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EFFECT OF SEASONING ON COMPRESSIVE STRENGTH AND MODULUS OF RUPTURE OF *MANGIFERA INDICA* AND *EUGENIA JAMBOLANA* WOODS

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Summary

In order to study the effect of seasoning on the engineering properties of woods, work was carried out to determine the compressive strength and modulus of rupture of *mangifera indica* and *Eugenia Jambolana* woods at various levels of moisture content. The study revealed that on seasoning below fibre saturation point in comparison to that of green woods the values of both the properties increased abundantly. However, below 12 percent moisture content there was no change in the values.

Introduction

Seasoning of wood is always necessary before its use. It should be done to a moisture content in equilibrium with the atmosphere in which the timber has to be used. In the absence of seasoning, the material may shrink or swell as a result of loss or gain of moisture. Generally, most of the wood rotting insects grow if the moisture is above 20 percent in the wood. The seasoning also prepares the material for finishing. Further, the seasoning affects the strength properties of the wood. However, no systematic work seems to have been done to know the trend of increase of various strength properties with lowering of moisture content of different woods. It was, therefore, thought worthwhile to study the effect of seasoning on different static bending and compression properties of a few soft and hard woods. The present paper deals with the studies on compressive strength and modulus of rupture of mango *(Mangifera indica)* and jamun *(Eugenia jambolana)* woods which were determined at various moisture content of the respective woods.

Experimental

Planks of green mango *(Mangifera indica)* and jamun *(Eugenia jambolana)* woods were cut along the vertical axis in the size 250x15.0x5.0 cm and were kept in Solar Timber Seasoning Kiln (1) for seasoning. The initial moisture content of the two respective woods were 75 and 58 percents. The specimens were cut for determining the properties at regular intervals from the planks and their moisture contents were measured according to IS : 1141 (1961) (2). The size of specimens for determining the compressive strength was 5x5x20 cm while for determining modulus of rupture it was 5x5x75 cm. The specimens were absolutely free from any defect and end planes were at right angle to the length of specimens. The properties were determined according to IS : 1708 (1958 (3). The results are shown in Fig. 1 and 2.

Results and Discussion

As shown in Fig. 1 (a) in case of mango wood the compressive strength at 75 percent moisture content was 180kg/cm^2. At 65 percent moisture content it was increased by about 2.7

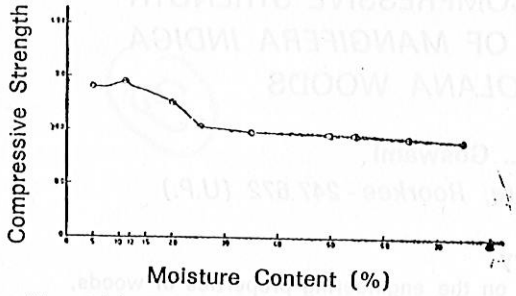

Fig. 1 (a) Compressive strength of mango wood with respect to M.C.

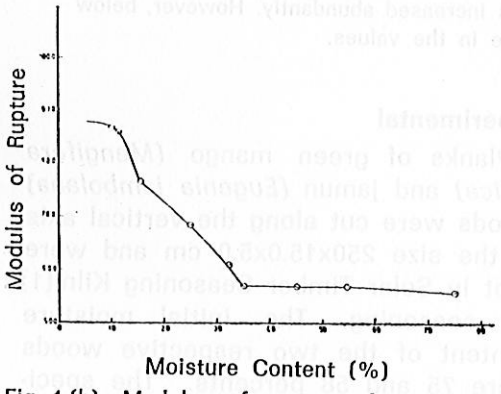

Fig 1 (b) Modulus of rupture of mango wood with respect to M.C.

percent. On lowering moisture again by 15 percent, the value of compressive strength was increased by 2.5 percent. However, at 30 percent moisture content, the value reached as 195 kg/cm². On seasoning further upto 25 percent moisture content, an increase of about 11 percent from the initial value of the compressive strength was noticed. However, it was further increased to 27 percent at 20 percent moisture content. At 15 percent moisture content, the increase was by 12 percent of the previous value. When the moisture content reached 12 percent the value of compressive strength was found as 290 kg/cm². Thus an increase of 60 percent in the value to that of green wood could be achieved. However, on further seasoning, a slight decrease was recorded which afterwards became constant.

