WOOD ANATOMY OF MAPLE (*ACER CAESIUM*) GROWN IN SWAT, KHYBER PAKHTUNKHWA

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ABSTRACT

A study was carried out to find the technological properties supportive to improve quality of Himalayan Maple grown in Swat, Khyber Pakhtunkhwa. Data were collected for the frequency and dimensional measurements of different wood elements/structures. Results showed that that the wood is of medium strength and may be used in furniture, flooring and construction where medium strength is required, however, chemical treatment of the wood before utilization with preservatives is prerequisite and can favor its endurance against biological deteriorates. Moreover, pulp and paper products may also be manufactured from this species.

INTRODUCTION

Himalayan maple *(Acer caesium* Wall.*)* is one of the important unevenly distributed deciduous trees belonging to family *Aceraceae* or maple family (Luna, 2005). It grows on north-facing slopes upto 25 meter in height and preferably on the moist soil. Basically, the word “Acer” derives from a Latin word meaning "sharp“, referred to the “sharp points on the leaves” and “caesium” means “Light blue”, shoots and young leaves gives a blueish-grey appearance. The tree is an economically important tree species, not only for its high quality wood, but also because it is mostly used as ornamental trees by home owners and municipalities (Ghosh, 1977).

Maple tree is native to China, India, Nepal, and Pakistan (Sheikh, 1993; Van Geldren *et al*., 2010). In Pakistan it is found in association with conifers at elevations between 2000 to 3500 m. Specific locations of this species are Chitral, Dir, Swat, Hazara, Murree Hills, and Azad Kashmir (Sheikh, 1993). The wood of the tree is used for carving bowls and cups, making plates, furniture, turnery articles, frames, boarding, flooring, alleys, squash court and rifle (Anonymous, 1983; Rendle, 1969; Sheikh, 1993).

Swat is bestowed with a wide range of tree species. Nearly 28 tree species belonging to 15 families are found in this ecological zone. Some are of commercial importance and others are being used as fuel wood due to lack of knowledge about their technological properties (Hamayum, 2005). It is therefore, necessary to approach testing and evaluation of these tree species through various wood properties for better utilization in view of scarce sources of Pakistan for timber industries.

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In this regard Himalayan Maple wood grown in Swat, Khyber Pakhtunkhwa was collected and studied with the objectives to compile basic data for anatomical and physico-mechanical properties, finding measures for the improvement of quality of the studied wood and evaluating their better utilization other than the conventional uses.

MATERIALS AND METHODS

To carry out the research work, the wood material in logs form were brought from Swat Valley, Khyber Pakhtunkhwa. Discs of about two inches were cut and standard blocks of 1x1x2 cm were prepared from each log. Permanent slides of cross, radial and tangential sections of all the wood samples were prepared by standard laboratory procedures and observe under microscope for various structural features. To measure the fiber length, a small portion of wood from each sample was macerated in Schulze's mixture (20% Nitric acid and Potassium chlorate) to separate the fibers (Anon., 1974). Data were collected for the frequency and dimensional measurements of different wood elements/ structures in each wood sample by the process of micrometry (Anon., 1971) and analyzed for statistical variables for each feature in each sample.

RESULTS AND DISCUSSION

General Characteristics of Wood

The wood is of Himalayan Maple is white in color, ageing to very pale brownish- white, with fine red lines demarking growth zones, having smooth feel with lustrous appearance and without characteristic odor or taste. It is lighter in weight, even, straight and silvery grained with very fine texture.

Anatomical Structure of Wood

Himalayan Maple has distinct growth rings, delimited by sharp, narrow red lines of terminal parenchyma and tangentially flattened fibres, 5-8 per inch. Vessels are very small, not visible with naked eyes and are open or occulated. The majority of vessels are solitary and in radial rows of 2-3, 25-45 per mm^2, 235-485 µ long. The parenchyma is terminal and para-tracheal in cambiform row of 2-4 units along the grain and the maximum long diameter 20-33 µ. The fibers are non-libriform to libriform, medium fine, non-septate, short 385-885 µ, 24-28 µ in width with 2-3 µ in thickness. Rays scarcely visible with naked eyes and are fine and straight, 4-8 per mm , 40-48 µ in maximum width and more than 500 µ in maximum height.

