AN INVESTIGATION OF MECHANICAL PROPERTIES OF DIFFERENT KINDS OF LOCALLY PRODUCED WOOD

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Abstract An experimental investigation of mechanical properties of different kinds of wood has been performed. The tensile strength, crushing strength and modulus of elasticity of locally produced Garjan and Gamari woods have been measured. It is observed that the strength of the Garjan wood is higher than that of the Gamari wood in general.

Keywords: Mechanical properties, Garjan and Gamari woods

INTRODUCTION

From the primitive age till today, people have been using wood in different construction works throughout the whole world. As a result, it has become necessary to study the various important mechanical properties of the wood. Mechanical properties of some varieties of wood are available in the literature. But very little information is available in regard to the locally produced wood. That is why, some locally produced woods such as, Garjan and Gamari have been taken into consideration for study as a preliminary step. Though many other varieties of woods are available in Bangladesh, Garjan and Gamari are very common ones for use in construction work and they are produced in large quantities in the forest of Bangladesh.

All woods are anisotropic in nature, i.e. exhibits different physical properties when tested in the different directions. It is a hygroscopic substance, i.e. it loses and gains moisture as a result of changes in the atmospheric humidity and temperature. Because of its anisotropic nature these moisture variations produce dimensional changes in wood which, are also unequal in the different directions.

The strength of wood depends on its age, soil condition, climatic condition, moisture content, seasoning, knot, local defect etc. It also depends on the direction at which it is tested. In this study the seasoned wood with negligible amount of moisture content has been considered for study. The study is performed in the direction parallel to the grain of the wood.

RESULTS AND DISCUSSION

The test has been conducted according to the ASTM standard D143. For the compression test the specimen was made with cross-sectional area of 50mmx50mm and the length was 200mm. The gage length was taken as 150mm. The load was applied in a universal testing machine in a direction parallel to the grain. The crushing strength is calculated from the relation:

$$S_c = F_c/A_c \quad \ldots \quad \ldots \quad (1)$$

where, F_c is the force and A_c is the cross-sectional area of the specimen.

Figure 1 and Figure 2 show the crushing strengths of the Garjan and Gamari woods respectively. Six samples have been considered for each variety of wood. It can be seen from the figures that the strength of the Garjan wood is higher than that of the Gamari wood in general. There have been significant variations among the values of strength of the samples for each variety.

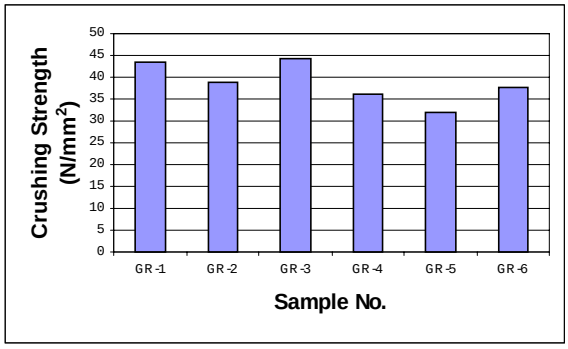

Fig.1 Crushing Strength of Garjan Wood

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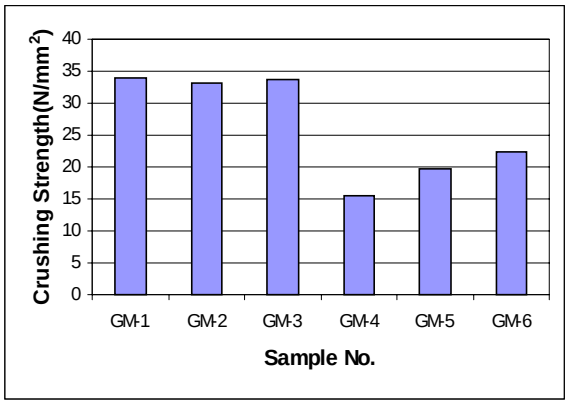

Fig. 2 Crushing Strength of Gamari Wood

The tensile strength is obtained from the relation :

$$S_t = F_t/A_t \quad \ldots \quad \ldots \quad (2)$$

where, F_t is the load and A_t is the cross-sectional area of the specimen.

