RESEARCH PAPER ON UTILIZATION OF FLYASH IN CONCRETE WITH ADDITION OF BANANA FIBER

Suheel Rashid Bhat[1], Dr. Rajesh Goyal[2], Dr.Pooja Sharma[3]
[1]M Tech in Structural Engineering, [2]Assistant Professor, [3]HOD
Department of Civil Engineering, Desh Bhagat University, Punjab (India)

ABSTRACT: Agriculture waste material can help to increase the strength of concrete. The source of natural fiber are found in plant and they are readily environmental friendly and cheap. In addition, natural fiber ash has an excellent potential to improve the performance of concrete. In my study, compressive strength test was conducted to know the strength of concrete with three different temperatures.

Banana trunk is cut layer by layer and bum in furnace with four different percentage compositions of banana fiber and fly ash. A total of 12 cubes with 150 mm x 150 mm x 150mm were used to determine the strength of concrete using banana fiber ash. All this specimens is cure for 7, 28 and 90 days using water curing method. 0.5% to 2% of banana fiber ash is added with fly ash 0-20% by weight. The materials use in my study is banana fiber ash, sand, cement, coarse aggregate, and water. The result analysis shows, the mix with 10% replacement of cement with fly ash achieved the maximum value of splitting tensile strength of 2.4 and 3.2 N/mm2 corresponding to 28 and 90 days of curing periods respectively. It was also concluded that specimen containing 10% replacement of cement with fly ash recorded increase in compressive strength of 27 N/mm2 & 29 N/mm2 over the control specimen at 28 and 90 days of curing respectively. Specimens with 10% and 20% replacement of cement with fly ash achieved higher flexural strength than the plain concrete.

Keywords: fly ash, cement, aggregate, banana fiber, sand, & curing.

I. INTRODUCTION

In my research, banana fiber ash was used as cementitious material to produced high strength concrete. Banana fiber ash has its own properties that can be found in stem itself. It has low density, appropriate stiffness, high disposability, and renewable. Fibers are broadly classified into man-made and natural fibers. Man-made fibers are made from synthetic materials like steel and natural polymers while natural fibers originate from vegetable, animal and mineral sources. Presently, the use of natural fibers in composites is preferred over manmade fibers due to their numerous advantages, which include light weight, high strength to weight ratio, corrosion resistance and other advantages such as biodegradability, low cost and wide spread availability.

II. PROBLEM STATEMENT

Agriculture waste is a raw material for industry nowadays. It does not only economical but also can lead to air pollution such as global warming (R.Srinivasan K. , 2010). Agriculture waste material usually disposed into landfill or dispose by open burning that may lead to air pollution. This waste material can be used to increase the strength of concrete.

Objective: The general objective of this study is to investigate the compressive strength of concrete banana fiber as cementitious to produce high strength concrete with different temperature. The specific objectives of this study were:

- To determine the compressive strength of concrete using banana fiber ash as waste agriculture with various temperature.
- To determine the chemical properties of banana fiber ash burning with different temperatures as cement replacement.

III. MATERIAL USED

- Cement: For this experimental investigation OPC 43 grade cement has been used and the cement is tested as per IS 4031- 1988. The different tests conducted on cement and the results obtained are tabulated in table 3.1,
- Fine Aggregate: For the present experimental work, locally available river sand has considered.
- Coarse Aggregate: The ratios from 80 mm to 4.75 mm are named as coarse aggregate. The coarse aggregate from crushed basalt rock, conforming to IS; 383 is be utilized. The flakiness and Elongation index were kept well under15%. Are shown in Table 3.2.
- Fly Ash: For the most fly ash quality is evaluated on the key parameters like pozollanic, material retain on 45 micron sieve, misfortune on ignition and other chemical parameters.
- Water: Water is transparent fluid and also a major constituent of fluid of the living thing. In mixing process, water must be clean from injurious of substances such as oil, acid, alkalis or other organic material.

Banana Fiber: Banana fiber is a characteristics fiber. The natural banana fibre displays some of the important advantages like low thickness, stiffness and mechanical properties and high sustainability and disposal. The different tests conducted on Banana fiber and the results obtained are tabulated in table 3.4.

Fig 3.2: Ordinary Portland cement

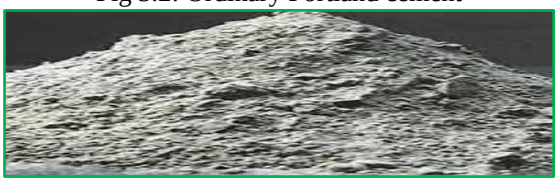

Fig. 3.4: Fly ash

Fig. 3.5: Banana Fiber

IV. EXPERIMENTAL DETAILS

4.1 General: Banana fibers used in this study were extracted from the stems of harvested banana plants. The specie of banana used in this study was musa acuminate (Modern banana). The fibers were extracted by water retting method. The properties of banana fiber used in this study were determined and presented in Table 4.3. Fly ash concrete of grade 25 was designed according to the specifications mix design method (British method). Fly ash was used to replace cement at various levels of 0%, 10%, 15% & 20% by mass of binder. Banana fibres of 30mm length and volume fraction of 0.5%, 1%, 1.5% & 2% were used in all mixes being the optimum values obtained by Anowai and Job for grade 25 concrete.

Batching, mixing and casting were done adopting a careful procedure. The fine aggregates and coarse aggregates were accurately weighed first. The required volume fractions of the banana fibers were computed and weighed out ready for mixing.

