A COMPARATIVE STUDY OF WOOD MATERIALS USED IN BUILDING CONSTRUCTION (REFERENCE TO MAIMATHAYA)

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Abstract

When constructing a building, it is very important to think about its durability. The material used for it is important here. Accordingly, there should be an understanding of types of wood, use of wood, etc. "Maimataya", an vāstuvidyā source, includes methods on the use of wood. The poems are written using very simple Sinhala language and the culture of that time for ease of understanding of the people of the past. Does the matter of wood used in home design contain any scientific method? is the problem of this research. The main aim of this research is to highlight the inherent scientific nature of vāstuvidyā sources. The objectives are also to educate society to identify suitable wood and reduce counterfeit use. "Maimataya" contains the methods used in the construction of ancient houses. Among them, the methods used since then have been mentioned on the points to be taken care of while choosing some woods. When choosing a plant, the nature of the plant was concerned with its strength and included mystical facts that were easily understood by the people of the time. Due to these facts, there are misconceptions about vāstuvidyā today. There are those who view vāstuvidyā with skepticism, seeing it as a pseudoscience. They argue that its principles can limit scientific creativity and impose unnecessary restrictions on construction and design. Vāstuvidyā is therefore largely dismissed as superstition. The purpose of this research is to dispel that myth to some extent. Also gives good knowledge about wood used in construction. It also creates awareness in society about how to choose wood properly. The research method here is the qualitative research method. According to the overall study of the research, it can be concluded that the facts contained in vāstuvidyā have a scientific substance.

Keywords: Comparative, Maymata, Scientific, Vāstuvidyā, Wood

Introduction

Wood has been a fundamental element in Vāstuvidyā design for centuries. The use of wood in Vāstuvidyā dates to ancient times, and its relevance has continued across various Vāstuvidyā elements. Traditional theories of wood in Vāstuvidyā encompass a rich history of practices, beliefs, and techniques that have evolved over time, contributing to the development of various Vāstuvidyā forms around the world. They underwent various changes based on the different faiths and beliefs prevailing in each period. There were different opinions about how wood should be used and the appropriate and inappropriate points of use. Studying the historical use of timber in Vāstuvidyā is essential to understanding how traditional ideologies have influenced design and construction practices over time.

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Local traditions and beliefs can provide insight into how the use of wood in Vāstuvidyā has been shaped. Understanding the physical properties of wood, such as strength, durability, and environmental sustainability, is important when comparing traditional and contemporary Vāstuvidyā practices. Here, a comparison is included about the scientific and practical aspects of the facts about wood contained in the "Maimataya" book.

Literature review

The use of wood in cottage industries is influenced by various factors, including cultural and traditional practices. In the context of vāstuvidyā, an ancient Indian system of vāstuvidyā design, the choice and use of wood plays a significant role in enhancing well-being and prosperity. This literature review explores the scientific basis of wood used in cottage industries, with particular emphasis on architectural principles.

In the "Maimataya" book, the appropriateness or inappropriateness of a certain wood to be used for building a house has been symbolically mentioned. It has been poetically mentioned about the misdeeds that happen in choosing unsuitable wood and the good results after choosing a suitable wood (කුමර, 1961).

Testing of composite materials, as described in this book, can present complex problems but is essential to ensure the reliable, safe, and cost-effective performance of any engineering structure. Compliant with contributions from leading practitioners in the field, this essentially practical book describes a wide range of test methods applicable to various types of advanced fiber composites. The book focuses on high modulus, high strength fiber/plastic composites and covers highly an isotropic materials such as carbon, aramid, and glass (Hodgkinson, 2000).

As an aid to the more efficient use of wood as a material of construction, this handbook was prepared by the Forest Products Laboratory. It was the first institution in the world to conduct general research on wood and its utilization. The vast accumulation of information that has resulted from its engineering and allied investigations of wood and wood products over seven decades - along with knowledge of everyday construction practices and problems - is the chief basis for this handbook. Individual chapters describe not only the wood itself, but wood-based products and the principles of how wood is dried, fastened, finished, and preserved from degradation in today's world (Robert, 1991).

