Analysis of Plant Configuration and Visitors' Characteristics in HEBIN Park

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ABSTRACT: To discuss internal relationship between plant configuration and characteristics of visitors in garden environment, the correlation was analyzed by using SPSS program and choosing such factors as canopy density, species richness, visitors sex proportion and ratio of visitors' age, and so on , based on investigation of 30 sample plots in HEBIN garden of SHAOGUAN city. The results showed as followed: there was significant negative correlation between canopy density, species richness and male visitors, but significant positive correlation between canopy density, species richness and female visitors, which displayed that males were less likely to act in high canopy density and high species richness, females were opposite. There was significant negative correlation between canopy density, species richness and the middle age proportion, but no any relationship between canopy density, species richness and the other age proportions. There was significant correlation between the young ratio and the children ratio, which showed the two groups in the activities of the region into a match.
KEYWORDS: I HEBIN Park, canopy density, plant richness, sexual proportion, age proportion

1 INTRODUCTION

There are less urban soil and smaller public activity space because of the increasing population, while decreasing natural vegetation lead to the declining of green land coverage and serious air contamination. "Garden green land" is the best area for citizen to be close to nature and have leisure entertainment, as well the important place to improve communication activities for people out of cement wall board. Environment can affect and introduce human's behavior[1], so that the interaction and social activities among people will be improved by transforming the environment[2-3]. Meanwhile, the number of plant can also affect the amount of visitors and the means of activities, the use of outdoor public green space can enhance social behavior between the neighbors[4-5]. Plant disposition can affect environment[6-9], including micro-environment, visual effect, function, furthermore, the psychology and behavior of visitors is affected. Therefore, the design of the plant, road, leisure environment in the park should be completed by human's behavior physiology and psychology[10]. This research took SHAOGUAN HEBIN park as the research object. Four methods were used in investigating, −plant investigation, observation[11], questionnaire and interview investigation. The quantization relationship between plant configuration and visitors' characteristics was disclosed by studying to provide scientific basis for rational plant disposition of urban green land.

1.1 *General Situation of Research Area*

Investigation area is located in the center of SHAOGUAN city, north latitude 24°48′, east longitude 113°35′, altitude 55~62 meter. The whole area of the park is 0.25hm^2, and divided into 3 regions (A, B, C) with 30 samples. (fig 1, table 1)

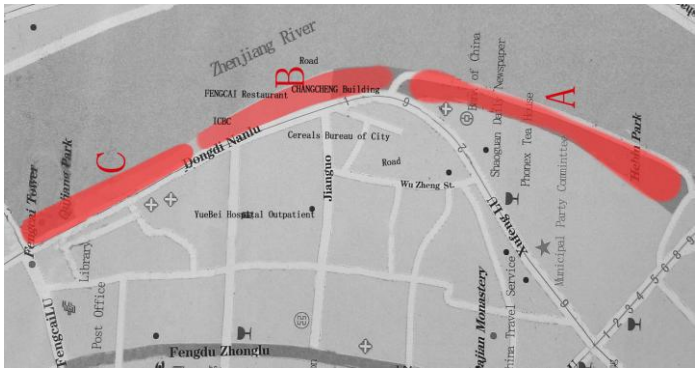

Figure 1. HEBIN Park location

Table 1. general situation of region A, B, C.

Region	Sample point	Canopy density	Main plant	species
A	1	0.7	Bauhinia blakeana Ficus altissima Bl. Ficus microcarpa Cinnamomumcamphora (L.)Presl. Grevillea robusta, Hymenocallisamericana Excoecariacochinchinensis Lour Etc.	24
	2	0.85		
	3	0.9		
	4	0.85		
	5	0.85		
	6	0.65		
	7	0.65		
	8	0.55		
	9	0.85		
	10	0.5		
B	11	0.55	Ormosia pinnata (Lour.) Merr., Ficus microcarpa, Grevillea robusta, Prunusserrulata, Hymenocallisamericana, Duranta repens, Zoysiamatrella Etc	17
	12	0.5		
	13	0.45		
	14	0.6		
	15	0.6		
	16	0.6		
	17	0.5		
	18	0.45		
	19	0.2		
	20	0.45		
C	21	0.65	Ficus microcarpa, Lagetstroemia speciosa, Prunusserrulata, Bauhinia blakeana, Calliandrahaematocephala, Hymenocallisamericana, Rhododendron pulchrum, Zoysiamatrella 等 Etc	20
	22	0.35		
	23	0.7		
	24	0.8		
	25	0.55		
	26	0.7		
	27	0.7		
	28	0.5		
	29	0.8		
	30	0.9		

2 RESEARCH METHOD

2.1 *Investigation Method*

Tally method was used in plant investigation, observation, questionnaire and interview was used in investigating the visitors' characteristics. The investigation was carried out during July-August, 2013.

2.2 *Statistical Analysis*

Original data were quantified and standardized processing, and the relationship was analyzed by SPSS software.

