Genetic and variation analysis studies on landscape genes of traditional Tibet and Qiang watchtower villages in western Sichuan

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Xiong Wei

College of Landscape Architecture, Sichuan Agricultural University, Chengdu Sichuan, 611130, China

e-mail: xiongwei00221@163.com

Abstract. Based on the biological characteristics of genetic inheritance and variation, taking the traditional Tibetan and Qiang watchtower villages in western Sichuan as the research object, four gene types were classified according to their genetic composition and importance, including the main gene that dominates the settlement pattern, accessory genes of architectural function and network system, mixed genes of building materials and architectural aesthetics, variant genes of settlement growth model, distribution form, internal spatial layout form and architectural form. Combined with history, regional environment, social environment, demand and other factors, this paper analyzes the characteristics and variation trend of its heredity and variation, clarifies the stability and core of the landscape gene prototype of traditional watchtower village of Tibetan and Qiang, and puts forward that landscape genetic variation is one of the important reasons for the diversity and richness of regional landscape culture.

1. Introduction

Genes are carriers of genetic information. The expression of gene function cannot be separated from the influence of internal and external environment. Each gene can faithfully copy itself to maintain the basic characteristics of the organism; however, the stability of genes is relative. Under certain conditions, genes can also be suddenly changed into another new existence form, that is, "gene mutation", so that organisms can be selected to be the most suitable individual for nature through natural selection. [1] From the perspective of genes, according to the composition and importance of landscape genes, it can be divided into main genes, accessory genes, mixed genes and mutant genes. [2] The main gene dominates the attributes of settlement landscape, and the accessory gene plays a certain strengthening role on the main gene; mixed genes are relatively diverse, but they are still unique landscape properties; affected by various factors, variant genes are attributes derived from the original landscape, but are necessarily related to the original landscape form.

2. Main gene -- settlement pattern of local conditions and enclosure type

Constrained by the production and lifestyle of the natural ecological environment, it led to the great dependence of the ancestors of Tibetan and Qiang on the environment. On the site selection of villages, most of them are built on the mountains or in the alpine valley area, which not only reflects the survival instinct of Tibetan and Qiang ancestors to strengthen and gather together to resist disasters in the relatively harsh natural geographical environment, but also is related to the early foreign invasion, tribal conflicts, wars and other factors. Therefore, the objective needs of making full use of limited resources

and security and defense led to the original settlement form of watchtower village of Tibetan and Qiang, and formed the prototype of "adapting measures to local conditions" and "centering" genes. Whether in river valleys, hillsides or hilltops, the proximity of mountains and water ensures the relative convenience of material life. In accordance with the layout of the mountain, the village has a compact structure, high building density and relatively concentrated population. So that the villagers can better exert their collective strength, make more effective and rational use of resources and share resources, increase the cohesion of the settlements, and at the same time actively defend against foreign enemies. Especially in the mountainous platform area, the spatial layout of the village centered on the guanzhai village reflects this main gene more prominently.

3. Accessory genes

3.1. Livable and warlike architectural functions

"Sui book · FuGuo biography" records: "(The countries)Near the valley near the mountain risk... bastion stones as nests. " Qiang and Tibetan people living in the Tibetan-Yi corridor of China created stone architecture, and this architectural form of livable warfare reflects that under the complex tribal relations and turbulent social environment in ethnic areas, the residential system with family defense as the unit and village defense as the whole has been widely adopted and continuously improved by the Tibetan and Qiang people. The stone buildings include watchtower, diaofang and guanzhai, among which watchtower is the most representative one with four types of landscape, including residential towers, communal towers, war towers and night watch towers. The overall shape and structure with width at the bottom and narrow at the top determine its sturdiness, exquisite craftsmanship and strong and anti-corrosion rubble stone materials, making it last for a hundred years. In the long evolution of social forms, the shape and structure of watchtower, their relationship with blockhouse and their layout in villages reflect the historical and cultural context, witness the existence and evolution of civilization, and are national symbols integrating military, religious, ritual and social characteristics. Such architectural form and village landscape are unique in both China and the world.

