STUDIES ON THE GLUABILITY OF CHAMPA

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Gluability of a veneer species is a function of the strength and durability of plywood. Champa has been one of the chosen decorative species for veneer. An investigation was made to find the gluability of Champa compared to that of Civit, a species having excellent gluability properties. Champa veneers peeled to 1.0 mm thickness and dried to 8% target moisture content were bonded with liquid UF glue catalysed with 2% hardener and extended with 20% wheat flour to make 3-ply plywood panels. The dry shear load and wet shear load of Champa plywood compared favourably with those of Civit plywood and the values were well above the minimum requirements. Therefore, plywood made from Champa veneer bonded with U F glue may be recommended for use as Warm Water Resistant Grade.

INTRODUCTION

The gluing characteristics of many of the indigenous timber species of Bangladesh are not known. Adequate knowledge of the gluing characteristics is essential for optimum utilization of the timber resources by the repsective industries like plywood and laminated wood. It is established a fact that gluability is a function of density of wood, its structure, presence of extraneous materials, etc. The study was undertaken in finding out the gluability of Champa veneer in the manufacture of plywood.

Champa (*Michelia champaca*) a large tree with a long straight cylindrical bole of 18 to 21 m in length and often of large girth, is found in the Chittagong Hill Tracts forests of Bangladesh. It is light, (sp. gr. approx. 0.53), soft, straight grained, even and medinm textured. Its sapwood is white, and the heartwood is light yellowish brown to olive-brown, somewhat lustrous, smooth working and takes good polish. It weighs 497 to 546 kg/m^3 at 12 percent moisture content. The timber dries well.

It is excellent a species for the manufacture of veneer (Pearson and Brown 1932).

MATERIALS AND METHODS

A Champa log, 1.4 m long and 0.79 m diameter was procured and was peeled into 1 mm thick veneer in the experimental Rotary Veneer Coe Lathe. The lathe was adjusted to a knife angle of 92° and the bar height and bar opening at 2.50 mm and 0.76 mm respectively, the optimum settings found suitable for the said thickness.

The peeled vaneer was clipped to 1.22m x 1.22 m size and dried in the steam-fed Coe Roller Conveyor Dryer to a target moisture content of 8 percent at a temperature of 121°C and 6 minutes' drying time. The moisture content of the dried veneer sheets was checked with a moisture determination balance.

The dried veneer was further trimmed to 60 cm x 60 cm sizes and glued by liquid urea formaldehyde resin of 52% solid content to fabricate 12 panels of 3-ply plywood. In preparing the glue mix the glue was extended with 20 percent wheat flour and catalyzed with 2 percent hardener as per manufacturer's recommendation. The 3-ply plywood assemblies were glue-spread and hot pressed in a 160 ton Williams and White Laboratory Hydraulic Hot Press using the following schedule :

Glue spread	: 36 gms glue mix for double glue line on core
Specific pressure	: 14 kg/sq cm
Presst emperature	: 120°C
Press time	: 4 minutes

From each plywood panel ten standard plywood shear test samples of 8.2 cm x 2.5 cm size and two delamination test samples, 15 cm x 15 cm, one from the middle and the other from the side of the panel were prepared. Standard shear test specimens suitable for 1.0 mm thick veneer were prepared, according to ASTM standards (Anon. 1956), with a shear area of 3.2 sq. cm (1.25 cm x 2.54 cm). Out of 10 shear test samples cut from each panel five samples were randomly taken for dry shear test and the remaining five were kept for wet shear test. For dry shear test, the samples were tested in the Riehle Electrical Plywood Shear Testing Machine at a rate of loading of 241 kg per minute. The shear loads at failure and the percentages of wood and glue failure were recorded. For the wet shear test, the samples were submerged in warm water at 67°±2°C for 3 hours, transferred to cold water and then subjected to the test while still wet. The shear loads at failure and the percentages of wood and glue failure were recorded as in the case of dry shear test.

For delamination test, the test specimens were submerged in water at room temperature for 4 hours and then air-dried for 20 hours, thus making one cycle. The test was continued, as per test procedure for water resistant bond (for Type II plywood), for 15 continuous cycles or until the specimens delaminated (Anon. 1956).

In Bangladesh Civit veneer is mostly used in the manufacture of plywood for various purposes. In the manufacture of teachests especially, it has, at present, no parallel with other locally available species. It is found that Civit veneer glues well (Salehuddin and Azizullah 1977,

Salehuddin *et al.* 1978). In this study plywood made from Civit veneer was taken as control and the gluability of Champa plywood was compared with that of Civit. A Civit log was, therefore, peeled into 1 mm thick veneer in the rotary veneer lathe. Both the gluing and hotpress schedules were kept identical in the manufacture of plywood with Civit as well as Champa.

RESULTS AND DISCUSSIONS

The loads at failure for Dry shear test and Wet shear test, their percentages of failure of wood and glue, and the results of delamination test are given in Table 1. Tests were also performed and the significant levels were indicated in the said Table.

between the means of shear loads at failure is also found significant. Both Civit and Champa plywood samples passed the 15 cycles of cold soak for Delamination test.

The higher difference between the Dry shear loads and Wet shear loads at failure of both Civit and Champa may be related with the gluability factor, which is in turn related to their wood characteristics. The wood texture of Champa is even and medium while in Civit it is rather coarse (Pearson and Brown 1932). Civit plywood, therefore, could withstand higher load at failure during Dry shear test compared to Champa.

Table 1. The results of Dry shear test, Wet shear test and Delamination test of Champa and Civit

Test \ Species	Champa	Civit	Significance
Average load of Dry shear test (kg/cm^2)	25.55	35.33	**
Percentage of failure ratio of wood to glue for Dry shear test	95 : 5	95 : 5	
Average load of Wet shear test (kg/cm^2)	12.57	14.05	*
Percentage of failure ratio of wood to glue for Wet shear test	6 : 94	0 : 100	
Delamination test	Passed	Passed	

***Significant at 1% level *Significant at 5% level*

In the Dry shear test the loads at failure in Civit plywood are higher than that of Champa and the difference between the means of loads at failure is highly significant. In the Wet shear test the difference

In the Wet shear test the load at failure, in both the cases of Civit and Champa, had a negligible difference. Due to soaking of the samples in hot water at 67°±2°C for 3 hours, glue adhesion fails and takes

minimum shear load at failure to break the weak glue bonding. In this case the shear load at failure is so low that the wood characteristics probablely find no chance to play their roles.

CONCLUSION

The Dry shear load at failure in Champa is well above and the Wet shear load at failure is above the minimum requirements for Warm Water Resistant (WWR) grade plywood prescribed in the Indian Standard Specification (IS : 303–1960) (Anon. 1960). Therefore, plywood made from Champa veneer and glued with UF resin may be recommended for use as a Warm Water Resistant grade.

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