Application of Lianas in Vertical Greening Landscape of Xi’an City

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Abstract: Vertical greening serves as one of the important forms in enriching urban landscape. In this paper, the writer investigated the liana landscape in eight parks of Xi’an and the matching types of several landscape elements (architecture, gallery, trellis, courtyard, flower rack, porch, highway, railway), discussed the common lianas in this city, and evaluated the landscape effect of lianas with different landscape elements by using scenic beauty method. How to better use lianas for landscaping plays a significant role in vertical greening landscape construction of Xi’an City.

1. Introduction
With the development of the city, residential buildings occupy a large amount of space, leaving little space for greening. Therefore, the vertical greening just makes up for the deficiency of the ground greening. By making full use of building walls, roofs, scaffolding, the greening rate of the city will be greatly increased.

According to the investigation of the application of vertical greening plant landscape in eight parks in Xi’an, the writer uses Scenic beauty estimation (SBE) method to evaluate the plant landscape. By doing that, people’s demand for vertical greening landscape and the choice of plants can be obtained. In addition, the needs of urban landscape construction will be satisfied and the vertical greening plant landscape in urban cities will take on more varieties.

2. Materials and methods

2.1 Site selection for investigation
As for the research on various parks in Xi’an, the vertical greening plant landscape of eight parks including Chang’an Park, Qingliangshan Park, Ecological Park, Mutasi Park, Qujiang Heritage Park, Zhonghu Park in Aerospace City, Qujiang Botanical Garden and Lianhu Park are selected for field investigation. And the selection, growing form and using frequency of vertical greening plants are analyzed.

2.2 Research method
Scenic beauty estimation (SBE), the simple and reliable landscape evaluation method, is easy to operate and promote[1]. In this study, the vertical greening plant landscape photos of the park serve as the evaluation samples. In order to avoid the repetition of similar landscapes and reduce the workload of the judges, the factors such as plant species, plant climbing form and plant use frequency have to be comprehensively considered.

In this paper, through the field investigation, data recording and comparative analysis of the vertical
greening plant landscape in the park, the evaluation materials are collected by photo shooting.

2.2.1. Photo shooting

(1) For photo taking, given that the weather has a strong impact on the whole effect of the photo and the evaluation of plant landscape beauty, this study has certain requirements for seasons [2].

(2) Camera, with good pixel and definition, is selected to take photos. When shooting the selected spot, the angle between the direction of the camera lens and the direction perpendicular to the green plant landscape should be controlled between 30 and 60 [3].

2.2.2. Making slides

Through field investigation and photo shooting, a total of 50 photos have been collected. After selecting the photos and eliminating the low-quality ones, two best photos in the same spot are kept, retaining all photos will produce landscape effects with large differences. Thus, 16 photos are selected as the samples in this research.

After that, the selected 16 photos are randomly sorted and numbered. The time of each automatic slide can be set to 6 seconds, so that the judges can score the landscape in the photos, but it should not be too long. The picture number represents the serial number of the slide.

Based on the beauty degree of the main landscape sample photos from the judges, the evaluation grade should be divided into five grades, and the scores are given respectively by using the 10-point system: extremely not beautiful (0-1), not beautiful (2-3), average (4-5), beautiful (6-7), very beautiful (8-9).

There are three groups in the evaluation, including the landscape expert group (10 people), professional students group (not less than 20) and non-professional students group (not less than 20) [4][5].

| Group | Name of judges’ group                  | Number of people |
|-------|---------------------------------------|------------------|
| 1     | the landscape expert group            | 10               |
| 2     | professional students group           | 23               |
| 3     | non-professional students group        | 23               |

3. Results and analysis

3.1 Application analysis of vertical greening plants in park

Table 2 Common plants for vertical greening of parks in Xi’an

| No. | Name            | Genera and species                        | Florescence               |
|-----|-----------------|-------------------------------------------|----------------------------|
| 1   | creepers        | Vitiaceae, Euphorbia                      | early June                |
| 2   | Campsis radicans| Bignoniaceae, Campsis Lour                | lid June to early September|
| 3   | climbing roses  | Rosaceae, Rosa                            | a season                   |
| 4   | Honeysuckle     | Loniceraceae, Lonicera                     | late April to late September|
| 5   | Ivy             | Araliaceae, ivy                           | April to May               |
| 6   | Quamoclit pennata rose | Convulvulaceae, subgenus Convulvulaceae | Mid July to early October  |
| 7   | wintercreeper   | Rosaceae, Rosa                            | Late April to the end of May|
| 8   | Wisteria        | Celastraceae, Euonymus                     | June to July               |
| 9   | Forsythia suspensa | Legume, wisteria            | Mid-April to early May     |
| 10  |                 | Oleaceae, forsythia                      | April to May               |
Table 3 Climbing forms of vertical greening plants in the park

| No. | Name                | Climbing forms                          |
|-----|---------------------|----------------------------------------|
| 1   | creepers            | architecture, scaffolding, porch       |
| 2   | Campsis radicans   | wall, scaffolding, porch               |
| 3   | climbing roses      | fence, flower rack, flower wall        |
| 4   | Honeysuckle         | climbing, flower rack, flower Gallery   |
| 5   | Ivy                 | courtyard, architecture                |
| 6   | Quamoclit pennata   | low wall, small pergola                |
| 7   | rose                | gate with flowers, flower fence, hanging|
| 8   | virginia creeper    | architecture, scaffolding, porch       |
| 9   | wintercreeper       | Scaffolding, highway, railway          |
| 10  | Wisteria            | scaffolding, porch                     |

