"Experimental Analysis on Abrasion Resistibility of Hydraulic Concrete"

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Abstract

Reinforced concrete (RC) is a versatile composite and one of the most widely used materials in modern construction. Concrete is a relatively brittle material that is strong under compression but less so in tension. Plain, unreinforced concrete is unsuitable for many structures as it is relatively poor at withstanding stresses induced by vibrations, wind loading, and so on. To increase its overall strength, steel rods, wires, mesh or cables can be embedded in concrete before it sets. This reinforcement, often known as rebar, resists tensile forces, In Present Investigation with concrete block with different admixtures i.e. biodegradable ash and wooden crumb are prepared separately in M-20 block also wooden crumb and biodegradable ash mixed together as a admixture in a concrete block with a percentage of 8%, 10%, 20% the compression test were perform on 9 block and found that the concrete block of M20 with a proportion of mixture 8% with biodegradable ash and wooden crumb imposes less CO2 and high compression strength is predicted. It was analyzed that silica fume mixed concrete and biodegradable ash shows comparatively high compressive strength compare to other admixture cube samples.

Keywords— *Compressive Strength, Column, Concrete, Rubber Crumb, Wooden Crumb, biodegradable ash, Admixture*

I INTRODUCTION

Concrete, commonly Portland cement concrete (for its visual resemblance to Portland stone), is a composite material composed of first-class and coarse mixture bonded together with a fluid cement (cement paste) that hardens through the years—most often within the beyond a lime-based totally cement binder, together with lime putty, however every now and then with other hydraulic cements, inclusive of a calcium aluminate cement or Portland Cement. It is outstanding from other, non-cementations kinds of concrete all binding a few shape of combination together, which consist of asphalt concrete with a bitumen binder, that is frequently used for avenue surfaces, and polymer concretes that use polymers as a binder. When combination is mixed with dry Portland cement and water, the combination office work a fluid slurry this is without difficulty poured and molded into form.

II COMPOSITION

Concrete is a composite material, comprising a matrix of aggregate (commonly a rocky fabric) and a binder (generally Portland cement or asphalt), which holds the matrix collectively. Many varieties of concrete are to be had, decided via the formulations of binders and the forms of aggregate used to match the utility for the material. These variables decide energy, density, in addition to chemical and thermal resistance of the completed product. Aggregate includes large chunks of fabric in a concrete mixture, typically a difficult gravel or crushed rocks together with limestone, or granite, collectively with finer substances which incorporates sand. A cement, most typically Portland cement, is the most general form of concrete binder. For cementations binders, water is blended with the dry powder and aggregate, which produces a semi-liquid slurry that may be customary, usually with the resource of pouring it into a shape. The concrete solidifies and hardens via a chemical technique known as hydration.

III TYPES OF CONCRETE

Concrete is produced in a variety of compositions, finishes and performance characteristics to meet a wide range of needs.

- **Mix design**
- **Historic concrete composition**
- **Modern concrete**
- **Stamped concrete**
- **High-performance concrete**
- **Ultra-high-performance concrete**
- **Micro-reinforced ultra-high-performance concrete**
- **Self-consolidating concrete**
- **Vacuum concrete**

IV ADMIXTURE

A substance supplementary than water, aggregates, or cement that is used as an element of concrete or mortar to administer setting and early harden, workability, or to give additional cementing properties. Admixtures are usually used to change the properties of concrete (such as increased workability or reduced water content, acceleration or retardation of setting time, acceleration of strength development, and improved resistance to weather and chemical attacks) to make it more suitable for a particular purpose. For instance, calcium chloride can be used to accelerate strength development in mass concrete during coldness. Air-entraining admixtures (reasonably priced soaps, detergents, etc.) entrain air which to a great extent improves the workability of concrete and therefore permits the use of harsher and more badly graded aggregates and also those of unwanted shapes.

Admixtures are used for getting following objectives:

- To speed up or retard setting and hardening.
- To recover workability.
- To boost strength.
- To advance durability.
- To reduce permeability.
- To communicate other desired properties

V METHODOLOGY

MATERIAL USED

The basic ingredients of concrete which were used in this research work are OPC (ultra tech cement), Fine Wooden crumb, biodegradable ash, silica fume, rubber crumb, Natural Coarse aggregate (sedimentary rock source), and Natural Fine aggregate (sand), Water (fresh drinkable water).

