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COMPARATIVE STUDY ON THE BEHAVIOUR OF STRENGTH OF CONCRETE BY PARTIAL REPLACEMENT OF CEMENT by USING FLY ASH & COCONUT SHELL ASH

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ABSTRACT

Aggregates provide volume at low cost comprising 66% to 78% of the concrete . With increasing concern over the excessive exploitation of natural and quality aggregates produced from industrial wastes and agriculture waste being viable new source for building material. This study was carried out to determine the possibilities of using fly ash and coconut shell ash as aggregate in concrete. Utilising coconut shell and fly ash as aggregate in concrete production not only solves the problem of disposing this solid waste but also helps conserve natural resources. In this paper, the physical properties of crushed fly ash and coconut shell aggregate were presented. The fresh concrete properties such as density and slump and 28 days compressive strength of a lightweight concrete made with fly ash, coconut shell ash and coarse aggregate also presented. It is concluded that crushed coconut shells and fly ash are suitable when it is used as substitute for conventional aggregates in lightweight concrete production.

Keywords— Coconut shell, fly ash, Light weight concrete, etc.

I.INTRODUCTION

There has been a lot of research over using fly ash and coconut shell ash as additive in cement, admixture in concrete and cement replacement material in concrete. Compressive strength of concrete at different proportions of cement being replaced by fly ash and coconut shell ash has been checked and results have been found effective and applicable. But most of the research has been limited to few percentages of cement replacement or less grades of concrete Hence, there borne a need to carry out an extensive research on compressive strength of different grades of concrete, different proportions of fly ash, coconut shell ash and different curing periods. Hence, a comparative study can be done and use of fly ash and coconut shell ash as a cement replacement in concrete can be analyzed and compared through various methods.

Addition of fly ash & coconut shell ash to concrete has many advantages like high strength, durability and reduction in emission of CO2 production. The optimum use of fly ash **&** coconut shell ash replacing at various percentage , and check the Compressive strength of the (Cement + fly ash + coconut shell ash) with sand and aggregate mixture.

II.METHODOLOGY

Following materials were used in the experimental work:

Cement: Ordinary Portland cement (Ultra-Tech Cements of 53 grades) was used having specific gravity: 3.15, 32.5% Consistency and Compressive strength 54 MPa

Fly ash: Fly ash is finely divided residue resulting from the combustion of pulverized coal and transported by the flue gases of boilers by pulverized coal. It was obtained from thermal power station, dried and used.

Fine Aggregate: Natural sand with maximum size of 4.75 mm was used (zone II) with specific gravity 2.6 and fineness modulus 2.63

. ***Coarse Aggregate:*** Natural aggregates with maximum size of 40 mm were used with specific gravity of 2.7 and fine modulus 7.51.

Water: Drinking water from Walchand College of Engineering, Sangli was used for the preparation of concrete. The water samples are potable and of uniform quality.

The concrete mix was designed for M30, M40 and M50 grade and the mix design was done as per IS 10262-1982 and IS 456-2000. Mix design for concrete was made considering the properties of constituents of concrete. Different concrete mixes with varying fly ash content percentage were produced, replacing 0% (reference concrete), 10%, 20%, 30%, 40%, 50% and 60% cement in terms of weight. Cubic specimens of 150 mm size were casted for compressive strength test. The cubes were casted in stainless steel moulds and wet cured at standard temperature until the time of test. The cubes were cured for a time period of 7, 28 and 45 days.

III.MATERIALS USED

1.1 Material specification

For the production of concrete, the constituent materials are cement, fine aggregates, coarse aggregated and water. To get better workability and strength, the material used have better quality. To maintain the safety of structure, provisions are provided as per IS456:2000.

1.2 Cement

A cement is a binder, a substance used in construction that sets, hardens and softness to other materials, binding them together. Cement is seldom used solely, but is used to bind sand and gravel (aggregate) together. Cement is used with fine aggregate to produce mortar for masonry, or with sand and gravel aggregates to produce concrete.

