Durability of timber from exotic species against termite attack in Indian conditions

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Need-64 million cu.m: supply is to the tune of 43 m.cum (MOEF, 1998): import of forest products amounts to US $ 1028 million (FAO 2000)

We own 4000 woody species

Life expectancy of non durable wood species varies between 2-15 years

Wood treatments is just 5% of the total wood supply
## Estimates of Import and Export (Rs. in Crores)

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Import</td>
<td>Export</td>
</tr>
<tr>
<td>1. Roundwood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Saw logs, sawnwood, Veneer logs, pulpwood)</td>
<td>753</td>
<td>109</td>
</tr>
<tr>
<td>2. Wood based panels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Plywood, particle board, Fiber board, MDF)</td>
<td>821</td>
<td>119</td>
</tr>
<tr>
<td>3. Wood Pulp</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>991</td>
<td>143</td>
</tr>
<tr>
<td>4. Paper &amp; Paperboard</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Newsprint, writing paper, packaging paper etc.)</td>
<td>1957</td>
<td>283</td>
</tr>
</tbody>
</table>

*(Planning Commission, 2001)*
Wood and wood products are imported into India to the tune of 15,40,000 cum.
Imported wood

Plantation timber
<table>
<thead>
<tr>
<th>Purpose</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing and Construction</td>
<td>62</td>
</tr>
<tr>
<td>Sleepers</td>
<td>08</td>
</tr>
<tr>
<td>Packing</td>
<td>06</td>
</tr>
<tr>
<td>Furniture</td>
<td>07</td>
</tr>
<tr>
<td>Vehicle Industry</td>
<td>07</td>
</tr>
<tr>
<td>Shipbuilding</td>
<td>04</td>
</tr>
<tr>
<td>Mining</td>
<td>02</td>
</tr>
<tr>
<td>Misc. (pencil, sports goods,</td>
<td>04</td>
</tr>
<tr>
<td>handicraft, tool handles)</td>
<td></td>
</tr>
</tbody>
</table>
## PROJECTED DEMAND FOR SAWN WOOD

(m Cu.m.)

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>15.90</td>
<td>4.62</td>
<td>2.52</td>
<td>0.19</td>
<td>0.45</td>
<td>0.03</td>
<td>5.70</td>
<td>29.41</td>
</tr>
<tr>
<td>2005</td>
<td>19.40</td>
<td>5.54</td>
<td>3.36</td>
<td>0.28</td>
<td>0.54</td>
<td>0.05</td>
<td>6.70</td>
<td>35.87</td>
</tr>
<tr>
<td>2010</td>
<td>22.10</td>
<td>6.40</td>
<td>4.62</td>
<td>0.41</td>
<td>0.65</td>
<td>0.07</td>
<td>9.40</td>
<td>43.65</td>
</tr>
<tr>
<td>2015</td>
<td>26.30</td>
<td>7.55</td>
<td>5.90</td>
<td>0.60</td>
<td>0.78</td>
<td>0.11</td>
<td>11.20</td>
<td>52.44</td>
</tr>
<tr>
<td>2020</td>
<td>28.50</td>
<td>9.00</td>
<td>7.53</td>
<td>0.87</td>
<td>0.95</td>
<td>0.16</td>
<td>15.15</td>
<td>62.16</td>
</tr>
</tbody>
</table>
## PANEL INDUSTRY

- **PLYWOOD**
- **PARTICLE BOARD**
- **MEDIUM DENSITY FIBRE BOARD**

### PANEL PRODUCTION FOR 1997

<table>
<thead>
<tr>
<th></th>
<th>PRODUCTION</th>
<th>INSTALLED CAPACITY</th>
<th>CAPACITY UTILIZATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PARTICLE BOARD</td>
<td>46,200 tonnes</td>
<td>113,000 tonnes</td>
<td>40%</td>
</tr>
<tr>
<td>MEDIUM DENSITY FIBRE BOARD</td>
<td>63,000 cu. m</td>
<td>122,000 cu. m</td>
<td>51%</td>
</tr>
<tr>
<td>PLYWOOD</td>
<td>22.44 m sq. m</td>
<td>54 m sq. m</td>
<td>42%</td>
</tr>
</tbody>
</table>
SAWNWOOD