ORDINARY PORTLAND CEMENT

The ordinary Portland cement of 53grade manufactured by the ULTRATECH Cement Company was used in the study, which is in accordance with IS 12269:1987.Having design strength for 28 days being a minimum of 53 MPa or 530 kg/sqcm.

COARSE AGGREGATES

Locally available coarse aggregates were used for the preparation of test samples using rubberized concrete. Graded coarse aggregate were used & is described by its nominal size i.e. 40mm, 20mm, 16mm, 12.5mm etc. The coarse aggregate having nominal size 20mm has been used in this study. Sieve analysis on the coarse aggregate samples was carried out in the laboratory and the results obtained are shown in the Table 3.2. The properties of the coarse aggregates used for the experiment are shown in Table

Table: 3.1 Properties of coarse aggregates

Properties	**Value as per test Results**	**Value as per IS standards for R.C.C work**
Specific gravity	2.62	2.60
Water absorption	1.1 %	< 2 %
Impact factor	6.16 %	< 45 %

FINE AGGREGATE

Fine aggregates are the aggregates which pass through an IS sieve that is less than 4.75mm gauge beyond which they are known as coarse aggregate. Fine aggregates acts as filler material between the coarse aggregate. For the present study locally available sand was used. Dust and debris were removed properly before preparing the samples of rubberized concrete.

PREPARATION OF CUBE

Cube samples of size 15 x 15 x 15 cm were prepared for this project. M20 grade of concrete was considered for the preparation of samples. The Table 3.3 shows the weights of materials taken for the preparation of test samples. The process included the 5 basic steps and these steps are as follows:

- Weighing & Batching
- Mixing
- Placing
- Compacting
- Curing

- **Weighing and Batching of materials**

The first step in the preparation of the cube sample is the weighing and batching of materials. The materials are batched according to the requirements and then a fixed amount from this batched lot of materials is taken for the preparation of sample. The figure 3.1 shows the simple batching done in the laboratory;

batching of materials

- **Sand Test**

Figure: 3.2 Sand Testing

- **Mixing of materials**

After the process of batching, the materials were selected in a ratio given in Table 3-3 and they were mixed together, the process is called the Mixing. Mix were prepared using volumetric proportions for M20 i.e. a ratio of 1:1.5:3. The following figure 3.2 shows the process of manual mixing done in the laboratory;

mixing of materials

Placing of concrete

VI RESULT AND DISCUSSION

4.1 Experimental Investigation Results

The compressive strength test was performed on the cubes of size 15 cm x 15 cm x 15 cm to check the compressive strength of silica fume, wooden crumb, biodegradable ash and rubber crumb concrete concrete and the results obtained are given in Table 4.1.

Target mean strength for 28 days for M20 concrete (f'ck) = fck + 1.65*s

= 20 + 1.65 x 4

=26.6 N/mm2

Where, f'ck= target mean strength at 28 days

fck = characteristic compressive strength at 28 days &

s = standard deviation = 4 (for M20 concrete)

4.2 Experimental Investigation Results for compressive strength test of Biodegradable Ash

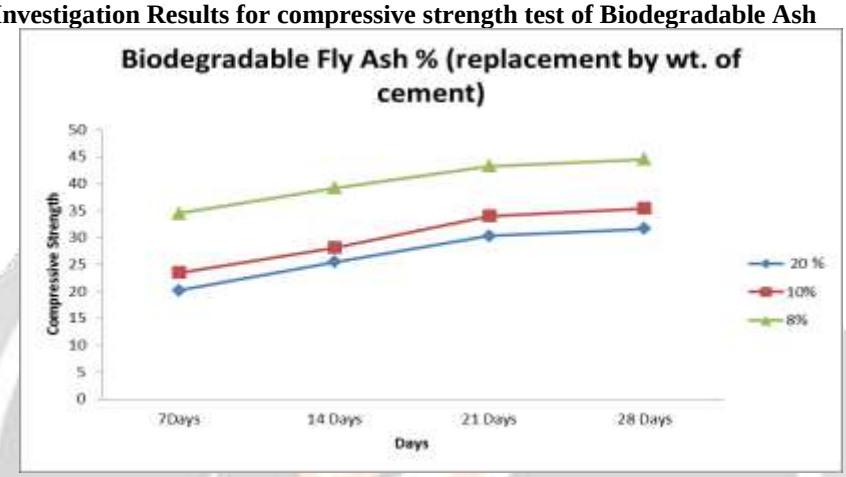


Figure 4.1 Graph shows Results of compressive strength test of Biodegradable Ash % (replacement by wt. of cement)

- From the above results it was observed that with the increase in percentage of biodegradable ash from 8% to 20% in concrete the compressive strength is observed to be optimum.

