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DEMONSTRATION AND APPLICATION OF PRODUCTION AND UTILIZATION TECHNOLOGIES FOR RATTAN SUSTAINABLE DEVELOPMENT IN THE ASEAN MEMBER COUNTRIES
[ITTO-Philippines-ASEAN Rattan Project]

Technology Guide No. 05

BLEACHING AND FINISHING OF RATTAN

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ANNEX A

Some success stories using the technology with varying concentration of the chemical compositions are the following:

The Dela Cruz House of Piña of Kalibo, Aklan increased their export revenue by USD 2 M in 2004 when they adopted the technology in their nito products.

The Riverside Handicraft Association of Baghao, Ilaya, Gasan, Marinduque has accepted an export order which needed a white vine as raw material in their handicraft products. They used nito and bleached it using the technology.

Lately Detasie Footware Factory and Melenoll's Report based in Carcar, Cebu improved their used of jute fibers when they adopted the technology. In the same place in Cebu, Cyprea Inc. which manufacture fashion accessories have also adopted the technology in their wooden beads.

Another is the Action Design Product Development Services Inc. of Burul Purok I Brgy. Biluso, Silang, Cavite adopted the technology in their buri and coco midrib to be exported to Europe.

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Bleaching and Finishing of Rattan Poles/Wickers

INTRODUCTION

Gifts, toys and handicrafts (GTH) manufacturers constitute the leading users of non-wood forest products (NWFPs) such as bamboo, rattan, twigs, fibers and various vine species for export. The selling point of handicrafts is on the appearance. It refers to what is seen and may include lines, shapes, colors and others.

The natural look of these products has always been a strong preference among consumers. In the export market, consumers prefer the natural appearance of the materials used. To make our products compete in the global market, the application of an appropriate finishing technology is important. Finishing is the final stage in the manufacture of furniture and handicraft. It covers all the operations involved in the application of transparent or opaque liquid coatings in order to preserve and accentuate the figure of the raw material to conceal undesirable imperfections resulting in improved appearance of the product. At present to provide the material with a more uniform color and conceal defects in the raw materials such as stains or blemishes bleaching is applied as a pretreatment prior to the application of finishes. Bleaching of rattan poles is not a new process. It has been used by some rattan manufacturers to lighten up its surface. Aside from the preservation and

and treatment to control the occurrence of blemishes caused by staining fungi, good finishing can improve the color of stain infected poles. Others bleach their materials to remove stains caused by staining fungi which generally attack rattan poles or wickers after harvest.

Rattan wickers are in great demand for furniture and handicrafts for the manufacture of baskets and other novelty items for domestic and export markets. Export markets of rattan products are the United States, Japan, Australia, United Kingdom and France. The exportation of rattan furniture and handicrafts have assumed considerable importance in the international market because of its unique and attractive appearance. However, exported rattan products are sometimes rejected due to the presence of defects such as stains and blemishes caused by staining fungi. This is a serious problem the rattan industry has to cope with.

RATIONALE

Bleaching process is the application of an oxidizing agent to remove the natural coloring of the material. Technical grade hydrogen peroxide (H_2O_2) with a concentration of 50% is extensively used as bleaching agent. It is effective

PRICE OF CHEMICALS AND FINISHING MATERIALS AND ADDRESSES SUPPLIERS

Price/Units 2006 Php/US$	Chemical/Finishes and other Materials	Address
P1,400/carboy US$28/cby P180-100/li P260/li 2.0-3.6 US$5.2/li	Hydrogen peroxide (50% Technical Grade) Sodium Silicate Tergitol	Chemical Scientific Enterprises #28 Law St., Victoria Subd., Tandang Sora, Quezon City Tel. # 02-984-1198 Fax # 02-084-1201 or RTC Supply House 11 Rimas St., Proj. 2, Q.C. Tel. # (02)433-7759 Fax #0-922-0293
P2,750/bag of 25 kg US$55/25k	Disodium Octaborate Tetrahydrate (DOT)	Connel Bros. Co., Pilipinas, Inc. 4th Floor Agustin Bldg. Emerald Ave., Ortigas Center Pasig City Tel.#02-633-4617 to 20 Fax# 02-633-4088;634-7225
P35-45/ft US$0.7-0.9/ft	Sanding paper, grit #100	Available at any given hardware
P10/pc US$0.2/pc	Sanding paper grit 180, 320	-do-
P450/gal US$9/gal	Sanding sealer	-do-
P480/gal US$9.6/gal	Clear gloss lacquer	-do-
P200/gal US$4/gal	Thinner	-do-
P145-150/liter US$2.9-3.0/li	NGR penetrating wood stain	-do-
P110/liter US$2.2/li	Oil wood stain	-do-
P60-65/print US$120-1.3/pint	Oil tinting color	-do-

