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USE OF *KHAYA SENEGALENSIS* WOOD IN SRI LANKA: A FIELD SURVEY

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Abstract:

Wood remains one of the most versatile and widely used natural materials, valued for applications ranging from construction and furniture production to ornamental and energy purposes. In Sri Lanka, teak (Tectona grandis) is the dominant timber species, followed by mahogany and satin. However, increasing elephant damage to teak plantations has necessitated the introduction of alternative species. African mahogany (Khaya senegalensis), introduced over 50 years ago and cultivated more extensively in the last two decades, has emerged as a promising substitute in dry and intermediate zones. With an attractive pinkish to reddish-brown hue and moderate density (570kg/m³), Khaya wood belongs to the medium-strength category (Class II as per STC classification) and is currently used in light construction, furniture, musical instruments, and plywood. Beyond its economic utility, Khaya also contributes to ecological sustainability by aiding in carbon sequestration and serving as a fuel source for power generation, with notable usage in countries such as Thailand and India. Recognizing the increasing domestic timber demand driven by population growth, the Sri Lankan government has promoted Khaya plantations to reduce wood imports and foreign exchange expenditures. This study aims to assess the awareness, prevalence, and use of Khaya wood in Sri Lanka, along with identifying challenges faced by consumers and stakeholders. The findings intend to support effective policy and plantation strategies by recommending solutions to improve utilization and address issues associated with Khaya sawntimber This study contributes to sustainable forest management and offers insight into the growing role of Khaya in Sri Lanka's timber industry.

Key words*: Khaya senegalensis; timber substitution; sustainable forestry; questionnaire, survey.*

INTRODUCTION

Wood is one of the most versatile natural materials, valued for its excellent properties and broad range of applications, including construction, furniture production, musical instruments, ornamental objects, medicines, firewood, fuel products, and energy generation (Mascarenhas et al. 2022; Muthumala et al. 2021). Teak (*Tectona grandis*) is the main timber species used for furniture manufacturing followed by Mahogany and Satin in Sri Lanka (Siriwardena & Muthumala 2020). Some areas with the incremental issues which rise from Elephant damage to the Teak plantations in Sri Lanka. To prevent this issue, *Kaya senegalensis* (African Mahogany or Khaya) has introduced by Forest Department instead of teak to Sri Lanka. *Khaya senegalensis* belongs to order Sapindales and family Meliaceae; it is a deciduous evergreen tree with 15-30m hight, wide dense crown and thick stem (Azam et al. 2016; Muthumala & Jayasinghe 2024). *Khaya* was introduced to Sri Lank more than 50 years ago as a shade and amenity tree. However large scale plantation establishment has been initiated about 20 years ago by the Forest Department for the purpose of harvesting wood (Perera, Weerawardhana and Amarasekara 2006). Kaya species has been introduced by the Forest Department as the substitute product for teak, on about 2187 acres in several dry and intermediate zones in Sri Lanka as commercial plantations. Today, it has been identified as one of the pioneer tree species for plantation establishment in Sri Lanka (Thilakaratna 2001; Thilakaratna & Weerawardane 1992).

Khaya senegalensis is a suitable species for establishment in nutritive, cultivated, clear-felled, and rehabilitated forest patches. With all these benefits it may be the best suited plant to take shades and create aesthetic beauty in urban and rural area. It can be easily planted through the lands due to having both type of vegetative propagation and seedling planting.

The wood of *Khaya senegalensis*is is odorless and having pinkish to reddish brown color. The sapwood and heartwood can't clearly identify. It consists with moderate weight and considerable density (570kgm^{-3}). Therefore it belongs to the medium strength category. According to the classification of the State Timber Corporation, it belongs to Class II category. In present the timber of *Khaya senegalensis* has used for several

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purposes throughout the country. Due to having medium strength properties it is used for light constructions, furniture, musical instruments, plywood and other purposes etc. (McGavin et al. 2021; Wijenayake 2014).