80% - Hard Wood Species
20% - Coniferous Species

COMMON BROAD LEAVED SPECIES IN USE

• TEAK
• SAL
• LAUREL
• MANGO
• BENTEAK

LEADING CONIFEROUS SPECIES IN USE

• DEODAR
• KAIL
• CHIR
CURRENT SOURCES OF WOOD

Government Forest 30%
Farmer Social forestry 10%
Open market including imported wood 60%
Raw Material Supply Policy in India

- Directs the forest department for the states to suspend the prevailing practice of selling forest raw material.
- Relevant section of the policy also directs the forest industries to raise their own raw material.
- Import of logs.
- Raw material from farmers.
NFAP- National Forestry Action Programme 1988

Annual Requirement of timber- 64 million cu.m
Supply – 43 million cu.m (12 m cu.m from natural forests + 31 m cu.m from forestry and other sources).

Demand for fuel wood- 201 million tonnes
Supply- 95 m tonnes. (17 m tonnes from forests + 72 tonnes from farm forestry & other sources).

Woody species in India – 4000 – Timber deficiency country. Hence hike in the prices of conventionally preferred species like Teak, Sal, Deodar, Rosewood, Red sanders etc.
HOW TO BRIDGE THE GAP?

• Import of wood
  – Import is not a long term remedy
    US$ 1028 million every year at present (FAO, 2000)

• Utilize short rotation plantation species
  Desirable solution
WHERE TO GROW AND WHAT TO GROW?

GROW MORE Short rotation species
including fast growing EXOTICS

IN?

Private plantations
Agroforestry
EXOTIC ACACIA SPECIES GROWN IN INDIA

Acacia auriculiformis

- Introduced to INDIA from AUSTRALIA
- Fast growing multi purpose trees
- Pest and disease resistant
- Reclaims waste lands
- High adaptation to new habitats
- Planted as shelter and ornamental plants
- Source of tannin, fuel, PULP and timber
- Durability as timber in Indian conditions is less known
**Acacia auriculiformis**

- Came to India in 1930
- Planted for firewood
- 1960 came to Karnataka
- In 1970 as border plants
- 1974 became favourite for Forest department
- Costs Rs. 1200/c.ft
- Has become so native
- Industries grow and use it for pulp
- Presently known as Mysore teak
- Being used for furniture
EXOTIC SPECIES - *ACACIA MANGIUM*

- Species for humid, tropical lowlands
- Best used for paper
- Good for furniture, handicrafts, timber uses
Acacia hybrid

- Evolved by reciprocal crosses between *A. auriculiformis* and *A. mangium*
- Fastest growing in high rainfall area
- Gaining popularity in South India
- As good as *A. mangium* for paper and pulp (Hemavathithi *et al.*, 2006)
Furniture and Joinery from *A. auriculiformis*
ACACIA HYBRID FOR FURNITURE
Handicrafts made from *A. mangium*
The stunning fact

Naturally durable timber account to as much as only 10% of wood used in industrial sector in India

Preservative treatment of timber forms a very important part of the national endeavour to conserve the material resources of the country and to achieve the most economic utilization.
# Durability of timber

<table>
<thead>
<tr>
<th>Class</th>
<th>Average Life (Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>120 and over</td>
</tr>
<tr>
<td>II</td>
<td>60 and over but less than 120</td>
</tr>
<tr>
<td>III</td>
<td>Less than 60</td>
</tr>
</tbody>
</table>
Studies so far

**Acacia auriculiformis**

Excellent fuel and suitable for paper and pulp (Guha and Pant, 1966)
For turnery and lacquer coating (Rajan et al., 1979)
Mechanical properties (Kumar et al., 1987)

**A. mangium**

Introduced as Fire break and fast growing species in South East Asia (Yap, 1986)
Uses include furniture, paper and pulp, fuelwood (Turnbull, 1986)
Classified as heavy, moderately hard (Kumar et al., 2004)

Little or no data available on natural resistance against fungi, borers and termites
No authentic data available on natural durability against termites
WOOD DETERIORATING INSECTS IN INDIA

In Timber

Structures, Products & Furniture

- Longhorn Beetle (*Stromatium barbatum*)
- Bostrychids (*Sinoxylon anale*)
- Lyctids (*Lyctus africanus*)
- Wood wasps (*Xylocopa sp*) & Ants
- Termites (*Odontotermes sp*)
Species diversity of termites

- Approximately 2000 species (400 lower termites and 1600 higher termites)
- <100 are considered economically important in causing damage to buildings and timber in service
TERMITES – THE MENACE

Major pests of saw mills, timber yards and manufacturers’ premises, and also in structures and furniture.

