

Study on yi yang small yu bamboo skill crafts taking material technique

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Abstract. Small yu bamboo art is a kind of folk traditional handicraft technology which has a long history in Yiyang , Hunan province. Its handmade products are not only handsome in appearance, but also work fine and exquisite workmanship. In this paper, bamboo yiyang small yu as the research object, from the bamboo material selection and raw materials processing of experimental analysis, research of bamboo raw materials, mechanical strength, material handling. For the small Yu bamboo products to provide technical support.

Key words. bamboo, material selection, process treatment.

1. Introduction

Draw material is the first process in the production process of “Small Yu bamboo skill crafts” , is to prepare materials for the production of products, this article analyzed from the two parts of draw materials and basic treatment of materials to obtain, it analyses the draw material process principle and operation norm of “Small Yu bamboo skill crafts”. The main process includes material selection, material preparation, rub, burning oil, straightening, coloring and preventing mold and moth treatment.

2. Technical term interpretation

“Small Yu bamboo” is produced in the Yiyang folk arts and crafts, it is the use of *Dendrocalamus latiflorus* less than 5 cm of bamboo as a skeleton, using *phyllostachys pubescens* as the auxiliary parts, a traditional folk handicraft, which is characterized

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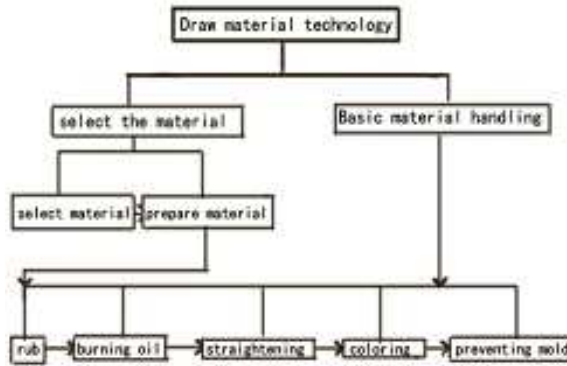


Fig. 1. “Small Yu bamboo skill crafts” draw material process

in that fire is processed into various utensils. “Small” is for the selected materials in Yiyang area, the technology of Yu bamboo is divided into “big” and “small”, the process principle adopted by both, they offer only material selection and structure differences. Small Yu uses smaller diameter *Dendrocalamus latiflorus*, big Yu uses larger diameter *phyllostachys pubescens*. “Yu” is Yiyang dialect, It means bending, “small Yu bamboo” has the characteristics of Yiyang dialect in the name of the process and structure. The author is Yiyang people, he has a more profound understanding of these names with local dialect features. In this research process, the author interviewed Yiyang local outstanding small Yu artists, get their dictation, and combined with the study of historical documents, make a standardized naming and explanation of “small Yu bamboo skill crafts” special noun.

2.1. Material selection

Select different materials for different product requirements, small Yu bamboo furniture chooses the 4-6 year old *Dendrocalamus latiflorus* bamboo pole as the main raw materials, 4-7 year old *phyllostachys pubescens* as auxiliary parts, in the production of small Yu crafts, according to product modeling requirements, with a purpose to choose bamboo.

2.2. Material preparation

According to the design drawing requirements, the bamboo is sawn into a suitable length, used hand saw in the past, now generally use a electric saw .

2.3. Burning oil

The sugar, protein, fat and water in bamboo are important factors affecting the processing properties of bamboo. Fire baked bamboo, bamboo interior nutrients along with water evaporation, known as burning oil.

2.4. Straightening

Using bamboo fiber heating softening principle, will be used to bamboo straight of make small Yu bamboo furniture frame structure .

