Retraction

Retraction: An Experimental Investigation of Marble Dust in Luffa Fibre Reinforced Concrete (IOP Conf. Ser.: Mater. Sci. Eng. 1145 012100)

Published 23 February 2022

This article (and all articles in the proceedings volume relating to the same conference) has been retracted by IOP Publishing following an extensive investigation in line with the COPE guidelines. This investigation has uncovered evidence of systematic manipulation of the publication process and considerable citation manipulation.

IOP Publishing respectfully requests that readers consider all work within this volume potentially unreliable, as the volume has not been through a credible peer review process.

IOP Publishing regrets that our usual quality checks did not identify these issues before publication, and have since put additional measures in place to try to prevent these issues from reoccurring. IOP Publishing wishes to credit anonymous whistleblowers and the Problematic Paper Screener [1] for bringing some of the above issues to our attention, prompting us to investigate further.

[1] Cabanac G, Labbé C and Magazinov A 2021 arXiv:2107.06751v1

Retraction published: 23 February 2022
An Experimental Investigation of Marble Dust in Luffa Fibre Reinforced Concrete

S. Anandaraj1, N. Deepa2, P. Manoj Kumar3, G. Anusha4, R. Gobinath5, A.R. Krishnaraja6, M, Harihanandh7, S. Sandeep Karthick8

1Assistant Professor, Department of Civil Engineering, KPR Institute of Engineering and Technology, Coimbatore, India
2M.E Student, KPR Institute of Engineering and Technology, Coimbatore, India
3Assistant Professor, Department of Mechanical Engineering, KPR Institute of Engineering and Technology, Coimbatore, India
4Professor, Department of Civil Engineering, KPR Institute of Engineering and Technology, Coimbatore, India
5Professor, Department of Civil Engineering, SR Engineering College, Warangal, India
6Assistant Professor, Department of Civil Engineering, Kongu Engineering College, Perundurai, India
7Department of Civil Engineering, Marri Laxman Reddy Institute of Technology and Management, Hyderabad, India.
8Managing Director, Plumeria Contracting Services, Coimbatore, India
anandaraj.s@kpriet.ac.in

Abstract. Typically, Concrete mixture is firm in Compression yet sickly in Tension and shear. Reason for this examination is to discover the conduct of cement built up with half-breed full-scale strands. By adding Luffa strands in rates like 0.5%, 1%, 1.5%& 2% to the solid, the mechanical properties are researched. The ideal level of Luffa fiber was discovered to be 1%. Marble has been generally utilized in structures since old occasions. The current examination is pointed toward using waste marble dust (WMD) in development industry itself as fine total in solid, supplanting characteristic sand and furthermore by adding the ideal level of Luffa fiber. The substitution is done halfway and completely in the different extents like 0%, 20%, 40%, 60% and 80% and its impact on properties of cement were examined. The ideal level of the solid by adding 1% of Luffa fiber and the extents was discovered to be 20%

Key Words: Reinforced concrete, Luffa fibre, marble dust, mechanical properties & Durability.

1. Introduction

Concrete mixture is an unquestionable thing for the development of different sorts of designs in the cutting-edge progression of common frameworks. Concrete is a broadly utilized development material for different sorts of construction dependability and strength. Every one of the materials required delivering
such gigantic amounts of solid come from the world's hull. Then again, human exercises on the Earth produce strong waste in significant amounts of more than 2500/MT each year, including modern squanders, farming waste sand squanders from rustic and metropolitan social orders. From the center of twentieth century, there had been an increment in the utilization of mineral admixtures by the concrete and solid businesses [1-5]. The expanding interest for concrete and cement is met by halfway concrete substitution. generous energy and cost reserve funds can result when modern side-effects are utilized as a halfway trade for the energy extreme Portland concrete. The utilization of by items is a natural cordial technique for removal of enormous amounts of materials that would some way or another dirty land, water and air. The vast majority of the increment in concrete interest will be met by the utilization of valuable solidifying materials. Ongoing mechanical advancement has shown that these materials are important as inorganic and natural assets and can deliver different helpful items. Among the strong squanders, the most conspicuous ones are marble dust, quarry dust, flyash, impact heater slag, rice husk, silica seethe and annihilated development materials. Thus, the motivation behind this examination was to research thermo compound conduct of cement built up with Luffa strands.

2. Materials Used In This Project:

- Luffa fiber.
- Marble dust.