3 RESULTS AND ANALYSIS

3.1 *Analysis of Relationship between Canopy Density and Visitors' Characteristics*

The results analyzed by researching canopy and visitors' characteristics of regions: in the whole research region, the average canopy of region A was the highest, 0.74; the following region was C, 0.67; the lowest one was region B, just 0.49. In the aspect of visitors' characteristics, because of different region area, it was necessary to unify diameter for equal comparison so that the visitors' characteristics in every region could be calculate according to certain ratio. By comparison, the ratio of male to female was 53:47; in proportion to the age, the elderly was 38.6%, middle-aged people was 33.3%, young people was 19.3%, children proportion was the lowest, only 8.8%, thus, the elderly and middle-aged people was 72%. It showed that there were more male in the park and the main group was the elderly and middle-aged people.

According to the analysis to figures of canopy density, sexual proportion and age proportion in 3 regions (Fig 2,3), as well as the analysis of SPSS correlation(table 4) , the results showed as followed: in the aspect of sexual proportion, the results of figure analysis of relationship between canopy density and sexual proportion matched with that of SPSS analysis, that is, there was significant negative correlation between canopy density and male proportion, while significant positive correlation between canopy density and female proportion, which displayed the tendency that men was more activity desire than women in lower canopy density region, and the lower the canopy density was, the male activity degree showed obvious increase, but female was the opposite. In the aspect of age proportion, there was only significant negative correlation between canopy density and the middle-aged proportion, and no relationship with the other ages. It showed that the middle-aged were more inclined to act in lower canopy density region, whereas, the proportion figure of children, who were more inclined to act in medium canopy density region and less activity in the higher or lower canopy density regions, was special, perhaps there being U-shaped curve relationship.

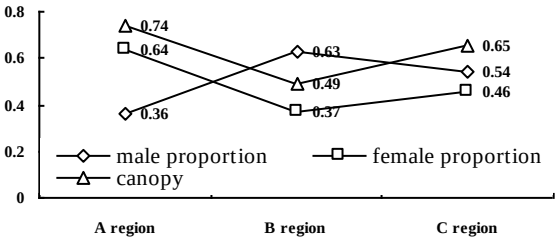

Fig 2 canopy density and sexual proportion

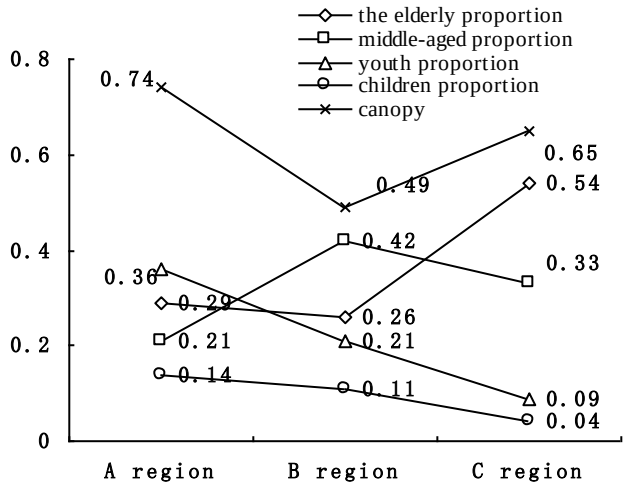

Fig 3 the ratio of canopy density to age

Table 4 the relationship between canopy density and sexual proportion, age proportion

Kendall method	Correlation coefficient	Sig.（2-sides）
C.D.—M.P.	-1.000**	.
C.D.— F.P.	1.000**	.
C.D.—E.P.	0.333	0.602
C.D.—M.A.P	-1.000**	.
C.D.—Y.P.	0.333	0.602
C.D.—C.P.	0.333	0.602

*C.D. represents canopy density; M.P. represents male proportion; F.P. represents female proportion; E.P. represents elderly proportion; M.A.P. represents middle aged proportion; Y.P represents youth proportion; C.P. represents children proportion.

3.2 *Correlation analysis between plant richness and visitors' characteristics*

The analysis results by researching species richness and visitors' characteristics showed: In the region A, there were main trees and shrubs, rare ground cover plants, less deciduous tree and more plant species, so that the region had single landscape structure and poor transmittance in winter. In the region B, there formed richer plant structure than region A, consisted of tree-shrub-herb multi- structure, but less plant species. In the region C, the plant species was same with the former, medium structure richness, while the area of hard landscape increased, and more human were acting in cluster.

According to the analysis to figures of species richness, sexual proportion and age proportion in 3 regions (Fig 4, 5), as well as the analysis of SPSS correlation (table 5) , the results showed as followed: in the aspect of sexual proportion, the results of figure analysis of relationship between species richness and sexual proportion matched with that of SPSS analysis, that is: there was significant negative correlation between species richness and male proportion, while the significant positive correlation with female proportion, which displayed that men were more inclined to stay in the region with open space, while women were the opposite. In the aspect of age proportion, there was significant negative correlation between plant species and the middle aged people, the other three ages had no obvious correlation, which showed the tendency that the middle-aged were more inclined to the region with lower plant species.