4.3 Experimental Investigation Results for compressive strength test of Wooden Crumb

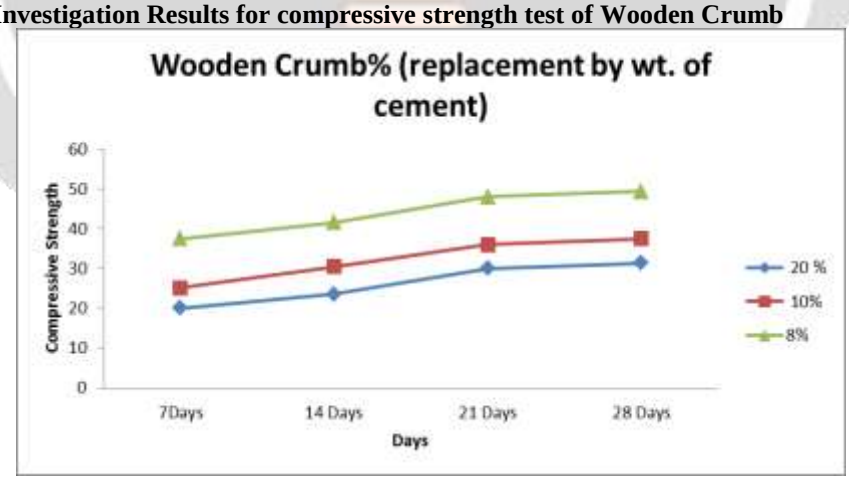
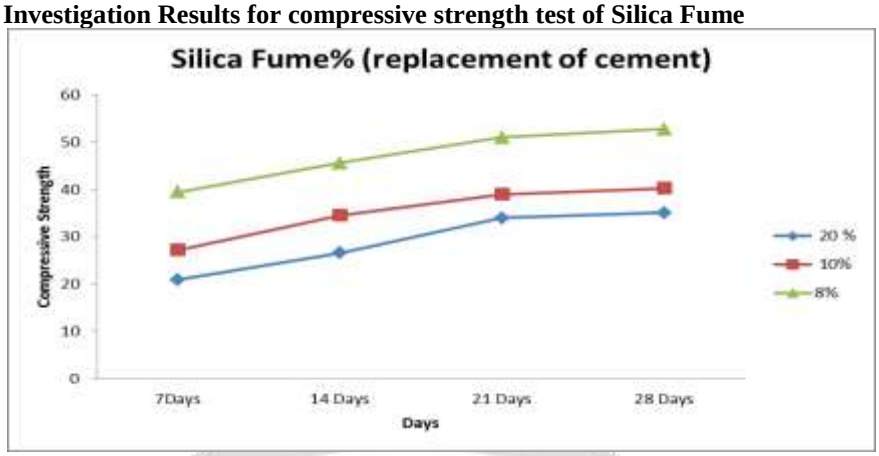


Figure 4.2 Graph shows of Result of Compressive Strength of Wooden Crumb% (replacement by wt. of cement)

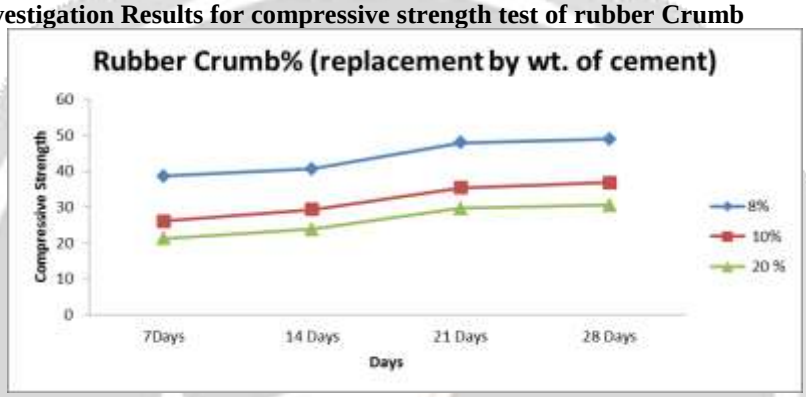
- From the above results it was observed that the compressive strength of wooden crumb mixed concrete was better than that of conventional concrete (i.e. at 8% replacement). It was also observed that the compressive strength of block is decreased with the increase in wooden crumb content in the concrete.