Table 4 Application of vertical greening plants in parks

| No. | Name                | Application of frequency | Number of Park Applications |
|-----|---------------------|--------------------------|----------------------------|
| 1   | creepers            | 10                       | 8                          |
| 2   | Campsis radicans   | 6                        | 4                          |
| 3   | climbing roses      | 5                        | 5                          |
| 4   | Honeysuckle         | 8                        | 7                          |
| 5   | Ivy                 | 5                        | 4                          |
| 6   | Quamoclit pennata   | 1                        | 1                          |
| 7   | rose                | 4                        | 3                          |
| 8   | virginia creeper    | 8                        | 7                          |
| 9   | wintercreeper       | 5                        | 4                          |
| 10  | Wisteria            | 8                        | 7                          |

From the survey results, it can be indicated that there are eight families and eight genera of vertical greening plants in these parks. Generally speaking, their flowering periods are from June to September (Table 2).
The climbing forms of vertical greening plants include such types as on the wall, fence, column and trellis. It can be seen from Table 3 that most of the climbing forms of vertical greening plants are mainly trellis and walls, and some plants can climb column and fence, forming a beautiful vertical greening landscape.

Table 4 demonstrates that the using of creeper is the most frequent, and its application in the parks is also the most, followed by honeysuckle and wisteria. Relatively speaking, creeper is relatively easy to grow through extensive management, so it is more commonly used. The vertical greening landscape of climbing roses is very beautiful, while the requirements for the environment are also relatively high. This kind of plant prefers sunlight, and needs a warm and air circulation environment. The soil, with good drainage effect, needs to be fertile and loose, because too much moisture will give rise to rot roots. The landscape formed by the rose is also wonderful. The flowers of the rose are white, red and other colors. Commonly used in fences, they like sunlight, and are also resistant to half shade and cold. Wisteria is commonly used in the gallery, which has strong adaptability to the environment and can form a beautiful scaffolding landscape.

3.2 Scenic beauty value analysis on vertical greening plants

| Photo id | The panel | Professional Students | Student group for non-majors | SBE value |
|----------|-----------|-----------------------|-----------------------------|-----------|
| 1        | 4.57      | 4.34                  | 6.45                        | 5.42      |
| 2        | 5.86      | 5.43                  | 7.43                        | 6.60      |
| 3        | 5.45      | 4.63                  | 6.45                        | 5.83      |
| 4        | 6.76      | 5.62                  | 5.98                        | 6.48      |
| 5        | 4.34      | 4.53                  | 6.03                        | 5.26      |
| 6        | 5.23      | 4.23                  | 5.93                        | 5.43      |
| 7        | 5.45      | 5.07                  | 6.04                        | 5.84      |
| 8        | 6.32      | 4.04                  | 5.87                        | 5.72      |
| 9        | 4.64      | 5.03                  | 6.45                        | 5.68      |
| 10       | 5.87      | 5.17                  | 5.76                        | 5.93      |
| 11       | 6.43      | 5.89                  | 6.08                        | 6.49      |
| 12       | 4.76      | 4.63                  | 5.87                        | 5.39      |
| 13       | 5.64      | 4.86                  | 5.12                        | 5.51      |
| 14       | 5.72      | 5.63                  | 6.65                        | 6.35      |
| 15       | 6.32      | 5.37                  | 5.72                        | 6.14      |
| 16       | 5.15      | 4.69                  | 6.21                        | 5.66      |
According to the SBE value, the most frequently used plant in the park is creepers. With a relatively low value of scenic beauty, this plant shows the greatest number. And the plants such as rose, climbing roses, and wisteria show a relatively high scenic beauty value. The main reason behind is that this kind of liana carries good ornamental characteristics and beautiful landscape effect, while the evergreen creeper grows luxuriantly. The low ornamental value determines that it fails to cause people’s visual beauty. Therefore, there are some differences in the beauty of different plant landscapes.

The highest scenic beauty value is the flower gate landscape formed by the roses in photo 2, followed by the flower wall landscape formed by the climbing roses in Photo 4, and then the gallery landscape formed by the wisteria in photo 14.

Through the analysis of vertical greening plant landscape with SBE value, it can be seen that the public pays more attention to the growth status and visual beauty of the plant, as well as the collocation of colors when they evaluate the vertical greening plant landscape. Creeper with lower SBE value grows vigorously, but the colors are simple.
4. Conclusion and discussion
At present, there are less and less available green areas in the city. As a form of greening, vertical greening can increase the green area of the city. However, according to the current analysis, the types and the number of the vertical greening plants are relatively small; it is suggested that the introduction of vertical greening plants with high ornamental value can be increased. Meanwhile, we can grow several plants together so as to enrich the vertical greening landscape of the city.

In the evaluation of vertical greening plant landscape of the park, the growth status and landscape effect of plants become one of the important factors that affect the evaluation results. The factors, like whether the plant growth is lush, whether there are diseases and pests, and whether the color matching is good-looking, are all the basis for the evaluation of scenic beauty.

Reference:
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