soil and regular water.

Vegetables



Chinese cabbage, bok choy

Brassica rapa

Bok choy is a cool to mild weather vegetable that likes sun, nutrition and a neutral to slightly acidic soil. This depends on the variety, and some are able to grow well in shady areas. This tasty vegetable will grow quickly with moderate watering so long as the medium is well drained. Bok choy is usually frost tolerant but if temperatures are consistently too cold (or too hot) the plant tends to bolt, flower and become bitter tasting. Plant in early spring.



Spinach

Spinacia oleracea

Spinach is an easy to grow vegetable and a quick producer. It prefers full sun in a fertile, neutral to slightly alkaline medium. Average watering is fine for spinach, and it will like a bit of fertilizer once the plant begins to flourish. Spinach grows best in cooler temperatures and will bolt as soon as temperatures rise. Plant in early spring after the frosts, or in winter in frost-free climates.



Lettuce

Lactuca sativa

Crisp and tasty, easy and fast growing, lettuce is a staple in gardens around the world. There are dozens of varieties to choose from, including smaller compact varieties perhaps better suited to vertical gardens. Garden lettuce is a cool weather lover, but needs full sun, regular watering and a nutrient-rich soil to thrive. It is best planted in early spring after the frosts, or in winter in warmer, frost-free climates. Its foliage will quickly become bitter if subjected to hot weather, where it will also begin to bolt.



Chili plants

apsicum sp

Ornamental and edible, small chili plants are a winner in a vertical garden. Best planted high and out of reach of little hands who will regret a painfully hot surprise! Chili plants also like hot and sunny conditions, average water and well-drained mediums ranging from neutral to slightly alkaline pH. Look for low-growing, compact and bushy varieties such as prairie fire, razzmatazz or garda chandelier. There are many more varieties to suit an individual's penchant for spice.



Radish

Rhaphanus sativus

Like beet, radishes also like a friable medium (light and crumbly for root growth). They are best grown from seed and are fun, fast and easy to grow. Radish really prefers mild to cool climates, so are best planted in early spring or late autumn in areas where summers are hot. They will flourish in full sun, a fertile, watered and well-draining medium. When growing a vegetable for its root the nutritional focus should be on phosphorus and potassium instead of nitrogen (as nitrogen encourages above ground foliage growth).



Scallion, spring onion

Allium fistulosum

With a very small root system scallion is a choice specimen for a vertical garden. Their upright greens are hollow, rounded and edible, as is their small white bulb, similar to a mild and sweet garden onion. Full sun, moderate watering and a rich medium will ensure strong and steady growth. Frost-hardy varieties will grow in winter, others plant in spring through autumn.

Succulents



Sempervivum

Sempervivum sp

As its Latin name suggests – 'always living' – this is a hardy succulent. Sempervivum is an alpine succulent, used to eking out a living between rocks and crevices. It takes a black thumb to knock one of these about. Sempervivum will happily squish into a vertical planter. Each rosette is a separate plant, and is monocarpic – it will die after it flowers – but is quickly replaced by new rosettes. They look good combined with echeveria as well.



Sedum

Sedum sp

We depart from the hen and chick variety for sedum. It is taken from the Latin word, 'to sit,' as it is a fantastic ground covering, spreading quickly and thoroughly. Filling any unsightly gaps, sedum is an excellent choice for a vertical garden. Sedum ternatum is the most widespread sedum found in the US. Aureum, oreganum, angelic and blue spruce are other options. Burro's tail is a drooping variety and particularly eye-catching.



Rhipsalis

Rhipsalis sp

In nature most are epiphytic and are accustomed to attaching themselves to trees or between rock crevices. Their hanging stems make them a fine choice for a wall garden as well. Most prefer partial sun to shade, and perhaps a bit more moisture than most succulents – a good option for the bottom of a wall garden. Many have hanging stems making them excellent hanging basket specimens. Most prefer shade and some humidity; in fact, hot baking sun may damage their leaf-like stems.

Herbs



Chives

Allium schoenoprasum

The beauty of chives is that they are easy and quick to grow, not to mention a tasty treat in the kitchen. They also have pretty, lavender or white flower heads that will brighten up a vertical herb garden. Grow chives in full sun in a rich, well-drained medium and water moderately. Best planted in early spring. In autumn, take out the bulbs and break them as up as they have a tendency to clump together. They can then be re-planted.



Oregano

Origanum vulgare

Low-growing, ground-covering varieties such as aureum or hirtum are slightly slower growing than their common cousins, but will grow compact and dense to fill the space in a vertical garden. Its sweet aroma is heightened when planted in prime conditions: full sun, poorish soil and good drainage. It is a very easy herb to maintain. Oregano is fairly heat resistant and prefers a neutral to slightly alkaline environment. It is also a good companion plant and is said to repel pests.