YOUNG’S MODULUS OF WOODS – A COMPARATIVE STUDY

PROJECT REPORT

Submitted by

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(AB20PHY032)

Under the guidance of

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In partial fulfillment of the requirements for the award of

Bachelor Degree of Science in Physics

ST.TERESA’S COLLEGE (AUTONOMOUS)

ERNAKULAM

2022-23

ST.TERESA'S COLLEGE (AUTONOMOUS)

ERNAKULAM

CERTIFICATE

This is to certify that the project report entitled "**YOUNG'S MODULUS OF WOODS – A COMPARATIVE STUDY**" is an authentic work done by JYOTHI K R, under my supervision at Department of Physics, St. Teresa's college for the partial requirements for the award of Degree of Bachelor of Science in Physics during the academic year 2022-23.The work presented in this dissertation has not been submitted for any other degree in this or any other university.

Supervising Guide	Head of the Department
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B.Sc. PHYSICS

PROJECT REPORT

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Year of Work : 2022-23

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Submitted for the University examination held at St. Teresa's College, Ernakulam

DATE: 25/04/2023

EXAMINERS: 25/04/23.

St. Teresa's College (Autonomous) Ernakulam ★ Department of Physics ★

DECLARATION

I hereby declare that the project work titled "YOUNG'S MODULUS OF WOODS – A COMPARATIVE STUDY" has been originally carried out under the guidance and supervision of Dr. KALA M S. Professor, Department of Physics, St. Teresa's College (Autonomous), Ernakulam in partial fulfillment for the award of the degree of Bachelor of Physics. I further declare that this project is not partially or wholly submitted for any other purpose and the data included in the project is collected from various sources and are true to the best of my knowledge.

JYOTHI K R

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I am extremely thankful to our project guide Dr. Kala M S whose immense support and valuable ideas helped us to make this project a successful one. I would like to express our sincere gratitude to the Head of the department Dr. Priya Parvathi Ameena Jose for her esteemed guidance and encouragement. I would also like to thank and express my heartfelt acknowledgement to our teachers and lab assistant Mr. Pearl who have always been there to help us throughout. I sincerely thank everyone who has helped and encouraged us to make this project a reality.

ABSTRACT

Woods are of great demand in furniture industry. In this project, we focused on variation of Young's modulus with different woods using uniform bending method. If the beam is loaded at both ends, the elevation produced will form an arc of a circle. This type of bending is called uniform bending. In uniform bending, the bar is placed symmetrically on two knife edges. Two weight hangers are suspended at equal distance from the knife edges. Weights are add one by one and corresponding readings are taken. From these readings, the mean elevation (y) of the midpoint of the bar for a given mass is determined. We have calculated and compared the Young's modulus values. We have studied the Young's modulus of teak, mahogany, jackfruit tree, wild jack and cotton tree. Application of these woods in furniture industry was also studied.

CONTENT

CHAPTER 1

INTRODUCTION

A rigid body generally means a hard solid object having a definite shape and size. But in reality, bodies can be stretched, compressed and bent. When a sufficiently large external force is applied to a very rigid steel bar, it will deform. This means that solid bodies are not perfectly rigid. A solid has a definite shape and size. A force is required to change (or deform) a body's shape or size. If a helical spring is stretched by gently pulling on its ends, the length of the spring will increase slightly. When you release the ends of the spring, it will regain its original size and shape. Elasticity is the property of a body that tends to recover its original size and shape when an applied force is removed, and the resulting deformation is known as elastic deformation. However, if a force is applied to a lump of putty or mud, they have no gross tendency to regain their previous shape, and they get permanently deformed. Such a material is called plastic. Putty and mud are near ideal plastics.

For small deformations the stress and strain are proportional to each other. This is known as Hooke’s law. Stress is directly proportional to strain i.e. stress = k × strain, where k is the proportionality constant. k is known as modulus of elasticity. Hooke's law has been found to be valid for most materials. However, there are some objects that do not obey Hooke's law.