2.1 Luffa Fibers:

This paper focuses on usage of some of common fiber squanders like luffa fiber. In this normal fiber improvement and examination of materials and strategies in structural designing office is to discover results are three most fundamental perspectives presence of material, monetary limitations and natural similarity. Luffa fiber is 100% totally bio-degradable and recyclable; it wipes out contamination, preservation of characteristic recourses. Utilizing luffa fiber, it helps decreasing structure cost and furthermore help to defend the climate by limiting the utilization of plant and rural waste. Luffa fiber is utilized as a characteristic fiber, supports concrete syntheses and improves protection from break as shown in figure 1.

![Luffa fibre](image)

Unique resources of Luffa fibers are,
- Overall dia of Luffa fibre is 22 μm
- Mass density is 2.08 (g/cm³)
- The tensile strength of Luffa fibers is 175-773 (Mpa)
- The Young's modulus of Luffa fibers is 14.2 (Gpa)
- The ultimate elongation of polyester fibers is 0.5-1.8%

2.1.1 Advantages Of Luffa Fibers:
- It shortens micro and macro cracks during fictile and setting stage.
- It cut downs water drainage and preserve reinforcement in concrete mixture from corrosion.
Loss due to Rebound hammer compressed to 45-75%.

The time spent on plastering is compressed and completion of work is speedy.

It boosts the wear resistance by more than 45% which increases the age of the concrete mixture surface.

It reduces the width of the crack because it acts as a bridge.

Impact strength increases by 20 to 40%.

2.1.2 Applications Of Luffa Fibers:
- Reinforced cement concrete and Plain cement concrete such as lintel cum sunshade, keel, column base, flooring works.
- Foundations, Overhead water tanks design and wall tiles placing.
- Plaster.
- Roadway works and sidewalks.
- Hollow blocks Pavers and ready-mixed concrete.

2.2 Marble Dust:

Figure 2 sows the Marble dust is a transformative rock because of the change of an unadulterated chalk. The virtue of the granite/marble is liable for its tone and aesthetic: it is white if the chalk is made exclusively out of calcite. Granite is utilized for development and design; granite is sturdy, has a respectable texture, and is thusly in incredible interest. A huge amount of dust is created during the cutting process. The outcome is that the mass of marble squander which is 20% of complete marble dust quarried has attained as high as a huge number of tons. This enormous total amount of waste granite squander comprising of exceptionally fine particles is today one of the ecological issues around the globe Concrete mixture is a homogeneous blend of concrete, aggregates and potable water [6-10]. The worldwide utilization of characteristic sand is excessively high because of its broad use in concrete mixture. The interest for regular sand is very high in agricultural nations inerable from quick infrastructural development which become distribution shortage. To defeat from this emergency, halfway supplanting of regular fine aggregate with marble dust, sand is monetary other option. The solid business is continually searching for beneficial material with the goal of lessening the strong garbage removal issue. marble powder is among the strong squanders produced by industry.
2.2.1. Necessity Of Marble Dust:
Marble stone industry produces both solid dump waste and stone powder slurry. In marble industry tonnes of waste powder dumped into the land and it leads to environmental pollution. For avoiding the pollution in land, we use the marble dust on behalf of cement and sand. Marble dust consist of rich calcium content and a part of silica content so marble dust is an alternate material used for cement and sand [11-12]. In cement calcium and lime content is more and in sand silica content is more so we use marble dust as a partial replacement for cement and sand. The main reason of using marble dust is to reduce the cost of sand and cement by implementing waste materials in construction industry.

2.2.2. Application Of Marble Dust:
The applications are as follows:
1. Floor coverings.
2. Road pavement works with light vehicle movements.
3. Calfskin material and deck slab works.
4. Cleanser works.
5. Concreting works.
6. An added substance for thermoplastic and as a solidifying specialist for elastic industry

2.2.3. Advantages In Waste Marble Dust
1. Marble dust acts as a filler material in concrete mixture and it increases the bonding between all ingredients.
2. The cement content is partially replaced by waste marble dust and it leads to rise in mechanical properties of concrete.
3. Partial replacement of sand by waste marble dust increase the compressive strength in concrete.
4. Marble dust is used in concreting works and other road pavement works.
5. Manmade marble pieces made of marble dust are widely used than 90% solid marble pieces.
6. By utilizing waste marble dust in concrete, cost of the construction decreases.
7. Waste marble dust is a by-product of white cement.

2.2.4. Disadvantages Of Marble Dust:
1. Only 20% of the possible result is acquired from marble industry.
2. Marble dust isn’t accessible taking all things together the spots.