Fig. I(b) represents the influence of moisture content on modulus of rupture of mango wood. In green stage the value of modulus of rupture of the wood was found as 567 kg/cm². At 55 percent moisture content it increased by about 8 percent. Upto 35 percent moisture content, no increase was observed. However, at 32 percent moisture content the increase was by about 8 percent to that of initial value. On

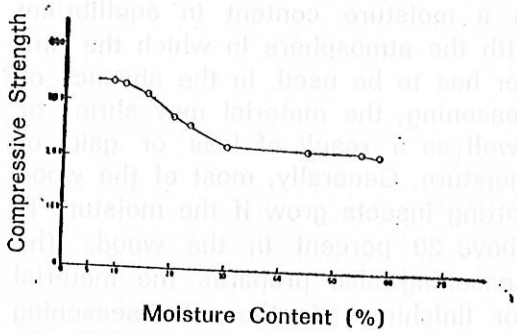

Fig. 2 (a) Compressive strength of jamun wood with respect to M.C.

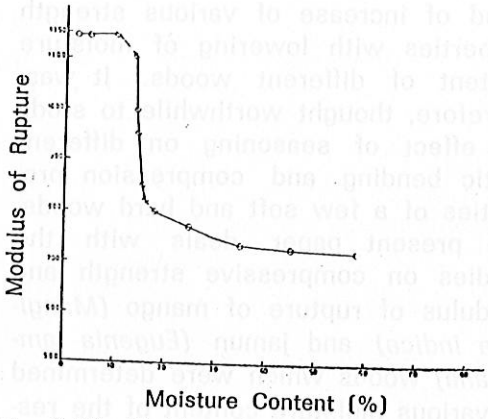

Fig. 2 (b) Modulus of rupture of jamun wood with respect to M.C.

seasoning further, at 25 percent moisture content, it increased by about 20 percent. At 15 percent moisture content, it was increased by 15 percent to that of previous value. When the specimens were seasoned upto 12 percent moisture content, the increase was about 55 percent to that of green wood. But further reduction in moisture content did not appreciably increase the value of modulus of rupture and it became constant.

The curve in Fig. 2 (a) depicts the variation in the values of compressive strength with respect to change in moisture content of jamun wood. Its value was found as 220 kg/cm² at the time when the wood was in green stage. At 45 percent moisture content, the value was increased merely by about 2 percent. However, between 45 to 30 percent moisture content, no change in compressive strength of the specimens was recorded. At 22 percent moisture content, it increased to 18 percent to that of initial value. On reducing moisture content further by 2 percent the value was increased by about 7 percent. A sharp increase was noticed at 15 percent moisture content when the value was increased by 45 percent to that of initial value. At 12 percent moisture content, the value of compressive strength was recorded as 330 kg/cm² which shows that the increase was more than 50 percent in it. As is clear from the figure, further reduction in moisture content showed only little shift in the value.

Fig. 2 (b) gives the graphical representation of the trend of shift in modulus of rupture with reduction in moisture content of the specimens of jamun wood. In green stage at which the moisture content was recorded as 75 percent the value of modulus of rupture was 720 kg/cm². This value increased by 5 percent at 55 percent moisture content and found as 725 kg/cm². Again a slight increase of less than 1 percent was recorded at 40 percent moisture content. However, at 30 percent moisture content, the value of MOR was increased by 4 percent to that of initial value. On seasoning at 17 percent moisture content the increase was by about 15 percent. As shown in the figure further seasoning gave a steep rise in the value and at 15 percent moisture content, the increase was about 55 percent. At 10 percent moisture content the value of modulus of rupture was found as 1145 kg/cm² which shows the increase of about 60 percent to that of in green stage.

From the above data of the trend of increase in the values of compressive strength and modulus of rupture of mango and jamun woods, it could be inferred that from green stage to about 30 percent moisture content, there was little increase in their values. It might be due to the fact that moisture content above 30 percent in the woods generally remains in the cell-cavities as free water (4) and does not impart any appreciable increase in the strength values. On seasoning below 30 percent, which is regarded as fibre-saturation point and upto 20 percent moisture content, the value of both the properties increased rapidly. Between 20 to 10-12 percent moisture content there was marked increase in the value of both compressive strength and modulus of rupture. This shift in strength may be attributed to the fact that when cellulose which is the major constituent in wood dries and shrinks, it im-

parts strength to the material (3). However, there was no change in the values of the above two properties below 10-12 percent moisture content.

Conclusion

From the foregoing discussion it could be concluded that on seasoning the wood below fibre saturation point the values of both modulus of rupture and compressive strength are increased. However, below 12 percent moisture content, there are no changes in their values. Moreover, the permissible moisture content of various woods is different for different parts of the country (3) because of the climate and geographical conditions. From the above study an important conclusion could be drawn that there is sufficient variation in the strength with change in moisture content. Therefore, in design of structures the strength at moisture content on which wood has to be used should be taken into account. In this consideration the data presented in this paper will be useful and provide scope for studies of other types of timber.

Acknowledgement

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