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Preliminary Study on Value added Bamboo Handicraft Processing

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တန်ဖိုးမြင့်ဝါးလက်မှုပစ္စည်းထုတ်လုပ်ခြင်းနည်းပညာအားပဏာမလေ့လာခြင်း

အောင်စိုး၊ လက်ထောက်သုတေသနအရာရှိ
ခရစ္စတီနေဝင်း၊ လက်ထောက်သုတေသနအရာရှိ
စုစုလှိုင်၊ သုတေသနလက်ထောက် - ၂

စာတမ်းအကျဉ်း

သစ်မဟုတ်သောသစ်တောထွက်ပစ္စည်းတစ်ခုဖြစ်သည့် ဝါးသည် ကျေးရွာနေပြည်သူများ၏ လူမှုဘဝ ဖွံ့ဖြိုးတိုးတက်စေရန်နှင့် ဆင်းရဲမှု လျော့ချရေးလုပ်ငန်းများအတွက် အသုံးဝင်ပြီး အရေးပါသောပစ္စည်းဖြစ်သည်။ မိရိုးဖလာဝါးလက်မှုလုပ်ငန်းများမှ တန်ဖိုးမြင့် ဝါးထုတ်ကုန် ပစ္စည်းများ ထုတ်လုပ်လာခြင်းအားဖြင့် ကျေးရွာနေ ပြည်သူများ၏ လူနေမှု ဘဝကို မြှင့်တင်နိုင်မည် ဖြစ်ပါသည်။ နေရာဒေသအသီးသီးရှိ ဝါးလက်မှုပစ္စည်းများဖြင့် အသက်မွေးဝမ်းကြောင်းပြုသူများသည် မိရိုးဖလာနည်းများဖြင့်သာ ဆက်လက် လုပ်ကိုင်လျက်ရှိကြပါသည်။ မိရိုးဖလာနည်းစနစ်များကြောင့် ဝါးအသုံးအဆောင် ပစ္စည်းများသည် ပိုးစားခြင်း၊ ခြစားခြင်း၊ မှို၊ ဖားဥစွဲခြင်းနှင့် မူလအရောင်မှ တဖြည်းဖြည်း မှေးမှိန်လာပြီး ကာလတိုသာအသုံးပြုနိုင်သဖြင့် ဝါးလက်မှုပစ္စည်းများ တန်ဖိုး ကျဆင်းလျက်ရှိပါသည်။ သို့ဖြစ်ပါ၍ အဆိုပါ အခက်အခဲများကို ဖြေရှင်းနိုင်ပြီး တန်ဖိုးမြင့် ဝါးလက်မှုပစ္စည်းများ ထုတ်လုပ်နိုင်သည့် နည်းလမ်းများကို အသုံးပြုနိုင်ရေးအတွက် နှီးလက်မှု လုပ်ငန်းများ လုပ်ကိုင်နေသည့် နေရာဒေသလေးခုတွင် အများဆုံး အသုံးပြုလျက်ရှိသော ဝါးဖြူ၊ ဝါးသခ်ိ (သို့) မယ်သခ်ိ၊ တင်းဝါး၊ ကရင်ဝါး၊ ဝါးဘိုး၊ ဝါးဖယောင်း၊ ဝါးနက်၊ တလက္ကဝါးနှင့် သိုက်ဝါး တို့ကို သစ်တောသုတေသနဌာန၊ သစ်အသားသေဌာနစိတ် ဓါတ်ခွဲခန်းတွင် ဝါးနှီး အရွယ်အစား အမျိုးမျိုးကို ဟိုက်ဒြိုလျင်ပါအောက်ဆိုဒ်ပြင်းအား အမျိုးမျိုးဖြင့် သတ်မှတ် အပူချိန်တွင် ရေဆွဲစိမ်ခြင်း၊ ရေနွေးနှင့်ပြုတ်ခြင်း၊ ရေနွေးငွေ့ဖြင့်ပေါင်းခြင်းစသည့် နည်းသုံးမျိုးဖြင့် စမ်းသပ်ဆောင်ရွက်ထားပြီး စမ်းသပ်တွေ့ရှိချက်များအရ အပူချိန် ၈၀ မှ ၁၀၀ ဒီဂရီစင်တီဂရိတ်နှင့် ဟိုက်ဒြိုလျင်ပါအောက်ဆိုဒ် ရာခိုင်နှုန်း ၆ မှ ၁၀ ရာခိုင်နှုန်း ပြင်းအားနှင့် ပြုပြင်ထားသော ဝါးနှီးများဖြင့် ပြုလုပ်ထားသည့် ပစ္စည်းများသည် မှိုစွဲခြင်း၊ ဖားဥစွဲခြင်း၊ ပိုးစားခြင်း၊ ခြစားခြင်းတို့ကို ကာကွယ်နိုင်ရုံသာမက မူလအရောင်ထက် တောက်ပကြောင်းတွေ့ရှိရပါသည်။

