

An Experimental Study on Short Term Durability and Hardened Properties of Bagasse Ash and Fly Ash Based Geo Polymer Concrete

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ABSTRACT

This project reports the comparison of bagasse ash and fly ash-bagasse ash based on geopolymer concrete. In which cement is fully replaced by pozzolanic material that is rich in silicon and aluminium like fly ash and bagasse ash referred to as "Geopolymer concrete" which is a contemporary material. Geopolymer concrete was actually manufactured by reusing and recycling of industrial solid wastes and by products. Fly Ash, a by-product of coal obtained from the thermal power plant is plenty available worldwide. Fly ash is used as ingredients in concrete which enhance the properties of concrete and utilization of fly ash is helpful for consumption. Bagasse ash is a final waste product of sugar obtained from the sugar mills. The base material, viz. fly ash and Bagasse ash, is activated by alkaline solution that is sodium hydroxide and sodium silicate to produce a binder which is rich in silica and aluminium. Sample 1 is cement. It is replaced by 100% fly ash geopolymer concrete and trial 2 is 10%, 30% & 50% replaced by Bagasse ash in Geopolymer concrete. The project presents the strength and durability of Bagasse ash based Geopolymer concrete and fly ash and Bagasse ash based Geopolymer concrete.

Keywords-- Bagasse, Ash, Fly Ash, Geo Polymer, Concrete

I. INTRODUCTION

1.1 General

Concrete is one of the most commonly used construction material in the world it is basically composed of three components cement, water and aggregates. Cement plays a great role in the production of concrete still now GGBFS, Pulverized fly ash and silica fume have been effectively used but currently; the main object is to introduce bagasse ash

1.2 Objectives of the Study

1. Preparation of geo polymer concrete (GPC) by using low calcium fly ash with 100% replacement of cement and partial replacement of bagasse ash.
2. To examine the influence of CS, STS, FS of GPC by varying the ratio of bagasse ash.
3. To determine the influence of Compressive strength, Split tensile strength and flexure strength of geo polymer concrete by keeping the

fixed morality of sodium hydroxide solution for different mix proportions.

4. To compare the experimental results with Conventional concrete.
5. To study the short term durability aspects such as Acid Attack, Magnesium Sulphate Attack & Salt Water Attack.

II. LITERATURE REVIEW

This chapter presents an analysis of recent research on Geo polymers and Geo polymer concrete, with an importance on low calcium bagasse ash-based geo polymer paste and concrete. A review of current approaches and models available to predict shear strength and bond strength of Portland cement concrete members is also included. These approaches will be used to predict the shear and bond strength of geo polymer concrete beams in this study. The word geo polymer was first presented by Davidovits in 1979 to name the tri dimensional aluminosilicates material, which is a binder produced from the reaction of a source material or feedstock rich in silicon (Si) and aluminium (Al) with a concentrated alkaline solution.

III. PROBLEM DEFINITION

To study the strength & Durability properties of geo polymer concrete addition with fly ash and Bagasse in concrete with partially replacement i.e. (10%, 30% and 50%).

IV. METHODOLOGY

1. M50 grade has been chosen for obtaining slump value.
2. Slump cone test has been done to obtain slump value.
3. Concrete is made with partial auxiliary of fly ash & Bagasse ash respectively in four Varying ratios.
4. Compressive strength is determined using 150mm cubes. The samplings are verified for 7, 14 & 28 days in CTM.

- Split Tensile Strength is carried out using 150mm (diameter) X300mm (height) cylinders. The samples are tested for 7, 14 and 28 days ages in CTM.
- Plain member of 100mm x 100mm x 500mm is made to study the Flexural Strength. The beams are tested in two point loading UTM.
- Short term durability test such as Salt water attack, acid attack, magnesium sulphate attack test

are carried out in 150mm cubes, 150mm (diameter) x 300mm (height) Cylinders for 28 days.

