

ANALYSING THE EFFECT OF USING MORTAR ADMIXTURES USED IN HISTORIC SRI LANKAN STRUCTURES ON CONTEMPORARY MORTAR

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The exceptional durability of historic Sri Lankan structures such as temples and stupas has long been associated with the use of traditional mortar admixtures, including organic and mineral-based additives. Among these, rice husk ash (RHA), an agricultural byproduct rich in amorphous silica, exhibits pozzolanic properties that may enhance the strength and longevity of contemporary mortars. Despite its historical significance and sustainable potential, scientific studies quantifying RHA's performance in modern construction remain limited. To address this gap, the present study investigates the incorporation of RHA into cement-sand mortar, aiming to evaluate its influence on key mechanical properties and determine optimal replacement levels for contemporary applications.

The research specifically aimed to assess the influence of RHA on workability, compressive strength, flexural strength, and shear bond strength of mortar and determine the optimal dosage for performance enhancement, as sustainable alternatives to conventional cementitious materials. Ordinary Portland Cement (OPC) and river sand were used in a 1:5 mix ratio, with RHA incorporated at 5%, 10%, and 15% by weight of cement. Mortar cubes, prisms, and triplets were cast and tested at 7 and 28 days. Standard procedures were adopted for the flow table test (BS EN 1015-3), compressive and flexural strength tests (BS EN 1015-11), and shear bond strength test (BS EN 1052-3). The results revealed that workability decreased progressively with increasing RHA content, attributable to the high surface area and porous nature of the ash. For compressive strength, 10% RHA provided the most significant improvement, reaching 17.02 MPa at 28 days, an enhancement of nearly 89% compared to the control mix. Flexural strength followed a similar trend, with 10% RHA achieving the highest value of 4.33 MPa, nearly double that of the base mortar. In contrast, shear bond strength was maximised at 5% RHA (0.40 MPa), with failure occurring within the masonry unit itself, indicating superior adhesion and interfacial performance. At higher replacement levels (15% RHA), all properties declined, confirming that excessive substitution compromises binder content and weakens the mortar matrix.

From these findings, the study concludes that incorporating RHA into modern mortar mixes offers both structural and sustainability benefits. An optimal replacement of 10% RHA enhances compressive and flexural performance, while 5% RHA is more suitable for improving bond strength in masonry applications. The study explores rice husk ash in mortar to enhance durability, promote sustainability, and preserve traditional construction knowledge. It is recommended that future studies extend this work to durability performance, long-term field applications, and integration with other natural admixtures to further validate the role of heritage-inspired materials in advancing modern green construction.

Keywords: Rice husk ash, Mortar admixtures, Pozzolanic reactivity, Sustainable construction

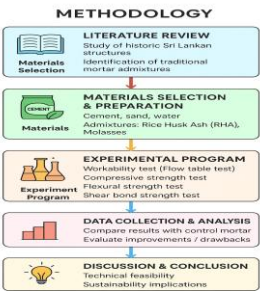
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Analysing the Effect of Using Mortar Admixtures Used in Historic Sri Lankan Structures on Contemporary Mortar

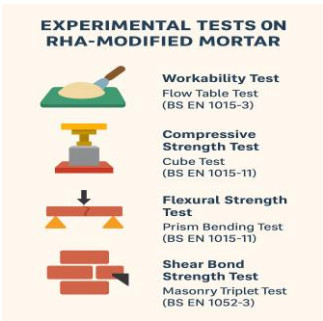
BACKGROUND

🏰 “Historic Sri Lankan structures achieve durability with traditional organic and mineral mortar admixtures.”

METHODOLOGY



EXPERIMENTAL STUDY



RESULTS

- 💧 **Workability** → Decreased with increasing RHA content
- 📏 **Compressive Strength** → Improved at optimum replacement level (10–15% RHA)
- 🔪 **Flexural Strength** → Slight increase compared to control mortar
- 🧱 **Shear Bond Strength** → Noticeable improvement with RHA addition

CONCLUSION

