

THE USAGE OF CLIMBING PLANTS IN FAÇADE GREENING IN TODAY'S URBAN LIVING WITH EXAMPLES OF THE CENTRAL URBAN REGION OF SKOPJE, R. MACEDONIAKANAREVA N., ¹RIZOVSKA ATANASOVSKA J.¹*Ss. Cyril and Methodius University in Skopje, Faculty of Forestry in Skopje, Skopje, Macedonia*
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ABSTRACT: We consider the climber plants that are structural elements of the façade greening. The new trends in the urban greening, such as façade greening, green walls and green roofs that affects buildings and architectural objects, belong to the group of vertical greening. They are important because of their function, firstly an aesthetic one (by covering damaged walls), and the sanitary function, by improving microclimate (oscillation of the temperature and humidity of the air). There are also other effects they have in an urban environment, they give heat, wind, sound and rain protection.

Keywords: climber plants, façade greening, vertical greening, green walls

1 INTRODUCTION

Facade greening has a long history that could be seen from the old draws, where some climbing plants, like vine and ivy are shown. It begun in the time of Babel and its hanging gardens, where plants were hanging over multileveled terrasses. Second point is the Romantic Era, period when castles were wrapped with plants. Ancient looking walls overgrown with ivy became then an ultimate fashion. The third point is at the beginning of the 20th century when they were revived again. Nowadays, we have modern green façades as a specific type of greening in the urban way of life.

In the modern cities where urbanization and traffic become bigger from day to day, there is a constant need for finding new methods and solutions for increasing green spaces. That means introducing plants among the architectural objects in the cities will raise the quality of life for the people. The new era started two or three decades ago, creating gardens on the roofs, modern façade greening and green walls. That was the initial point of usage the new trends in urban landscaping.

Considering that, some new trends in cities greening are: living walls, façade greening and green roofs. Designers, architects and engineers now have opportunities to put beautiful 'clothes' on buildings, no matter if the need is aestetical or functional. A good relation between green areas and nature suppose to improve the living of the citizens in an urban environment.

Facade greening is a pretty new concept for increasing greenery in the big city where there is not enough space for parks and gardens. Commonly used plants for facade greening are climbing plants. Vertical gardening or greening, using climbing plants, can insert the spirit of nature, offer a new view on architecture and make cities good places for living. The city greyness, damaged or monotony facades, can easily be changed with this type of greening concept, considering it as good decoration for buildings.

Today, with the contribution of this kind of greenings and the other types of open green spaces in the cities, many scientists in the world are facing to strong task in front of them to make our environment more clean, more beautiful and more healthy place for living.

The term facade greening is very closely connected to the usage of climbing plants matters dealt with in this paper. There will be described the climbers and how they affects on buildings, their suitable growth support system

and the types of the mechanisms they are using to crawl on the surface.

2 MATERIAL AND METHODS

In this paper is present affects off the climber species as essential parts of façade greening and their use in this type of greening in an urban surrounding, considering few examples from the central urban region of Skopje (the settlements: Centar, Avtokomanda, Karposh 1, Karposh 2, Karposh 3, Kapishtec). There are some architectural objects and public buildings and some other objects directly related to the green spaces, like fences, damaged walls or trees. The detected object and buildings are correctly described and the climber species are determined. Than are given the morphological characteristics and ecology of the climber species and also their usage according their specifics in facade greening. Here are presented some photos from the climbers and their growth support systems.

The literature connected to this issue had to be found while researching the climbing plants, their usage and effects they have on the environment. That means appropriate information about their morphological characteristics and principles for designing green facades would be properly given. Furthermore should be given some suggestions for their appropriate use, to propose species considering their functions (decorative and sanitary), effects and benefits that come out from their usage.

Climbing plants should be divided in two groups: flower decorative and leaf decorative ones. Also there are described the functions and the type of surface attachment mechanism from different climber species. At last, locations and the buildings with façade greening in Skopje were pointed out.

3 RESULTS AND DISCUSSIONS

Façade greening belongs in the group of vertical greening, together with green walls and green roofs. Before start talking about façade greening we should be introduced with this term and make difference with green walls.

There is a big difference between green walls and facade greenings. The concept of green wall is more complex then supporting system of façade greening. Creating a green wall means specially made panels attached on a wall, planted with different kinds of plants and there must be designed an irrigation system too. In

that panels can grow different species of grasses and flowers while for façade greening usually are used only climbers. The concept for façade greening is creating a suitable climbers growth support system. After installing it on the wall, climbers can be planted in the ground or in a pot, and later they erect on the wall. Some of these plants can climb freely on the surface of the wall (self-clinging climbers, *Hedera helix L.*) and the others can climb up only with suitable growth support systems (*Wisteria sinensis Sims.*).