Preliminary Study on Value Added Bamboo Handicraft Processing

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Abstract

Among minor forest products, Bamboo is one of the most versatile forest products to develop the rural community and to alleviate the poverty of the rural poor. To enhance the life of rural poor, traditional bamboo handicrafts can be changed to value added bamboo handicrafts by using the modern processing techniques and by the production of value added bamboo handicrafts. People who survive by buying and selling of bamboo handicrafts in everywhere are still using in the old traditional style of processing and production of its various bamboo handicrafts. In making the competing of bamboo handicrafts in the market, the application of an appropriate finishing technology is important. Without using the appropriate finishing technology, bamboo handicrafts becomes susceptible to attack by fungi and insects, resulting in degraded performance, shortened service life, and reduced value. At present to provide the material to lighten up its surface with a more uniform colour and conceal defects such as stains or blemishes bleaching is applied as a pre-treatment prior to the application of finishes. Nine species of bamboo which are made the various kinds of bamboo handicrafts were tested by using the different concentration of hydrogen peroxide (H_2O_2) with three different methods in this study. Testing of soaking, boiling and steaming with H_2O_2 on nine species of bamboo in 4%,6%,8%,10%,12% solution of hydrogen peroxide with temperature maintained at 60° C, 70° C , 80° C , 90° C, 95° C and 100° C, the results of soaking in 6-10% solution of hydrogen peroxide and boiling in 6-10% solution of hydrogen peroxide at the temperature of 80°C - 95°C in a steal tank and steaming in 6-10% solution of hydrogen peroxide at the temperature of 90°C ,100°C effected on the brightness of colour without moulding, mildewing, insect attack and fungi.

Keywords: Bamboo, Boiling, Hydrogen peroxide, Soaking, Steaming

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1. Introduction

Bamboo is a perennial plant known for its economic, aesthetic and environmental importance. Bamboo occurs naturally in Myanmar and includes (102) species in (23) genera. It has been a valuable resource both economically and socially in Myanmar society for a long time. Rural people are especially related to bamboo processing and utilization directly and indirectly. Since time immemorial, in the Myanmar and other Southeast Asian Countries, bamboo has been traditionally associated with livelihood, providing human needs for housing, implements for agriculture and fishing, furniture, handicraft, paper and for many other uses including food. Nowadays, bamboo has great potential to upgrade the living standard of the rural poor and to increase the economic value of bamboo handicrafts through development of the technical knowhow on modern processing techniques in the production of high quality value added products.

Bamboo products are all made by hand in the old traditional style of processing and production in some villages of Myanmar. The selling point of handicrafts is on the appearance. It refers to what is seen and may include lines, shapes, colours and others. The natural look of these products has always been a strong preference among consumers of not only in the domestic market but also in the export market. In making the bamboo products for competing in the global market, the application of an appropriate finishing technology is important. Without using the appropriate finishing technology, bamboo handicrafts become susceptible to attack by fungi and insects, resulting in degraded performance, shortened service life, and reduced value. At present the provision of the material to lighten up its surface with a more uniform colour and conceal defects such as stains or blemishes, bleaching is applied as a pre-treatment prior to the application of finishes. Bleaching process is the application of an oxidizing agent to remove the natural colouring of the material. Among the available methods, application of hydrogen peroxide (H_2O_2) with a concentration of 30%-50% is the simplest, effective and non-polluting method. In this paper findings on nine species of bamboo which are made into variety of bamboo handicrafts and treated with 30% concentration of hydrogen peroxide (H_2O_2) solution were presented.