STRESS-STRAIN CURVE:

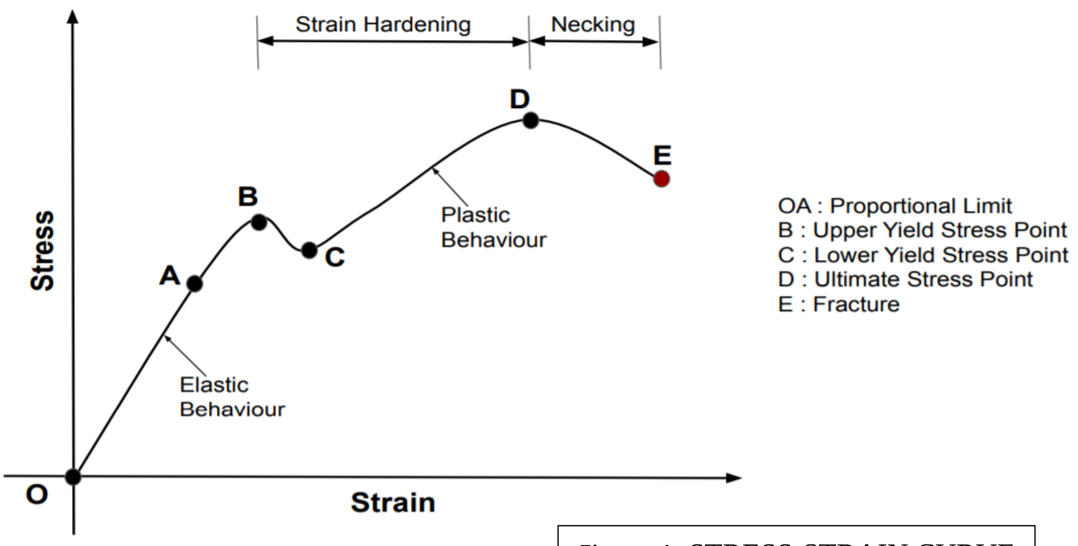

Figure 1: STRESS-STRAIN CURVE

We can experimentally determine the stress-strain relationship of a material under tensile force. A graph is plotted between the stress (which is equal in magnitude to the applied force per unit area) and the strain produced. A typical graph for a metal is shown in fig.1. These curves help us to understand how a given material deforms with increasing loads. From the graph, we can see that in the region between O to A, the curve is linear. In this region, Hooke's law is obeyed. The body regains its original dimensions when the applied force is removed. In this region, the solid behaves as an elastic body.

In the region from A to B, stress and strain are not proportional. Nevertheless, the body still returns to its original dimension when the load is removed. The point B in the curve is known as yield point (also known as elastic limit) and the corresponding stress is known as yield strength (σ_y) of the material. If the load is increased further, the stress developed exceeds the yield strength and strain increases rapidly even for a small change in the stress. The portion of the curve between B and D shows this. When the load is removed, say at some point C between B and D, the body does not regain its original dimension. In this case, even when the stress is zero, the strain is not zero. The deformation is said to be a plastic deformation. The point D on the graph is the ultimate tensile strength (σ_u) of the material. Beyond this point, additional strain is produced even by a reduced applied force and fracture occurs at point E. If the ultimate strength and fracture points D and E are close, the material is said to be brittle. If they are far apart, the material is said to be ductile. The stress-strain behavior varies from material to material. For example, rubber can be pulled to several times its original length and still returns to its original shape. Although elastic region is very large, the material does not obey Hooke's law over most of the region.

The ratio of stress and strain, called modulus of elasticity, is found to be a characteristic of the material. The ratio of tensile (or compressive) stress (σ) to the longitudinal strain (ε) is defined as Young's modulus and is denoted by the symbol Y

$$Y = \frac{(F/A)}{(\Delta L/L)} = \frac{F \times L}{A \times \Delta L} \qquad \text{Equation(1)}$$

Since strain is a dimensionless quantity, the unit of Young's modulus is the same as that of stress i.e., N m^{-2} or Pascal (Pa).

Elastic modulus or Young’s modulus is a measure of the stiffness of an elastic material.

The modulus of elasticity (MOE) measures a wood’s stiffness, and is a good overall indicator of its strength. Technically it is a measurement of the ratio of stress placed upon the wood compared to the strain (deformation) that the wood exhibits along the length.