COST OF BLEACHING STAINED RATTAN

Cost of 10 liters of Bleaching Solution; for 20 rattan pole/wicker

1.Slightly & heavily stained core and wicker

Chemicals	Slightly stained Php/US$ 2006	Heavily stained Php/US$ 2006
Hydrogen peroxide	7.00 / 0.114	7.00 / 0.114
DOT	11.00 / 0.22	11.00 / 0.22
Sodium silicate	20.00 / 0.40	30.00 / 0.60
Surfactant or wetting agent	5.20 / 0.104	5.20 / 0.104
Total	43.20/ 0.864	53.20 / 1.064
Cost/pole	2.16/ 0.0432	2.66 / 0.0532

2. Slightly stained pole & wicker or heavily stained poles

Chemicals	Slightly stained Php/US$ 2006	Heavily stained Php/US# 2006
Hydrogen peroxide	14.00 / 0.28	21.00 / 0.92
DOT	11.00 / 0.22	11.00 / 0.22
Sodium silicate	20.00 / 0.40	30.00 / 0.60
Surfactant or wetting agent	5.20 / 0.104	5.20 //0.104
Total	50.20 / 1.004	67.20 /1.394
Cost/pole	2.16 / 0.0432	2.66 /0.0532

and non-polluting. There are several bleaching agent available in the market, i.e., the commercial wood bleach which is available in 2 solutions as Solution 1 or A and Solution 2 or B. Solution 1 is sodium hydroxide and Solution 2 is hydrogen peroxide. Another is the sodium hypochlorite or commercially known as zonrox. This contains chlorine which is found carcinogenic when used for a long time and is not environment friendly. However, most important requisites for successful peroxide bleaching are alkaline conditions to ensure adequate supply of perhydroxyl anions and the presence of peroxide stabilizers. Effective bleaching involves maximizing the 2 reaction stages, i.e., oxidation of lignin and other coloring matter and oxidation (Herbert 1963) of cellulose and hemicellulose to bring about development of high stable brightness, without loss in weight and least damage in strength.

In this technology, the main source of alkaline are disodium octaborate tetrahydrate (DOT) and sodium silicate, which besides providing alkalinity also buffers the bleach solution in the proper pH range. Sodium silicate also inactivates metal cations present and reduces peroxide decomposition. Under optimum ratio of DOT and sodium silicate concentration of 1:3 efficient bleaching and complete removal of stains is obtained. Surfactant or wetting agent is also added to enhance the penetration of the chemicals into the sample. It is a non-ionic alkyd-phenylpolyethylene-glycoether wetting agent which

do not react with hydrogen peroxide.

It is important to emphasize that alkali and peroxide levels must be properly balanced to ensure that small amounts of their residues are present towards the end of the bleaching process. If total alkali is completely consumed, perhydroxyl anions will not be produced and no further bleaching will occur. On the other hand if peroxide is totally exhausted while alkali is still present, the cellulose material loses its brightness through color reversion or yellowing (Allison 1983). This is in this regards, that hydrogen peroxide is added when the solution is already boiling. This is to a allow the complete oxidation of lignin and other coloring matter, first before the oxidation of the cellulose and hemicellulose.

FINISHING OF RATTAN POLES

The basic finishing processes involved are the following:

» Sanding - This is the most important operation in preparing a sample for a finish. Proper sanding calls for starting with a coarse sand paper and finishing with finer ones. This is called the sanding schedule or the use of different grit to achieve smooth surface. It is important to sand along the grain of the wood, not across it, as this may result in scratches which can be brought out by stain as ugly undesirable lines. Sanding schedule for rattan pole is grit no. 100-180-320.

SAFETY PRECAUTIONS SHOULD BE PRACTICED STRICTLY IN THE PREPARATION, HANDLING CHEMICALS AND IN BLEACHING AND FINISHING PROCESS.

