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Application of Shrub Landscape on Campus from the Perspective of Ornamental Characteristics of Plants

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Abstract In the campus greening design, the shrub height is generally consistent with people's horizontal line of sight, which plays a significant role in people's visual focus. From the perspective of ornamental characteristics of plants, the application of shrub landscape is explored in a campus environment. Based on the analysis of the selection, arrangement and maintenance of shrub plants in campus gardens, the application of shrub landscape on campus was evaluated comprehensively from the theoretical analysis of plant ornamental characteristics and campus shrub landscape. Based on the research background of the problems existing in the application of shrub landscape on campus, this paper first collected and sorted out the relevant theories extensively, and then conducted in-depth research on the relevant theories by using analysis methods such as literature data, field investigation and questionnaire survey. The results will provide a theoretical guidance and practical advocacy for campus garden planning and design, and help to create a livable and comfortable campus environment. It is hoped that the results will have some references for future campus shrub landscape and play a certain promoting role.

Keywords Shrub landscape, Campus landscape, Ornamental characteristics
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In modern society, people pay more and more attention to aesthetics and environmental protection, and garden landscape has become an important part of urban development, especially in a campus environment. Plant landscape is an important factor constituting campus environment[1]. Shrub landscape is a kind of low, plump and luxuriant shrub plants, which have unique aesthetic value and environmental benefit in campus landscape environment.

In the dimension of environmental curriculum, people pay attention to the creation of campus artistic atmosphere and the cultivation of the beauty of teacher-student behavior[2]. In the current healthy development of students, campus plant landscape plays a critical role, such as providing places for leisure activities, alleviating students' myopia rate, etc. How can landscape design better develop and serve students will be the direction of future development[3]. At present, most of the campus landscape environment is still dominated by flowers and supplemented by lawns, and the application of shrub landscapes has not been fully developed. Therefore, exploring the application of shrubs in campus landscape environment is of great significance for improving campus environment quality, enhancing landscape effect, and enhancing people's sense of beauty and happiness. Shrub landscapes belong to the middle layer in the plant community, and are the transition between trees and ground covers, and between buildings and ground[4]. When exploring the application of shrub landscapes on campus, it is particularly important to study the design, collocation and application of landscape plants from the perspective of plant ornamental characteristics. Natural landscape is a direct reflection of natural ecology and a carrier of ecosystem[5]. Shrub is an important plant species in the campus garden environment. Its combination with flowers and lawns adds new visual experience and landscape art value to campus environment. The beautiful colors of plants and soft and varied lines are used to block or mitigate the stiff lines of some buildings and enrich the colors of buildings[6]. Reasonable design, collocation and application of campus shrub landscapes can better meet people's visual needs for color, shape, texture and luster of landscape plants, and improve the ornamental value and psychological benefits of campus landscape.

1 Important landscape performance from the perspective of plant ornamental characteristics

1.1 Morphological characteristics

The morphological characteristics of plants mainly refer to diversity, adaptability, plasticity, hereditary and functionality. The morphological characteristics of plants mainly include root morphology, stem height and branching, leaf size and shape, flower color and morphology, and fruit type. These morphological characteristics are important for identifying and classifying plants, and also reflect differences in plants adaption to different environments and lifestyles. Different species of plants have diverse morphological characteristics, which can create diversified landscape effects through the selection, collocation and combination of plants.

1.2 Color characteristics

The color characteristics of plants include flower color, fruit color, leaf color and bark color. The color of some plants may change during growth and development. For example, some leaves are red or purple when young and gradually turn green as the trees grow older. The color characteristics of plants play an important role in plant classification, identification and beautification. Plants of different colors can form rich visual contrast and layers, making the landscape architecture more vivid and distinct.

1.3 Texture characteristics

The texture characteristics of plants refer to the line and texture characteristics of plant surfaces, including the vein, line and texture of plant leaves, barks and flowers. Texture characteristics vary with different plant species and growth environment. Different texture characteristics of plants can create a colorful and textured landscape.

