

EXPERIMENTAL INVESTIGATION ON CONCRETE WITH BANANA FIBER AND PARTIAL REPLACEMENT OF CEMENT BY BANANA LEAF ASH

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Abstract: This experimental investigation was undertaken to know the concrete property by using Banana Leaf Ash and Banana Fiber. Concrete is one of the materials that are widely used in construction all around the world. This material is widely used because it has several benefits. The world is now concentrating on alternative material sources that are less harm full to the environment. The Banana Leaf Ash and Banana Fiber are agricultural waste. The Banana Leaf Ash (BLA) has potential to replace one of the construction material which is cement. The BLA contain pozzolanic reaction that usually occurs in Portland Cement. The BLA is used in cement to replace about 0%, 2%, 4%, and 6%. The usage of Banana Fiber (BF) to enhancing the properties of concrete. Concrete is good in compression and weak in tension. The fibre in concrete generally increases both compression and tension in concrete. In this experiment BF is added as a additional material for about 0.2%. To determine the strength of the concrete to produce good cementitious material by using BLA and to increase the tensile strength BF is added.

Keywords: Banana Leaf Ash, Banana Fiber, High Strength Concrete.

INTRODUCTION

General:

Concrete is most widely used as a construction material due to its good compressive strength & durability. It is material which is used more than any other man-made material on the earth for construction work. The use of alternative material in the construction is increasing day by day. The project deals with the comparative study of properties of concrete by using Banana Leaves Ash as a cementitious material in the concrete mix. The ash produced from various types of agricultural waste can be used effectively as a partial replacement of cement. Some researchers evaluated the presence of Pozzolanic activity in the deriving ash of Banana Leaves. Farming waste material generally disposed-off by land-filling or open burning which leads to air pollution. This material can be utilized to improve the quality and properties of concrete by partial replacement of cement or additive material for concrete. It provides good strength and durability. The economy achievement is also the key factor to utilize farming waste.

Cement:

Cement is the essential binding material used in the concrete. In the concrete binding material place a vital role in achieving the strength. Portland cement is the common form of cement. Cement of various strength is available. It depends on the requirement of concrete it is to be chosen. Ordinary Portland cement (OPC) is by fair the most important type of cement.

Aggregate:

Aggregates are the important constituents in concrete. They give body to the concrete, reduce shrinkage and effect economy. Earlier aggregate were consider as chemically inert materials but now it has been recognized that some of the aggregate are chemically active and also that certain aggregates exhibit chemical bond at the interface of aggregate and paste. The mere fact that the aggregate occupy 70 to 80 percent of the volume of concrete

Quarry dust:

Quarry dust is a fine rock particle. When boulders are broken into small pieces quarry dust is formed. It is grey in colour and used for replacement of sand. By exploding mountain, rock will be crushed to small size stones and along with this dust type particles called quarry dust will be formed during the process which is going as waste. So it becomes as a useless material and also fallout in air pollution too. Therefore, quarry dust can be used in building works, which will decrease the cost of construction and the construction material would be saved and the natural resources can be used properly

Banana Leaf Ash:

Banana leaf ash is an agricultural waste that as potential to replace one of the construction material which is cement. Because it contains a pozzolanic reaction that usually occurs in Portland cement. This ash as a potential to improve the performance of the concrete.

| PARAMETERS | COMPOSITION OF BANANA LEAF ASH % |
|---|----------------------------------|
| Silicon dioxide(SiO ₂) | 48.7 |
| Iron oxide(Fe ₂ O ₃) | 1.4 |
| Aluminum oxide(Al ₂ O ₃) | 2.6 |
| Sodium oxide(Na ₂ O) | 0.21 |
| Loss of ignition | 5.06 |



(Table 1) Composition of BLA

(Fig 1) Banana Leaf Ash

Banana Fiber:

Banana, as a natural fiber, has inherent advantages like silky luster, high tensile strength, low extensibility, considerable heat and fire resistance and long staple lengths. Banana fiber can be used in many different areas, and has been receiving increasing attention from industry. Their interests focus not only on the traditional uses of banana fiber, but also on the production of other value-added products such as, pulp and paper, geo-textiles, composites and home textiles etc

| PARAMETERS | COMPOSITION OF BANANA FIBER % |
|-------------|-------------------------------|
| Cellulose | 56 |
| Lignin | 17 |
| Extractives | 7 |
| Moisture | 11 |
| Ashes | 9 |