In every steps in the bleaching and finishing procedure the worker should always wear body protection i.e., mask, gloves and laboratory gown or apron.

Wash with soap and water any part of the body which had been in contact with the chemicals.

INFORMATION ABOUT THE WASTEWATER FROM BLEACHING

1. The use of technical grade hydrogen peroxide with concentration of 50% is non- polluting.
2. The disodium octaborate tetrahydrate known as preservative is used at its minimum of 1% which is still allowable for disposal to the sewerage.
3. After one (1) hour of bleaching treatment chemicals are already used up and no longer available in the solution.
4. 6% alum maybe added to bring the pH to 5-6 to neutralized the solution before disposing in the sewerage.

c. Straight Finish of Bleached Rattan Pole, Core/Wicker

» Sand lightly the surface using fladder- type portable sander with grit no. 180, until desired smoothness is attained.

» Spray a coat of sanding sealer. Slightly sand with fladder- type portable sander with grit no. 320. Clean.

» Spray 3-4 coats of NC lacquer top coat.

Unbleached rattan core

Bleached rattan core

Unbleached rattan pole

Bleached rattan pole

For rattan core sanding schedule is starting with grit no. 150 to 220.

» Dust off - A final wipe with a tack cloth is advisable to remove any remaining particles present and dust attraction due to static electricity.

» Stain - These are coloring matters or pigments suspended in a vehicle. The vehicle determines the types of stain such as water stain, oil stain and lacquer stain. This is applied to produce a uniform, overall tone and produce a desired color or figure. Stain is use primarily to produce color rather than to produce a protective coating on the surface. These are generally applied once.

» Sealer - are formulated from nitrocellulose resin called silex and nitrocellulose lacquer as solvent. Sealers are applied as base coat to stop the absorption of succeeding coats, to produce high build and for quick drying. The operation of sealing rattan surface is called “wash coating.”

» Topcoat - This is the application of final coat such as varnish, lacquer, and polyurethane lacquer.

Information on the different topcoats

Type of topcoat	Mode of Application	Number of coats	Drying Time
NC Lacquer	Muñego Brush Spray	3-5	15 - 20 min to recoat 30-45 min dry hard
PU	Spray only	1-2	30-45 min to re-coat 4-8 hrs. dry hard

OBJECTIVES

At the end of the course, the participants would be able to explain and perform the finishing of rattan with bleaching as pretreatment process to lighten or brighten up and remove fungal stains in rattan surface.

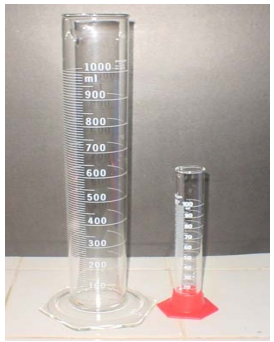
METHODOLOGY

A. Bleaching and Finishing Tools/ Equipment

» Bleaching tools/Equipment

Vat (stainless steel)

Stove



Weighing scale (1 kg capacity)

Wooden ladle

Measuring cylinder

» Finishing tools/Equipment

Water Filter

Air compressor/airhose

Spray gun

Sander (disc, fladder type)

b. Full NGR Finish of Bleached and Unbleached Rattan Core/Wicker

» Sand surface using fladder- type portable sander with grit no. 180. Clean.

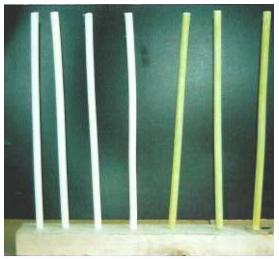
» Spray stain of desired color. Let dry.

» Spray a coat of sanding sealer. Lightly sand with fladder-type portable sander with grit no. 320. Clean.

» Spray toning color to even the color of the surface. Let dry.

» Spray 2-3 coats of NC lacquer top coat (clear gloss lacquer).

» Spray a final coat of flat or semi flat top coat if dull finish is required.



Bleached-NGR Stained core

Unbleached-NGR Stained core

Bleached wicker

NGR-Stained wicker

4. Preparation of Rattan Poles for Finishing

a. Full NGR Finish of Bleached and Unbleached Rattan Pole

» Sand surface using grit number 180, until desired smoothness is attained.

» Spray stain on the surface. Dry.

» Spray a coat of sanding sealer. Let dry. Lightly sand the surface using grit no. 320. Clean.