V. RESULTS AND DISCUSSIONS

5.1 Compressive Strength Test

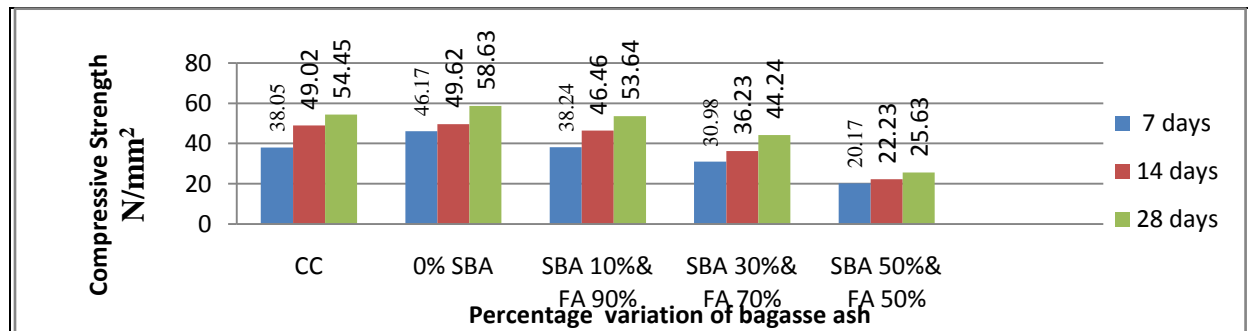


Figure 5.1: Compressive Strength of M50 Grade of Concrete with Fly ash and Sugarcane Bagasse Ash (SBA) Replacement 0% to 50% for 7,14 and 28 days in N/mm^2

5.2 Split Tensile Strength

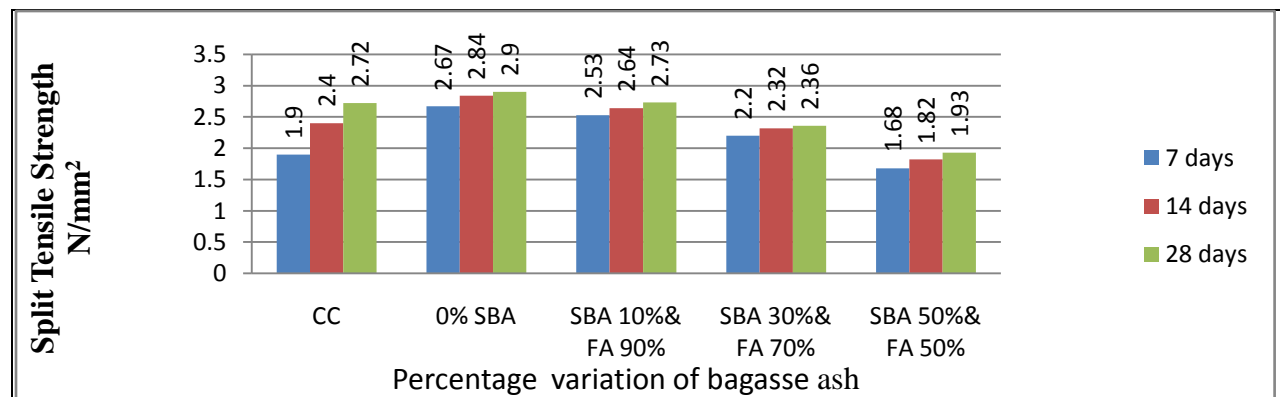


Figure 5.2: Split Tensile Strength of M50 Grade of Concrete with Fly ash and Sugarcane Bagasse Ash (SBA) Replacement 0% to 50% for 7,14 and 28 days in N/mm^2