1.1 Objectives

1) To study the appropriate concentration of hydrogen peroxide for various sizes of bamboo slivers and strips
2) To disseminate the technique of bleaching with hydrogen peroxide as pre-treatment process to lighten or brighten up and remove fungal stains in the surface of bamboo handicrafts for the small - scale enterprises

1.2 Literature Review

Bamboo is a natural organic matter like wood; both of them are heterogeneous and anisotropic material. But there are significant differences in morphology, structure and chemical composition between them, demonstrating specific physic-mechanical properties. In comparison with wood, bamboo has enough strength, great toughness and high rigidity, and it can be processed easily. For this reason bamboo material is widely utilized. There are strong points generally speaking, but they may turn into shortcomings from certain other angle. Therefore it is necessary to understand them thoroughly for successful utilization of bamboo resources. Bamboo material has straight grain. It can be cleaved into thin splits (several micron in thinness) easily with simple instruments. The splits can be used to weave handicrafts of different patterns, furniture, agricultural tools and articles of unique shapes through baking. Bamboo material is of light color, it can be bleached and colored easily. Raw bamboo can also be used directly in building industry making fishing rod and other products.

Bamboo contains more nutrients for insects and fungi. These organic matters are protein (1.5~6.0%), carbohydrate (± 2.0%), starch (2.0~6.0%) fat and wax (2.0~4.0%). Under the conditions of proper temperature and humidity bamboo is apt to be attacked by insects and fungi. Main insect pests are bamboo beetle, termite and bamboo wasp. The most serious damage is by bamboo beetle, rottenness and mildew are by fungi. Mildew is apt to take place under high humidity and high temperature with poor ventilation. Many tests showed that the durability (resistance to aging) of untreated is lower (Z.Qisheng, J.Shenxue, T.Yongyu; 2001).

The basic density of bamboo material (whole stem weight\green bamboo volume) is in the range of 0.40~0.80 (0.9)g/cm^3. This mainly depends on the density of vascular bundles and their composition. As a rule, the density of bamboo stem increases from inner to outer part and from lower to upper part. The density of inner layers of stem wall increases with the growth of stem and thinning of wall, while the outer layers only change slightly. The density of nodes is higher than that of inter-nodes (Z.Qisheng, J.Shenxue, T.Yongyu; 2001).

The moisture content of growing bamboo is rather high, it depends on different seasons and species. The average moisture content of *Phyllastachys pubescence* at the cutting age is approximately 80% (Z. Qisheng et al, 2001). The equilibrium moisture content of bamboo material after air seasoning changes in connection with atmosphere temperature and humidity. The equilibrium moisture content of *Phyllastachys pubescence* in Beijing area is 15.7% (Z. Qisheng et al, 2001).

The water content of disinfected-bleached bamboo threads is quite high, it should be reduced to 10-12% by means of artificial drying. In general, they are dried by air drying. In order to economize on energy resource and shorten the time of drying, it is possible to combine the kiln drying with air drying (Z. Qisheng et al, 2001). Dry shrinkage of bamboo is resulted from water evaporation in the drying process after cutting. The dry shrinkage varies in different directions. From air seasoning to full drying when the moisture content decreases 1% the average shrinkage rate of *Phyllostachys pubescence* is as follows; lengthwise 0.024%, tangential 0.1822%, radial 0.1890% (on node parts 0.2726%, on inter-node parts 0.1521%), (Z. Qisheng et al, 2001). It is clear that the lengthwise shrinkage is much less than crosswise shrinkage, the tangential shrinkage is similar to radial shrinkage. (Z. Qisheng et al, 2001).

2. Materials and Methods

This study was conducted in Bagan, Nyaung Oo Township in Mandalay Region, Yekyi, Ngathaing Chaung Township in Ayeyawady Region, Thantwe Township in Yakhaing State and Naung Cho Township in Shan State where the variety of bamboo handicrafts are produced.