This research paper explored the feasibility of the finite element method (FEM) and Hankinson formula to predict the compressive properties of cross-grain wood with a wide range of moisture content, avoiding the waste of materials and time in experimental methods. This study examined the influence of moisture content and cross-grain orientation on the elastoplastic performance of beech wood under compressive loads. The comparison of compressive load–displacement curves between the experiment and FEM was achieved, and the relative errors of compressive yield strength or modulus of elasticity between the experiment and FEM. The stress concentration distribution and failure models of different principal planes were analyzed (Wei, 2022)

The methods used in Australia for the testing of small clear specimens of timber to determine mechanical strength properties are described. Methods of sampling for the determination of species mean values are briefly discussed. The procedures for the correction of strength properties of dry timber to equivalent values at a standard moisture content and for the correction of properties of green and dry timber to equivalent values at a standard temperature are also described (Joseph, 1979).

Numerous organizations have conducted research to develop nondestructive testing (NDT) techniques for assessing the condition of wood members in structures. This report presents a comprehensive review of published research on the development and use of NDT tools for in-place assessment of wood members. It examines the fundamental hypothesis behind the NDT of wood, reviews several widely used NDT techniques, and summarizes the results of projects that focused on laboratory verification of the fundamental hypothesis. Results obtained from projects that used NDT techniques for in-place evaluation of wood members are presented. In addition, recommendations are given for future in-place assessment NDT research (Robert, 1991).

Since its first publication in 1966, the Timber Construction Manual has become the essential design and construction industry resource for building with structural glued laminated timber. Timber Construction Manual, Sixth Edition provides architects, engineers, contractors, educators, and related professionals with up-to-date information on engineered timber construction, including the latest codes, construction methods, and authoritative design recommendations. Content has been reorganized to flow easily from information on wood properties and applications to specific design considerations (Jeff, 2012).

Divided into three sections, the book first details the general aspects of the subject, from basic information, including terminology, to the theoretical basis for the evaluation of delamination. A settled terminology in this subject area is the first key goal of the book, as the terms that describe delamination in wood and wood-based composites are numerous and often confusing. The second section examines different and highly specialized methods for delamination detection, such as con-focal laser scanning microscopy, light microscopy, scanning electron microscopy, and ultrasonic. Ways in which NDE (non-destructive evaluation) can be employed to detect and locate defects are also covered. The book's final section focuses on the practical aspects of this defect in a wide range of wood products covering the spectrum from trees, logs, laminated panels, and glued laminated timbers to parquet floors. Intended as a primary reference, this book covers everything from the microscopic, anatomical level of delamination within solid wood sections to an examination of the interface of wood and its surface coatings (Voichita, 2010).

After studying each book and research paper as above, it was revealed that there are many different research and information related to wood, but the information related to wood and traditional ideologies have not been compared. A comparative presentation of the scientific basis of information on wood in traditional vāstuvidyā has not been done. To fill that gap, this research was done based on the "Maimataya" book.

Research problem

Today's society recognizes the vāstuvidyā as devoid of elements based on mysticism and orthodoxy. There is an opinion that this is built only from beliefs. Among the woods used for building a house, certain woods are suitable, and some are unsuitable for architecture. It is a question whether there is a science in these or, if not, just a belief. According to that, Does the matter of wood used in home design contain any scientific Method? Finding out is the problem of this research.

The objectives

The main aim of this research is to highlight the scientific content of wood in vāstuvidyā sources. Among the other objectives are to study the truth and falsity of the facts mentioned in the "මයිමතය", to identify suitable woods, and to educate society to reduce false practices.

Research Methodology

The methodology of this research is qualitative research methodology. In this research, the scientific and practical aspects of the facts about wood in "Maimataya," which is a secondary source, were studied.

Results and discussion

This research can be done with the help of some unique poems among poems about wood contained in "Maimataya."

"අගින් දළ වී න ම්
එගස වසනා රුදු න ම්
යකිනියක් වී න ම්
කපා නො ගනින් ඒ ගස එහෙන ම්"

(කුරේ, 1961)

