DENSITY AND STRENGTH PROPERITIES OF TAMARIX APHYLLA WOOD IN AIR DRY CONDITION

Jaleel A. Khan and K. M. Siddiqui*

Abstract

Five logs of *Tamarix aphylla* wood from Sukkur Forest Division were tested for their density and strength characteristics using standard techniques. The results are given as average values, their standard deviation and co-efficient of variation as well as the range of observations for different properties. On the basis of the strength proporities, *Tamarix aphylla* could be classed as a fairly hard and heavy timber which is suitable for a number of uses including constructional work.

Introduction

Tamarix aphylla locally called farash or ghaz is of considerable importance in the arid and semi-arid areas of Pakistan on account of its special growth charactristics. It is a hardy species capable of withstanding extremes of temperature as well as excessive drought. It has also been found to tolerate soil salinity to a considerable extent. It has been commonly planted for sand dune fixation and erosion control. *Tamarix aphylla* is found in the dry plains throughout the country. It grows best in the alluvial tract of river Indus. In Sind, it is one of the principal species found in association with Bahan (*Populus euphratica*), Babul (Acacia arabica) and Lai (

of the principal species found in association with Bahan (*Populus euphratica*), Babul (*Acacia arabica*

of the principal species found in association with Bahan (*Populus euphratica*), Babul (*Acacia arabica*) and Lai *(Tamarix dioica*). The wood of *Tamarix aphylla* is commonly used as fuel and for making charcoal. It is also used in turnery work, furniture manufacture and for agricultural implements. In view of the extreme shortage of timber in the country, however, *Tamarix aphylla* wood can also be used for other purposes if its wood characteristics especially its strength properties are known. The present study was initiated with the objective of determination of physical and mechanical properties of *Tamarix aphylla* wood.

Materials and Methods

Five logs of wood were obtained from Sukkur Forest Division for this study. Each log was about 1.5 meters in length and 81 to 91 cms in girth. For the measurement of strength properties, 3 cm thick planks were sawn from each log along four mutually perpendicular radii. These planks were further converted into sticks of 2 x 2 cms cross sectional areas starting from the end near to the pith. From each stick, test samples for various strength properties except shear were cut in accordance with the British Standard 373. The shearing strength

* The authors are respectively the Wood Seasoning and Preservation Officer and Director, Forest Products Research Division, Pakistan Forest Institute, Peshawar.

was determined according to the A.S.T.M Standards D 143-52. Since logs has considerably dried by the time these were received at the Institute, it was decided to carry out tests in air-dry condition only. All the samples were kept in the laboratory for at least 2 weeks before testing, to allow them to reach an equilibrium moisture condition. The values for different strength properties in air-dry condition were adjusted to 12% moisture content using the correction factors for each one precent change in moisture. The data for each property were computed as an average value, standard deviation, co-efficient of variation and the total range of variation. The specific gravity was measured for the samples used for the determination of the compressive strength parallel to the grain direction. The weight and valume of each sample was recorded prior to its testing.

Results and Discussion

The data for strength properties and density of *Tamarix aphylla* wood are given in Table 1. From these results it can be seen that *Tamarix aphylla* is a fairly hard and heavy timber with high strength values. The average air-dry specific gravity of the wood was 0.70 (range 0.63 - 0.78) which is in agreement with the reported value of 0.69 (range 0.60 - 0.75). The maximum compressive strength parallel to grain and the modulus of rupture dully corrected for density were found to be 6.9 and 14.3 respectively. These values are quite similar to those of some indigenous hardwood species. The ratio between modulus of rupture and maximum compres-

Table 1. Strength properties of *Tamarix aphylla* wood in air-dry condition (12% moisture content)

S. No.	Property	Average value		Standard deviation	Co-efficient of variation %	Range
1.	Specific gravity	0.70	±	0.03	4.4	0.63-0.78
2.	Modulus of rupture: Kg/cm^2	1,000	±	153.9	14.4	750-1316
3.	Modulus of elasticity: Kg/cm^2	85,007	±	18613	21.9	58465-117494
4.	Maximum compressive strength parallel to grain Kg/cm^2	483	±	63.4	13.1	404-628
5.	Compressive strength parallel to grain at elastic limit: Kg/cm^2	329	±	63.2	19.1	220-480
6.	Compressive strength perpendicular to grain at elastic limit: Kg/cm^2	120	±	15.5	12.9	86-160

S. No.	Property	Average value	Standard deviation	Co-efficient of variation %	Range
7.	Maximum shearing strength: Kg/cm^2	176 ±	21.0	11.9	152-231
8.	Maximum tensile strength perpendicular to grain: Kg/cm^2	44 ±	9.0	20.4	27-64
9.	Cleavage: Kg/cm^2	33 ±	5.7	17.3	25-45
10.	Impact bending: m-$Kg/4cm^2$	2.08 ±	0.62	29.8	0.90-3.22
11.	Hardness: Side: Kg	667 ±	74.9	11.2	550-860
	End: Kg.	800 ±	62.8	1.8	770-920

sive strength parallel to the grain direction ratio was calculated as 2.07.The compressive strength parallel to the grain at elastic limit was found to be 68% of the maximum compressive strength in the same direction. The compressive strength parallel and perpendicular to the grain directions were in the ration of 4: 1. The shearing strength was found to be exceptionally high due to the presence of irregular grain in this species. The failure in most cases of static and impact bending tests was of brash type. The end hardness was about 20% higher than the side hardness. Furthermore, *Tamarix aphylla* wood showed considerable variation both in density and strength properties. The coefficient of variation was minimum in density and maximum in impact bending strength.

Conclusions

On the basis of the strength characteristics, *Tamarix aphylla* wood can be classed as a strong and fairly hard and heavy timber. It has a density/strength ration almost similar to that of shisham (*Dalbergia sissoo*). On the basis of these results, it can be used for different purposes including constructional work as posts or joists as well as cross arms on transmission poles after presevative treatment as it is not a durable wood. It works to a smooth shiny surface and produces good finish. When quarter sawn, it presents a most attractive silver grain, which could be used in cabinet work. However, the wood of this species is available in limited quantity only. The size of logs is also rather small. Older trees are generally hollowed out by decay. These factors may be kept in view while planning rational utilization on farash wood.

BIBLIOGRAPHY

1. Anon. 1955 Wood Hand Book No. 72. Forest Products Laboratory, U.S. Department of Agriculture, U.S.A.

2. Armstrong, F.H. 1960 The strength properties of timber. Forest Products Research Bulletin No. 45, Department of Scientific & Industrial Resrarch, U.K.

3. Pearson, R.S. & H.P. Brown. 1932 Commercial timbers of India. Volume II, Government of India, Central Publication Branch, Calcutta.

4. Sallenve, F. 1972 Physical and mechanical properties of tropical wood. (Second supplement). A translation from French by the U.S. Department of Agriculture, Forest Service, U.S.A.

5. Troup, R.S. 1975 The Silviculture of Indian Trees. Vol. I, Controller of Publications, Delhi, India.