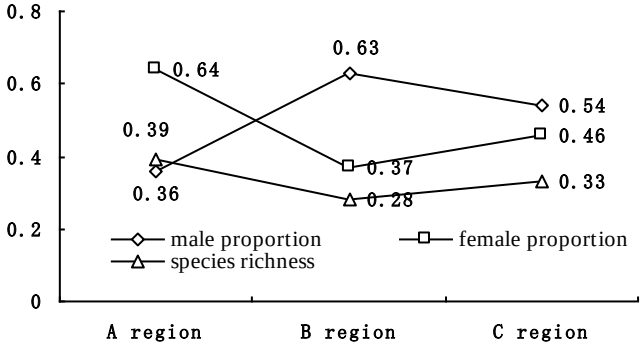

Fig 4 species richness and sexual proportion

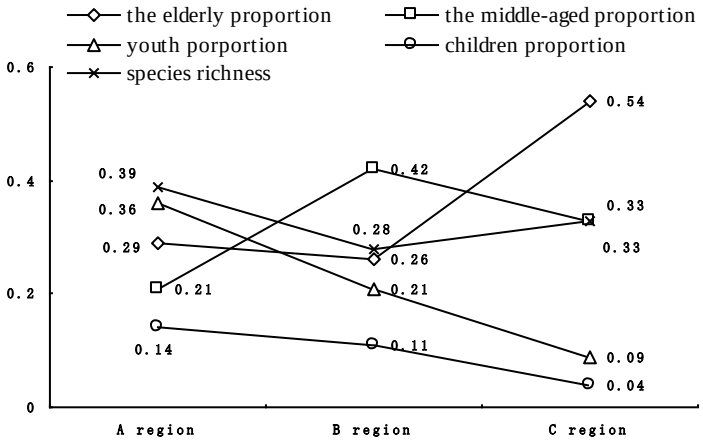

Fig 5 species richness and age proportion

Table5 correlation between plant richness and sexual proportion, age proportion, canopy density

Kendall method	Correlation coefficient	Sig(2-sides)
S.P.—M.P.	-1.000**	.
S.P.—F.P.	1.000**	.
S.P.—E.P.	0.333	0.602
S.P.—M.A.P	-1.000**	.
S.P.—Y.P.	0.333	0.602
S.P.—C.P.	0.333	0.602
S.P.—C.D.	1.000**	.

*P.R. represents plant richness

By researching the relationship among age proportion in the three regions (table 6), there were only significant positive correlation between youth proportion and children proportion, that is: it was just the youth-children group that were inclined to have activities in the same region, while the other five groups(the elderly-the middle aged, the elderly-youth, the elderly- children, the middle aged-youth, the middle aged-children)

Table6 The relationship among age proportion

Kendall method	Correlation coefficient	Sig(2-sides)
E.P.—M.A..P	-0.333	0.602
E.P.—Y.P.	-0.333	0.602
E.P.—C.P.	-0.333	0.602
M.A.P.—Y.P.	-0.333	0.602
M.A.P.—C.P.	-0.333	0.602
Y.P.—C.P.	1.000**	.

4 CONCLUSION AND DISCUSSION

1. There were significant correlation between canopy density and plant richness, therefore, the analysis of correlation between canopy density and visitors' sexual, age matched with that of plant richness.
2. There were significant negative correlation between canopy density and male visitors, as well as plant richness, in HEBIN park, while there were significant positive correlation between those and female visitors. Men were more likely to act in the region with lower canopy density, liking open area for showing themselves and not minding the plant richness; whereas, women were more inclined to act in the region with higher canopy density and plant species, to some extend who wanted to hide themselves, center self activities and appreciated more beautiful scenery.
3. There were significant negative correlation between the middle aged proportion and canopy density ,so did plant richness, in HEBIN park, no correlation with the elderly, youth, probably U-shaped curve relationship with children proportion. Therefore, the middle aged people were inclined to take activities in the region with low canopy density and plant richness, the elderly and the youth people didn't have obvious tendency, yet children were more likely to take activities in the region with medium canopy density, and suitable plant richness so that they could accept a certain amount knowledge in the entertainment.
4. In every age proportion, there were significant positive correlation between youth proportion and children proportion, no correlation in the other ages. It showed that children had the same activity tendency as youth.
5. The park environment especially plant configuration can affect distribution of visitors' characteristics. The canopy density and plant richness were chosen for their representative and availability in this article, but it needs further analysis to test whether they are the key factors or not. It is persuasive to some extend to use the data, such as visitors' sexual and age−but they are dynamic data with features of rapid change and randomness−to analyze visitors' characteristics. Therefore, it should take more time and different time period to observe the park, so that the data collected during longer time and different period would be more convincing.

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