3. Material selection

3.1. Morphological characteristics and structure of bamboo

Bamboo has the characteristics of good wood quality, easy reproduction, strong vitality, fast growth, high yield, early maturity, short rotation and so on. It is a natural fast-growing materials, and wood has a similar texture, its soft color, clear texture, feel smooth, flexible, giving people a good sense of vision, smell and touch. It has the advantages of light weight, good toughness and high strength ,is a high-quality furniture making raw materials. At the same time, bamboo is an eco-friendly green material,CO₂ absorption is 4 times that of common trees, it has the milling and carving process performance in wood processing. After the use period, the material can be completely recycled and reused. *Dendrocalamus latiflorus* used for making small Yu bamboo furniture frame structure, also called sweet bamboo, Daye black bamboo, *dendrocalamus*, stem cluster, bamboo pole is straight and slender, in the Yiyang area, also has a habit called *phyllostachys* , the author read a lot of books and literature found that *dendrocalamus latiflorus* and *phyllostachys* belong to different bamboo species, therefore can not be regarded as the same bamboo species.

Bamboo is made up of underground stem, bamboo stalk, bamboo branch and bamboo leaves. The leaves of bamboo plants are usually long elliptic to conical needle shaped, midrib raised. The appearance of bamboo stalk is cylindrical and hollow jointed stems, part between the two joints is called the internode, the shape and length of internodes vary greatly, which is usually cylindrical, green, but some slightly square, some testudinate , some areatropurpureus, some are yellow or has striped.

Bamboo stalk is the most important part of bamboo. Bamboo wood usually refers to bamboo stalk, it is the most valuable part of bamboo. Internode hollow, call it the medullary cavity, the wall around the medullary cavity is called the bamboo wall. Bamboo wall is generally the most thick roots, to the upper gradually thinning.

Bamboo bark is the outer part of the pole wall, close organization, hard texture and strong toughness, smooth surface, leaves contain chlorophyll, so green. Tabasheer is the endothelium of the stalk wall, organization is relatively loose, texture is relatively fragile, color is generally light yellow; bamboo pulp is woody tissue

between bamboo bark and tabasheer.



Fig. 2. 1-stalk wall 2-tabasheer 3bamboo pulp 4-bamboo bar

3.2. Physical and mechanical properties of bamboo

The structure of bamboo determines the properties of bamboo, bamboo has many excellent properties: the density is small (usually 0.5-0.8 g/cm³); high strength, tensile strength and compressive strength are better than wood; toughness and flexibility, strong anti-bending ability, resistant to break; fine texture, smooth hard, straight texture, small shrinkage; bamboo is easy to split lengthwise, it can be sawing, planing, drilling, milling, and good adhesion; a good split, especially the bamboo bark, can be cut into thin slices and thin filaments, flexibility and strength. In addition, bamboo in the high temperature state will soften, under the action of the external force is easy to bend into a curve, cooling can be shape. This feature has brought convenience and features to bamboo furniture production and bamboo ornament.

Bamboo has not only beautiful texture, its mechanical strength, splitting good, easy to process, bamboo furniture product stability is good. According to some concerned researches show that the tensile strength of bamboo is 2-25 times that of wood, the compressive strength is 1.5-2 times that of wood. The tensile strength of steel is 2.5-3 times that of bamboo, but the density of bamboo is 0.6-0.8 kg / m³, if the unit weight is used to calculate the strength, the tensile strength of the bamboo unit weight is 3-4 times of that of steel.

Table 1. Test data of bamboo mechanical strength

Grain				
Tensile	Compression	Extrusion	Radial Compres- sion	Splitting
150	65	59	11.5	2.3

Stripes			Stripes extrusion		
Radial compression	chordwise compression	bending resistance	Tangential	Radial inner edge	Radial outward edge
10.6	20	1157	22.6	154	22.8

3.3. *The tools of draw material*

Broadsword. Broadsword has two kinds, one kind of ordinary blade, used for cutting bamboo, a knife edge is arched, on the inside. (As show in Figure 2.1A,B). Mainly used for chopping, cutting straight and light, is one of the main tools for bamboo furniture making.

Handsaw. Because of the use and size of materials are different, so the size of the saw is also different. The general saw length in 50-70cm. There are 4 kinds of saw tooth size, a saw tooth of 3.3 mm, specially designed for the preparation of materials, a serrated size moderate, pitch of 2mm, specially used for sawing bamboo and open mouth, a relatively small pitch, tooth spacing of 1.7mm, specially used for saw tableting bevel angle, there is a small sawing special used for saw lattice, pitch only 1.4mm. In the use of a handsaw, should keep the same direction, first in order to keep the mouth smooth, second is to protect the tools.