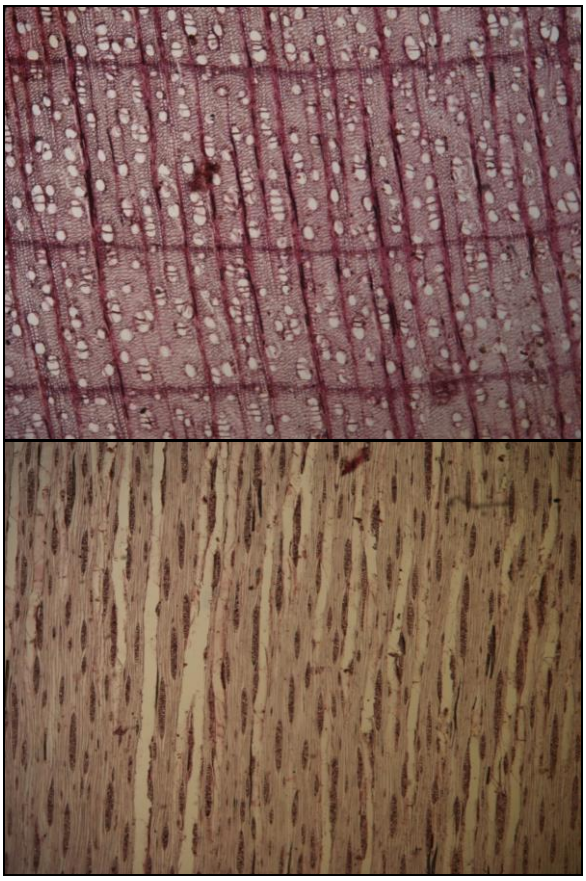

Fig. 1. Cross and Tangential Section View of Himalayan Maple grown at Swat Valley, Pakistan

Results given in below table 1 showed that fibers of Maple wood were 0.04.-0.88 mm long, 10.90-30.40 µ in diameter and have 1.91-4.00 µ thick walls. The vessel were found 60.60-159.09/mm^2 in number and 32.85-97.38 µ in diameter. The wood rays are 70-78 /mm in cross section and 15.15-83.33 /mm^2 in tangential section. The largest wood rays are in height 379.09 µ (50 cells) and 66.19 µ (40 cells) in width.

Table 1. Frequency and Dimensional Measurement of Different wood elements in Maple (*Acer caesium*) Grown in Swat, Khyber Pakhtunkhwa

Anatomical Parameters	Units	Averages value	Standard deviation (±)	Co-efficient of variation (%)
Fiber length	(mm)	0.614	0.136	22.15
Fiber diameter	(µ)	17.77	4.44	25.01
Fiber wall-thickness	(µ)	2.81	0.50	17.99
Fiber lumen width	(µ)	12.15	-	-
Runkel ratio	-	0.46	-	-
Frequency of vessels	No. of vessels/mm^2	111.96	25.48	22.76
Vessels diameter	(µ)	77.97	15.26	19.57
Rays frequency	No. of rays/mm^2	46.36	20.90	45.09
Rays frequency	No. of rays/mm	74.88		
Height of ray	(µ)	192.13	105.36	54.83
No. of cells in ray height	-	15.82	12.84	81.18
Width of ray	(µ)	27.22	13.16	48.37
No. of cells in ray width	-	7.92	8.59	108.49

It is evident from anatomical characteristics of Himalayan Maple that the wood may be medium in strength with suitable hardness due to narrow lumen width and average wall thickness of fibers. Moreover, fibers runkel ratio value also represented its suitability for making pulp and paper materials from this wood. Drying behavior of this wood may be moderate as the vessels diameter lies in medium range. However, preservation process of this wood may be quick because of large vessels number per unit area. Wood rays parameters reflected that the wood may be moderately resistant to biological agents and chemical treatment with preservatives can favor its natural endurance before utilization.

CONCLUSION AND RECOMMENDATIONS

Based on the results of anatomical features, it can be concluded that Maple wood is of medium strength with suitable hardness and may be used in furniture, flooring and pulp and paper products. However, treatment with preservatives is recommended to enhance the life span of this wood.

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