EXPERIMENTAL INVETIGATION ON CORN COB ASH AND SAW DUST ASH AS PARTIAL REPLACEMENT OF CEMENT IN CONCRETE

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ABSTRACT

The conventional concrete is effect of environmental on the properties of corn cob ash (CCA) and saw dust ash (SDA) cement concrete. It is the CCA powder as an alternate cementations material was evaluated in this study. The physical and chemical characteristics of CCA were studied. The compressive strength, tensile strength, flexural strength by used in hardened concrete and workability in slump cone test used in fresh concrete. The concrete cube size 150x150x150 mm with different percentage by weight of combination of CCA and SDA to Portland cement in the order of 0%, 10%, 20%, 30% were cost. The concrete were tested of the age of 7, 14 and 28 days. By using the grade of concrete M35. Recycling of waste materials in a more useful and economical way should be encouraged by government and any organization with viable programs and adequate funds to encourage interested researchers.

Keyword: Corn cob Ash, Saw Dust Ash, OPC, Super plasticizer.

1.INTRODUCTION

Concrete is the most versatile heterogeneous construction material and the impetus of infrastructural development of any nation. Civil engineering practice and construction works around the world depend to a very large extant on concrete. The growing use of concrete is special architectural configurations and closely spaced reinforcing bars have made it very important to produce concrete that ensures proper filling ability, good structural performance and adequate durability. In recent years, a lot of research was carried out throughout the world to improve the performance of concrete in terms of its most important properties, i.e. strength and durability. Concrete technology has under gone from macro to micro level study in the enhancement of strength and durability properties from 1980onwards. Till 1980 the research study was focused only flow ability of concrete, so as to enhance the strength however durability did not draw lot of attention of concrete technologies. Corn cob is the hard thick cylindrical central core of maize (on which are borne the grains or kernels of an ear of corn). Raheem A.A. (2010) described Corn cob as the agricultural waste product obtained from maize or corn; which is the most important cereal crop in sub-Saharan Africa. According to Food and Agriculture Organization (FAO) data, 589 million tons of maize were produced worldwide in the year 2000 (FAO Records; 2002). The United States was the largest maize producer having 43% of world production. Africa produced 7% of the world's maize (IITA Records; 2002). Nigeria was the second largest producer of maize in Africa in the year 2001 with 4.62 million tons. Environmental pollution would be controlled and job would be created for our teaming unemployed youths who could become agents for supplying the CCA and SDA to concrete industries that needed it.

1.1OBJECTIVE

1. To reduce the Co_2 emission by adding CCA, SDA and coarse aggregates in convention concrete.

2.To determined the strength at various percentage of CCA and SDA(0%,10%,20% and 30 %) by replacement on cement for making M_{35} grade high strength concrete

3. To find out the fresh concrete for wokability test on slump cone and compaction factor test.

4. To find out the hardened concrete for compressive ,split tensile and flexural strength of concrete.

1.2SCOPE

The scope of the study is restricted to the following aspects. The workability, compressive strength, split tensile strength of CCA and SDA of different mix proportions with constant w/c ratio have been investigated.

1.3 METHODOLOGY

- Literature Collection And Study
- Material Collection And Study
- Test On Material Study & Properties
- Mix Design M-30 Grade Of Concrete
- Testing Of Fresh Concrete
- Casting Of Specimens
- Curing Of Specimens
- Testing The Mechanical Properties Of The Concrete
- Result And Discussions
- Conclusion

2.MATERIAL PROPERTIES

2.1 MATERIAL UESD

a) Cement (OPC 53)
b) Coarse Aggregate
c) Fine Aggregate
d) River sand
e) Mixing of water

2.1.1 Cement

OPC53 Grade conforming IS12269:1987, Minimum cement content:320 kg/m3 (IS456:2000), Specific gravity of Cement: 3.12

S. No	Test for Cement	Apparatus	Value Obtained
1.	Standard consistence test	Vicat apparatus	26.5%
2.	Initial setting time	Vicat apparatus	30 minutes
3.	Final setting time	Vicat apparatus	230 minutes
4.	Specific gravity test	Conical flask	3.12

2.1.2 Coarse Aggregate

As per IS 383:1970 the 20mm used. The shape of coarse aggregate is angular, water absorption is 0.7%. Specific gravity of nominal size of aggregate is 2.46

S.No	Test for coarse aggregates	Apparatus	Value obtained
1.	Fineness modulus	Sieve	6.23
2.	Specific gravity	Cylindrical container	2.46
3.	Water absorption	container	0.7%
4.	Impact value	Impact testing machine	13.5%

2.1.3 Fine Aggregate

As per IS 383:1970 fine aggregate properties were tested. Water absorption is 0.4%, Specific gravity of fine aggregate is 2.53

S.No	Test for fine aggregates	Apparatus	Value obtained
1.	Fineness modulus	Sieve	2.39
2.	Specific gravity	Pycnometer	2.53
3.	Water absorption	Container	0.4%

2.1.4 CORN COB ASH

As per IS 383:1970 fine aggregate properties were tested. Specific gravity of fine aggregate is 3.11

S.NO	Test for CCA	Value obtained
1.	Standard consistence test	28.5%
2.	Initial setting time	32 minutes
3.	Final setting time	250 minutes
4.	Specific gravity test	3.11

2.1.5SAW DUST ASH

As per IS 383:1970 fine aggregate properties were tested. Specific gravity of fine aggregate is 3.15

S.NO	Test for SDA	Value obtained
1.	Standard consistence test	26.5%
2.	Initial setting time	32 minutes
3.	Final setting time	250 minutes
4.	Specific gravity test	3.15

2.1.5 Water

According to IS 3025, water to be used for mixing and curing should be free from injurious or deleterious materials. Portable Water is generally considered satisfactory. In the present investigation, available water within the campus is used for both mixing and curing purposes.