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1.4 Light sensing characteristics

The light sensing characteristics of plants refer to the perception and response mechanism of plants to light, including photoperiodical perception, light leaf development, light quality response and photosynthesis. Therefore, the effects of light and shadow should also be considered when designing shrub plant landscape near water bodies[7]. By sensing and responding to changes in light, plants can reasonably adjust their growth, development and metabolic processes to adapt to different light conditions and ecological environments. These light sensing characteristics also make plants have certain adaptability and competitive advantages in environmental changes. The light and shadow effect of plants in the sunlight can not only increase the three-dimensional sense and layer sense of landscape architecture, but also increase the emotional expression of the landscape.

1.5 Seasonal characteristics

The seasonal characteristics of plants refer to the characteristics of growth, development and performance of plants in different seasons, including the timing of flowering, defoliation and fruiting of plants. Spring is usually a period of rapid growth for plants. When spring comes, some plants begin to germinate and grow, and new leaves and shoots appear. Trees and shrubs may bloom, and some herbs will form flower buds. Summer is the high growth period for most plants, and plants usually grow luxuriously in summer, with dark green leaves and blooming flowers. Summer is also the season of fruit ripening and seed dispersal, and many plants bear fruit. Autumn is the season when plants prepare to go into dormancy or hibernation. In autumn, some plants change the color of leaves and gradually fall off. Some trees and shrubs form flower buds and bud scales to protect their growing points during the winter. The fruits of some plants also ripen and disperse seeds for the propagation in the next season. Winter is the dormant or hibernant period of many plants. During the cold winter, many trees and shrubs will enter dormant state and their leaves wither and fall to reduce water loss. Some plants may survive the winter as seeds, waiting for spring.

The plant landscape in different seasons will form diverse landscape styles and create various visual experiences.

2 Theoretical analysis of campus shrub landscape

2.1 Effect of campus shrub landscape

Campus shrub landscape has a strong greening, environmental protection, practical and interactive functions, plays an active role in the construction and promotion of campus environment, and creates a better learning and living place for students. In the process of landscape design, shrubs are one of the main materials of modern landscape space. Most shrub resources have the advantages of extensive management, simple reproduction, wide adaptability and strong stress resistance, and have the functions of rich spatial hierarchy, connection and transition to hard landscape[8].

Campus shrub landscape can increase the green area of the campus, beautify the campus environment, and create a beautiful and comfortable campus environment atmosphere, making students study and live in a good environment. By absorbing and filtering pollutants in the air, it can improve the air quality of the campus, and guarantee the health of teachers and students. Drought-resistant and cold-resistant plant species can be selected as campus shrub landscape to ensure good growth under campus environmental conditions. After the completion of plant landscape construction, it needs to be maintained and managed continuously[9]. The lawn is prone to flooding in case of much rainfall, and trees are not suitable for planting in the central area of the campus. Shrub landscape objectively becomes a fixed root system to support the lawn and alleviate the situation of lawn flooding. High-quality and diverse campus shrub landscape can attract the attention of teachers and students, stimulate their interest, and provide practical basis for subject education, educational appreciation and popular science teaching.

2.2 Characteristics of campus shrub landscape

Campus shrub landscape is one of the important landscape elements in campus greening construction, which has many characteristics such as high green density, strong planting flexibility, high ornamental value, strong adaptability and fast growth rate.

Compared with trees and lawns, shrubs are more suitable for planting on campuses with small space, which can create a green effect in the limited space and improve the green density of the campus. Campus shrub landscape planting must be reasonably matched according to campus environment, space, climate, soil and other factors, and can be reasonably arranged, distributed and laid out according to different needs, so it is more flexible in application. Due to a variety of forms, leaf colors, flower colors, textures and other different characteristics, shrub planting can present a variety of beautiful visual effects, enhance people's viewing experience, and improve the cultural and artistic value of the environment. The species of shrubs and plants can be selected according to different environmental adaptability, such as young, flexible, high temperature, cold and pollution resistance, so it is easier to adapt to the changes in the campus environment and adapt to the characteristics and needs of different campuses. The growth rate of shrubs is generally faster than that of trees and can complete green coverage in a short time, so planting shrubs to gradually green the campus environment with the times has become a more rapid and effective means.