5.3 Flexural Strength

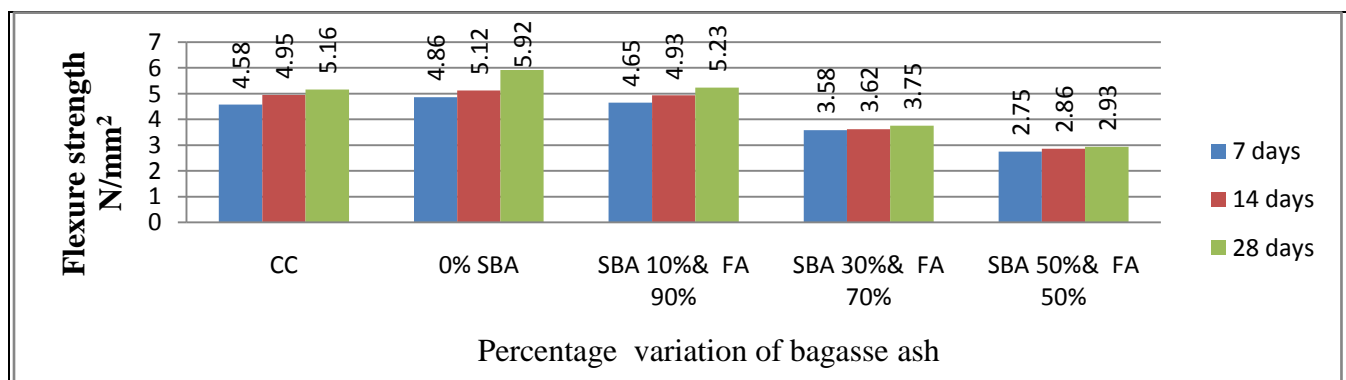
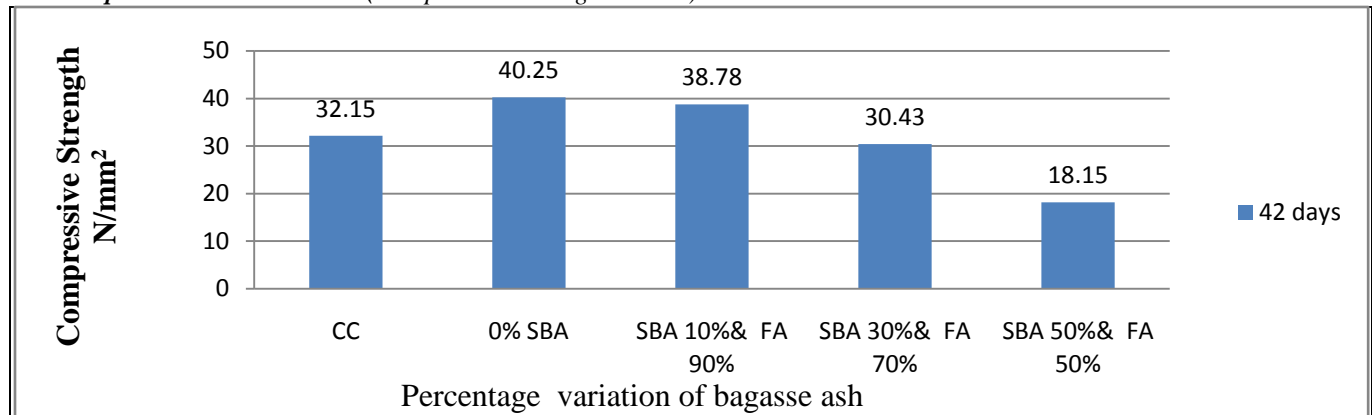