The materials with higher Young’s modulus bear higher stiffness materials than lower Young’s modulus materials. They are more durable, thus have several applications.
By measuring the properties such as Young’s modulus, Rigidity modulus etc. of kinds of wood, a great deal of uncertainty can be removed from the building process.
Finding Young’s modulus of different woods is useful especially in the field of construction work.

CHAPTER-2

THEORY

UNIFORM BENDING

PRINCIPLE

The beam is loaded uniformly on its both ends; the bend beam forms an arc of a circle. The elevation is produced in the beam. This type of bending is known as uniform bending. In uniform bending, the bar is placed symmetrically on two knife edges. Two weight hangers are suspended at equal distance from the knife edges. Weights are added one by one and corresponding readings are taken. From these readings, the mean elevation (y) of the midpoint of the bar for a given mass is determined.

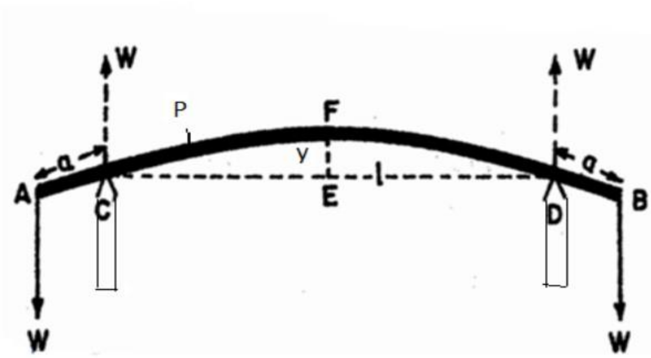

Figure 2: Young's modulus of the beam by uniform bending.

At the equilibrium position of the section PA of the beam two equal forces, the applied load W at A (download) and the normal reaction W at C (upward) are acting in the opposite direction constitute a couple.

The External bending moment = $(W \times AE) - (W \times CE)$

$$= W\,(AE - CE)$$

$$= W \times AC$$

$$= Wa$$

Equation(3)

Where, R is the radius of curvature.

Internal bending moment = $\frac{Y}{R} I_g$

Equation(4)

Where Y–Young's modulus of the cantilever.

I_g - Geometrical moment of inertia of its cross-section.

R - Radius of the curvature of the neutral axis at P.

At Equilibrium,

External bending moment = Internal bending moment

$$Wa = \frac{Y}{R} I_g$$

Equation(5)

Since, Wa is a constant, R is also constant. Therefore the beam bends into an arc of a circle of radius R. Hence the bending in this case is said to be uniform.

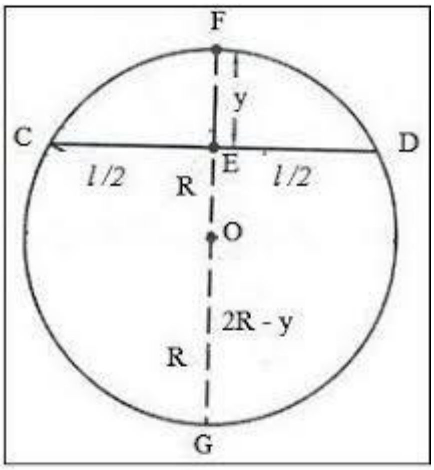

Figure 3: Uniform bending

From the property of circle,

$$CE \times ED = EF \times EG$$

$$l/_2 \times l/_2 = y(2R - y)$$

$$\frac{l^2}{4} = 2Ry - y^2$$

Equation(6)

Here y is the elevation produced in the beam. Since the elevation is very small compared to the radius of curvature of the circle, y^2 can be neglected.

$$\frac{l^2}{4} = 2Ry$$

$$R = \frac{l^2}{8y}$$ Equation(7)

Substituting equation (7) in equation (5)

$$Wa = \frac{YI_g}{[\frac{l^2}{8y}]}$$

Young's modulus by uniform bending,

$$Y = \frac{Wal^2}{8yI_g}$$

Equation(8)

For a bar of rectangular cross section, if b and d are the breadth and thickness of the beam

$$I_g = \frac{bd^3}{12}$$ Equation(9)

And $$W = Mg$$ Equation(10)

$$Y = \frac{3Mgal^2}{2bd^3y}$$

Equation(11)

Young's modulus of the material of the beam by uniform bending can be calculated as using equation(11).