According to this poem, if the tip of a plant is dal or conscious, a demon resides in that plant. It is said that it is inappropriate to cut the plants that are the habitat of a demon and bring them home for use. Devil worship, a major religion of the time, has been included in these poems. Thus, the poet has been anxious to compose in such a way that common people who are unable to understand a deep matter can understand it. In examining the scientific essence of the said matter, it was found that if the lower part of the stem of a plant is thin, that plant is considered a weak plant. It is weak because of the small number of plants that can be used. If the lower part of the stem of a plant is small, that plant is taken as a weak plant and thus excluded from household work. Accordingly, in order to be able to understand the past people, they mentioned that devils live in that plant and they have worked to avoid using wood for household work with such plants. Taking a cross-section of a certain plant and separating its parts, the leaf part and the leaf part can be introduced as one part. If these two parts are the same size in each station of the plant stem, it is impossible to use the plant in parts and take it for wood. Moreover, if such a plant is used for wood outside of the root part and the leaf part, it will be destroyed soon because of its low strength. That is why the wood from the bark is not used for furniture or anything else that needs to last for a long time. Since this fact could not be said in a way that the people of that time could understand, it was mentioned that one part of the small plants was inhabited by a demon, and such plants were prevented from being cut.

"බෙර කඳක් විලස ට
වට වී ගසක් දුටු වි ට
කපා ඒ ගස ගෙ ට
මඟුල් කපයට රැගෙන නොකිලි ට"

(කුරේ, 1961)

The drum can be introduced as a very intimate instrument to the people of the past. As an instrument commonly used for peace ceremonies, the drum is something that constantly catches the eye of the people. Among them, the yak drum is unique. Accordingly, in this poem "බෙර කන්දක් විලසට" What is mentioned may be the trunk of the "යක් බෙරය" which was often seen in "දේවාල". It has a uniform, rounded appearance. If a plant is curved in the shape of a "යක් බෙරය", it indicates that such plants are very auspicious for the home industry. To symbolize that it is more auspicious "මඟුල් කප" The poet has emphasized that such plant stems can be used for In terms of scientific evidence on this point, it is important to note that plants which are uniform and round in nature are also curved and therefore stronger and such plants are extremely suitable for creating furniture used in the home industry. If a plant is round and has the same root, middle, and end, it looks like the stem of a drum. These plants are well suited for household purposes. The poet has very skillfully described that in a way that the people

of that time could understand. Thus, if a certain plant is surrounded by "යක් බෙරය" style, it is well implied that many of them have been used for this purpose because it is possible to produce a significant amount of furniture from that plant.

"මුලින් දලවූ ග ස
ගැනු ගස යැයි ඉසි බ ස
මැදින් දලවූ ග ස
නපුන්සක නම් වේය ඒ ග ස"

(කුරේ, 1961)

If the root part of a plant is withered, the sages believe that the plant is a female plant. Sages have mentioned that if any plant is thin in the middle, that plant is a neuter plant. It states that these plants are not suitable for use at all. At that time, sages had a very high place in society. Therefore, following the language of the sages in saying something was a distinctive feature of the ancients. Therefore, the poet has mentioned the matter as a statement of sages. In discussing the scientific here, it is mentioned that if a tree is thin in the beginning or in the middle, it is not suitable for use. This is because parts that are out of focus are less strong. This shows that the people of the past named the plants as neuter and feminine in a way that the people of the past could understand, and for that, they tried to explain in a way that people could understand by giving examples and saying that those plants should not be used as a habit.

"ඇතුළත බෙන් සැ දී
ගසා සිඳ ඒ ගෙයක් සැ දී
සෝදුක් බිය වැ දී
අවැඩ වීගෙන නොයෙක් දේ සැ දී"

(කුරේ, 1961)

The poet has mentioned that if the plants that are inside are cut and taken away and used to build a house, the residents will have to face many diseases and sufferings. Here, the poet is worried that such plants should not be taken into the house as they may cause pain and trouble by cutting down a tree with branches. If the interior is damaged, the roof may also be damaged. A strong plant cannot have cavities. According to science, when checking this, it was found that the chances of breaking are higher if there are cavities. Cavity points are less robust. Therefore, those plants are unsuitable. This type of plant was discarded by the ancients because it was unnecessary to cut plants. It was found that plant parts with stems were discarded as unsuitable for the cottage industry.

"පණුවන් කාපු ග ස
මඟුල් කපයට නොව ලෙ ස
ගේ ඇති හිමියගෙ කු ස
උදර රෝගය පැමිණ පෙර බ ස" (කුරේ, 1961)

The poet has mentioned that plants that have been damaged by small animals, like moths, are not suitable for wedding ceremonies. It is said that if the house industry is taken from such plants, the housewives will get stomach diseases. The best part of the plant is used in the wedding ceremony. Hence, damaged plant parts are not taken for "මඟුල් කප". Plant parts damaged by animals, such as birds, are also not suitable for the home industry. According to science, it is inappropriate to use such cavity plants. Because furniture made from cavity plant parts breaks down more quickly, such plants are not used in cottage industries. Cavity parts are not used. Plants damaged by insects such as worms are reduced in vigor. Therefore, it is not possible to make more durable furniture or household appliances from such plants. Therefore, wood for household purposes is not obtained from such plants.