Nine species of bamboo namely; 1) Wa phyu (*Dendrocalamus membranaceus*), 2) Wa-tin-hka or Mal-tin-hka (*Cephalostachyum pallidum* Munro), 3)Tin wa (*Cephalostachyum pergracile* Munro), 4) Kayin wa (*Melocanna baccifera* Kurz), 5) Wabo *(Dendrocalamus giganteus),* 6) Wa-payaung (*Dendrocalamus brandisii* Kurz), 7) Wanet *(Bambusa vulgaris* Schrad. Ex Wendl.), 8)Telagu wa (*Dendrocalamus longispathus*), 9) Thaikwa *(Bambusa tulda* Roxb) were collected from the relevant four sites in two regions and two States.

Three bamboo culms of different sizes from each species were collected. Then each culm was cut into three 3-feet (0.914m) long portions such as bottom, middle, top portion before splitting into sticks and slivers.

Some of the bamboo culms were cut into various sizes of bamboo sticks and slivers in these studies sites. Then they were transported into the Timber seasoning Lab, in the Forest Research Institute and tested by using the different concentration of hydrogen peroxide (H_2O_2) with three different methods as follow. Firstly, before testing with the hydrogen peroxide (H_2O_2), bamboo strips and slivers were kept in clean water for a few minutes to avoid colour-change.

Boiling and steaming methods are employed for lacquer wares products in Nyaung Oo Township. Bamboo handicrafts that are made by bamboo slices are applied by using steaming method for Yekyi Township. Boiling method is used for making bamboo curtain which is made by bamboo stick in Thantwe Township. Boiling process is conducted for making bamboo waving in Yephyu village in NaungCho Township.

2.1. Hydrogen Peroxide Soaking Method

1) Mix 30% concentration of hydrogen peroxide (H_2O_2) solution with water using a proportion of 6 to 10% H_2O_2 (e.g. 60ml to 100ml H_2O_2 for every 1 litre of water).
2) Dip bamboo strips into the mixture and allow them to soak.
3) Use bricks to hold down bamboo strips in the liquid to prevent them from floating.
4) Allow the strips to soak for 24-38 hours and then wash them with water.
5) Dry the strips in a shaded area.

2.2. Hydrogen Peroxide Boiling Method

1) Mix 30% concentration of hydrogen peroxide (H_2O_2) solution with water using a proportion of 6 to10% H_2O_2 (e.g. 60 ml to 100ml H_2O_2 for every 1 litre of water).
2) Dip the bamboo strips into the mixture and boil the mixture for approximately 15-30 minutes, or until they are fully bleached.
3) Use bricks to hold down bamboo strips in the mixture to prevent them from floating.
4) During the boiling process turn the strips over twice so that both sides of the strip are bleached properly.
5) After bleaching, wash the strips with water.
6) Allow the strips to dry in a shaded area.

2.3. Hydrogen Peroxide Steaming Method

1) Mix 30% concentration of hydrogen peroxide (H_2O_2) solution with water using a proportion of 6 to10% H_2O_2 (e.g. 60 ml to 100ml H_2O_2 for every 1 litre of water).
2) The hydrogen peroxide solution is placed in a big container.
3) A shelf is then placed above that container.
4) Specimens to be treated are placed on the shelf.
5) The whole unit, including the container, shelf and the Specimens were covered by a coverall in order to prevent the leakage of hydrogen peroxide steam.
6) Then the hydrogen peroxide container is heated 5 to 8 mins, or until they are fully bleached.
7) Dry the handicrafts and hats in a shaded area.

To observe the changes of colour and effects on the unbleached and bleached of bamboo sticks and slivers; 30 number each of bamboo sticks and slivers from top, middle, base portions of nine bamboo species without using hydrogen peroxide solution were kept in room temperature of Timber Seasoning Section and checked once a week for 6 months.

Bamboo handicrafts such as table lamps, trays, flower pots, handset stand, tissue box, kitchen tools, traditional hats, various size of bamboo curtains, etc. were produced in the study areas by the tested bamboo sticks and slivers based on the results that were obtained from the laboratory.

3. Results and Discussions

3.1. Laboratory Test

In testing thirty number of bamboo sticks and slivers without using hydrogen peroxide solution at room temperature, it was found that moulding, mildewing, reduction in the brightness of colour and fungi attacks occurred during 3 to 6 months.

