

**COMPARISON OF ANATOMICAL PROPERTIES OF ASH
(*FRAXINUS EXCELSIOR*) WOOD GROWN IN DIFFERENT
CLIMATE ZONE OF PAKISTAN**

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ABSTRACT

A study was carried out to compare the anatomical properties of Ash wood grown in different climate zones of Pakistan in order to find variations in their technological properties based on the wood structure. Results indicate that Ash wood grown in Kashmir and Quetta are nearly similar in strength and hardness in view of fiber morphological characteristics. Ash wood grown in Kashmir may be better in seasoning and preservation behavior due to its vessels frequency and diameter. Moreover, on the basis of parenchyma distribution Ash wood grown in Kashmir may be comparatively durable against biological decaying agents as compared to that of grown in Quetta, Balochistan.

INTRODUCTION

Fraxinus excelsior is one of the largest European native deciduous trees and is valued for its strong, elastic timber used to make sports goods notably tennis rackets, crickets stumps and hockey sticks and the handles of striking tools such as axes and hammer, and garden tools like spades, rakes and hoes etc. It is widely distributed on the continent and the timber is exported to UK from France and other European countries to supplement domestic supplies (Rendle, 1969; Dinwoodie, 1983).

In Pakistan, it is found as a large deciduous tree 18 to 30 m tall with diameters of 0.6 to 1.0 m. It is known as a tolerant tree that grows on a variety of rich, deep soils and adapted to a precipitation zone of 600 to 1200 m/yr preferring a humid cool temperate, sub-tropical winter/monsoon, climate with a temperature range of 12 to 35°C at elevations between 1200 and 2700 m. Ash wood supplies are available from Hazara Division and Azad Kashmir (Sheikh, 1993). In Balochistan *Fraxinus excelsior* was introduced as an exotic species in Hazar-Gunji National Park on experiment basis and now frequently found in Quetta Valley especially on roadsides as biological indicator of pollution (Saddaullah, 2013).

Study of various wood elements like parenchyma, vessels and fibers etc, not only provide assistance to identify a species but also helpful in assessing technological properties of the wood. On the basis of parenchyma cells durability

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of wood can be judged, presence of vessels represents its seasoning and preservation behavior and the fibers indicate its density and strength properties. (Nasir, 2010).

The current study has been carried out with the objective to collect the anatomical data of Ash wood grown under the prevailing climatic conditions of Kashmir and Balochistan in order to observe variations and evaluate their technological properties.

MATERIALS AND METHODS

To carry out the research work, Ash wood was collected in log form Neelam Valley, Azad Jammu and Kashmir and Quetta, Balochistan. Discs of about two inches were cut from end face of each butt logs and standard blocks of 1x1x2cm were removed from each log. Permanent slides of cross, radial and tangential sections of wood from each block were prepared by standard laboratory procedures and observed 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 and Properties

The Sapwood is yellowish or grayish white in color while heartwood grayish-white to light-brown, lustrous, straight-grained, medium fine and uneven texture; the wood is ring-porous.

Basic Structure of Wood

Growth rings are distinct, delaminated by a light zone of large pores in the springwood followed by a darker zone of summerwood consisting of denser fibrous tissue and much smaller pores. Vessels are variable in size. Springwood vessels are large to medium sized, solitary or in short radial or oblique rows of 2-3 cells. Summerwood vessels are very small to extremely small in size, solitary or in short radial rows of 2-3 cells. Parenchyma is in the form of terminal, paratracheal, paratracheal-zonate and metatracheal. The wood rays are fine and not distinct with the naked eye. The fibers are semi-libriform to libriform, medium fine, forming extensive tracts between the vessels and narrow rays.