This tree has performed some special role economically and ecologically. The charcoal produced from this wood represents a powerful is the powerful source for generating the electricity to activate boilers. There are 15 thermal power plants using *Khaya* coal in Thailand and India (Wijenayake 2014). It helps to retain C in the environment and helps to equilibrate the Carbon cycle too (Warnasooiya & Sivanntha 2012). Over the past decades, the rapid increase in population has resulted in higher rates of wood consumption. To supply the higher demand of customers it is necessary to import wood annually. When import rates going up it will increase the foreign exchange of the country. With the purpose of investing the foreign exchange government tries to expand the plantation projects throughout the country. For succeeding the implementation of the projects, Khaya can be used to supply the demand of consumers. Therefore, this study will helpful to identify the wood usage of Kaya and the issues which the customers have to face with using this timber and find the solutions and recommendation throughout this survey. The objectives of the study are to determine the awareness, prevalence, and use of Khaya wood species, as well as perceptions of the problems arising from their use.

METHODOLOGY

A study was conducted in the selected ranges of Forest Department were belonged to the Kurunegala District in Sri Lanka. As the first step of the survey, it was collected information which needs to prepare the questionnaire for distributing among the people in selected sites. Questionnaire was prepared under major categories which highlight the purpose of the survey with the guidance of the officers, expertise persons and the consultants who have the knowledge and the experience in the relevant field of that area. After preparing the questionnaire it was distributed among carpenters, sawmill operators, furniture shop owners through the Range Forest Officers, District Forest Officers of the Forest Department and the Coup Officers, Depot Officers of the State Timber Corporation, Saw mill Managers and Furniture factory managers of the Kurunegala District. Data were gathered by filling the questionnaires from people who worked in the selected sites of Kuliyapitiya, Mahawa, Kurunegala, Malsiripura, Galgamuwa depots of Forest Department and Nikawaratiya, Kurunegala, Malsiripura and Kankaniyamulla sales depots of State Timber Corporation. The volunteer participants who preferred to participate in survey were scheduled for face to face interview for 5 minutes in understandable manner with preferred language and filled the questionnaires. Descriptive analysis was done using all the qualitative and quantitative data gathered from interviews and the filled questionnaires within 6 months' time of this survey.

The methodology of this study includes a description of the questionnaire design, data collection procedures, and data analysis methods. The questionnaire consisted of different types of questions developed according to the criteria used to generate the graphs presented in the results section. These questions were designed to capture relevant quantitative and qualitative information related to the study objectives.

A total of 84 participants took part in the survey. The questionnaire was in, allowing participants to respond within a specified time frame. Participation was voluntary, and responses were collected anonymously to ensure confidentiality.

After data collection, the responses were systematically processed and analyzed. Quantitative data were coded and statistically analyzed to produce graphical representations, while qualitative responses were categorized and interpreted thematically. The analyzed data were then used to generate the graphs and tables presented in this study.

RESULTS AND DISCUSSION

The number of participants were altogether 84 volunteers who belong to the age categories of 30-40, 41-50, 51-60, 61-70, 71-80 participated in this survey. Out of them 76 were males and 8 were females. The highest percentage of 38.15% from males had belonged to the 30-40 age limit while 50% from females had belonged to the 41-50 age category (Table 1). Out of total participants 71% both males and females were aware on the *Khaya senegalensis* (Table 1).

Therefore it represents that most of the voluntary participants who participated in this survey were less than 50 years old and most of them were males and out of all participants a considerable amount were known about the *Khaya senegalensis.* The energetic youth of the country has aware on Kaya and it will be a good for the usage of the Khaya in future.

Table 1

Demographic data on participants for the survey of Khaya senegalensis (African mahogany) in Kurunegala District

Demographic on age category		
Age Category	Male	Female
31-40	38%	12%
41-50	35%	50%
51-60	32%	27%
61-70	03%	12%
71-80	01%	00%
Awareness of African Mahogony		
Yes	71%	
No	29%	
Awareness of usage of *Khaya senegalensis*		
Yes	46.67%	
No	53.33%	

When considering the usage of *Khaya senegalensis*, out of the 84 participants, 46.67% were used the Kaya timber species in Kurunegala district while 53.33% were not used (Table 1). Although they were aware it seems to be not known the properties of Kaya and preference to use is in low condition. And also there were some issues perceived during the usage.

The use of Kaya wood of the participants who used the Kaya species 82.15% used the timber for roofing. It represents that the *Khaya senegalensis* is very preferred timber at the construction sites for building the roves of the buildings. Lowest percentage of 3.57% used it for decorative items as valancing material. Others 7.1% for manufacturing furniture and making door or window frames. Therefore Fig. 1 graph clearly emphasize the preference of usage and can easily identified that the wood of this species is most famous for roofing in Kurunegala District. The majority of aware participants used for that purpose. But due to having the medium wood properties there may be a trend for manufacturing furniture in near future.