Testing of soaking, boiling and steaming with H_2O_2 on nine species of bamboo in 4%,6%,8%,10%,12% solution of hydrogen peroxide with temperature maintained at 60° C, 70° C , 80° C , 90° C, 95° C and 100° C, the results of soaking and boiling in 6-10% solution of hydrogen peroxide at the temperature of 80° C - 95° C in a steal tank and steaming in 6% to 10% solution of hydrogen peroxide at the temperature of 90° C ,100° C showed that there was brightness of colour without moulding, mildewing, insect attack and fungi.

3.2. Processing

3.2.1. Nyaung Oo Township

In Nyaung Oo Township, various kinds of lacquer ware products are produced since time immemorial. Wa phyu (*Dendrocalamus membranaceus*), Wa-tin-hka or Mal-tin-hka (*Cephalostachyum pallidum* Munro), and Tin wa (*Cephalostachhyum pergracile*) from the natural forest of the upper Chindwin Katha are used as raw material. Lacquer wares products are made by gluing. Using the PU comporent Adhesive 1B-971 Germany and Cyanoachylate Adhesive FH-Bond 502 Haifeng China which has high quality standard in gluing is more effective in maintaining the glue bond quality and strength properties for steaming process because of bamboo raw materials after bleaching with hydrogen peroxide are low in gluing quality. The following studies resulted in a more beautiful and bright appearance without damaging mould and insect attack on the various sizes of bamboo sticks and slivers that were employed in the three different tests. Table 1and 2 show the detail of the study.

Table (1) Time and suitable concentration of hydrogen peroxide in three different methods for bamboo slivers

Township	Bamboo Species		Size mm	Suitable conc. of H_2O_2	Treating Time		
	Local Name	Scientific Name			Soaking in water (hours)	Boiling water (minutes)	Steaming (minutes)
Nyaung Oo	Wa phyu	*Dendrocalamus membranaceus*	0.15 to 0.30	6%	34	14-16	5-8

	Wa-tin-hka	*Cephalostachyum pallidum*	0.15 to 0.30	6%	36	14-18	5-8
	Tin wa	*Cephalostachyum pergracile*	0.15 to 0.30	6%	36	14-15	5-8

Table (2). Time and suitable concentration of hydrogen peroxide in three different methods for bamboo sticks

Township	Bamboo Species		Size mm	Suitable conc. of H_2O_2	Treating Time		
	Local Name	Scientific Name			Soaking in water (hours)	Boiling Water (hours)	Steaming (minutes)
Nyaung Oo	Wa phyu	*Dendrocalamus membranaceus*	1.8 to 5.0	6-8%	38	2	15-20
	Wa-tin-hka	*Cephalostachyum pallidum*	1.8 to 5.0	6-8%	48	2.5	15-20
	Tin wa	*Cephalostachyum pergracile*	1.8 to 5.0	6%	42	2	15-20

3.2.2. Yekyi, Ngathaing Chaung Township

Yekyi, Ngathaing Chaung Township is situated near the river of Ngawun. In this Township, out of 38 village tracts, 30 village tracts are living on bamboo weaving and craft making for their livelihood. Each village specializes in a few specific items. So remarkable is the growth of the bamboo small scale production that each village creates distinct weaving patterns of its own. The craft makers use mainly Tin wa (*Cephalostachyum pergracile* Munro) because it is more flexible than Wanet*(Bambusa vulgaris*), Kayin wa(*Melocanna baccifera*) and Telagu wa (*Dendrocalamus longispathus*). But they have to buy Tin wa (*Cephalostachyum pergracile* Munro) from Ingapu Township due to the scarcity of this bamboo raw materials in their region.

Species such as Kayinwa (*Melocanna baccifera*), Telaguwa (*Dendrocalamus longispathus*), Wabo (*Dendrocalamus giganteus*) are used for making other local use bamboo products and only Tinwa (*Cephalostachyum pergracile*) species is mainly used for making bamboo hats in Yekyi. The bamboo hats producers used one year old Tinwa (*Cephalostachyum pergracile* Munro) as it is more flexible and easy to weave. The following tables 3 and 4 show the detail of the study.