4.3 Compressive Strength of Banana Fiber Reinforced Fly Ash Concrete: The compressive strength of the concrete is observed to be decrease with the expansion of textile sludge. At 10% and 20% the replacement of cement with the textile sludge. This test is done as per IS 516 – 1999 guidelines conducted on concrete specimen of size 150 x 150 x 150mm. The samples which are submerged in fresh water for the following 7, 28, 90 days testing and the samples are kept in dry with the goal that the water is depleted well to improve the interpretations.

The compressive strength calculate by using formula.

FC = P/A, Where FC = Compressive strength N/mm2 , P = Ultimate load KN, A = Loaded area mm2

The results of the compressive strength of concrete mixtures are presented in Figure 4.1. The result shows that there are small reductions in compressive strengths of concrete as a result of inclusion of banana fibres.

Table 4.4: Compressive Strength of Banana Fibers Reinforced Concrete with Varying Fly Ash Content.

S. No	Banana Fibre composition (%)	Fly Ash Composition (%)	Compressive strength (N/mm^2)		
			7 days	28 days	90 days
1	0.5	0	23.5	29.4	32.57
2	1.0	10	20.36	27.75	29.35
3	1.5	15	16.36	23.00	25.42
4	2	20	15.25	19.35	23.45

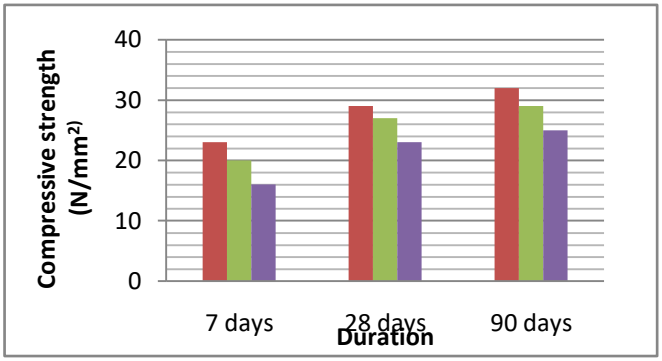

Fig 4.2: Compressive Strength of Banana Fibres Reinforced Concrete with Varying Fly Ash Content.

4.4 Flexural Strength: Flexural strength tests were carried out on 100 mm x100 mm x 500 mm beams on the 28th day using a 100kN capacity Universal Testing Machine (UTM) apparatus. The system of loading used in finding out the flexural tension is two point loading as per IS 516–1959.

Flexural strength F = $\frac{Pl}{bd}$ in N/mm^2

Where, P – Ultimate load applied to the specimen in N , l – Length of specimen between supports in mm, b – Breadth of the specimen in mm.

Test Results It was physically observed during testing that the plain concrete failed suddenly without warning while banana fiber reinforced concrete specimens with and without fly ash failed in ductile manner giving ample warning. The results of the flexural strength of concrete mixtures are presented in table 4.5. The flexural strength results indicates that the specimen containing 0.5% volume fraction of banana fiber and 0% fly ash achieved flexural strengths of 6.0 N/mm2 and 6.5 N/mm2 at curing ages of 28 and 90 days respectively as against 5.0 N/mm2 and 5.5 N/mm2 achieved by plain concrete at 28 and 90 days curing ages respectively.

Table 4.5: Flexural Strength of Banana Fibers Reinforced Concrete with Varying Fly Ash Content.

S. No	Banana Fibre composition (%)	Fly Ash Composition (%)	Flexural Strength (N/mm^2)		
			7 days	28 days	90 days
1	0.5	0	4.5	6	6.5
2	1.0	10	4	5	6
3	1.5	15	2.5	3.5	5
4	2	20	2	3.2	4

The result also shows that replacement of cement with fly ash resulted in lower flexural strength at early curing ages but the strength recovered at 90 days of curing age. Specimens with 10 and 15% replacement of cement with fly ash achieved higher flexural strength than plain concrete at 90 days. It was also observed that at 20% & greater than 20% replacement of cement with fly ash, the flexural strengths were lower than that of plain concrete for all ages of curing.

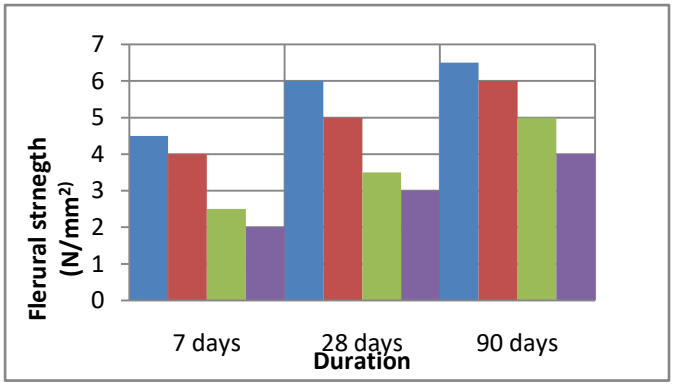

Fig. 4.4: Flexural Strength of Banana Fibres Reinforced Concrete with Varying Fly Ash Content.

V. CONCLUSIONS

The results show that replacement of cement with fly ash resulted in lower flexural strength at early curing ages but the strength recovered at 90 days of curing age. Specimens with 10 and 20% replacement of cement with fly ash achieved higher flexural strength than the plain concrete.

Partial replacement of cement with fly ash by weight resulted to a reduction in the concentration of OH- ions and led to significant reduction of the pH of the concrete specimens tested 0%, 10%, 15%, & 20% partial replacement of cement with fly ash resulted to concretes with pH of 12.20, 11.50, 11.20, 11.50 respectively after curing for 90 days.

RECOMMENDATION

Based on the findings in my study, it is recommended that cement should be partially replaced with maximum of 20% fly in banana fiber reinforced fly ash concrete in order to improve the durability of bananafibers without underling the mechanical properties of the concrete.

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