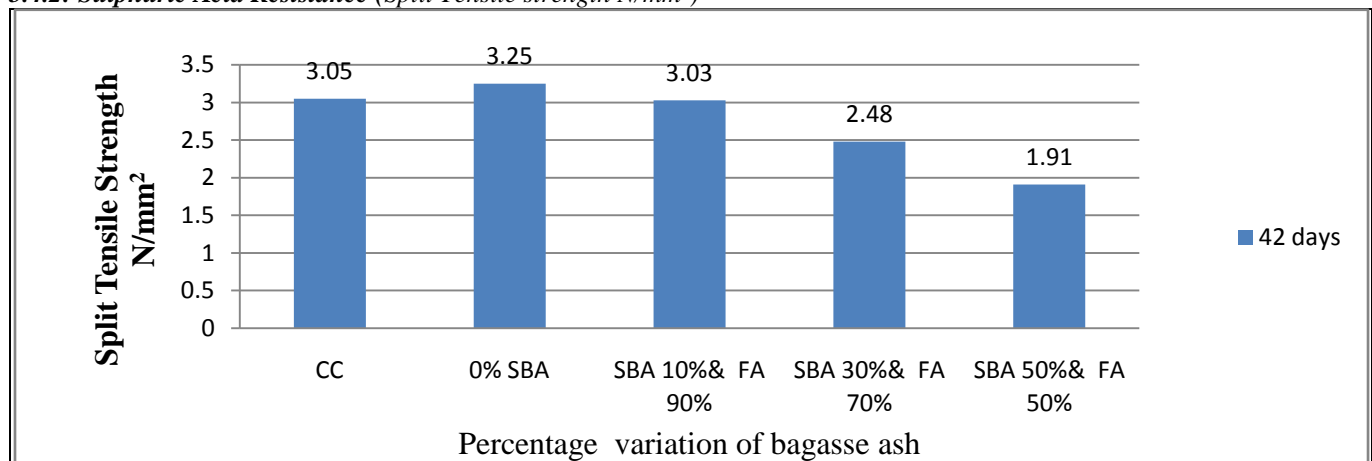
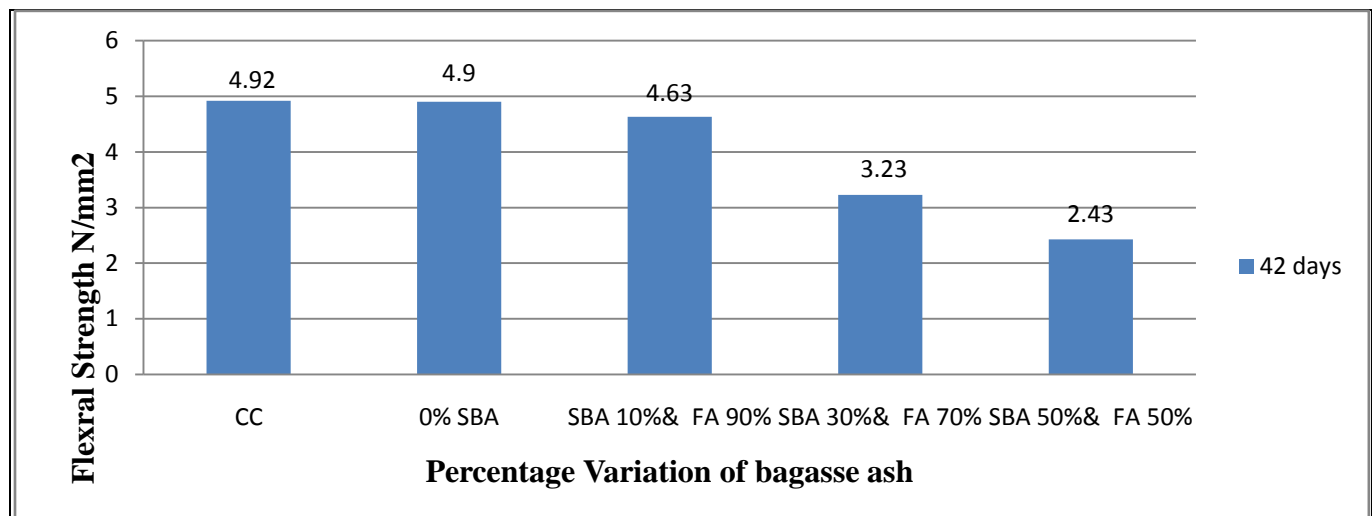