Scraper. Mainly used for scraping bamboo bark, scraper is “edge steel”. The knife face is arched, edge and back are arc, end with wooden handle, in order to facilitate the use of the operator.



Fig. 3. Traditional bamboo craftsman common tools

3.4. *The Principle of Draw Material*

Bamboo age. The production of small Yu bamboo furniture needs to choose a mature bamboo, 4-6 years old bamboo is the best, the bamboo fiber structure is compact, the material is thick and strong, the moisture content of bamboo is about

70%, and the shrinkage is small, the structure of the product is firm and durable. At the same time, according to the valid test data, 4-7 year old bamboo is less than 30% 1-4 year old bamboo pests. 1-4 year old bamboo is called young bamboo, its fiber structure is relatively loose, material is not strong. The bamboo moisture content is relatively high, a large shrinkage, the products structure is easy to loose, and also prone to moth.

Felling season. Spring is a pest mating and spawning season, therefore, this time cutting bamboo, bamboo moth rate will be as high as 40%. In the summer harvesting to bamboo, although nutrition consumption more, leading organization compact, hard material, not prone to moth. However, the processing performance of bamboo in summer is not good, so it is not suitable for cutting bamboo in summer.

Bamboo diameter. Select the diameter of 20-35mm *dendrocalamus affinis* as a skeleton structure making the small Yu bamboo ware. Like other parts of the panel and the brace can choose *phyllostachys pubescens* as raw material, the wall is thin in the upper part of bamboo, bamboo internodes longer, so we choose the upper parts of bamboo to make bamboo furniture, bamboo for make the skeleton should not be too bent.

3.5. Prepare the Material

Prepare material according to the design drawing after material selection??specific process requirements are as follows:

Calculation. According to the requirements of the drawings, calculate all Yu gap position, around bamboo and column bamboo should be avoided bamboo joint at around Yu point. Because the bamboo fiber structure is mesh, it will affect the effect of around Yu.

Machining allowance. Calculate the length of material required in accordance with the drawings before preparing the material, consider the production of the late structure, all materials must be reserved for 10-15mm machining allowance, the position of the Hua Mao structure reasonably extend the length of bamboo according to the depth of birch. In actual operation, in order to save the material according to the actual situation of reasonable arrangement of ingredients.

Bamboo storage. The site or warehouse for storing bamboo should be disinfected and sterilized in advance, in addition, bamboo storage should be kept in a cool and ventilated place, avoid direct sunlight.

4. Basic material handling

This section mainly includes grinding, burning oil, straightening, coloring and bamboo moth proof treatment four process, Because of burning oil and straightening are borrowed into the "small Yu bamboo skill crafts" inside the most important elements-fire.

4.1. *Bamboo Moth Proof Treatment*

Basic principle. The composition of bamboo mainly includes starch, fat, carbohydrate, protein, lignin and cellulose, these nutrients are easy to mildew and moth, causing mildew and moth proof in bamboo. The content of reducing sugar in bamboo is proportional to the degree of bamboo mildew, to prevent the bamboo mildew infestation, is to destroy the bamboo nutrition as much as possible, make mold and moth cannot survive. Bamboo mothproof treatment has two kinds of methods of physical and chemical treatment.

5. Conclusion

In the aspect of material selection, “small Yu bamboo skill crafts” retains the original characteristics of bamboo. The bamboo contains “hollow with joints”, “upright and outspoken” bamboo culture, This culture has been the largest embodiment. At the same time, because each round bamboo can not be exactly the same, so the objects made of bamboo will also show a unique shape, it can be said that the world can not find any two exactly the same small Yu works, greatly enhance the “Xiao Yu bamboo skill crafts” artistic value and economic value. In the whole process of draw materials are reflected in the “small Yu bamboo” close to nature and advocating the natural simplicity of environmental design concept.

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