3. Objectives Of This Work:
- Examine the conduct of cement by including luffa fiber of 0.2%, 0.4%, 0.6% and 0.8%.
- To decide the conduct like compressive strength, split elasticity, flexural strength.
- To decide the ideal estimation of strands with above %.
From the ideal estimation of fiber, the supplanting of fine total with marble residue of 20%, 40%, 60% & 80% and to decide the flexural strength, pressure strength and split rigidity.

4. Methodology:

5. Design Mix:

M25 grade of concrete is used in this research study and it is mainly approved by Indian standard guidelines IS 10262 – 1982 as shown in table 1.

Table 1. Mix design (M25 Grade)

| Cement | Sand | Gravel | Water |
|--------|------|--------|-------|
| 1      | 1.38 | 2.45   | 0.46  |
| 465kg/m³ | 684Kg/m³ | 1108Kg/m³ | 186 Litre |

6. Preliminary works:

6.1 Compressive Strength Test

Out of many test applied to the solid, this is the most extreme significant which gives a thought regarding every one of the attributes of cement. By this single test one adjudicator that if Concreting has been done appropriately. The durability of cement is constrained by the blending of concrete, gravel, sand, treatable water. The proportion of the portable water to solidify is the central process for deciding solid power as appeared. Reducing the water-concrete proportion, the Compressive strength gets increased. A specific least measure of water is fundamental for the legitimate synthetic activity in the solidifying of solid; additional water expands the functionality (how effectively the solid will stream) however decreases the
compressive strength is mentioned in figure 3 and 4. A proportion of the usefulness is acquired by a droop test. Genuine strength of cement set up in the construction is additionally extraordinarily influenced by process quality techniques for position and examination as shown in table 2 and 3.

**Table 2.** Compressive Strength test results for Luffa Fiber (7days & 28 days)

| Sl.No | No of Days | % Luffa Fiber Added |
|-------|------------|---------------------|
|       |            | CC   | 0.5% | 1%  | 1.5% | 2%  |
| 1     | 7          | 20.52 | 20.88 | 21.64 | 19.58 | 17.76 |
| 2     | 28         | 31.8  | 31.94 | 32.52 | 30.12 | 29.68 |

**Figure 3.** Variation of Compressive strength for luffa Fiber (7 days and 28 days)

**Table.3** Compressive Strength for 0.4% luffa fiber and various percentages of Marble dust in concrete

| Sl.No | No of Days | % Marble dust Replacement in Fine Aggregate |
|-------|------------|-------------------------------------------|
|       |            | CC | 25% | 50% | 75% | 100% |
| 1     | 7          | 20.52 | 25.68 | 24.64 | 21.28 | 19.54 |
| 2     | 28         | 31.8  | 33.63 | 31.48 | 29.26 | 27.64 |

**Figure 4.** Variation of Compressive Strength for 1% Luffa Fiber and Marble Dust

6.2 *split Tensile Strength Test*
Figure 5 and 6 shows the split tensile strength test of cylinder specimens was obtained based on IS: 5816-1999 is mentioned in table 4 and 5.

\[
\text{Tensile strength} = \frac{2P}{\pi LD} \text{ Mpa}
\]

**Table 4. Split Tensile Strength test for Luffa Fiber (7 days and 28 days)**

| Sl.No | No of Days | % Luffa Fiber Added |
|-------|------------|---------------------|
|       |            | CC  | 0.5% | 1%  | 1.5% | 2%  |
| 1     | 7          | 2.03| 2.32 | 2.78| 2.38 | 1.92|
| 2     | 28         | 3.23| 3.32 | 4.15| 3.19 | 2.82|

**Figure 5. Variation of Split Tensile Strength for Luffa Fiber (7 days and 28 days)**

**Table 5** Split Tensile Strength for 1% Luffa fiber and variation of various percentage of Marble dust in concrete

| Sl.No | No of Days | % Marble dust Replacement in Fine Aggregate |
|-------|------------|--------------------------------------------|
|       |            | CC  | 20% | 40% | 60% | 80% |
| 1     | 7          | 2.03| 2.45| 2.16| 1.93| 1.75|
| 2     | 28         | 3.23| 3.52| 3.24| 2.61| 2.12|

**Figure 6. Variation of Split Tensile Strength for 1% Luffa Fiber and Marble Dust**

6.3 **Flexural Strength Test**
Figure 7 and 8 shows the strategy is utilized to decide the energy break of examples arranged and restored. The strength parameters decided will shift are contrasts in example size, planning, dampness or restoring. The technique cover assurance of the properties of solid examples of utilization of a straightforward bar with focus point stacking. The qualities expressed in every framework may not be accurate counterparts; hence, every framework will be utilized freely of the other is mentioned in table 6 and 7.