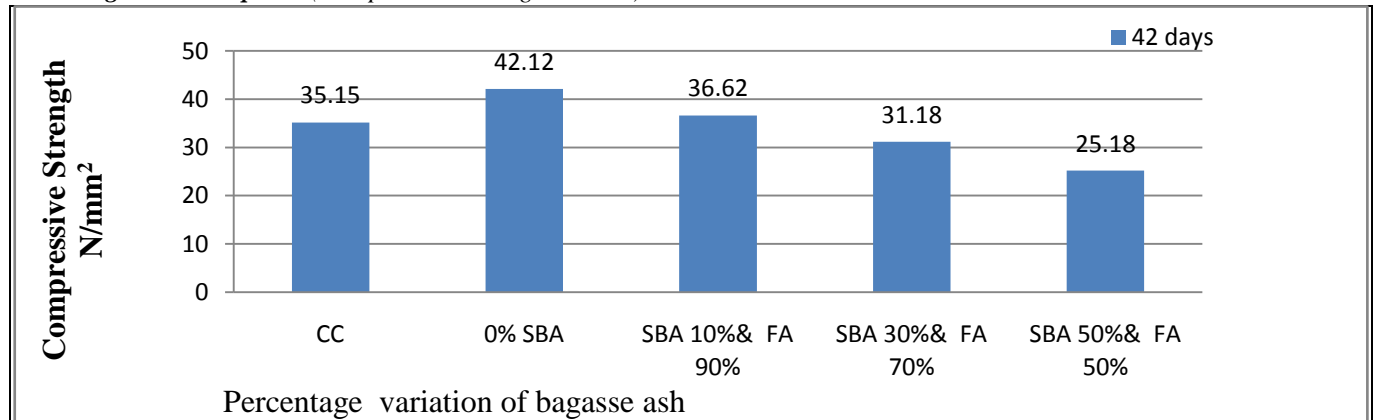
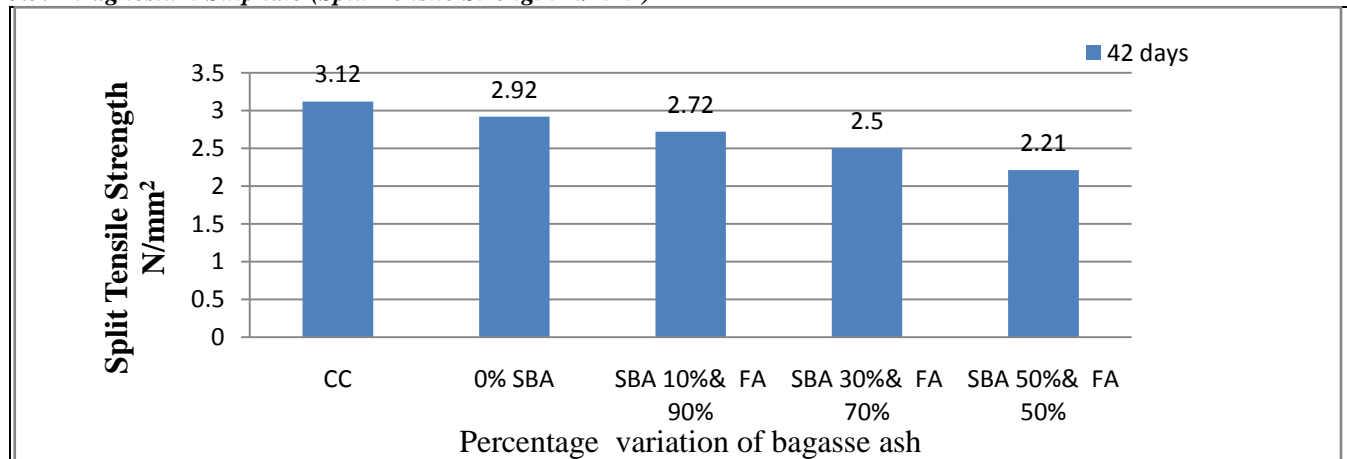