PROCEDURE:

The bar is placed symmetrically on two knife edges. Two weight hangers are suspended at equal distance from the knife edge. The distance between the knife edges and distance p of the weight hanger from knife edges are measured. A pin is fixed vertically at the midpoint of the bar with its pointed end upward. The microscope is arranged in front of the pin and focused at the tip of the pin. The slotted weights are added one by one on both the weight hangers and removed one by one a number of times, so the bar is brought into an elastic mode. With some dead load w_0 on each weight hanger, the microscope is adjusted so that the image of the tip of the pin coincides with the point of intersection of cross wires. The reading of the main scale and Vernier of the travelling microscope are taken. Weights are added one by one and corresponding readings are taken. From the loading and unloading readings, the mean elevation (y) of the midpoint of the bar for a given mass is determined.. The breadth of the bar (b) is measured by using Vernier calipers and thickness of the bar (d) is measured using screw gauge. The Young's modulus of the material bar can be calculated using Equation (4).

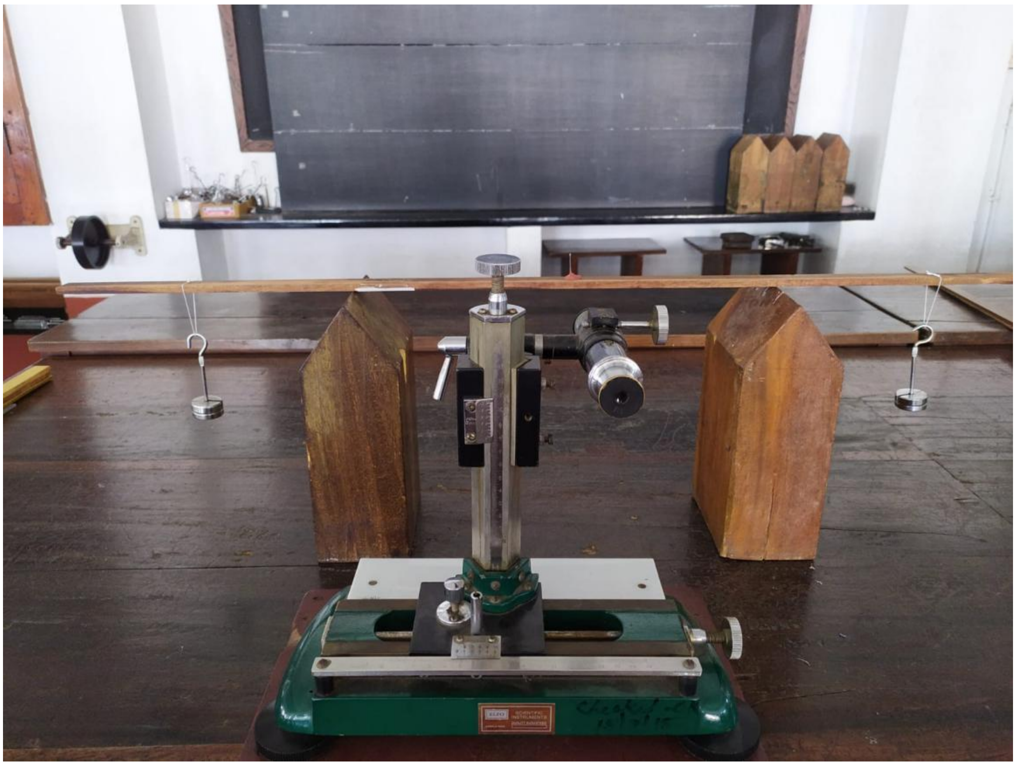

Figure 2: UNIFORM BENDING - PIN & MICROSCOPE APPARATUS

CHAPTER 3

EXPERIMENTAL OBSERVATIONS

Uniform bending – pin and microscope method was used to study the Young's modulus of teak, mahogany, jackfruit tree, wild jack, cotton tree. Woods are selected based on local availability and used for construction purposes. The five woods were cut into rectangular bars of meter scale dimensions and experiment was done using pin and microscope apparatus.The Young's modulus of the above mentioned woods are calculated and the values compared.