3.2. Road network of three-dimensional interchange

The Tibetan Qiang watchtower village contains a three-dimensional interwoven network composed of road network, water network and air passage. The road is the skeleton of the settlement, which plays the role of contacting and connecting the whole settlement and each unit. [3] The form of village road formation is determined by living habits, production needs and defense needs, the development of the road system also fully shows the development process and spatial organization characteristics of settlements. With the increasing scale of the village and the increase of the population, the number of dwellings increases continuously, and then some irregular paths are formed around the house. Some places between dwellings can only accommodate one person to pass sideways. The tortuous road space and narrow scale are affected by the natural adaptability of the objective mountain terrain, as well as by the cold and windy climate factors in the plateau area, which strengthen the close combination of buildings. At the same time, it is also based on the need of defense against foreign invasion, which is conducive to the effective control of invasion behavior. In the whole village road system, it has also formed nodes of communication, production and religious activities. In the road, it plays the role of convergence and transition. The entrance to the village and the square in the central area of the centricity village are the important node space for life communication. It is the center where residents gather to discuss outside news or their daily life, the place for gatherings and sacrificial activities, and the political and cultural core of the whole village. Where the farmland is concentrated is the production node. Tibetan temples are often religious nodes in the settlements. In the villages in the valley area or the mid-mountain area, water is often introduced into the homes, forming a natural underground water supply and drainage system, which is convenient for residents to get water on the spot. Another very typical feature of the watchtower village is the passage that forms a third dimension in the air. The flat roof of the folk house becomes the fifth facade of the overall image of the settlement. In addition to being used

as a playground, the roof of the whole village is organically connected into a complete whole through gangplank, ladder and street building. The daily contact between residents was strengthened, and at the same time, a defense system from the ground to the air was formed [4]. In wartime, the ability to quickly unite the inhabitants of the village played an important functional role.

4. Mixed genes

4.1. Construction materials locally sourced

The main material of traditional architecture in most parts of China is wood. The western Sichuan region is located in the region with the most active geological movement, which is dominated by plateaus and alpine valleys. The stone is abundant and the land is poor. Therefore, stone is the most widely used material for the construction of villages. Although in the past, due to low productivity, the stone mining technology and the use of bulk stone are not as good as those in Europe, the overall structure and the technology of laying stones are unique.[5] The traditional Qiang architectural culture is characterized by "building stones as rooms". After years of inheritance and development, it is enriched in the process of absorbing other ethnic cultures. [6] The stone building is built by spiral layers of flake stone with yellow mud as the bonding material, supplemented by timber as floor support and bearing. Its building strength is no less than modern concrete materials, in many earthquakes, still relatively intact. At the same time, stone has a higher fire resistance than wood, which can effectively control the fire in wartime or in case of fire, not to destroy the whole village. The local areas in western Sichuan, such as the east of WenChuan, are rich in wood but lack of stone. In addition, the annual rainfall in the region is large. Therefore, the slope roof structure, which is more conducive to drainage and moisture-proof, is adopted in combination with the stone wall. A perforated wooden framework is used as the load-bearing system of the building. The roof is covered with slabs or boards and surrounded by stone walls. This kind of combination of stone and wood reflects the wisdom of the Tibetan and Qiang people, which is flexible and changeable in different times and places.

4.2. Multi-cultural integration of settlement architecture aesthetics

4.2.1. The harmonious beauty of mountain settlements

Due to the restriction of living environment and the mutual influence of lifestyle, military defense and religious belief, the Tibetan and Qiang villages have formed an interdependent ecosystem with the surrounding environment. High mountains and valleys, buildings and rivers and plants complement each other, and their aesthetic features are highlighted by the harmonious beauty of "heaven, earth, man and god" presented by the combination of settlements and the rhythm of spatial structure.

4.2.2. The simple beauty of living form

As a unique settlement form, the whole watchtower village of the Tibetan and qiang dynasties presents a dignified, simple and quiet image. With the minjiang river valley and mountains as the background, it presents a vigorous and rough primitive beauty. The buildings made of natural stone and loess seem to grow out of the earth, and white stone is placed on the top of watchtowers and houses. The whole settlement, in terms of environmental color and material construction color, is integrated with the natural mountains, showing the calmness and sophistication, fully expressing the simple beauty of the residential form.

4.2.3. The extraordinary beauty of watchtower and residential buildings

As a representative regional cultural building, watchtower is the carrier of the cultural transmission of national corridors and the cultural exchanges among different ethnic groups. With its thick and crude shape, it stands among the mountains and valleys, displaying a religious mystique, giving a strong visual impact and a shocking power. In terms of plane form, it is also very rich. The square, polygon, star and other appearances shrink up layer upon layer. The contrast between light weight on the top and heavy

weight on the bottom makes the building more cohesive and stable.At the same time, it also forms the rising dynamic in vision. The facade texture effect of the building presents a wonderful arc, which reflects the beauty of the structure and the virtuality, as well as the beauty of the details in the construction of doors, Windows, eaves and roof ridges. The desolate ancient blockhouse and scattered folk houses also form the varied rhythmic beauty.

5. Variant genes

In the process of development and change, landscape genes will have both inheritance and variation. [7] Variation is an inevitable requirement for the village to seek development and survival in the process of adapting to the natural environment, cultural environment and social environment.