TERMITES attack wood of all species, in any stage, any age and anywhere.
The study

• To test the natural durability of Acacia spp.

• To study the comparative durability

• Testing insecticides and botanicals for enhancement of durability
TERMITES IN THE TEST SITE

- *Odontotermes hornii*
- *O. obesus*
- *O. redemanni*
- *Microtermes obesi*
TREATMENTS

• Pressure treatments as per BIS :401
• with CCA- 4%
• Permethrin – 1%
• and CNSL -30%
• 15 minutes vacuum followed by 50lbs/sq.inch pressure for 30 minutes
Termite Test method : BIS- 4833
TEST SPECIES

A. auriculiformis
A. mangium
Acacia hybrid

Untreated rubber wood (Hevea brasiliensis)
<table>
<thead>
<tr>
<th>Timber species</th>
<th>Mean per cent damage at different Months After Implantation (MAI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acacia auriculiformis (Untreated)</td>
<td>0.00 0.00 0.00 0.00 2.00 3.33 6.66 6.66 8.00 10.00</td>
</tr>
<tr>
<td>Acacia auriculiformis (Treated with CSNL)</td>
<td>0.00 0.00 0.00 0.00 0.00 0.00 0.00 1.66 2.00 3.33</td>
</tr>
<tr>
<td>Acacia auriculiformis (Treated with Permethrin)</td>
<td>0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00</td>
</tr>
<tr>
<td>Acacia auriculiformis (Treated with CCA)</td>
<td>0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00</td>
</tr>
</tbody>
</table>
# Acacia mangium

<table>
<thead>
<tr>
<th>Timber species</th>
<th>Mean per cent damage at different Months After Implantation (MAI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Acacia mangium (Untreated)</td>
<td>1.60</td>
</tr>
<tr>
<td>Acacia mangium (Treated with CSNL)</td>
<td>0.00</td>
</tr>
<tr>
<td>Acacia mangium (Treated with Permethrin)</td>
<td>0.00</td>
</tr>
<tr>
<td>A. mangium (Treated with CCA)</td>
<td>0.00</td>
</tr>
<tr>
<td>H. brasiliensis untreated</td>
<td>100.0</td>
</tr>
</tbody>
</table>
## Acacia hybrid

<table>
<thead>
<tr>
<th>Timber species</th>
<th>Mean per cent damage at different Months After Implantation (MAI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
</tr>
<tr>
<td><strong>Acacia hybrid</strong> (Untreated)</td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Acacia hybrid (Treated with CSNL)</strong></td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Acacia hybrid (Treated with Permethrin)</strong></td>
<td>0.00</td>
</tr>
<tr>
<td><strong>Acacia hybrid (Treated with CCA)</strong></td>
<td>0.00</td>
</tr>
<tr>
<td><strong>H. brasiliensis untreated</strong></td>
<td>100.0</td>
</tr>
</tbody>
</table>

Mean per cent damage at different Months After Implantation (MAI)
Comparative performance

- Our studies on resistance to fungi had shown that *A. auriculiformis* can be classified as highly resistant timber.
- Susceptibility of *A. mangium* to termites in other countries also showed it is less durable than *A. auriculiformis*.
- The present study shows that the durability of these exotics are same as in other tropical countries.
CONCLUSIONS

• The study revealed that timber of young *A. auriculiformis*, *A. mangium* and their hybrid are more durable than mature Rubberwood. They can be used for utilities as timber material.

• Acacia hybrid was found as the most durable timber.

• *A. mangium* is found very susceptible to termite attack and hence require chemical protection for their use as timber material.
Acknowledgements

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- Indian Council of Forestry Research and Education (ICFRE) for permitting me to attend the conference
- Authorities in IUFRO for accepting my paper and participation
THANK YOU