However, from the perspective of landscape effect, shrubs without fertilization have poor growth, dark and dull leaf color, slow growth of new branches, uneven and incomplete crown, and many yellow and fallen leaves, resulting in poor landscape effect[10]. Therefore, the management of campus shrub landscape is also very important.

2.3 Landscape methods of campus shrub landscape

2.3.1 Layering landscape method. A relatively gentle part of the site can be selected on campus to create a layered landscape structure such as stepped flower beds, lawns and small squares through the modeling of shrubs. Through clever design, we can create a campus landscape with distinct levels, different shapes and beautiful appearance.

2.3.2 Scaling landscape method. The effect of scaling landscape can be achieved by planting shrubs of different sizes and varieties, and the organic combination of low shrubs and high flower beds can create a friendly, flexible and lively campus landscape atmosphere.

2.3.3 Complementation method. Through the collocation of different characteristics such as color, shape, texture and flowering period between different plants, the effect of setting off each other and highlighting the ornamental effect of greening can be achieved. People's psychological association to the color of plant landscape is close to people's preference for color[11]. In the landscaping of flowering shrubs, the richness of their species and colors should be concerned to achieve harmony with the surrounding environment, making sure that the scenery can be enjoyed in four seasons[12]. Thus, a campus landscape of "blue sky with white clouds, green pine hanging green vine" can be formed.

2.3.4 Landscape method with the theme of seasonal changes. In different seasons, the campus landscape changes accordingly. For

example, when designing shrub landscape in autumn, shrubs with rich colors such as red, yellow and purple should be selected to create a colorful autumn landscape, which can make the campus look unique in different seasons.

3 Comparative analysis of the application of existing shrubs and new shrubs in campus landscape

3.1 Field survey

The application of shrub landscape under plant landscape arrangement in Anhui Xinhua University was investigated on the spot, and the selection, application and types of campus shrub landscape were summarized by means of relevant materials, photos and observations. The survey data are shown in Table 1.

Through data collection, it is found that there are 54 species of shrub plants on campus of Anhui Xinhua University, most of which belong to Rosaceae, Lamiaceae and Ericaceae.

3.2 Importance of the development and application of new shrub varieties from the perspective of plant ornamental characteristics

Through questionnaire distribution to students on campus, the demands of most students on campus plant landscape environment were understood. Combined with the influence of campus shrub landscape on students' psychology and spirit, the feelings of new and old shrub landscape construction were recorded and analyzed.

A total of 1,000 students filled in the questionnaire, including 500 boys and 500 girls. According to the analysis in Fig.1, more than 80% of the students suggested promoting the application of new shrub varieties on campus.

The development and application of new shrubs is of great significance to the campus greening construction by enhancing the ornamental value, improving the quality of greening, adapting to complex environment and enhancing the cultural connotation, and injecting new vitality into the construction of characteristic campus cultural landscape.

4 Existing problems and solutions of campus landscape

4.1 Problems in campus landscape

4.1.1 Unreasonable ratio of greening. In the greening work of some schools, there are problems such as single plants, insufficient planting area, unreasonable ratio of trees and lawns, which lead to poor campus greening effect and affect the comfort and beauty of campus environment.

4.1.2 Simple and monotonous landscape design. Some of the campus landscape design lack innovation, personality, novelty and diversity, with high repeatability, making the campus environment monotonous, lack of highlights and attractiveness.

4.1.3 Inadequate management and maintenance. There are some problems in the greening management and maintenance of some schools,