Table (3). Time and suitable concentration of hydrogen peroxide in three different methods for bamboo slivers

Township	Bamboo Species		Size mm	Suitable conc. of H_2O_2	Treating Time		
	Local Name	Scientific Name			Soaking in water (hours)	Boiling water (minutes)	Steaming (minutes)
Yekyi, NgathaingChaung	Kayinwa	*Melocanna baccifera*	0.18 to 0.30	6%	30	14-18	7-10
	Wabo	*Dendrocalamus giganteus*	0.18 to 0.30	8%	35	14-18	5-8
	Telaguwa	*Dendrocalamus longispathus*	0.18 to 0.30	8%	48	14-20	5-10
	Tin wa	*Cephalostachyum pergracile*	0.18 to 0.30	6%	36	14-15	5-8

Table (4). Time and suitable concentration of hydrogen peroxide in three different methods for bamboo sticks

Township	Bamboo Species		Size mm	Suitable conc. of H_2O_2	Treating Time		
	Local Name	Scientific Name			Soaking in water (hours)	Boiling water (hours)	Steaming (minutes)
Yekyi, Ngathaing Chaung	Kayinwa	*Melocanna baccifera*	1.5 to 3.0	6-8%	48	2	10-15
	Wabo	*Dendrocalamus giganteus*	1.5 to 3.0	6-8%	50	2.5	10-15
	Telaguwa	*Dendrocalamus longispathus*	1.5 to 3.0	6-8%	50	2.5	5-10
	Tin wa	*Cephalostachyum pergracile*	1.5 to 3.0	6%	36	2	5-8

3.2.3. Thantwe Township

In Thantwe Township, the native species namely Wabo (*Dendrocalamus giganteus*), Kayinwa (*Melocanna baccifera*) and Wapayaung (*Dendrocalamus Brandisii* Kurz)are used as raw materials in making various kind of bamboo curtains. Table 5 shows the detail of the study for Thantwe Township.

Table (5). Time and suitable concentration of hydrogen peroxide in three different methods for bamboo sticks

Township	Bamboo Species		Size mm	Suitable conc.of H_2O_2	Treating Time		
	Local Name	Scientific Name			Soaking in water (hours)	Boiling water (hours)	Steaming (minutes)
Thantwe	Wa bo	*Dendrocalamus giganteus*	1.8 to 3.0	6-8%	50	2	-

	Kayinwa	*Melocanna beccifera*	1.8 to 3.0	6-8%	48	2	-
	Wa-payaung	*Dendrocalamus brandisii*	1.8 to 3.0	6%	24	1	-

3.2.4. Naung Cho Township

Naung Cho Township in the Shan State is a region where corn, beans, paddy, garlic and tomato are cultivated yearly. Peasants from Ya-phyu village in Naung Cho Township had been using Danu traditional bamboo hats while caltivating their crop since over seventy years ago. Thaikwa (*Bambusa tulda* Roxb.) and Wanet (*Bambusa Vulgaris*) are used as raw materials in making these Danu traditional bamboo hats. Table 6 shows the detail of the study for Naung Cho Township.

Table (6). Time and suitable concentration of hydrogen peroxide in three different methods for bamboo slivers

Township	Bamboo Species		Size mm	Suitable conc. of H_2O_2	Treating Time		
	Local Name	Scientific Name			Soaking in water (hours)	Boiling water (minutes)	Steaming (minutes)
Yephyu village	Thaikwa	*Bambusa tulda*	0.15 to 0.18	6%	38	14-20	5-8
	Wanet	*Bambusa Vulgaris*	0.15 to 0.18	6%	38	14-20	5-8

4. Conclusions

It could be concluded that a solution with 6% to 8% hydrogen peroxide (H_2O_2) would be a suitable bleaching condition for various bamboo species in order to obtain the brightness of colour, less in mould damage and insect attacked.

When comparing between bamboo handicrafts in domestic market, it was found that the untreated bamboo handicrafts were infected with mould and mildew, and there was a reduction in the brightness of colour during 6 months whereas, the treated ones were not infected with mould nor mildew. Moreover, the brightness in colour lasted for one and a half year.

Value Added of Souvenir from Nyaung Oo Township

Value Added of Souvenir and Bamboo hats from Yekyi, Ngathaing Chaung Township

Value Added of Danu Bamboo hats from Naung Cho Township

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