(Table 2) Composition of BF



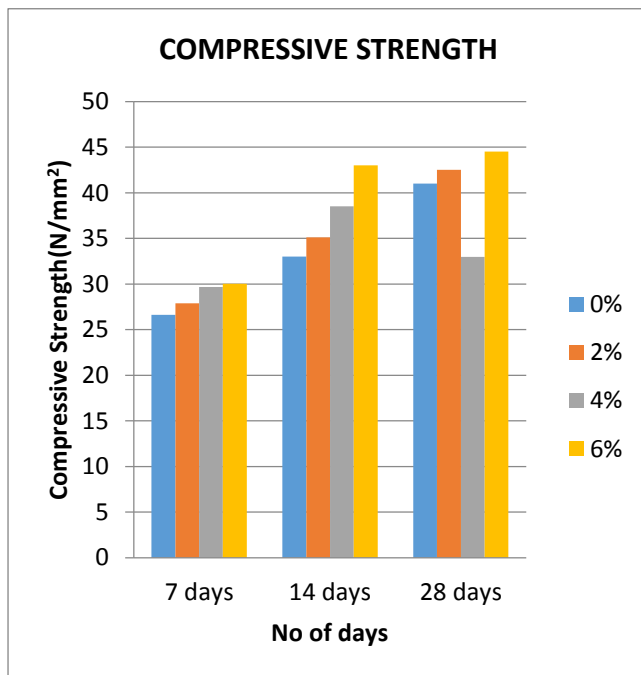
(Fig 2) BF

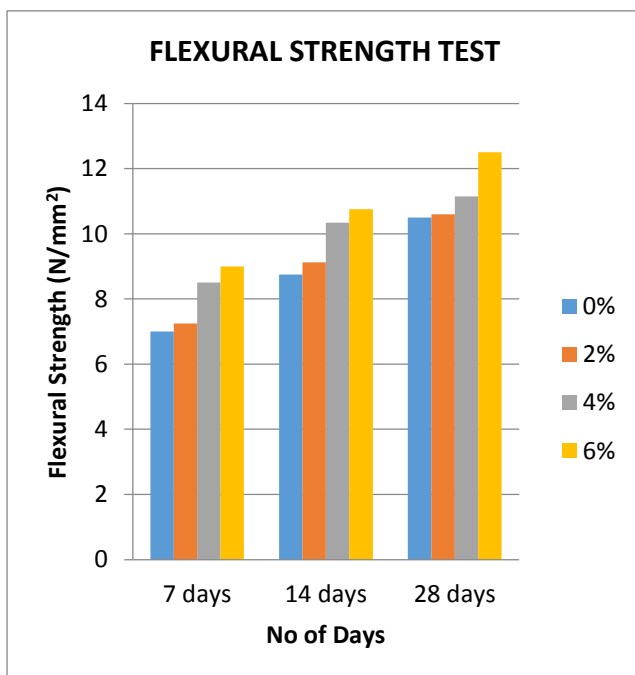
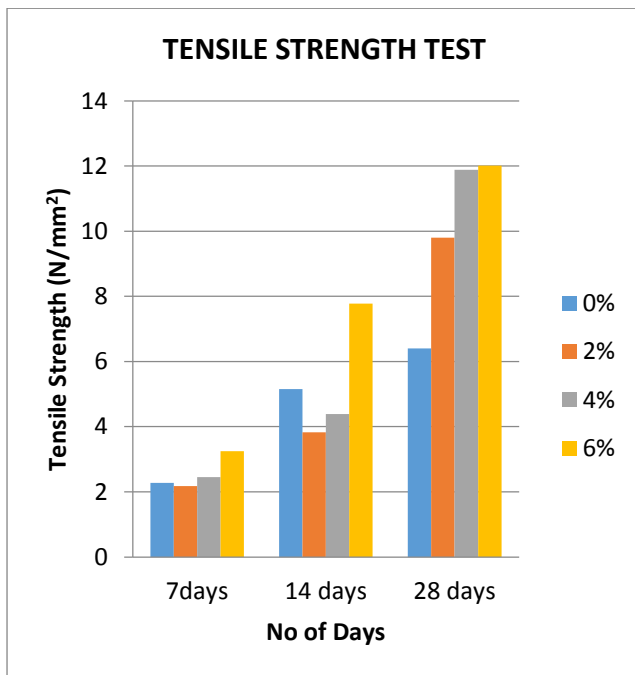
Calcium carbonate:

Calcium carbonate used in these investigations for alkali treatment. Alkali treatment in natural fiber is to removes the cellulose from the fiber. This cellulose involve in the process of decomposition of the fiber which reduces the strength of the fiber. Here banana fiber is immersed in the calcium carbonate solution for two hours and the fiber is immersed in normal water for about one hour. This normal water immersion removes the waste cellulose and calcium carbonate from the fiber.

RESULTS AND DISCUSSION

Fig 3 shows the compressive strength test and graph 1 shows the strength variation of the concrete. Fig 2 shows the tensile strength test and graph 2 shows the tensile strength variation of the concrete. Fig 3 shows the Flexural strength test and graph 3 shows the flexural strength variation of the concrete





CONCLUSION

Based on experimental research for concrete made with partial replacement of cement by Banana Leaf Ash (2%,4% and 6%) and with addition of Banana Fiber with 0.2% are conducted, the test result shows that the strength of the concrete is increased. The concrete mix is varies in workability when compared with conventional mix. The addition of Banana Leaf Ash slightly increases the compressive strength of the concrete in 2% and 6%. This gives clear idea about the replacement can done by the ash is successfully fulfill the cementitious properties. Addition of Banana fiber to the conventional mix by 0.2% increases the tensile strength of the concrete.

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