

# BLEACHING PROPERTIES OF SIX HARDWOOD SPECIES OF BANGLADESH

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## INTRODUCTION

It is in practice in most of the furniture shops and allied industries to stain wood with artificial colour either to hide the defects and imperfections of wood surface or to imitate and impart the popular colour and shades of teak, mahogany and other valuable species of wood. By this process cheap and inferior woods are used for furniture and fixture with better look. But modern outlook has a strong trend in favour of light coloured or blonde furniture. This is one of the many causes for which bleaching of wood is going to play an important role in furniture and cabinet industry. Another important reason for bleaching wood is to give an uniform colour to wood which are finished with clear and transparent lacquers or varnishes. In some species of wood the intensity of colour depends mostly on the maturity of tree. The colour, even in the same species of different age groups, varies to such an extent that it is practically impossible to match and produce uniform coloured furniture pieces or panels out of the wood from different trees. Besides, individual pieces of wood may be abnormally darker due to other reasons and may contain mineral streaks and other blemishes which may be removed or made lighter to match the surrounding wood.

Practices are in vogue to bleach wood for elimination of certain glue stains, hand marks, etc., which are, however, beyond the scope of this paper.

Considering these factors and in conformity with the modern trend for light coloured or blonde furniture and other wood products, the present study was undertaken to find out the suitable bleaches and to establish procedure for bleaching of certain species of wood for furniture and other products.

## MATERIALS AND METHODS

### Species:

In the Bangladesh the few species of wood available in light colour are inferior in quality and are rarely



used for furniture, fixture and cabinet making. All the hardwood species extensively used for these purposes are more or less dark in colour except gamar, (Gmelina arborea) which is highly expensive and is seldom available in clear lumber due to the presence of a great number of insect holes of rather large dimension.

The following species were studied:-

1. Toon (Cedrela toona)
2. Shilkoroi (Albizia procera)
3. Champa (Michelia champaca)
4. Chapalish (Artocarpus chapalasha)
5. Civit (Swintonia floribunda)
6. Chikrassi (Chukrassia tabularis).

These are among the important commercial species of the Bangladesh. All the six species of wood have definite and individual colours. The samples of all the species except champa (Michelia champaca) were defect free. The test samples of champa were broadly classified into two kinds, viz., defect free, and with dark reddish mineral streaks. The defective samples were included to study the effect of bleaches on mineral streaks & methods for its elimination. In selecting the test samples utmost care was taken so that the individual test samples could be the true representatives of the species.

#### Chemicals:

No information on the bleaching properties of the above species was available. Based on the literatures on bleaches and bleaching, the following groups of bleaching chemicals were selected for the study to find out the most suitable agent from the view point of effectiveness, ease of application and economy. For selecting these chemicals a preliminary investigation was carried out with some other chemicals including the ones mentioned in Table I.

In each case, one pound glacial acetic acid in 10 gallons of water was used to neutralize and remove the traces of bleaches from the surface of wood after bleaching.



Table 1. Bleaching Chemicals

Group	Bleaching Chemicals	Solution No. Recommended Formulation
A.	Sodium hydroxide. Hydrogen peroxide.	1. Four lbs. sodium hydroxide in 10 gals of water. 2. One gal. of hydrogen peroxide (6%) in equal volume of water.
B.	Sodium hydroxide Calcium hydroxide Hydrogen peroxide	1. 12.1/2 lbs sodium hydroxide and 10 oz. Calcium hydroxide in 10 gals. of water. 2. Same as in group "A".
C.	Sodium hydroxide Silicate of Soda Hydrogen peroxide	1. 10 lbs. Sodium hydroxide and 1/3 lbs. Silicate of Soda - 42° Be in 10 gals. of water. 2. Same as in Gr. "A".
D.	Sodium hydroxide Silicate of Soda Calcium hydroxide Hydrogen peroxide.	1. 11 lbs. Sodium hydroxide 10 oz. silicate of Soda 42 Be & 10 oz. Calcium hydroxide in 10 gals. of water. 2. Same as in Gr. "A".

## PROCEDURE

Eight 3/4" x 5" x 10" test samples from each species except champa (*Michelia champaca*) were made out of flat sawn, straight grained and kiln dried lumber having 12% to 14% moisture content. As indicated earlier, as the intensity of colour of timber from different trees of same species differ substantially, all the test samples were divided into two categories, viz., dark and light. The test samples of champa were divided into three categories, viz., dark, light and medium. The dark and light samples were prepared by bleaching with solution of



into three categories, viz., dark, light and samples with dark reddish mineral streaks thus requiring a total number of twelve test samples. Again each test sample was divided into two equal halves with a  $1/8$ " wide and  $1/4$ " deep width-wise saw kerf. Bleaching solutions were tested on one half of the sample, the remaining half being left intact, for ease in comparing the bleached surface with non-bleached one.