5.1. Settlement growth model

The central distribution area of watchtower in western Sichuan is the core area of southwest China's ethnic corridor, where ethnic and religious cultures collide, communicate and integrate. In each historical period, the Tibetan and Qiang people migrated in this high mountain valley region, and the Tibetan civilization and central plains civilization on the east and west sides of the region gradually penetrated into this region. Foreign Tibetan Buddhism and Christianity also collided with local witch culture and bon culture and survived here. [8] With increasing productivity and changing modes of production, the way of life has also changed. The traditional settlement forms and architectural space can no longer meet the daily life and production needs of the current residents, and the settlement scale is constantly changing due to the population growth. Therefore, due to natural changes, cultural customs, cultural integration, social development and other factors, settlements produce different growth patterns.

5.1.1. Growth under the influence of natural factors

In peace time, the growing population makes the living space compressed, resulting in the original living environment and production and living resources tension. Some villages have redeveloped new farmland, scattered parts of the population and built new homes. The process of village evolution extends outwards just like cell division, resulting in more new settlement landscape layout patterns. Therefore, population is one of the most important causes of settlement evolution and growth. The geographical conditions also make the settlement landscape grow in different forms. The watchtower villages in the river valley form a lateral growth trend along the river, such as the Maerkang Zhibo village. The settlement pattern in the hillside gentle slope zone is spatially diffused, the core of the settlement is not obvious, and it is a decentralized growth pattern around. The effective farmland area of the platform type settlement space is extremely important, and the layout is relatively concentrated and orderly. In order to get rid of the spatial restrictions, the vertical growth mode is formed.

The concentrated distribution area of the watchtower villages of Tibetan and Qiang is also an area with active geology and frequent natural disasters. However, in the past, limited by financial resources, transportation, ideas and other aspects, most of the Tibetan and Qiang ethnic groups have been living in the semi-high mountains or the top of the mountains for generations, leading a nomadic life supplemented by farming. After many earthquakes, mountain torrents and other natural disasters, houses suffered varying degrees of damage. In 2000, they began to move down the mountain one after another. After the wenchuan earthquake in 2008, some villages were moved as a whole. These residents left the original villages and the rebuilt villages are more in line with the needs of production and life. In villages with better economic conditions, most people's main production mode is no longer dominated by farming and grazing, and the traditional settlement layout in the past is no longer adapted to the new lifestyle. However, those villages less affected by natural disasters can still grow freely in a relatively complete and orderly way.

5.1.2. Growth under the influence of social factors

Social factors include different aspects such as customs and culture, social structure and national policies. Under the influence of these external social factors, the villages have changed, the process of settlement changes is relatively rapid, and the growth cycle is also short.

（1）Social structure

In order to strengthen the centralization of the Tusi system, the Ming Dynasty took Tusi guanzhai as the center in the settlement space to strengthen its position. For example, the Songgang Tibetan village in Maerkang was built on the basis of Tusi guanzhai, however, with the abolition of the chieftain system, the function of the village was gradually weakened, and the layout of the village became increasingly loose. Zhibo village, on the other side of the river, was developed with the temple as the religious center and was relatively less affected. There are also villages that resisted the oppression of the Ming dynasty but were not incorporated into the tusi system. For example, the Heihu Qiang village in Mao County, located on the ridge, is scattered in an overall layout with dwellings and watchtowers scattered on the slopes on both sides of the valley. Watchtower stands in line for several square kilometers, and the Xia xiaoheba blockhouse under the mountain is built around a defensive blockhouse.

（2）National policy

Under the guidance of the strategic planning for rural revitalization, the state has vigorously strengthened the unified planning of villages and towns, optimized the layout of rural development, and strictly protected the ecological space. In the post-disaster reconstruction of the watchtower village of Tibetan and Qiang, it is strongly supported by national policies. For example, the watchtower and residential buildings that were seriously damaged are repaired in Wabu village, the infrastructure of the village is improved, and the spatial form of the settlement is further expanded and extended. Luopo Qiang village and Songgang Tibetan village belong to the terraced settlement. After the earthquake, the original building was completely damaged or damaged a lot. Therefore, the site is rebuilt, part of the relics are restored and preserved in the old village, and the new village is uniformly planned as agricultural and forestry production, village activities and tourism and leisure area, bringing sightseeing, folk culture and experience life into the new village landscape.

（3）Lifestyle of residents

With the exchanges between urban and rural areas and the further development and prosperity of commerce and tourism, the economy has shifted from a self-sufficient economy to a diversified one that integrates farming, tourism and commerce. At the same time, people's ideas and material economy have also undergone great changes. The way of life and communication is becoming more and more urbanized. The traditional semi-closed settlement life mode has been transformed into an open modern settlement form. The big family gradually changes to the living mode of independent small families, so the single-family mansion becomes a compound living space composed of multiple independent dwellings, showing the independence and connection between buildings. Higher requirements are put forward for the quality of living environment. The original livestock space on the ground floor is removed and set independently. A variety of public buildings and public Spaces have emerged to increase communication, and the village scale space has also changed significantly.