Table 1: Properties of cement

Sr. No.	Test Name	Experimental values
1	Soundness value	4.00 mm
2	Fineness	1%

3	Specific gravity	2.90
4	Normal consistency	30-32 %
5	Initial setting time	30min
6	Final setting time	8hr 30min

1.3 Fine Aggregate(Sand)

Sand is naturally occurring granular material composed of finely divided rock and mineral particles. It is defined by size , being finer then gravel and coarser then silt .The most common constituent of sand is silicon dioxide, usually in the form of Quartz. Silt sand particle size varies from (0.004mm to 0.0625mm). . Sieve analysis of sand is given in table no. 2

Table 2 Fine Aggregate

S.No.	Property	Result
1.	Specific gravity	2.7
2.	Fineness modulus	2.75
3.	Grading zone	4th

1.4 Coarse Aggregate

Coarse aggregate confirming to IS: 383-1987 was used. Aggregates of size 12.5mm and 45 mm of specific gravity 2.84 and fineness modulus 8.47 were used. Properties of Coarse aggregate are given in Table No.3

Table 3: Properties of coarse aggregate

Sr. No.	Properties	Results
1	Specific gravity	2.68
2	Particle shape	Angular
3	Impact value	8.4

1.5 Fly ash

Fly ash is a residual material of energy production using coal, which has been found to have numerous advantage for use in concrete some of the advantage include improved workability, reduced permeability, increased ultimate strength, reduced bleeding, better surface and reduced heat of hydration. The properties of fly ash are shown in Table no.4

Table no.4 Fly Ash

S.No.	Test name	Experimental values
1.	Specific gravity	2.7
2.	Physical form	powder

3.	Size	90(microne)
4.	Colour	Dark grey

1.6 Coconut Shell ash

- Many researchers have made efforts for preparing carbon black from agricultural by-products such as coconut shell apricot stones, sugarcane bagasse, nutshells, forest residues and tobacco stems.
- Coconut shells have little or no economic value and their disposal is not only costly but may also cause environmental problems.
- Coconut shell is suitable for preparing carbon black due to its excellent natural structure and low ash content. Conversion of coconut shells into activated carbons which can be used as adsorbents in water purification or the treatment of industrial and municipal effluents would add value to these agricultural commodities, help reduce the cost of waste disposal, and provide a potentially cheap alternative to existing commercial carbons.

1.7 Water

The concrete mix was designed for M20 grade and the mix design was done as per IS 10262-1982 and IS 456-2000. Mix design for concrete was made considering the properties of constituents of concrete. Different concrete mixes with varying fly ash and coconut shell ash content percentage were produced, replacing 0% (reference concrete),5% 10%, 15% cement in terms of weight. Cubic specimens of 150 mm size were casted for compressive strength test. The cubes were casted in stainless steel moulds and wet cured at standard temperature until the time of test. The cubes were cured for a time period of 7, 14 and 28 days.

IV.RESULT

The concrete is made by partially replace the CEMENT by 0%,5%, 10%,15% with coconut shell ash and fly ash. Compression test were conducted on the cubes of size 150mm*150mm*150mm at 7 day, 14 day and 28 day .The value for compressive strength is given below

Table no. 5 Compressive strength of concrete

MIX	**% of Replacement**	**Compressive strength (N/mm2)**					
		7days		**14 days**		**28 days**	
		FA	**CSA**	**FA**	**CSA**	**FA**	**CSA**
M0	**0**	15.6		18.3		34.22	

M1	**5**	13.89	12.89	19.56	17.56	34.08	31.78
M2	**10**	12.36	11.11	17.09	14.89	26.53	23.33
M3	**15**	9.86	8.66	13.84	12.44	23.08	19.78

From Table 5 it is clear that the compressive strength is better at 10% replacement of coconut shell ash and fly ash. On further increasing the percentage above 10%, the compressive strength decreases continuously.