Table 1 Campus shrubs of Anhui Xinhua University

No.	Family name	Latin name	Life form
1	Hamamelidaceae	*Loropetalum chinense* var. *rubrum*	Evergreen shrub
2	Apocynaceae	*Catharanthus roseus* (L.) G. Don	Subshrub
3	Pittosporaceae	*Pittosporum tobira* (Thunb.) W. T. Aiton	Evergreen shrub
4	Rosaceae	*Rosa chinensis* Jacq.	Evergreen shrub
5	Malvaceae	*Hibiscus rosa-sinensis* L.	Evergreen shrub
6	Berberidaceae	*Nandina domestica* Thunb.	Evergreen dwarf shrub
7	Liliaceae	*Yucca gloriosa*	Evergreen shrub
8	Lythraceae	*Lagerstroemia indica* L.	Deciduous shrub
9	Elaeagnaceae	*Elaeagnus pungens* var. *variegata* Redh.	Evergreen shrub
10	Aquifoliaceae	*Ilex crenata* Thunb.	Multi-branched evergreen shrub
11	Oleaceae	*Ligustrum* × *vicaryi* Rehder	Deciduous shrub
12	Verbenaceae	*Lantana camara* L.	Erect or vine shrub
13	Theaceae	*Camellia japonica* L.	Shrub or small tree
14	Lythraceae	*Cuphea hookeriana* Walp.	Shrub or subshrub
15	Araliaceae	*Fatsia japonica* (Thunb.) Decne. et Planch.	Evergreen shrub
16	Malvaceae	*Hibiscus mutabilis* L.	Deciduous shrub
17	Ericaceae	*Rhododendron* × *pulchrum* Sweet	Semi-evergreen shrub
18	Rosaceae	*Spiraea japonica* L. f.	Erect shrub
19	Verbenaceae	*Vitex agnus-castus* L.	Shrub
20	Lamiaceae	*Teucrium fruticans* L.	Herb or subshrub
21	Rosaceae	*Spiraea cantoniensis* Lour.	Deciduous shrub
22	Oleaceae	*Ligustrum ovalifolium* 'Aureum'	Evergreen shrub
23	Lamiaceae	*Rosmarinus officinalis* L.	Shrub
24	Berberidaceae	*Nandina domestica* var. *porphyrocarp* Thunb.	Evergreen dwarf shrub
25	Apocynaceae	*Vinca major* Linn. cv. Variegata Loud	Evergreen dwarf shrub
26	Rosaceae	*Prunus mume* Siebold & Zucc.	Small tree, dwarf shrub
27	Saxifragaceae	*Hydrangea macrophylla* (Thunb.) Ser.	Shrub
28	Oleaceae	*Osmanthus* sp.	Evergreen tree or shrub
29	Asteraceae	*Spiraea japonica* ' Goldflame'	Deciduous shrub
30	Oleaceae	*Jasminum nudiflorum* Lindl.	Deciduous shrub
31	Caprifoliaceae	*Abelia* × *grandiflora* (André) Rehd.	Evergreen dwarf shrub
32	Lamiaceae	*Salvia splendens* Ker Gawl.r	Subshrubby herb
33	Malvaceae	*Hibiscus syriacus* L.	Deciduous shrub
34	Rosaceae	*Rosa* spp.	Deciduous shrub
35	Rosaceae	*Chaenomeles speciosa* (Sweet) Nakai	Deciduous shrub
36	Rosaceae	*Climbing Roses*	Vine shrub
37	Paeoniaceae	*Paeonia* × *suffruticosa* Andr.	Deciduous shrub
38	Rubiaceae	*Gardenia jasminoides* J. Ellis	Evergreen shrub
39	Rosaceae	*Spiraea thunbergii*	Deciduous shrub
40	Scrophulariaceae	*Buddleja lindleyana* Fortune	Shrub
41	Caprifoliaceae	*Weigela florida* 'Red Prince'	Deciduous shrub
42	Ericaceae	*Rhododendron hybridum* Ker Gawl.	Evergreen shrub
43	Oleaceae	*Ligustrum sinense* 'Variegatum'	Evergreen shrub
44	Hydrangeaceae	*Hydrangea paniculata* Siebold	Deciduous shrub
45	Salicaceae	*Salix integra* 'Hakuro Nishiki'	Deciduous shrub
46	Aquifoliaceae	*Ilex* × *attenuate* 'Sunny Foster'	Shrub
47	Caprifoliaceae	*Lonicera japonica* Thunb.	Shrub
48	Aquifoliaceae	*Ilex cornuta* Lindl. & Paxton	Evergreen shrub
49	Saxifragaceae	*Deutzia rehderiana* C. K. Schneid.	Deciduous large shrub
50	Myrtaceae	*Myrtus communis* L.	Evergreen shrub
51	Ericaceae	*Rhododendron simsii* Planch.	Deciduous shrub
52	Guttiferae	*Hypericum monogynum* L.	Shrub
53	Rosaceae	*Rosa banksiae* W. T. Aiton	Climbing dwarf shrubs
54	Oleaceae	*Jasminum mesnyi* Hance	Evergreen subshrub