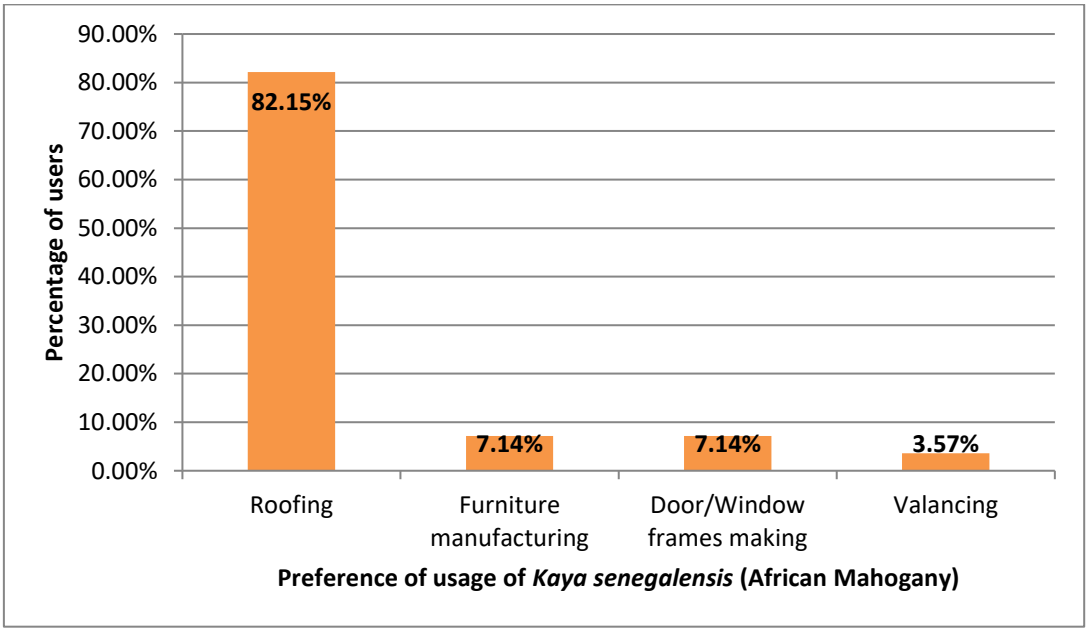

Fig. 1.
Preference of African Mahogany (Khaya senegalensis) usage in Kurunegala District.

There were so many issues such as cracking, curving, twisting, fibrillating, shrinking, concaving and roughness which rise when using the timber of *Khaya senegalensis.* When screening cutting and felling majority, 57.69% perceived issue of fibrillated and roughness, 30.77% perceived issue of curving and twisting and lowest percentage of 11.53% perceived the issue of cracking. Shrinking and concaving issues were not screened (Fig. 2).

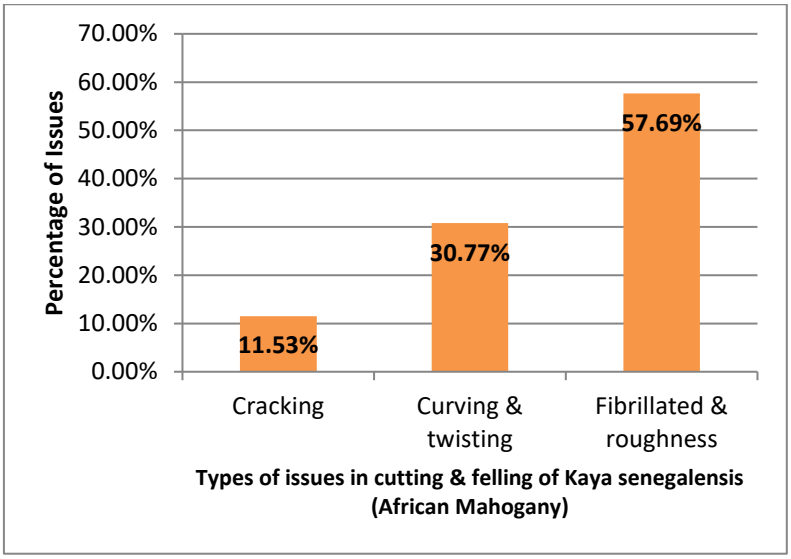

Fig. 2.
Issues occurred in cutting & felling of Khaya senegalensis (African Mahogany) in Kurunegala District.