Figure 3 and Figure 4 respectively show the tensile strengths of the Garjan and the Gamari woods. Twelve samples for the Garjan and ten samples for the Gamari wood have been considered for the investigation. It can be seen from the figures that the strength of the Garjan wood is higher than that of the Gamari wood in general.

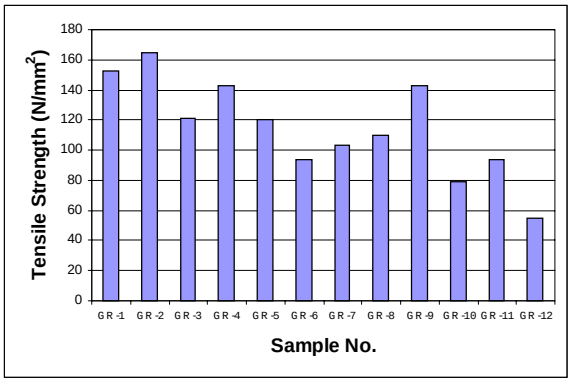

Fig.3 Tensile Strength of Garjan Wood

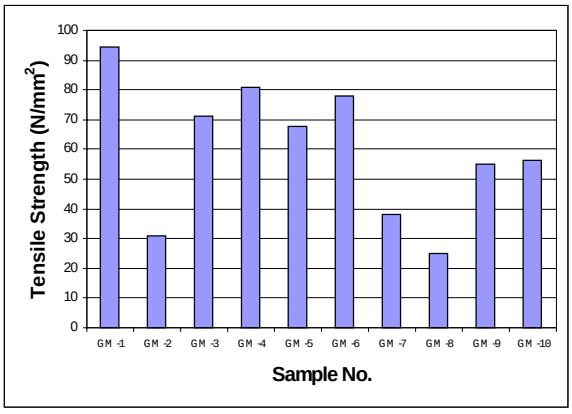

Fig. 4 Tensile Strength of Gamari Wood

The nature of tensile strength vs. strain curves of the Garjan and Gamari woods have been presented in the figures 5 and 6. They give the linear pattern.

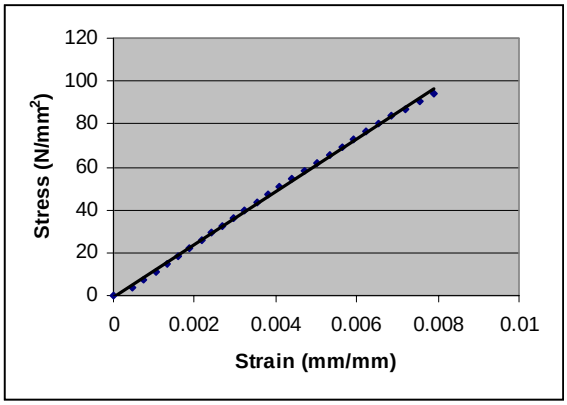

Fig. 5 Stress vs. Strain curve of Garjan wood

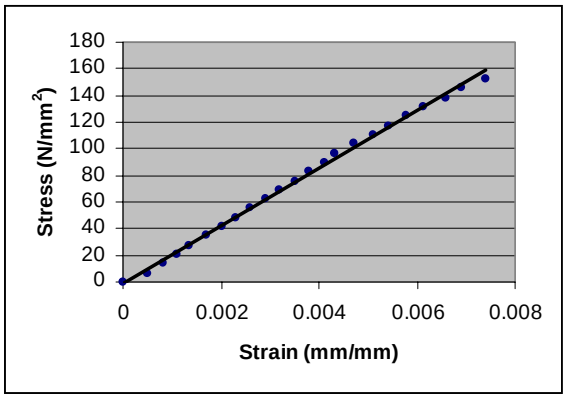

Fig. 6 Stress vs. Strain Curve of Gamari Wood

The modulus of elasticity of both the Garjan and Gamari woods have been determined. The average values of modulus of elasticity of the Garajan and Gamari woods are determined as 21.5GPa and 12.2 GPa respectively

CONCLUSIONS

The values of the crushing strength, the tensile strength and the modulus of elasticity of the Garjan wood are higher than those of the Gamari wood in general. Wide variations have been observed in the strengths of the tested specimens for each variety of wood.

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