If a plant is damaged by animals, the implication is that the plant is not very strong. The material used to build a house must have good strength. It is a practical fact that animals such as worms damage plants that are not so strong. Therefore, if such plants are obtained for timber, they will not last long, and time, money, and labor will all be wasted. Therefore, it is stated that such plants should be excluded.

"සඟරාමද දෙවොල් ආදියට ත්
සිංහාසන රජ මන්දිර වලට ත්
ගන්නා මඟුල් කප මී ගස යහප ත්
දන්නා මේ වග අය වඩුකම සලස ත්"

(කුරේ, 1961)

It has been mentioned very well to use the bee plant for the "මඟුල් කප", which is taken in places of worship such as temples, shrines, thrones, royal palaces, etc. The poet mentioned that one who does things with understanding can provide the qualifications to become a carpenter. Beetroot is a plant with many uses. At that time, the farmer used to plant a rat plant near every field because the droppings of bats that ate the fruits of the rat plant contained a lot of urea. A field with such a plant does not require the use of artificial fertilizers. Therefore, the ancients did not cut rat plants and used them to make furniture. This is because this plant works effortlessly for fertilizer. This also happens according to science. Due to the properties contained in this plant, it is said that it is inappropriate to cut such plants because it causes severe damage to the environment. They do not cut the bee plant. As the reason, they mention that it is forbidden to cut the bee plant. However, even in those days when science was not so developed, it was possible to think about the knowledge possessed by the people at that time by making such a statement. There is no need to argue that. Vāstuvidyā is a science related to the environment. Therefore, if one works in accordance with architecture, it is the same as working without harming the environment. Accordingly, it is clearly implied that vāstuvidyā is a science related to the environment.

Conclusions

Today's vāstuvidyā is an element that has evolved along with the practices of the people. Today's architecture is distorted from the correct architecture because it has become so popular by word of mouth. The above-mentioned Purana "Maimataya" is an ancient text for vāstuvidyā. It has not mentioned that any plant is not suitable to be named. It is that the farmers must face many problems by using plants that have certain qualities in the home industry. In examining the scientific facts related to this, it was implied that the strength of a certain plant should be measured before making a product using the stems. If a product is produced without it, its durability may be reduced. Therefore, the quality of the wood is measured by taking some plant parts taken from the plants and undergoing various tests. Although this was done in a scientific research laboratory, the ancients have outlined certain standards using the knowledge of that time. In vāstuvidyā, there are several norms that are specific to such an environment. Today, architecture has become distorted, so society has come to believe that architecture is something that contains only traditional mysticism. Analyzing the data obtained from the sample revealed that vāstuvidyā is a subject devoid of a scientific core, full of mystical beliefs. The reason for that is that the contents of architecture have been socialized outside of correct methods at present. But it must always be said that the facts contained in vāstuvidyā are not mere traditionalism but deep scientific facts are contained. According to the entire study, it can be said that vāstuvidyā is not a meaningless subject that contains only conventional facts. Thus, it can be concluded that the scientific nature of the contents of the vāstuvidyā sources is highlighted. Moreover, it was revealed that the facts mentioned in the myth have scientific substance.

Recommendations

The average lifespan of a house is 50 years. Nowadays, people live in a house for more than 50 years. The reason for this is that due to the current economic recession, it is not possible to allocate money for repairs. However, a house is built to last for a long time. Because of this, the quality of the raw materials used for the house should be taken care of. Therefore, it is imperative to think about the durability of the raw materials used. Wood can be introduced as a raw material used to build a house. The wood used for construction should have strength. Accordingly, society should be aware of the choice of wood used for house construction. Architecture is a special aspect related to nature. The facts contained in it tell the knowledge of the ancients. According to the overall study of the research, it appears that the facts contained in the architectural sources are not things composed in vain. Therefore, understanding the essence of those sourced facts is a good help in everyday life.

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