The following technique was applied to bleach the test samples:

1. The surfaces were rough sanded and made free from dust by blowing compressed air.
2. Solution No. 1 was applied literally and evenly by mopping the surface with a cloth swab. The surface was allowed to dry for half an hour in a well ventilated room.
3. Solution No. 2 was applied uniformly in the same manner as solution No. 1 and again the surface was allowed to dry for half an hour.
4. The above steps were repeated till the desired bleaching effect was attained.

Note:-Note:- The process described above is called two solution method since the reducing and oxidising agents (Sol. No. 1 & NO. 2) are applied separately at an interval of half an hour. Instead, the two solutions prepared separately may be mixed together immediately before application and applied in a single operation. This process known as one solution method will cut down the time and cost of labour considerably. But for better results two solution method is preferred.

When the desired bleaching effect is attained, the wood goes through the process of neutralisation to eliminate the traces of chemicals, in absence of which it will interfere with finishing coats which may result in blisters, blemishes and undesirable spots.

The test samples were neutralised in the following manner:-

1. The bleached surfaces of the samples were thoroughly washed with cold water.
2. The neutralizing solution was applied with a cloth swab and the solution was allowed to stand for 10 - 15 minutes.



3. The surface was rinsed with water thoroughly and allowed to air dry for a minimum time of 48 to 72 hours for complete evaporation of the moisture absorbed by the wood during the entire process of bleaching and neutralization.

4. The wood surface was sanded lightly with No. 1 sand paper to remove the last trace of bleach residue, if any, and also the raised grain, an inevitable result of absorption of water by the wood surface. The sanding was done very carefully not to cut through the thin layer of bleached surface. Now the wood is ready for application of finishing materials which, of course, should be clean and transparent.

#### RESULTS AND DISCUSSIONS

All the four groups of solution were tested on every species. Group A was found to be the most effective and satisfactory bleaching agent for each one of the species. Other groups of chemicals were also found more or less equally good but the amount of chemicals, time and labour required were higher than those of group A. So the first group was considered to be most suitable from the view point of effectiveness as well as cost.

On application of Sodium hydroxide soln. (Soln. No.1) the wood started darkening which intensified as drying proceeded ultimately assuming black to grey colour. When Hydrogen peroxide (Soln. No.2) was applied the process was reversed resulting in lightening of the colour with the progress of drying. After neutralisation, washing and drying the woods had individual characteristic of bleached surface.

The experiment was carried out in 1965-67.

Test samples finished with clear gum copal (locally known as chundrus or karpa) were put to indoor exposure. So far no change of colour has been observed.



Table 2.

Sl. No.	Species	Scientific name	Colour of wood	Chemical used	No. of coats of bleach	Remarks.
1.	Toon	Cedrela toona	dark	Group-A	3-4	Instead of being bleached, attained deep mahogany colour.
			light	"	2	Excellent.
2.	Shilkoroi	Albizzia procera	dark	Group-A	3	Fairly good.
			light	"	2-3	Good.
3.	Champa	Michelia champaca	Dark	Group-A	3-4	Fairly good.
			light	"	2-3	Good.
			with mineral streaks	"	3-4	Fair.
4.	Chapalish	Artocarpus chapalish	Dark	Group-A	3-5	Difficult to bleach.
			light	"	3	Fair.
5.	Chikrassi	Chukrassia tabularis	Dark	Group-A	3-4	Very good.
			light	"	2-3	Excellent.
6.	Civit	Swintonia floribunda	Dark	Group-A		Excellent.
			light	"		Excellent.



## SOME SUGGESTION FOR A PRODUCTION SHOP

For large scale production of bleached furniture and other wooden articles the following suggestion may be of substantial help.

1. Instead of using a cloth swab or brush, a spray gun may be employed. Since the bleaches are very corrosive in nature, ordinary spray gun should not be used for the purpose. Spray guns with glass containers and corrosion resistant metals must be used. The gun should be thoroughly washed immediately after use by spraying water through it.
2. The wood should be air or kiln dried to 12-14% moisture content.
3. If glue is used in any part of the manufactured article, it should be atleast water-resistant.
4. At the time of manufacture wood of similar shade and colour should be used as far as practicable. In unavoidable cases, darker portion may be given a few more coats.
5. After neutralizing and rinsing the bleached surface, sufficient time should be allowed for moisture to escape. To accelerate the drying the bleached surface may be subjected to forced drying at a suitable temperature higher than the ambient temperature.