» To build-up coat, do the muñego technique until desired build-up of coat is achieved.

» Spray toning color to even the color of the surface.

» Spray 2-3 coats of NC lacquer top coat (clear gloss lacquer).

» Spray a final coat of flat or semi flat top coat if dull finish is required.

Staining

Sealing

Topcoating

Brush

Blow torch

» Finishing Materials

Sanding paper (grit #100, 180, 320)

Sanding sealer

Clear gloss lacquer

Oil stain (pigment stain)

NGR stain (dye stain)

Tinting color in oil

Lacquer thinner

Paint thinner

Gasoline

» Chemicals

Hydrogen peroxide (H_2O_2)

Sodium silicate ($NaSiO_3$)

Disodium octaborate tetrahydrate (DOT)

Surfactant or wetting agent

» Other Materials

Rubber gloves

Apron

Plastic basin

Plastic pail

Cotton rag (white)

B. Procedure:

1. Preparation of Chemicals for Bleaching

Table 1. Guide in the Preparation of Chemicals for Bleaching

1.Slightly & heavily stained core and wicker		
	Amount	
Chemicals	Slightly stained	Heavily stained
Hydrogen peroxide	10 gm	10 gm
DOT	10 gm	10 gm
Sodium silicate	20 gm	30 gm
Surfactant or wetting agent	2 ml	2 ml
Water	1000 ml	1000 ml
2. Slightly stained pole & wicker or heavily stained poles		
	Amount	
Chemicals	Slightly stained*	Heavily stained
Hydrogen peroxide	20 gm	30 gm
DOT	10 gm	10 gm
Sodium silicate	20 gm	30 gm
Surfactant or wetting agent	2 ml	2 ml
Water	1000 ml	1000 ml

*For wicker and core to have a higher brightness

Note: To compute 10 liters of bleaching solution, multiply all components by 10X

» Immerse the rattan core and wicker fully.

» When boiling add H_2O_2 and maintain for 45 minutes for slightly stained samples and 60 minutes for heavily stained.

» Remove the samples and wash with water until the smell of H_2O_2 is removed.

» Dry under the sun.

For unstained poles/wicker or when the objective is only to lighten up the surface, the concentrations of the different chemicals is the same but application time maybe shorter. (For unstained pole 30 – 45 minutes; For unstained core/wicker 25 – 30 minutes)

Bleached and unbleached slightly stained poles

Bleached and unbleached heavily stained poles

Bleached and unbleached slightly stained core/wicker

Bleached and unbleached heavily stained core/wicker

3. Preparation of Core and Wicker for Bleaching

» Sand lightly with grit no. 180

» Dust off surface and wipe with clean cotton rag

» Sort according to length, diameter and color

» Compute for liquor ratio (LR). The proportion of the weight of material in kilogram to the volume of water in liters (appropriate LR is when the material is fully submerged in the solution).

» Weigh chemicals based on the type of wicker and core as required in Table 1.

Weighing of DOT

Weighing of $NaSiO_3$

» Dissolve the different chemicals except H_2O_2 in a known volume of water. Dissolve completely then fill up to the desired volume.

» Mix thoroughly and heat to 40^0C. (Two (2) burner gas stove or charcoal- fired stove maybe used)

Mixing of chemicals except H_2O_2

2. Preparation of Rattan Poles for Bleaching

> Scrape the surface with an appropriate scraper (drawback, bolo, knife)

Scraping of poles

Sanding of Poles

» Sand surface thoroughly using grit #100.

» Dust off surface and wipe with clean cotton rag.

» Sort according to length, diameter and color.

Sorting

» Compute for liquor ratio

(LR). The proportion of the weight of material in kilogram to the volume of water in liters (appropriate LR is when the material is fully submerged in the solution).

» Weigh chemicals based on the type of poles as required in Table 1.

Weighing of DOT

Weighing of $NaSiO_3$

» Dissolve the different chemicals except H_20_2 in a known volume of water, dissolve completely then fill up to the desired volume.

» Mix thoroughly and heat to 40°C.

» Immerse the rattan samples fully.

Mixing of chemicals except H_2O_2

Soaking of samples

» When boiling, add H_20_2 and maintain for 45 minutes for slightly stained samples and 60 minutes for heavily stained.

» Remove the samples and wash with water until the smell of H_20_2 is remove.

» Dry under the sun.