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Enhancing Sustainability of Concrete with Bamboo Fiber Reinforcement and Sawdust Substitution**Shobitha, N.^{1*}, Vasuki, S.²**¹*Department of Construction Technology, University College of Jaffna,
University of Vocational Technology, Jaffna, Sri Lanka*²*Department of Hospitality Management, University College of Jaffna,
University of Vocational Technology, Jaffna, Sri Lanka***shobitha9214@gmail.com***Abstract**

Concrete is the key building material in the construction industry and its continuous demand contributes to the excessive use of natural resources. This study investigates the effectiveness of adding sawdust as a partial substitute for fine aggregate and bamboo fibers as reinforcement in cement mixtures to improve the mechanical properties and sustainability of concrete. The experiments were developed to examine compressive strength, split tensile strength, and workability while assessing the environmental benefits of incorporating these natural by-products. Various proportions of bamboo fibers (0.5-1%) and sawdust (15-40%) were included in mix designs prepared in accordance with BS standards. The specimens were tested after 7, 14, and 28 days of curing. The results from slump tests indicated that sawdust increased workability, with the slump rising up to 86 mm at 40% sawdust and 1% bamboo fiber, which is considered medium workability. In contrast, the addition of bamboo fibers reduced slump due to their water absorption capacity. Compressive strength increased gradually with curing age. Although sawdust replacement alone reduced strength, the optimal combination of 40% sawdust and 1% bamboo fiber achieved 27 N/mm² at 28 days, which is acceptable compared with the control mix at 30 N/mm². Split tensile strength also improved with increasing curing age, with a maximum of 2.97 N/mm² at 40% sawdust and 1% bamboo fiber. These results demonstrate that bamboo fibers enhance tensile strength while sawdust contributes to reduced weight and improved sustainability. The study concludes that the inclusion of sawdust and bamboo fibers in concrete offers a practical approach to addressing raw material depletion and disposal issues of wood waste and agricultural by-products. Proper proportions are essential to obtain desired strength and durability. While the present results confirm the potential of bamboo and sawdust concrete as a sustainable alternative, further studies on flexural strength, fire resistance, and durability under environmental exposure are recommended.

Keywords: *Saw dust, Bamboo fiber, Concrete compressive strength*