3.MIX DESIGN

3.1Concrete mix proportion

The mixes were designated in accordance with IS 10262-2009 mix design method. Based on the results, the mix proportions M35 was designed. Concrete mix with w/c ratio of 0.45 was prepared. The details of mix proportions for $1m^3$ of concrete are given in Table below

Mix proportions for M35 Grade of Concrete (Kg/m^3)

Grade	Cement	FA	CA	Water
Mix 35	369.75	920.20	1071.35	147.5
	1	2.21	2.75	0.45

4.CASTING OF SPECIMENS

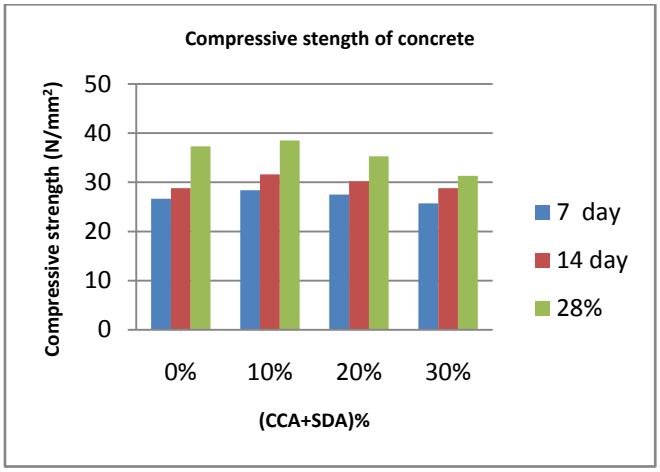
a) Cubes (150x150x150mm)
b) Cylinders (150mm diameter, 300mm height)
c) Prism (500,100 and 100mm)

5.TESTING OF SPECIMENS

a) Compressive strength test
b) Split tensile strength test
c) Flexural strength test

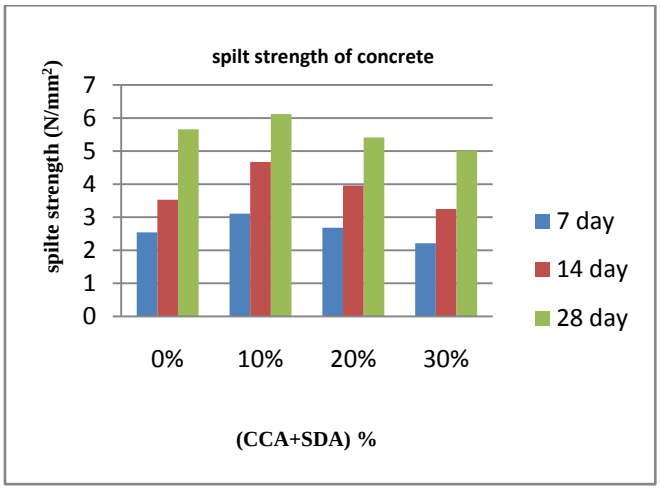
5.1.1COMPRESSION STRENTH TEST

S.NO	SAMPLE	COMPRESSIVE STRENGTHTEST N/mm²		
		7 DAYS	14 DAYS	28 DAYS
1.	0% of CCA and SDA	26.67	28.8	37.3
2.	10% of CCA and SDA	28.4	31.6	38.5
3.	20% of CCA and SDA	27.5	30.2	34.3
4.	30% of CCA and SDA	25.7	28.8	31.3



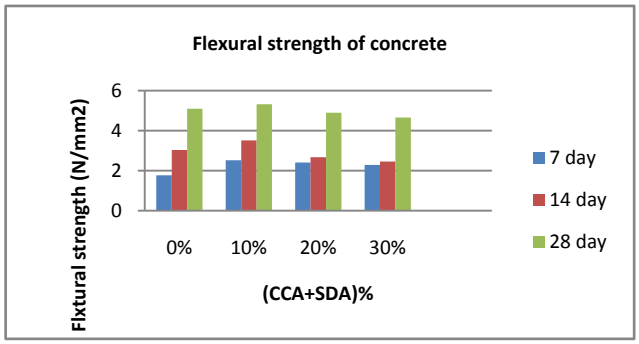
5.1.2 SPILT TENSILE STRENTH TEST

S.NO	SAMPLE	SPLITE TENSILE STRENGTH (N/MM²)		
		7 DAYS	14 DAYS	28 DAYS
1.	0% OF CCA AND SDA	2.54	3.53	5.66
2.	10% OF CCA AND SDA	3.11	4.67	6.12
3.	20% OF CCA AND SDA	2.68	3.96	5.41
4.	30% OF CCA AND SDA	2.21	3.25	4.99



5.1.3 FLEXURAL STRENTH TEST

S. NO	SAMPLE	FLEXURAL STRENTH (N/mm^2)		
		7 DAYS	14 DAYS	28 DAYS
1.	0% of CCA and SDA	1.77	3.03	5.1
2.	10% of CCA and SDA	2.52	3.51	5.32
3.	20% of CCA and SDA	2.41	2.67	4.9
4.	30% of CCA and SDA	2.29	2.46	4.66



7. CONCLUSION

- The workability of fresh corn cob ash and saw dust ash concrete measured by the slump test reduces as the CCA and SDA content increases.
- The compressive , splite and flextural strength of concrete reduced as the percentage CCA and SDA replacement increased but increases with curing age.
- For an optimum percentage of strength attained by 10% replacement of cement with CCA&SDA is recommended by compaction strength, split strength & flexural strength.
- Recycling of waste materials in a more useful and economical way should be encouraged by government and any organization with viable programs and adequate funds to encourage interested researchers.

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