TEAK

DETERMINATION OF ($\frac{al^2}{y}$) USING PIN AND MICROSCOPE METHOD

<table>
<tr><th rowspan="2">a (m)</th><th rowspan="2">Length l (m)</th><th rowspan="2">Mass (kg)</th><th colspan="3">Reading of the telescope</th><th rowspan="2">Elevation for 150 g (cm)</th><th rowspan="2">Mean elevation for 150 g y (m)</th><th rowspan="2">($\frac{al^2}{y}$) (m^2)</th></tr>
<tr><th>On loading (cm)</th><th>On unloading (cm)</th><th>Mean (cm)</th></tr>
<tr><td rowspan="6">0.1</td><td rowspan="6">0.5</td><td>W_0</td><td>7.105</td><td>7.107</td><td>7.106</td><td rowspan="2">0.147</td><td rowspan="6">0.00159</td><td rowspan="6">15.723</td></tr>
<tr><td>W_0 + 50</td><td>7.155</td><td>7.153</td><td>7.154</td></tr>
<tr><td>W_0 + 100</td><td>7.206</td><td>7.207</td><td>7.206</td><td rowspan="2">0.155</td></tr>
<tr><td>W_0 + 150</td><td>7.253</td><td>7.253</td><td>7.253</td></tr>
<tr><td>W_0 + 200</td><td>7.304</td><td>7.307</td><td>7.305</td><td rowspan="2">0.1785</td></tr>
<tr><td>W_0 + 250</td><td>7.385</td><td>7.385</td><td>7.385</td></tr>
</table>

Mean y = 1.59 x 10^{-3} m

($\frac{al^2}{y}$) = 15.723 m^2

BREADTH (b) USING VERNIER CALIPERS

Value of main scale division = 1 mm

Number of divisions on the Vernier scale, n = 10

Least count (LC) = $\frac{1}{n}$ = 0.01 cm

Trial	MSR (cm)	VSR (division)	Total reading [MSR+(VSR X LC)] (cm)
1	2.7	5	2.75
2	2.7	6	2.76
3	2.7	6	2.76
4	2.7	5	2.75
5	2.7	6	2.76

Mean breadth, b = 2.756 x 10^{-2} m

THICKNESS (d) USING SCREW GAUGE

Value of pitch scale division = 1 mm

Distance moved by the screw for 6 rotations = 6 mm

Pitch = $\frac{Distance\ moved}{Number\ of\ rotations}$ = $\frac{6}{6}$ = 1 mm

Least count (LC) = $\frac{Pitch}{Number\ of\ divisions\ on\ head\ scale} = \frac{1}{100} = 0.01$ mm

Zero coincidence = 98

Zero error = -2

Zero correction = +2

Trial	PSR (mm)	HSR (division)	Corrected HSR (division)	Total reading [PSR+(corrected HSR X LC)] (mm)
1	6	63	65	6.65
2	6	62	64	6.64
3	6	62	64	6.64
4	6	63	65	6.65
5	6	63	65	6.65

Mean thickness, d = 6.646 x 10^{-3} m

SUBSTITUTION AND CALCULATIONS

Young's modulus of Teak wood :

$$Y = \frac{3Mg}{2bd3}\left(\frac{al^2}{y}\right) = \frac{3\ x\ 0.50\ x\ 9.8\ x\ \ 15.723}{2\ x\ 2.756\ x10-2\ \ x\ (6.646\ x\ 10-3)3} = 1.42 \text{ x } 10^{10}\ \text{N/m}^2$$

The standard value of Young's modulus of teak wood = 1.22 x 10^{10} N/m^2

ERROR: Percent error, $\delta = \frac{|observed\ value - actual\ value|}{actual\ value} \times 100\%$

$$\delta = \frac{|1.42 \text{ x } 10^{10} - 1.22 \text{ x } 10^{10}|}{1.22 \text{ x } 10^{10}} 100\% = 16.286\ \%$$

COTTON TREE (PARUTHI)