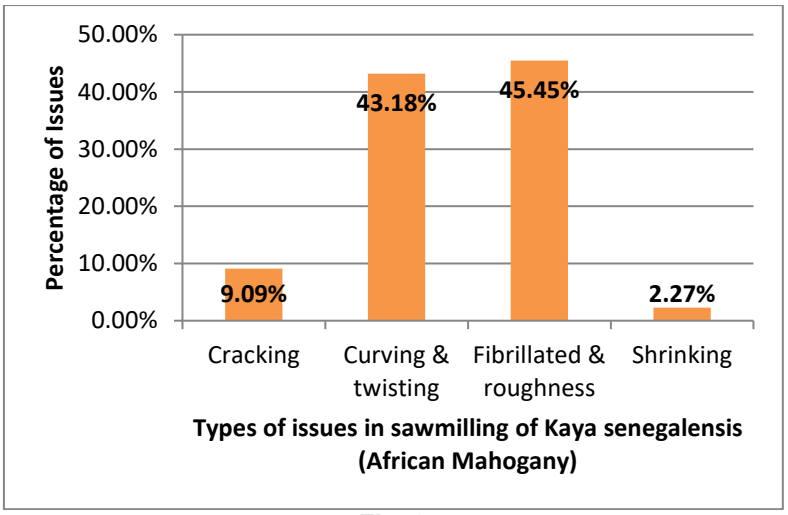

Fig. 3.
Issues occurred in sawmilling of Kaya senegalensis (African Mahogany) in Kurunegala District.

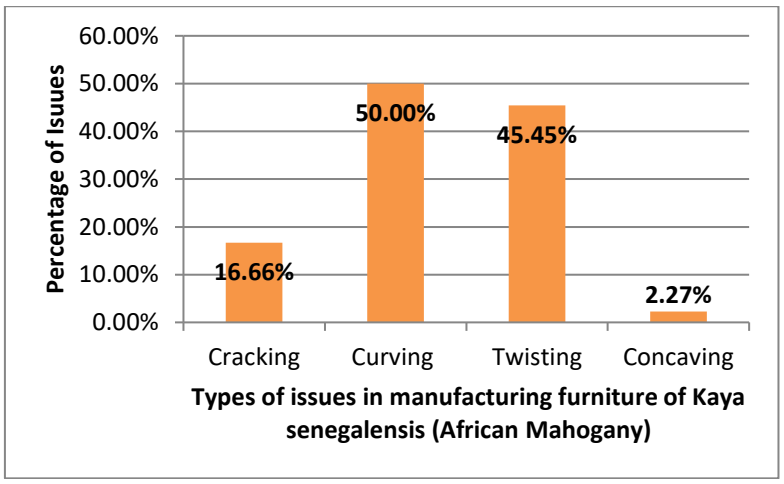

Fig. 4.
Issues occurred in manufacturing of Khaya senegalensis (African Mahogany) in Kurunegala District.

This analysis examined whether defects observed in furniture production were associated with the processing of lumber (sawntimber). Respondents were asked to identify the types of defects that occurred during the manufacture of furniture components.

The reported defects included cracking, curving, twisting, and concaving. In the Kurunegala District, curving was the most frequently perceived defect, reported by 50% of respondents, followed by twisting at 45.45%. Cracking was identified by 16.66% of respondents as an issue during furniture manufacturing. Concaving was the least common defect, reported by only 2.27% of participants. Although the issues of fibrillating and roughness were been major issues when cutting, felling and sawmilling, curving and twisting caused to occur issues in furniture manufacturing. Therefore by taking preventive measures for occurring issues it will very effective to create good demand and value for the *Khaya senegalensis (African Mahogany)* in future.

CONCLUSION

The following general conclusions can be drawn from this study. Majority were used Khaya timber for roofing works in Kurunegala District. After felling, when cutting and sawing the wood, the majority of respondents, 57.69% perceived issue of fibrillated and roughness, 30.77% perceived issue of bending and twisting and lowest percentage of 11.53% perceived the issue of cracking. During the processing of sawtimber for furniture manufacturing, the majority of respondents reported the occurrence of defects, primarily bending (50%) and twisting (45.45%). In the Kurunegala District, curving was the most commonly perceived defect (50%), followed closely by twisting (45.45%). By taking preventive measures for occurring issues, the activity will be more efficient, value will be added to the final products, and the market for the *Khaya senegalensis* in future.

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