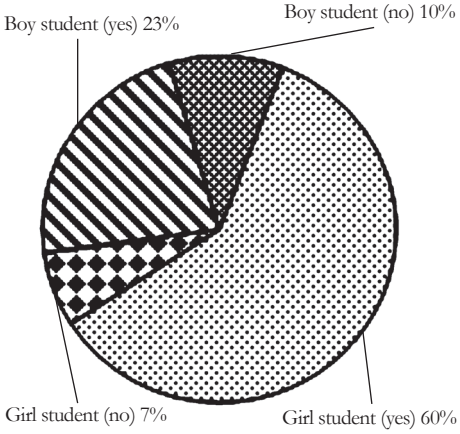

Fig.1 Proportion of whether recommending new shrub varieties

such as lack of professionals, inadequate water and fertilizer management, weak plant pest control, etc., which make some landscape plants on campus have weak growth and poor overall state, affecting the greening effect on campus.

4.1.4 Poor campus pressure environment. Due to the learning atmosphere, work pressure and other reasons, there are man-made destruction of green facilities on campus, such as shaking trees, trampling on the lawn and other behaviors, resulting in the destruction and pollution of campus environment, and reducing the reputation of the entire campus.

4.2 Solution

In view of the problems existing in campus landscape, we can promote the protection and construction of campus environment and create a beautiful and harmonious campus environment through reasonable planning of greening ratio and innovative landscape design.

(1) According to different functions and characteristics of campus area, the greening ratio should be rationally planned. For example, lawns and seats should be appropriately increased in the main activity areas and crowded areas to create leisure activity places; trees and shrubs can be planted on both sides of the road on campus to increase the ornamental value and air purification effect.

(2) Introducing diverse and innovative landscape design ideas. For example, plant diversity layout, waterscape collocation, architectural landscape integration and other methods can be used to create a personalized, cultural campus environment.

(3) Strengthening the construction of greening management team, and improving the professional and scientific level of greening management. The maintenance of lawns, hedges and flower beds must be intensified, and the technical strength and management skills in plant diseases and pests control must be strengthened, to improve the efficiency of greening work.

(4) By carrying out a series of activities such as environmental protection, ecology and cultural education, we can improve teachers and students' environmental awareness and green living standards, guide teachers and students to cherish the campus environment, and actively participate in campus environmental protection activities. At the same time, the patrol and publicity work, facility protection, etc. must be strengthened, and the protection and management of green facilities must be enhanced.

5 Conclusions

Appreciating shrub landscape is not only to enjoy the pleasure of appreciating beautiful scenery, but also reflects people's cognition, pursuit and concern for nature. In modern urban life, the appreciation of shrub landscape is of great significance for relieving pressure, promoting physical and mental health, and enhancing cultural connotation. In addition, shrub landscape plays an irreplaceable role in campus environment. Reasonable planning, scientific design, careful management and maintenance are the keys to realize the shrub landscape, which is conducive to creating a more beautiful, harmonious and livable campus environment. After exploring and studying the application of shrub landscape on campus, the following conclusions can be drawn.

(1) Shrub landscape is an indispensable part of campus greening construction. Through collocation, combination and layout, a diversified, three-dimensional and hierarchical landscape space can be formed to enhance the aesthetics and artistry of campus greening.

(2) According to different campus areas, campus nature and purpose, shrubs and plants should be selected and configured according to the ornamental value and adaptability characteristics of shrubs, so as to achieve the best landscape effect and beautify and protect the campus environment.

(3) Shrub landscape has been widely used in green enclosure, landscape separation, landscape transition, humanistic decoration, etc. At the same time, shrub landscape can also create a more comfortable and healthy campus environment for teachers and students by relieving campus pressure and improving campus air quality.

(4) Shrub plants grow faster and maintain more easily, and have the advantages of easy planting and remarkable effect. However, in the process of shrub planting and management, it is also necessary to pay attention to the habits, ecological characteristics, cutting treatment and other aspects of different species to avoid adverse effects.

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