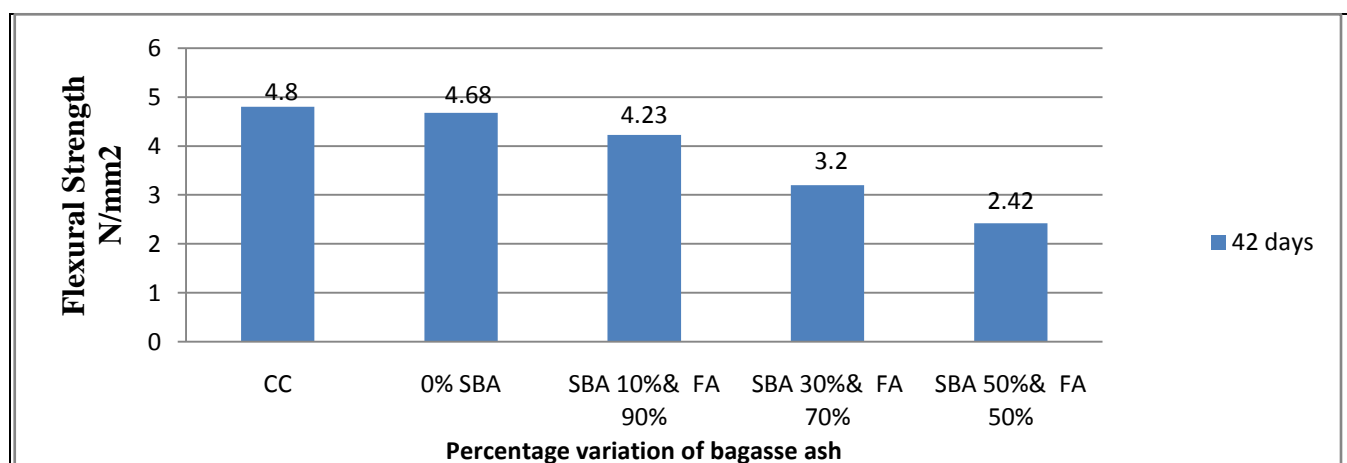
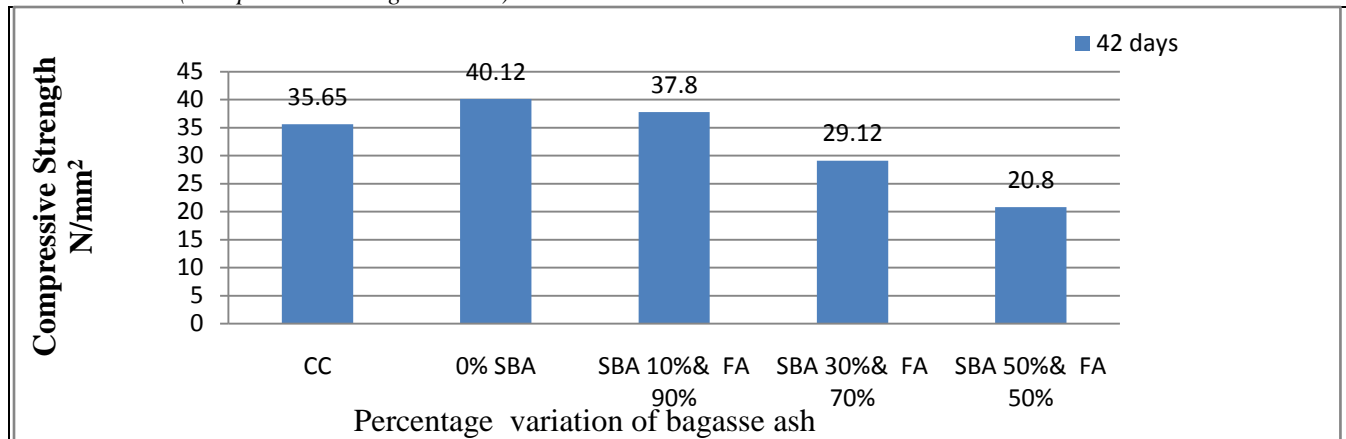