5.2. Distribution form of villages

Most of the topography in western Sichuan is mountainous with a relatively large slope, and there are few open and flat areas with gentle slope. Due to the need of defense, most of the traditional Tibetan and Qiang villages are built on dangerous and inaccessible high mountains and slopes, or on steep slopes about 300 meters from the relative height of the river valley, with an altitude of more than 2000 meters. Relying on natural barriers, they are easy to defend and difficult to attack. This is the main place where the Tibetan and Qiang people lived before the Ming and Qing Dynasties. After qianlong in the Qing dynasty, the policy of returning to the native soil and seizing farmland was implemented. In modern times, the distribution of Tibetan and Qiang villages also extended from the high mountains to river valleys. In the small and flat areas village with convenient transportation and open space, the altitude is still around 1000 meters. After the founding of new China, the society developed steadily. Especially in

the past 20 or 30 years, due to the urgent needs of external transportation and communication, the distribution of villages has a more obvious downward trend.

5.3. Internal space layout form

The traditional Tibetan and Qiang villages mainly rely on rivers, mountains and the spatial layout centered on watchtower and guanzhai. The arable land resources are very precious, so the village layout is generally close, the road system is complex and changeable, but the texture of the whole village is still relatively clear. For example, Qiangfeng village in Mao county is divided into farming areas and residential areas. It takes the watchtower as the defense center, backs the mountain and faces the minjiang river valley, and houses rely on the watchtower. The highest point in the Tusi Tibetan village is the official residence or temple of the tusi family, which reflects the strict social hierarchy and the core status of religion. However, as the traditional cultural values are constantly influenced by the Han area, the internal spatial layout of the village changes accordingly. Villages in modern times are mostly distributed in the river valley and distributed according to the nature of the mountains. The architectural groups appear in the form of natural groups and form semi-enclosed courtyard space to a certain extent. For example, the Wulong village in Beichuan has no watchtower, and almost all the dwellings are at the same altitude. Influenced by the architectural culture of Han area, the spatial layout is scattered, with courtyard space as the basic unit. The building density is very small, and the road texture is fuzzy.

5.4. Architectural form

In " Later Han. Nanman Southwest Yi Chuan", " all buildings are based on the mountain, stone base for the room, the height more than ten zhang, like Qionglong. "[9] the history of building stone houses in the upper reaches of the Minjiang River valley, especially the defensive watchtower, can be traced back at least to the Han Dynasty. However, this architectural form has been relatively intact for nearly two thousand years.[10] The traditional village building is blockhouse or slope-roofed slab house with stone walls and through-jointed timber frame. It has a three-layer spatial mode of "livestock raising on the ground floor, people living on the second floor, and terrace on the third floor". Due to the influence of war, geological disaster and sinicization, quite a few blockhouses in western sichuan have been destroyed, and stilted buildings, quadrangle, buildings and other new building forms have appeared, and concrete block materials have been adopted. But in the detail still has the Qiang nationality traditional culture demonstration, fully manifests the architectural culture fusion the regional characteristic. Traditional Tibetan village houses are in the form of stepped "three-section" or "two-section" facade structure, which forms the form of the lower solid and the upper virtual. They are built with strips of stone, pieces of stone or gravel, small size of doors and windows reflects strong defensiveness, the overall style is honest and sincere. There are no bedrooms in the interior, and the main room is the focus of all daily activities. As the demands of modern life change, the fireplace disappears, its functionality gradually differentiates and weakens, becomes the spiritual core, and evolves into the functional unit of the bedroom. At the middle and bottom of the dwellings, the corral was cancelled and replaced by the layout of storage or direct residence, so that the original plane shape changed from rectangle to "L" or "concave" shape. This new type of Tibetan dwellings retains the original characteristics of local dwellings, and at the same time, it also improves the disadvantages of some traditional dwellings by rebuilding or expanding them on the basis of the original dwellings.[11]

6. Conclusion

By analyzing the landscape genes of watchtower village of Tibetan Qiang in western Sichuan, on the one hand, it makes clear the stability and core of the traditional village landscape of watchtower village in the inheritance of the basic form of adaptation to local conditions and enclosure. On the other hand, it also puts forward that genes of traditional village landscape will vary due to the change of regional environment, social environment and demand in the development process. It is precisely such variations that constitute the diversity and difference of regional landscape culture. In the context of the current national rural revitalization, a correct understanding of this issue, with special emphasis on the concept

of the integrity and unity protection of traditional village landscape genes, will be of certain enlightenment to the conservation planning and tourism development planning of historical and cultural villages.

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