DETERMINATION OF ($\frac{al^2}{y}$) USING PIN AND MICROSCOPE METHOD

a (m)	Length l (m)	Mass (kg)	Reading of the telescope			Elevation for 150 g (cm)	Mean elevation for 150 g y (m)	($\frac{al^2}{y}$) (m^2)
			On loading (cm)	On unloading (cm)	Mean (cm)			
0.1	0.5	W_0	6.855	6.853	6.854	0.043	0.0373 x 10^{-2}	67.024
		W_0 + 50	6.876	6.875	6.875			
		W_0 + 100	6.895	6.899	6.897	0.035		
		W_0 + 150	6.902	6.901	6.9015			
		W_0 + 200	6.910	6.911	6.9105	0.034		
		W_0 + 250	6.931	6.931	6.931			

Mean y = 0.0373 x 10^{-2} m

($\frac{al^2}{y}$) = 67.024 m^2

BREADTH (b) USING VERNIER CALIPER

Least count (LC) of Vernier caliper = 0.01 cm

Trial	MSR (cm)	VSR (division)	Total reading [MSR+(VSR X LC)](cm)
1	2.6	5	2.65
2	2.6	6	2.66
3	2.6	4	2.64
4	2.6	5	2.65
5	2.6	6	2.66
6	2.6	5	2.65

Mean breadth, b = 2.6516 x 10^{-2} m

THICKNESS (d) USING SCREW GAUGE

Least count (LC) of screw gauge = 0.01 mm

Zero coincidence = 12

Zero error = +12

Zero correction = -12

Trial	PSR (mm)	HSR (division)	Corrected HSR (division)	Total reading [PSR+(corr. HSR XLC)](mm)
1	7	52	40	7.40
2	7	53	41	7. 41
3	7	49	37	7.37
4	7	50	38	7.38
5	7	55	43	7.43
6	7	48	36	7.36

Mean thickness, d = 7.3916×10^{-3} m

SUBSTITUTION AND CALCULATIONS

Young's modulus of cotton tree wood (paruthi)

$Y = \frac{3Mg}{2bd3}(\frac{al^2}{y}) = \frac{3 \; x \; 0.150 \; x \; 9.8 \; x \; 67.024}{2 \; x \; 2.6516 \; x \; (7.3916 \; x \; 10-3)3} = 1.38 \times 10^{10}$ N/m^2

The standard value of Young's modulus of cotton tree wood = 0.94×10^{10} N/m^2

JACKFRUIT TREE

DETERMINATION OF ($\frac{al^2}{y}$) USING PIN AND MICROSCOPE METHOD

a (m)	Length l (m)	Mass (kg)	Reading of the telescope			Elevation for 150 g (cm)	Mean elevation for 150 g y (m)	$(\frac{al^2}{y})$ (m^2)
			On loading (cm)	On unloading (cm)	Mean (cm)			
0.1	0.5	W_0	6.906	6.904	6.905	0.091	0.07816×10^{-2}	31.9828
		W_0 + 50	6.940	6.944	6.942			
		W_0 + 100	6.967	6.965	6.966	0.0615		
		W_0 + 150	6.993	6.999	6.996			
		W_0 + 200	6.003	6.004	6.0035	0.082		
		W_0 + 250	6.048	6.048	6.048			

Mean y = 0.07816×10^{-2} m

$(\frac{al^2}{y})$ = 31.9828 m^2

BREADTH (b) USING VERNIER CALIPERS

Least count (LC) of Vernier caliper = 0.01 cm

Trial	MSR (cm)	VSR (division)	Total reading [MSR+(VSR X LC)] (cm)

1	2.6	9	2.69
2	2.6	9	2.69
3	2.6	9	2.69
4	2.6	8	2.68
5	2.6	9	2.69
6	2.6	8	2.68

Mean breadth, b = 2.686 x 10^{-2} m

THICKNESS (d) USING SCREW GAUGE

Least count (LC) of screw gauge = 0.01 mm

Zero coincidence = 12

Zero error = +12

Zero correction = -12

Trial	PSR (mm)	HSR (division)	Corrected HSR (division)	Total reading [PSR+(corrected HSR X LC)] (mm)
1	7	43	31	7.31
2	7	47	35	7. 35
3	7	55	43	7.43
4	7	50	38	7.38
5	7	42	30	7.30
6	7	40	28	7.28