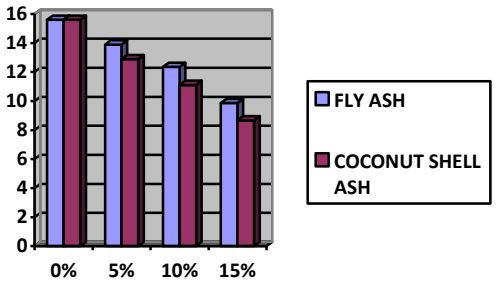

Fig.1: % replacement of OPC with CSA and FA for 7 days

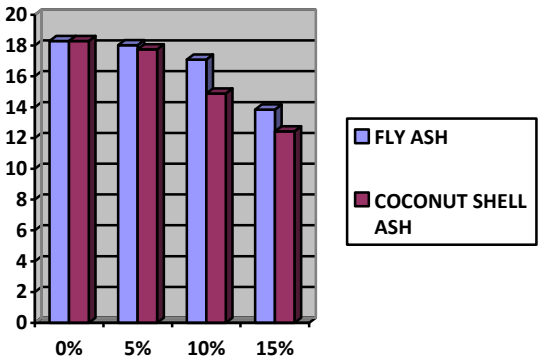

Fig.2**:** % replacement of OPC with CSA and FLY ASH for 14 days

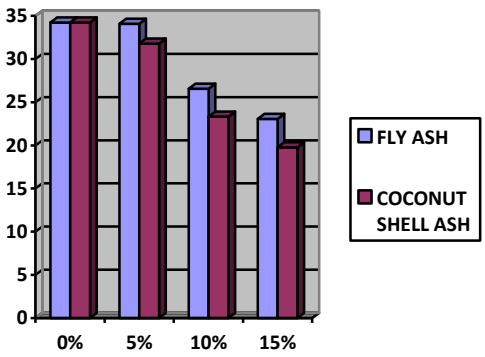

Fig. 3**:** % replacement of OPC with CSA and FA for 28 days

V.CONCLUSION

It is clear by this research that replacement of ordinary Portland cement with coconut shell and fly ash makes the concrete economical than the conventional regular concrete. But it is also noticed that replacement of OPC with high percentage of fly ash and coconut shell ash reduces the strength of concrete . It is also clearly observed that the concrete with 15% of replacement of OPC with coconut shell ash and fly ash gives strength similar to other combination. So the mixing of coconut shell ash & fly ash is suitable for reducing the density as well as cost of structure. Mixing of coconut shell & fly ash in construction gives a benefit to the solid waste management for coconut shell ash & fly ash waste which is more than 3 million tons annually.

So this experiment helps to dispose solid waste such as coconut shell ash & fly ash in construction work as well as make the concrete lighter than normal concrete.

REFERENCES

[1] Noor Md.,Sadique Hasan,habibur RAHMAN sobuz, Md Shiblee Sayed and Md. Saiful Islam,"The use of coconut fiber in the production of strucural lightweight concrete",Journal of applied science, 12,831-839,2012.

[2] Shetty M.S."Concrete technology: theory and practice", New Delhi: chand & company , Ltd, 2006.

[3] Parag S. Kambli and Sandhya R. Mathapati,"Application of coconut shell as coarse aggregate in concrete: A review'', International journal of Engineering research and applications,vol.4,pp498-501,2014.

[4] Amarnath Yerramala and Ramachandrudu C,"Properties of concrete with coconut shell as aggregate replacement",internastional journal of engineering innovations, vol.1, issue 6, pp 21-31,2012.

[5] T.A.I Akeju and F.Falade, "Utilisation of Bamboo as Reinforcement in concrete",Structural Engineering, mechanics and computation (vol.2)A.Zingoni(Editor).

[6] Masani,"Studies on Bamboo concrete composite Construction",1997.

[7] IS 383-1970; Specification for coarse and fine aggregates from natural sources for concrete.

[8] Jigar K. Sevalia and Nirav B. Siddhpura,"Study on Bamboo as reinforcement in cement concrete", International journal of research and application (IJERA) volume 3,2013.

[9] IS 1489 (part 1) 1991 (Specification of Portland Pozzolona Cement).

[10] Himanshu Dahiya, Naveen Dharni,(Jan 2015) "Concrete with crush coconut shell as aggregate",International journal of research and development organization.