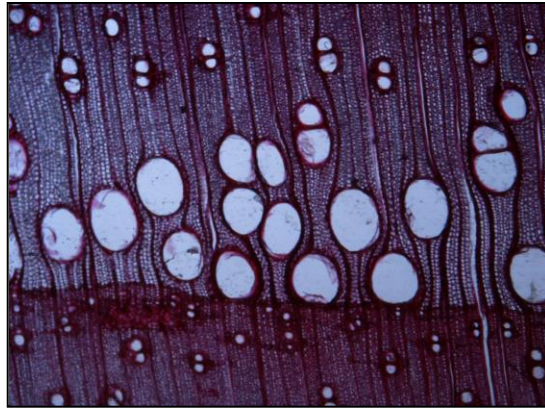


Fig.1. Photomicrograph of the cross section of Ash wood showing the structure

Anatomical properties of Ash wood grown in Kashmir

In Ash wood grown in Kashmir, the frequency of earlywood vessels was found 2-5/mm² and the latewood vessels were calculated 7-15/mm². The diameter of earlywood vessels was measured 173-268 μ while that of latewood vessels were found 29-143 μ wide. The number of wood rays was determined as 5-7/mm in cross-section and 39-53/mm² in tangential section. There were 3-9 cells (62-356 μ) in ray height and 1-3 cells (14-54 μ) in ray width. The fibers were ascertained 0.56-1.58mm long, 9.52-27.85 μ in diameter and their walls were 2.22-5.83 μ in thickness.

Anatomical properties of Ash wood grown in Quetta

In Ash wood brought from Quetta, the frequency of earlywood vessels was calculated 2-3/mm² and the latewood vessels were found 13-19/mm². The diameter of earlywood vessels was 116-262 μ while latewood vessels were 34-83 μ wide. The number of wood rays was determined as 6-8/mm in cross-section and 68-106/mm² in tangential section. There were 2-11 cells (30-216 μ) in height and 1-4 cells (10-63 μ) in ray width. The fibers were 0.52-1.37mm long, 15.24-25.40 μ in diameter and their walls were 2.54-4.82 μ in thickness.

Comparison of Anatomical Data

Based on the average values as shown in Table 1, the frequency and diameter of vessels both in case of earlywood and latewood was observed higher in Ash wood grown in Kashmir which showed its better seasoning and preservation behavior than that of grown in Balochistan. The frequency of wood rays both in cross and tangential sections was found greater in Ash wood grown

Table 1. Frequency and dimensional measurement of various wood elements/structure in Ash grown in Kashmir & Quetta, Pakistan

Origin		Anatomical Features														
		No. of Vessels/mm ²			Diameter of vessels(μ)		No. of rays in tangential section/ mm ²	No. of rays in cross section/ mm	Height of rays		Width of rays		Fiber length (mm)	Fiber diameter (μ)	Fiber wall-thickness (μ)	Fiber lumen width (μ)
		Early wood	Late wood	Range	Early wood	Late wood	Section/ mm ²	mm	Microns	No. of cells	Microns	No. of cells				
Kashmir	Avg.	4.00	10.45	230.30	87.34	Range (39-53)	5.85	191.68	9.59	32.18	1.89	1.21	20.43	3.79	12.85	
	S.D±	0.87	2.12	26.26	20.06	-	-	82.07	3.83	8.55	0.36	0.20	4.29	0.83	-	
	C.V	21.89	20.91	11.40	22.97	-	-	42.81	40.37	26.58	19.37	16.80	20.63	21.12	-	
	Min.	2.17	6.71	173.45	29.48	-	5	61.97	3	13.97	1	0.56	9.52	2.22	-	
	Max.	5.40	15.49	267.97	142.69	-	7	356.08	9	54.03	3	1.58	27.85	5.83	-	
Quetta	Avg.	2.06	16.45	203	55.71	Range (68-106)	7.71	123.77	6.5	34.83	2.36	1.04	19.53	3.41	12.71	
	S.D±	0.32	1.77	35.54	12.16	-	-	53.95	2.89	14.56	1.07	0.22	2.95	0.57	-	
	C.V%	15.53	10.75	17.53	21.83	-	-	43.58	44.46	41.80	45.33	21.42	15.14	16.74	-	
	Min.	1.54	13.42	116.40	34.42	-	6	30.48	2	10.16	1	0.52	15.24	2.54	-	
	Max.	2.66	19.10	261.90	82.83	-	8	215.9	11	63.50	4	1.37	25.40	4.82	-	

Av. = Average S.D=Standard Deviation C.V=Coefficient of variance

in Quetta, Balochistan that indicates the wood is comparatively lower in resistance against decaying agents. The length of fibers, their diameter and wall-thickness were found nearly analogous in both wood samples which represents their similarity in strength and hardness.

CONCLUSION

Based on the results, it can be concluded that Ash wood grown in Kashmir and Quetta are analogous in strength and hardness. However, the wood grown in Kashmir may be comparatively naturally resistant than that from Quetta and its preservation may also be easier.

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