3.1 Aesthetic functions of green façades

A group of different species positioned right on a façade, could represent a beautiful picture, camouflaging a monotonous, damaged or ruined wall. Designing façade greening, some visual effects could be changed, vertical lines can be less tall and long walls will look shorter (if a climber is planted and growing up near to a window, taller building would look smaller, opposite of this, if the climber is clinging higher on a wall, the building would look taller).

Some climbers can give nice aromatic note to the surrounding, like *Clematis armandii*, *Lonicera americana*, *Lathyrus odoratus L.*, and their position should be nearby windows and doors.

Parthenocissus tricuspidata Planch. and *P. quinquefolia Planch.* have leaves that in autumn become red and give to walls remarkably looking. *Hedera helix L.* is suitable for north sided walls. Its dark green leaves can cover the whole surface of the wall even in winter. Some walls will look astonishing during summer if there are flower plants like *Campsis radicans Seem.* with red-orange flowers.

Climbing plants can wrap spiral around pillars, the others can form green spots on the walls or make tracks near to the doors. Suitable for these types of figures are: *Clematis × jackmanii Jackman & Sons*, with dark violet flowers, *Lonicera caprifolium L.*, with yellow flowers, *Wisteria sinensis Sims.*, with rich blue-violet flowers, etc. In climbers selection should make attention on a wall exposure. For south and south-west exposures, good choices are sun-loving plants like: *Parthenocissus quinquefolia Planch.*, *Lonicera caprifolium L.* and *Periploca graeca L.* and for north exposures: *Hedera helix L.* and *Campsis radicans Seem.* Façade greening can be arranged with annual and perennial climbers. Perennials usually are used for long lasting period. For short period (fast camouflage or decoration) there are some kinds of annuals, such as *Ipomoea violacea L.* with white, rose and blue flowers, *Lathyrus odoratus L.* with smelling flowers, *Phaseolus coccineus L.* with small red flowers and *Tropaeolum L. sp.* with orange-red flowers.

3.2 Sanitary function of the green façades

Despite the aesthetic function, façade greening have sanitary function too. The usage of climbing plants does not make damages on walls because they are not directly attached on them; they are growing on special designed supporting system. But the benefits of greened facades are many:

1. They improve microclimate, binding the dust from the air and enriching it with oxygen;
2. They equate oscillations of temperature and humidity through evaporation;
3. Give wind protection and directs the wind reducing the losses of thermal energy;

4. Offer heating protection, helped by air bags between façade and climbing plants;
5. Give protection from rain and direct transportation of water to roots;
6. Give sound protection, the leaves of the plants have ability to absorb the sound;
7. They have ability of filtering and improving the air quality by absorbing hard metals;
8. They are living space for birds and insects.

3.3 Climbing plants commonly used for façade greening

Climbing plants or lianas belong to more than 110 families of vascular plants. Climbers are fast growing, woody or legume species, their roots are in soil but the life form of stems have need for some support to creep on it. It is convenient to recognize two categories of adaptation for climbing plants, with active mechanisms, involving growth and tropisms of the plant to become attached, and with passive mechanisms, whereby they have existing structures that come in contact with the supporting structure. Each mechanism provides biomechanical and ecological advantages and disadvantages, depending on situation in which the vine or liana is growing.

- Active mechanisms
 - a) Attachment by tendrils (stem, stipule, leaf tip, flower axis)
 - b) Twining
 - c) Attachment using adventitious roots
- Passive mechanisms
 - d) Arrangement of branches or leaves in a supporting design
 - e) Spines and stiff emergences
 - f) Sprawling (scrambling or scandent growth habits)



a) Tendrils



b) Twining



c) Adventitious roots

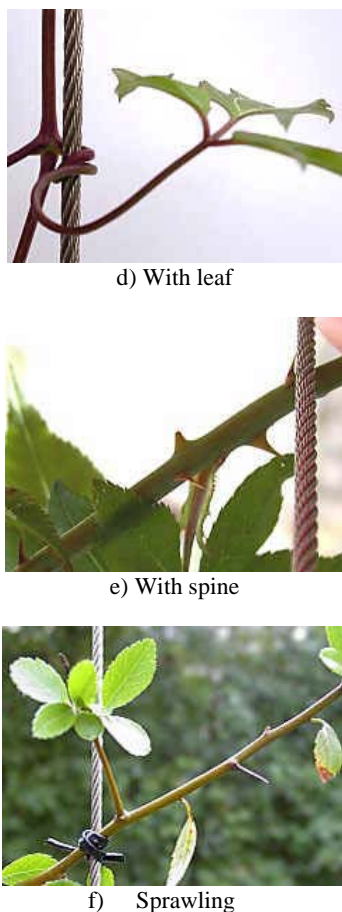


Figure 1: Active and passive mechanism of attaching to surface

➤ Flower decorative climbers

Clematis sp. L. grows in semi-shaded to moderately sunny positions, on fresh, humus-rich soils with good drainage and shade on the root zone. Climbers with leaf-tendrils and foliage from May to October, defoliation of dried up leaves often go slow. Flowers, depending on cultivars, often with beautiful filigree seed heads.