Mean thickness, d = 7.3416 x 10^{-3} m

SUBSTITUTION AND CALCULATIONS

Young's modulus of jackfruit tree wood

$$Y = \frac{3Mg}{2bd3}\left(\frac{al^2}{y}\right) = \frac{3\ x\ 0.5\ x\ 9.8\ x\ 31.9828}{2\ x\ 2.686\ x\ 10{-}2\ x\ (7.3416\ x\ 10{-}3)3}$$

$= 2.21 \times 10^{10}\ N/m^2$

WILD JACK

DETERMINATION OF ($\frac{al^2}{y}$) USING PIN AND MICROSCOPE METHOD

a (m)	Length (m)	Mass (kg)	Reading of microscope			Elevation for load in 150g (cm)	Mean elevation for 150g y (m)	($\frac{al^2}{y}$) (m^2)
			On loading (cm)	On unloading (cm)	Mean (cm)			
0.1	0.5	W0	7.985	7.986	7.985		0.0423X10^{-2}	59.0597
		W0+50	8.006	8.006	8.005	0.039		
		W0+100	8.01	8.01	8.01	0.04		
		W0+150	8.025	8.024	8.0245	0.048		
		W0+200	8.045	8.046	8.0455			
		W0+250	8.058	8.058	8.058			

Mean y = 0.0423X10^{-2} m

($\frac{al^2}{y}$) = 59.0597 m^2

BREADTH (b) USING VERNIER CALIPERS

Least count (LC) of Vernier caliper = 0.01 cm

Trial	MSR	VSR	Total reading=MSR+(VSR x LC)

	(cm)	(cm)	(cm)
1	2.6	3	2.63
2	2.6	4	2.64
3	2.6	5	2.65
4	2.6	4	2.64
5	2.6	4	2.64

Mean breadth (b)=0.0264 m

THICKNESS (d) USING SCREW GAUGE

Least count (LC) of screw gauge = 0.01 mm

Zero coincidence = 0

Trial	PSR (mm)	HSR (division)	Corrected HSR (division)	Total reading=PSR+(corr.HSR x LC) (mm)
1	7.5	11	11	7.61
2	7.5	12	12	7.62
3	7.5	13	13	7.63
4	7.5	12	12	7.62
5	7.5	13	13	7.63

Mean Thickness (d) = 0.007618 m

SUBSTITUTION AND CALCULATION

Young's modulus of wild jack, $Y = \frac{3Mg}{2bd^3}(\frac{al^2}{y})$

$$= \frac{3\times0.5\times9.8}{2\times(2.64\times10^{-2})(7.618\times10^{-3})^3}(59.0597)$$

$$= 3.72\times 10^{10}\ N/m^2$$

MAHOGANY

DETERMINATION OF ($\frac{al^2}{y}$) USING PIN AND MICROSCOPE METHOD

a (m)	Length (m)	Mass (kg)	Reading of microscope			Elevation for load in 150g (cm)	Mean elevation for 150g y (m)	($\frac{al^2}{y}$) (m^2)
			On loading (cm)	On unloading (cm)	Mean (cm)			
0.1	0.5	W0	7.197	7.197	7.197		$0.0641\text{x}10^{-2}$	38.9614
		W0+50	7.206	7.207	7.2075	0.057		
		W0+100	7.226	7.226	7.226	0.0595		
		W0+150	7.253	7.225	7.254	0.076		
		W0+200	7.267	7.267	7.267			
		W0+250	7.302	7.302	7.302			

Mean y = $0.0641\text{x}10^{-2}$ m

($\frac{al^2}{y}$) = 38.9614 m^2

BREADTH (b) USING VERNIER CALLIPERS

Least count (L.C) of vernier caliper = 0.01 cm

Trial	MSR(cm)	VSR(cm)	Total reading=MSR+(VSR x LC)(cm)
1	2.5	4	2.54
2	2.5	3	2.53
3	2.5	3	2.53
4	2.5	3	2.53
5	2.5	3	2.53