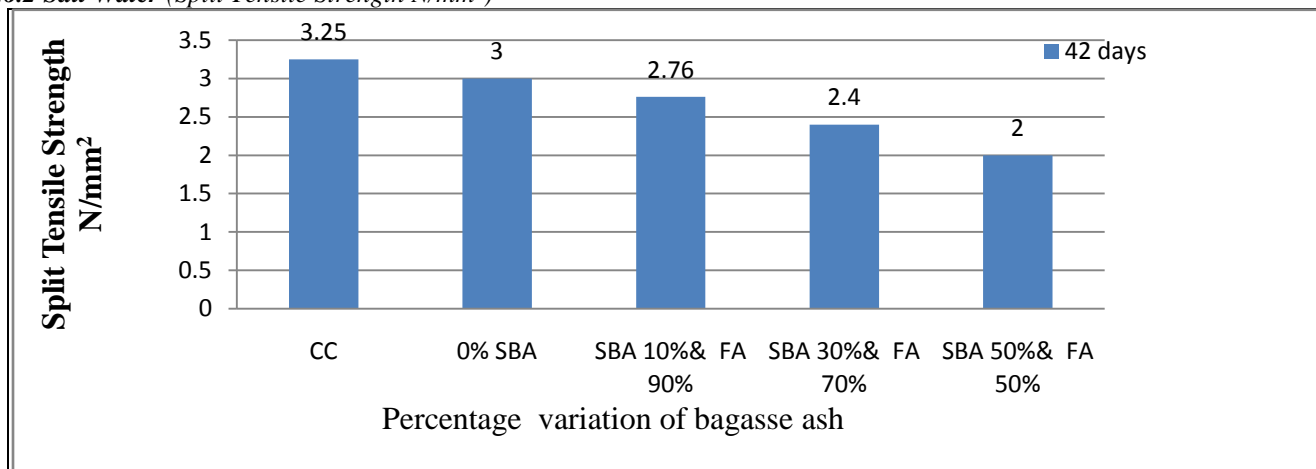
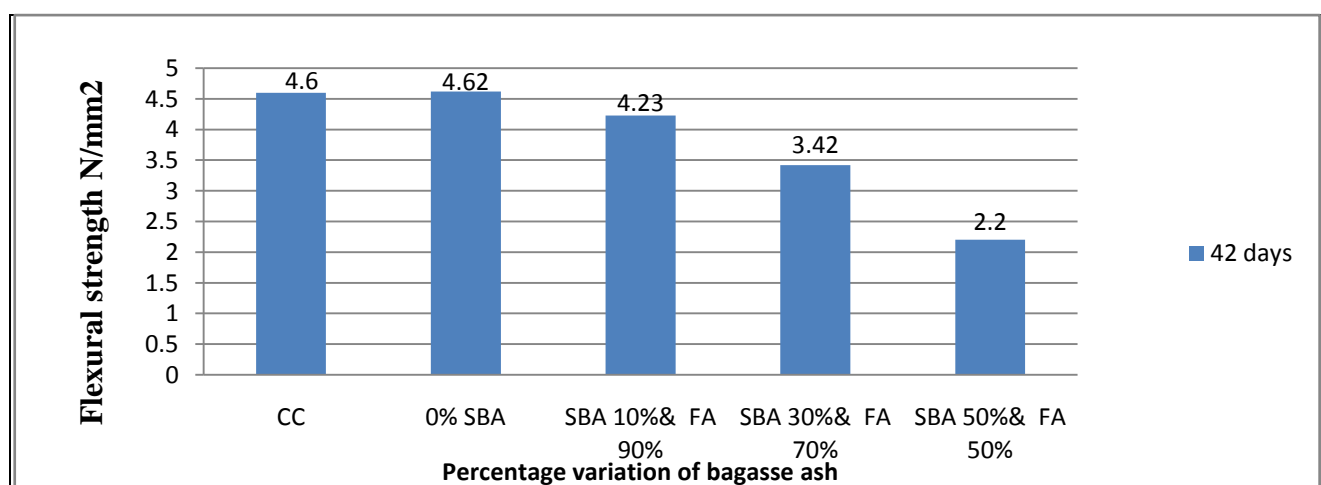