Jasminum officinale L. grows on sunny to semi-shaded positions. Foliages appear in April and last till October. White flowers of this plant bloom all summer. It has moderate to vigorous growth habit, suitable for detail and accent planting.

Lonicera sp. Thunb. usually grows on sunny to semi-shaded positions, rather than full sun exposure. *Lonicera* belongs to twiners, their foliage appears in April and last till October. The colors of the flowers are different depending on species and they are white, crème, yellow to orange, pink and red. They have long-lasting blossoms; some species exude a heavy perfume.

Aquebia quinata Houltt, prefers sunny to shaded positions, protected from wind. This evergreen plant is a twiner and its initial growth is rather slow. Flowers are red-brown, clusters in early spring and perceived from close-up.

Wisteria sinensis (Sims.), grows on full sunny position, if possible. It is an extremely strong and vigorous twiner that can reach 20 m height. Leaves are mostly light green, foliage from May to November, in autumn rarely with yellow coloring. Flowers have rich

deep blue or deep purple color and show up in midsummer.

Campsis radicans Seem., prefers warm, sunny to part-sunny position; shade on the root zone is beneficial. It is a frost resistant self-clinging climber with adhesive stem roots. Flowers are red or yellow-orange and blossoms appear from July until September.

Polygonum aubertii L. or Silver Lace vine prefer sunny to semi-shaded position. It is a strong twiner and one of the most vigorous climbers. Foliage last until November. White flowers flowering from July until September.

Passiflora coerulea L., grows on sunny to semi-shaded position, not too windy. For constant flowering should be fertilized several times. Flowers are white with violet color and resist all summer. Foliages with dark green color are very decorative.

➤ Climbers with picturesque leaf color

Hedera sp. L. stands sunny to semi-shaded position. It is self-clinging climber with adventitious stem roots. This evergreen specie has dark green color of its leaves attractive even in winter.

Parthenocissus quinquefolia Planch is a moderate to good self-clinging vine, well-known for its beautiful leaf form and autumn color. It stands sunny to semi-shaded position. With its adventitious stems can cause building damages.

Parthenocissus tricuspidata Planch grows on sunny to semi-shaded positions. Leaves are light green from May to October and in autumn they change their color in red. It is self-clinging climber that covers extensive areas quickly. It is one of a favorites for façade greening.

Vitis coignetiae Pulliat. needs sunny to semi-shaded positions. Its foliage appear in May and last till October. If its leaves are exposed in sun during the autumn, they pass from green to intense yellow and red color. This climber has tendrils and vigorous growth.

All characteristics of the climbing plants are shown in Table I below.

3.4 Façade greening in the central urban region of Skopje

The terms: vertical gardens, green roofs, façade greening, green walls, are new trends in greening of the architectural objects in the cities. They are contributing in improvement of the life in an urban environment, considering the amount of vegetation there. So, the importance for increasing the open green spaces of any type, in dense settlements including is very big. Considering Skopje as a city with lots of traffic, various types of architectural objects and industrial capacities, it is obvious that this kind of greening fulfils numbers of functions and satisfy the need of green spaces in the dense urban environment. Although today not many buildings are greened that way, in future the number of them might be bigger.

It could be recognized green façades in some locations in Skopje, more rarely on public buildings, than on individual ones which number is certainly bigger. The one of the most remarkable ones is in the center of the city, the point end of Partizanski odredi Street, where green façade is made from *Hedera helix* L. and *Parthenocissus quinquefolia* Planch. It is very attractive especially in autumn when there is a contrast between dark green leaves of *Hedera helix* L. and red ones of *Parthenocissus quinquefolia* Planch. Other location with façade greening is present in the City Mall in the center of the city (Dame Gruev Street), where there is

living, increasing the green areas where there is not enough space for large parks and gardens.

Despite sanitary function, this kind of greening improve the quality of urban living making better microclimate conditions in the cities and in the same time it has an aesthetic function too as décor on the buildings or other architectural objects.

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