Mean breadth (b) = 0.02532 m

THICKNESS (d) USING SCREW GAUGE

Least count (LC) of screw gauge $=$ 0.01 mm

Zero coincidence = 0

Trial	PSR (mm)	HSR	Corrected HSR	Total reading=PSR+ (corr. HSR x LC) (mm)
1	7	20	20	7.20
2	7	22	22	7.22
3	7	22	22	7.22
4	7	20	20	7.20
5	7	20	20	7.20

Mean Thickness (d) = 0.007208m

SUBSTITUTION AND CALCULATON

$$Young's\ modulus\ of\ mahogany\ \ ,Y = \frac{3Mg}{2bd^3}(\frac{al^2}{y})$$

$$Y = \frac{3 \times 0.5 \times 9.8}{2 \times (2.532 \times 10^{-2})(7.208 \times 10^{-3})^3}(38.9614)$$

$$= 2.752 \times 10^{10}\ N/m^2$$

CHAPTER 4

RESULTS AND CONCLUSION

The value of Young's modulus obtained for various woods using Uniform bending method Follow as:

Wood	Young′s modulus obtained
Teak	1.42 x 10^{10} N/m^2
Mahogany	$2.75\times 10^{10}\ N/m^2$
Wild jack	$3.72\times 10^{10}\ N/m^2$
Jackfruit tree	2.21 x 10^{10} N/m^2
Cotton tree (paruthi)	1.38 x 10^{10} N/m^2

Young's modulii of different woods have been estimated using the Uniform bending method. . It is seen that Young's modulus varies with respect to the materials selected. A material with higher Young's modulus is more elastic than a material with lower Young's modulus. In such materials more deformation occurs and they are unable to return to their original shape when deforming force is removed. The materials with higher Young's modulus bear higher stiffness materials than lower Young's modulus materials. Also, it can be said that stress to strain ratio is higher for more elastic materials than lower elastic materials.

Measurements of wood mechanical properties are crucial in assessing overall relative strengths (i.e., resistance to fracture) of different wood products, and in their propensity to deform under load.

Teak is mainly used in manufacture of furniture and boat deck because it is one of the strongest hardwood (have high Young's modulus value). Teak's high oil content, high tensile strength and tight grain make it particularly suitable where weather resistance is desired. It is also used for cutting boards, indoor flooring and much more due to its high tensile strength. Teak has been grown extensively due to its high durability and applications in furniture industry. These properties make it costly.

Mahogany is a versatile durable hardwood. It is commonly used in furniture joinery and musical instruments. It is resistant to wear and tear. It is also used for construction of small boats. It is solid and stable and much less likely to twist, warp, split or crack over time.

Jack fruit tree is superior to teak for furniture because it's Young's modulus is greater than that of teak. It is used for manufacturing of windows, door, musical instruments such as veena and drums like mridangam, khajira etc. It is also termite proof.

Cotton wood is one of the lightest hardwood because it tends to fuzz (a frizzy mass of hair or fibre). It is mainly used to make wooden baskets, boxes. It is used as low cost furnishing. Strength of the cotton wood is barely week.

Wild jack is used to make frames of doors and windows. It has got high timber value; the quality is equivalent to teak with the advantage of lightness. It is highly preferred for furniture industry. Famous snakes boat of kerala are often build of this wood.

Among the 5 woods wild jack tree would seem to be stronger than others therefore it is best suitable for construction purposes and other applications. According to the results, Young's modulus of the five types of wood in decreasing order are as follows,

Wild jack > Mahogany > Jackfruit > Teak > Cotton tree

Wood originating from various types of trees has different properties. Even wood from one tree has different properties compared to the end with its base. In timber technology, deep knowledge is needed in the use of wood as a structural component. Therefore, the use of wood must be truly effective and optimal with high efficiency, namely using low-quality wood which is varied with high-quality wood. There is also wide range of application for Young's modulus.

Elasticity is used widely in the design and analysis of structures such as beam, plates, shells. By measuring the properties such as Young's modulus, Rigidity modulus etc. of kinds of wood, a great deal of uncertainty can be removed from the building process. Finding Young's modulus of different woods is useful especially in the field of construction work.

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