Figure 5.3: Flexure strength of M50 Grade of Concrete with Fly ash and Sugarcane Bagasse Ash (SBA) Replacement 0% to 50% for 7, 14 and 28 days in N/mm^2

5.4.1 Sulphuric Acid Resistance (Compressive Strength N/mm^2)**Figure 5.4.1:** Compressive strength of M50 Concrete for 42 Days immersion in Sulphuric Acid (N/mm^2)**5.4.2: Sulphuric Acid Resistance (Split Tensile strength N/mm^2)****Figure 5.4.2:** Split Tensile Strength of M50 Concrete for 42 Days immersion in Sulphuric Acid (N/mm^2)**Figure 5.4.3:** Flexural Strength of M50 Concrete for 42 Days immersion in Sulphuric Acid (N/mm^2)

5.5.1 Magnesium Sulphate (Compressive Strength N/mm^2)**Figure 5.5.1:** Compressive strength of M50 Concrete for 42 Days immersion in Magnesium sulphate (N/mm^2)**5.5.2 Magnesium Sulphate (Split Tensile Strength N/mm^2)****Figure 5.5.2:** Split Tensile Strength of M50 Concrete for 42 Days immersion in Magnesium sulphate (N/mm^2)**Figure 5.5.3:** Flexural Strength of M50 Concrete for 42 Days immersion in Magnesium sulphate (N/mm^2)

5.6.1 Salt Water (Compressive Strength N/mm^2)**Figure 5.6.1:** Compressive strength of M50 Concrete for 42Days immersion in Salt water (N/mm^2)**5.6.2 Salt Water (Split Tensile Strength N/mm^2)****Figure 5.6.2:** Split Tensile Strength of M50 Concrete for 42 Days immersion in Salt water (N/mm^2)**Figure 5.6.3:** Flexural Strength of M50 Concrete for 42 Days immersion in Salt water (N/mm^2)

VI. CONCLUSIONS

- ❖ The compressive strength of Fly ash based Geopolymer concrete increases 7.67% and Bagasse ash of 10% replacement in Geopolymer concrete decreases 1.51% compared to conventional concrete.
- ❖ The Tensile strength of fly ash based Geopolymer concrete increases 6.62% and of Bagasse ash of 10% replacement in Geopolymer concrete increases 0.36% compared to conventional concrete.
- ❖ The Flexural Strength of fly ash based Geopolymer concrete increases 14.72% and Bagasse ash of 10% replacement in Geopolymer concrete increases 1.36% compared to conventional concrete.
- ❖ The Compressive strength M50 Fly ash based geopolymer concrete for 42 days immersion in Sulphuric acid, Magnesium sulphate and Slat water increases 25.19% , 19.83% and 12.54 % Compared to conventional Concrete and also partial replacement of bagasse 10% decreased by 3.79%, 15.02% & 6.14% compared to fly ash based geopolymer concrete.
- ❖ The Split Tensile Strength of M50 Fly ash based concrete for 42 days immersion in Sulphuric Acid, Magnesium sulphate and Slat water increases by 6.55%, 6.84% and 8.34% compared to conventional Concrete and also the partial replacement of bagasse ash of 10% in geopolymer concrete decreases 7.22%, 7.35% & 8.69% compared to fly ash based geopolymer concrete.
- ❖ The Flexural strength of M50 Fly ash based concrete for 42 days immersion in Sulphuric Acid, Magnesium sulphate and Slat water decreases 0.40%, 2.99% and 0.43% compared to conventional concrete and also the partial replacement of bagasse ash of 10% in geopolymer concrete decreases 5.83%, 10.63% & 9.21% compared to fly ash based geopolymer concrete.

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