**Table.6** Flexural Strength for polyester Fiber (7 days and 28 days)

| Sl.No | No of Days | % Luffa Fiber Added | 0.5% | 1%  | 1.5% | 2%  |
|-------|------------|---------------------|------|-----|------|-----|
|       |            | CC                  | 3.28 | 3.56| 3.92 | 3.74|
| 1     | 7          |                     | 3.12 |     |      |     |
| 2     | 28         |                     | 4.52 | 5.16| 5.82 | 4.74|
|       |            |                     |      |     |      | 4.12|

**Figure 7.** Flexural Strength for Luffa Fiber (7 days and 28 days)

**Table.7** Flexural strength for 1% Luffa Fiber and various percentage of Marble dust in concrete

| Sl.No | No of Days | % Marble dust Replacement in Fine Aggregate |
|-------|------------|-------------------------------------------|
|       |            | CC | 20% | 40% | 60% | 80% |
| 1     | 7          | 3.18 | 3.74 | 3.46 | 3.21 | 2.72 |
| 2     | 28         | 4.52 | 5.35 | 4.72 | 4.23 | 3.36 |
Figure 8. Variation of Flexural Strength for 1% LuffaFiber and Marble Dust

7. Conclusion:
The paper concludes the following things by the experimental studies:
- The marble dust could be used as alternative materials for sand.
- The strength of the concrete is optimum when the luffa fibre is added by 1%.
- The strength of the concrete is optimum when the constant 1% luffa fibre added and sand is replaced by marble dust at 20%.

References
[1] Aalok D. Sakalkale, G. D. Dhwale, R. S. Kedar, Experimental Study on Waste Marble Dust in Concrete, Int. Journal of Engineering Research and Applications 4(10) (Part - 6), October 2014
[2] K.S. Elango and V. Revathi, Mechanical and durability studies on pervious concrete using different types of binders, Romanian Journal of Materials, 50( 21) & pp. 258 -267, 2020.
[3] V. Kavinkumar, S. Elavarasan, S. Anandaraj, R. Dharmaraj, Development of subgrade layer using scrap tire and stabilised expansive soil Materials Today Proceedings, DOI:https://doi.org/10.1016/j.matpr.2020.06.188
[4] V. Rajeshkumar, S. Anandaraj, V. Kavinkumar, K.S. Elango, Analysis of factors influencing formwork material selection in construction buildings Materials Today Proceedings, DOI: https://doi.org/10.1016/j.matpr.2020.06.044Deshmukh S.H, Bhusari J. P, Zende A. M.Effect of Glass Fibres on Ordinary Portland cement Concrete, IOSR Journal of Engineering June. 2012, Vol. 2(6)
[5] H. Anandakumar and K. Umamaheswari, A bio-inspired swarm intelligence technique for social aware cognitive radio handovers, Computers & Electrical Engineering, vol. 71, pp. 925–937, Oct. 2018. doi:10.1016/j.compeleceng.2017.09.016
[6] R. Arulmurugan and H. Anandakumar, Early Detection of Lung Cancer Using Wavelet Feature Descriptor and Feed Forward Back Propagation Neural Networks Classifier, Lecture Notes in Computational Vision and Biomechanics, pp. 103–110, 2018. doi:10.1007/978-3-319-71767-8_9 I. B. TOPCUAN D. M. CAIS 10262: 2009 –Concrete Mix Proportioning – Guideline
[7] IS 8112: 1989 – Ordinary Portland Cement, 43 Grade- Specification
[8] M. S. Shetty – Concrete Technology
[9] NicolaetTarant, Gabriel Oprisan, MihaiBudescu, AlexandruSecu, IonelGosav, The use of glass fibre reinforced polymer composites as reinforcement for tubular concrete poles,Proceedings of the 11th WSEAS International Conference on Sustainability in Science Engineering
[10] Nitisha Sharma, Ravi Kumar, Review on Use of Waste Marble Powder as Partial Replacement in Concrete Mix, International Journal of Civil Engineering (SSRG-IJCE) – EFES April 2015
[11] Park, R., and Paulay, T., Reinforced Concrete Structures, John Wiley and Sons, 1975