4.4 Experimental Investigation Results for compressive strength test of Silica Fume



Results of compressive strength test for Silica Fume% (replacement by wt. of cement)

4.5 Experimental Investigation Results for compressive strength test of rubber Crumb



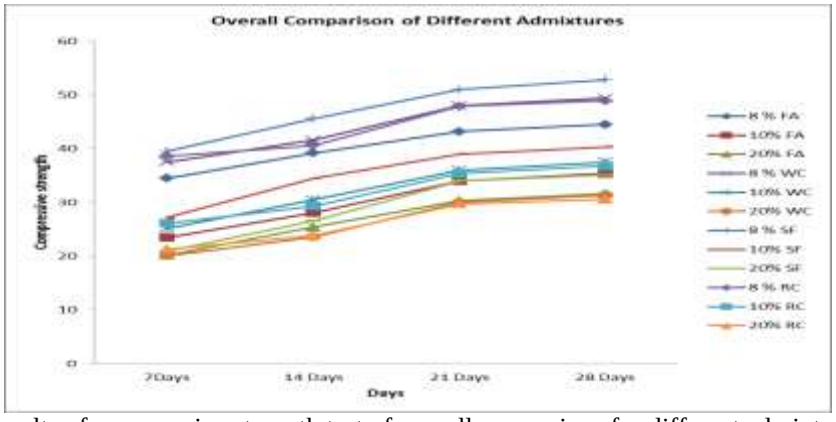
Results of compressive strength test for rubber Crumb% (replacement by wt. of cement)

4.6 Experimental Investigation Results for compressive strength test of overall comparison for different admixture

Table 4.5 Results of compressive strength test of overall comparison for different admixture

Admixtures	7Days	14 Days	21 Days	28 Days
8 % FA	34.5	39.2	43.2	44.5
10% FA	23.5	28.1	34	35.4
20% FA	20.2	25.4	30.3	31.6
8 % WC	37.5	41.6	48	49.4
10% WC	25.2	30.5	36	37.5
20% WC	20.1	23.6	30	31.4
8 % SF	39.5	45.6	51	52.8
10% SF	27.2	34.5	39	40.3
20% SF	20.9	26.6	34	35.1
8 % RC	38.6	40.6	47.9	48.9
10% RC	26.1	29.3	35.4	36.8
20% RC	21.3	23.8	29.7	30.6

- From the above results it was observed that with the increase in curing of 28 days (concrete, silica fume, wooden crumb, biodegradable ash and rubber crumb concrete) the overall compressive strength is compared to investigate high convergence of solution.



Results of compressive strength test of overall comparison for different admixture

VII CONCLUSION

• The test results of this study concludes that there is great potential for the utilization of bio gradable ash, Silica Fume, Rubber Crumb and Wooden Crumb mixer in concrete mixes in several percentages, ranging from 8% to 10% and 20%. Based on present study, the following conclusions can be made.

• Concrete with higher percentage of admixture possess low workability i.e. with increase in percentage of admixture the concrete workability decreases.

• The compressive strength of the concrete decreases about 56% when 15% of sand is replaced by wooden crumb. The compressive strength of the concrete decreases about 25% when 15% of sand is replaced by biodegradable Ash. With the addition of the both mixture, the reduction in strength cannot be avoided. However, these data provides only preliminary guideline for the strength-loss of locally produced modified concrete in comparison with the conventional concrete of 600KN targeted strength.

• The reduced weight qualities of biodegradable ash concrete as compared to conventional concrete may be of great use for architectural application for example false facade, stone baking, interior construction, can be used in buildings as an earthquake shock wave absorber, where vibration damping is required such as in foundation pads for machinery at railway station, where resistance to impact or explosion is required, such as in jersey barrier, railway buffers, bunkers and f or trench filling.

• We observed that silica fume mixed concrete gives better compressive strength in curing of 28 days compare to other mixed cube sample.

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