INVESTIGATIONON PROPERTIES OF CONCRETE BY PARTIAL REPLACEMENT OF CEMENT WITH DOLOMITE POWDER BY USING ABACA FIBRE

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Abstract

Concrete is most adaptable, durable and reliable construction material over the world and it is the most important basic material in all civil engineering structures. The ingredients of concrete are cement, fine, coarse aggregates and water, which are mixed in a particular proportion to get required strength. Increase in demand of cement around the globe seeks high intention in finding some alternatives to cement in concrete. The inception of new alternative limits the CO_2, a major greenhouse effect causing gas. Research is taking place on all corners of the globe in search of different material options. River sand is collected from river beds to build houses and giant infrastructure to satisfy population growth requirements. The globalization and advanced technology required to meet the requirements of the worldwide economy at domestically and internationally has become a significant issue in preserving the river sand used as a fine aggregate in concrete manufacturing. In this study a small trial is done to modify the properties of concrete by partial replacement of cement with dolomite powder with different percentages 0%, 6%, 12% & 18% and fine aggregate with abaca fiber is varied different percentages of 0%,0.25%,0.5% and 1%.

Keywords: - Dolomite powder, Abaca fiber, compressive and split tensile strength.

1. INTRODUCTION:

The need for concrete has grown to be second only to the need for water due to technological advancements and an expanded range of applications for cement and mortars. As a result, it was necessary

to alter a number of the characteristics of regular cement to make it more versatile, sensible, and ecologically friendly. As a result, cementation materials are used. In order to reduce the amount of cement required, lower carbon dioxide (CO2) emissions, protect existing assets, and improve the quality and strength of the concrete, dolomite and crushed sea shells can be used in place of portion of the concrete in a solid. Dolomite, often known as calcium magnesium carbonate, has the chemical formula CaMg(CO3)2. leaf fibre from a vegetable known as abaca. The abaca fibre is taken from the plant's leaf stalks. Abaca is also known as Manila hemp. Although it resembles the banana plant in appearance, it has very different properties and uses. Abaca fibres are frequently used to make ropes, woven fabrics, tea bags, filter paper, banknotes, and other goods. It also goes by the titles biodegradable fibre and sustainable fibre. Abaca is regarded as the strongest natural fibre.

2. OBJECTIVES

a) To maximise the use of Abaca Fiber and cement with dolomite powder, respectively.

b) To assess the test results for the compressive and split tensile strengths.

3. Materials

The properties of cement are presented in Table 1.

Table 1 Physical properties of cement

S. No.	Property	Cement (53 grade)
1	Specific gravity	3.14
2	Fineness	10%
3.	Bulk density	1440 N/mm^2

3.1DOLOMITE POWDER

Dolomite is a calcium magnesium carbonate mineral, ideally composed of CA Mg (CO3)2. Additionally, a sedimentary carbonate rock primarily made of the mineral dolomite is referred to by this name. The trigonal-rhombohedral system is how the mineral dolomite crystallises. Crystals made of it can be white, tan, grey, or pink. With an alternate structural arrangement of calcium and magnesium ions, dolomite is a double carbonate. It does not dissolve quickly unless it is in the form of a fine powder.

3.2 ABACA FIBER:

Utilizing Abaca fibre as a building material in concrete is a challenge in the management of Abaca fibre waste. Abaca fibre was used in concrete as a partial or complete replacement for fine and coarse particles. This essay reviews the research on abaca fiber's impact on concrete aggregate. Based on its chemical, physical, and thermal characteristics, abaca fibre has the potential to become a substitute material. Because to the structure of its cell walls, abaca is one of the natural fibres with outstanding mechanical qualities. The cellulose, hemicellulose, and lignin content carbonate, as well as the cell wall structure, have a significant impact on the mechanical qualities of abaca fibre.

4. EXPERIMENTAL INVESTIGATIONS:

4.1 Compressive strength results

The compressive strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in table 2 to 4.

Table 2: Compressive strength of concrete with Dolomite as partial replacement of cement in concrete.

Sl.no	Dolomite	7 days N/mm^2	28 days N/mm^2
1	0%	27.31	39.64
2	6%	29.13	41.86
3	12%	30.03	43.79
4	18%	28.93	42.67

Table 3: Compressive strength of concrete with addition of Abaca fibres:

Sl.no	Abaca fibres	7 days N/mm^2	28 days N/mm^2
1	0%	27.31	39.64
2	0.25%	30.93	44.26
3	0.5%	32.35	46.82
4	1%	28.20	40.99

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Table 4: Compressive strength of Concrete Dolomite and Abaca fibre

Sl.no	Dol + AF	7days	28days
1	0%	27.31	39.64
2	12%Dol +0.5%AF	32.02	48.89

4.2 Split tensile strength results

The split tensile strength conducted in compression testing machine for the cast and cured specimens and the results are furnished in table 5 to 7.

Table : Split tensile strength of concrete with Dolomite as partial replacement of cement in concrete.

Sl.no	Dolomite	7 days N/mm^2	28 days N/mm^2
1	0%	3.55	3.91
2	6%	2.82	4.09
3	12%	2.95	4.55
4	18%	2.85	4.15

Table 6: Split Tensile strength of concrete with addition of Abaca fibres: -

Sl.no	Abaca fibres	7days N/mm^2	28 days N/mm^2
1	0%	3.55	3.91
2	0.25%	2.88	4.19
3	0.5%	3.70	5.33
4	1%	1.77	2.64

Table7 : Split tensile strength of Concrete Dolomite and Abaca fibre

Sl.no	Dol + AF	7 days	28days
1	0%	3.55	3.91
2	12%Dol +0.5%AF	3.70	5.64

5. CONCLUSION:

In this study, the concrete ingredients like cement and fine aggregate are partially replaced by Dolomite powder and Abaca fibre respectively. Abaca fibre are varied different percentages of 0%,0.25%,0.5%,and 1% and dolomite powder is varied with different percentages like 0%, 6%, 12%, and 18%.

- At 12% replacement of cement by dolomite the achieved compressive strength of concrete at 7&28 days is 30.03 N/mm^2, 43.79 N/mm^2
- At 12% replacement of cement by dolomite the achieved Split strength of concrete at 7 &28days is 2.95 N/mm^2, 4.55 N/mm^2,
- At 0.5% replacement of Abaca fibre the achieved compressive strength of concrete at 7 &28 days is 32.35 N/mm^2, 46.82 N/mm^2.
- At 0.5% replacement of Abaca fibre the achieved split tensile strength of concrete at 7 &28 days is 3.70 N/mm^2, 5.33 N/mm^2.
- By the combination of 12% Dolomite +0.5% Abaca fiber the compressive strength Of concrete at 7 and 28 days are 32.02 N/mm^2, 48.89 N/mm^2.
- By the combination of 12% Dolomite +0.5% Abaca fiber the Split tensile strength Of concrete at 7 and 28days are 3.70 N/mm^2, 5.64 N/mm^2.

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