## PRECAUTIONS

1. Bleaching solutions are strong corrosive chemicals. The containers used for mixing and storage of solutions should be made of glass, wood, earthenware, concrete or any other corrosion-resistant material.
2. The surface of the wood to be bleached should be free from dust, grease and handmarks.
3. After finishing, complete drying of wood should be ensured prior to finishing so as to avoid the occurrence of any tiny air bubbles, blistering and other defects.
4. The bleached layer of wood is very thin, hence the surface should be very carefully and lightly sanded so as not to cut through and expose the unbleached wood.
5. Each time the solution should be freshly prepared.



Solution older than two hours are considerably weaker and does not produce the desired effect.

6. The solutions prepared separately, should be mixed only immediately before application since mixed solutions get weakened slowly and become ineffective after two hours - (given hours or minutes).

7. After each use the swab should be washed in fresh cold water to remove the coloured material extracted from wood. If the swab is directly dipped in the container of solutions, the extracted material will affect the solution making it weak and less effective.

This is applicable to both the reducing and the oxidizing solutions.

8. In handling the bleaches, the following safety precautions should be taken.

a) The bleaching should be performed in a well-ventilated room free from dust and any other combustible materials.

b) If bleaching is done by mopping, measures should be taken to protect the skin, eyes and clothes by wearing rubber gloves, goggles and rubber apron.

c) If spraying is employed, in addition to precautions described in (b), a gas mask should be used to prevent the inhalation of atomised chemicals floating in the air.

### CONCLUSION

The following conclusions may be drawn:-

1. Solution of Group A, i.e., Sodium hydroxide and Hydrogen peroxide are the most satisfactory bleaching agents.

2. In case of toon, it was an interesting phenomenon to note that the dark variety of timber was not bleached but attained a dark red mahogany colour. The cause of this peculiar behaviour was unknown. Further investigation is necessary to ascertain the cause and to explore the possibility of producing an artificial mahogany out of toon.

3. Civit and chikrassi are excellent woods for bleaching.

4. The following conclusions may be drawn:-



4. Champa responded quite good to the bleaching action. But red mineral streaks could not be completely eliminated, although could be made lighter.
5. Chapalish was found unsuitable for bleaching.
6. Shilkoroi responded to the process of bleaching quite well but the bleaching surface of wood was not so attractive.

#### REFERENCES

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#### SUMMARY

The objective of bleaching wood is to make the darker wood lighter and to produce even coloured surface where intensity of colour varies on the same board or panel. This paper presents the results of the tests carried out to determine the effect of bleaches on six indigenous species of Bangladesh. After preliminary test with different chemicals four groups of bleaches were finally selected for extensive investigations. Out of six species of wood chapalish was found unsuitable for bleaching, dark grade toon attained mahogany colour instead of being bleached, champa and shilkorai bleached good and civit, chikrassi and light grade toon, excellent.



### ধারা ১৭

কার্পঠ জুটীকরণের সুখ্য উদ্দেশ্যে হচ্ছে কার্পঠ গাছ রঙে হানকা করা  
 ও একই উদ্দেশ্যে রঙের যে তারতম্য থাকে তার মধ্যে সমতা রক্ষা করা। বাঙলাদেশের  
 উষ্ণ জায়গার কার্পঠ উৎপন্ন বিভিন্ন জুটীকরণ রসায়নের পুনঃপুন গরীফা করে যে ফলাফল  
 পাওয়া গিয়েছে তা এই প্রবন্ধের আলোচ্য বিষয়। বিভিন্ন রসায়নিক দ্রব্য নিয়ে প্রাথমিক  
 গরীফানিরীফার পর মোট ছয়টি ধরনের বাওতাভূত রসায়নিক দ্রব্য পুনঃপুন গরীফার জন্য  
 নির্বাচন করা হয়। উষ্ণজায়গার কার্পঠ উৎপন্ন এগুলো প্রয়োগ করে দেখা গেছে যে চাপাঙ্গিন  
 কার্পঠ জুটীকরণের অনুপযুক্ত। গাছ রঙের তখন কার্পঠ জুট হওয়ার পরিবর্তে গাছ অস্বস্তি  
 রঙ ধারণ করে। চন্দনা ও গিলকরই কার্পঠ জুটীকরণের বেশ উপযুক্ত। এই প্রকিন্যায় সব  
 চাইতে ভাল ফল পাওয়া গিয়েছে সিডিট ও ডিকরানি কার্পঠ।