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An experimental investigation on concrete with partial replacement of cement by Groudnshell ASH (GSA) and sea shell powder

S. Shanmuga Vadivel [1], N.Venkadesh [1],R.Vishnuvarthan[1], T.Gowri Prasadh [1]
S.K.Gowtham. [2],
UG STUDENTS [1], ASSISTANT PROFESSOR [2]
DEPARTMENT OF CIVIL ENGINEERING
NANDHA ENGINEERING COLLEGE, ERODE.

ABSTRACT:

This study investigates the use of considerable volume of groundnut shell ash and sea shell powder as the partial replacement for cement in concrete production. A total of 100 specimens of the GSA/OPC concrete were cased in cubes of 150mm dimension for 7, 14, 28 days and the compressive strength and density determined.

INTRODUCTION:

The continuous increase in the price of Portland cement is attributed to the insufficient production rate of the raw materials when compared with the demand rate in the construction industries. During and after the harvest of groundnut, the shell is regarded as waste product which when accumulated in large quantity in a particular area will constitute an environment hazard.
The utilization of groundnut shell ash reduces the environmental problem resulting from the accumulation of the shells in a large quantity in a particular area.

Replacement level of 0-15% is to be carried out by comparing the strength property with which recommends that cement partially replaced with pozzolanas should reach a compressive strength of 65-95% of the control specimen in 28 days and hence an optimum replacement of 15% recommended.

The main objective of this study is to investigate the suitability GSA as partial replacement for cement in concrete. Groundnut shell ash 12 (GSA) will be used as secondary cement envious material various percentages Of GSA(10%, 15%, 20%) will be used to produce the concrete M40 grade of concrete and GSA /OPC concrete's compressive strength is measured after curing.

LITERATURE STUDY:

PROPERTIES OF GROUNDNUT SHELL ASH & SEA SHELL POWDERAS REPLACEMENT OF CEMENT:

In this journal the v.samidurai analyzed the properties of groundnut shell ash powder and used the GSA as a partial replacement of cement in concrete. The journal proves that the 10% and 15% replacement of

cement on concrete will be suitable for construction work.Now for (2012) studied that a good tendency for pozzolonic action for percentage replacement less than 10% based on the previous research which is focused on looking for alternatives for OPC concrete, the GSA/OPC concrete is considered as a good development for masonry walls and mass foundations.And Groundnut shell is by product from agricultural waste cheaper than Ordinary Portland cement and available in large quantities, the utilization of this product in concrete work would reduce the effect of this agricultural waste an agent of environmental pollution Adole (2011) reported the effects of chemicals on the properties of the concrete.

MATERIAL USED :

CEMENT:

It is produced by heating limestone and clay very high temperatures in a rotating kiln. Cement is produced by grinding the resulting clinker to fine powder. The cement used in this project is 53 grades ordinary portland cement .The cement used has a specific gravity of 3.18.

FINE AGGREGATE:

River sand the problem of huge shortage in many areas due to large requirement in construction industry.The per unit of sand cost increase day by day & there is a need for alternative material so using by product of M sand.

Specific gravity of M sand: 2.7.

GROUNDNUT SHELL ASH:

Groundnut shell ash is the residue powder that is left after the combustion of groundnut shell.

It has to be burn 500 to 600 deg C to get the ash

The ashes are sieved through 75microns sieve to obtain the size of the cement particles. The specify gravity test of GSA is found to be 2.25.

SEA SHELL POWDER:

The sea shell powder is rich in calcium oxide so increasing the sea shell powder content in GSA it will give extra strength.

The sea shells are heated to more than 800 deg C and sieved through the 75 microns to obtain the cement size.

Specific gravity of Sea shell powder: 4.3.

Chemical composition of GSA/OPC:

Constituent	% Composition (GSA)	% Composition OPC
Ferrous oxide (Fe2O3)	1.8	4.65
Silica (SiO2)	16.21	22.0
Calcium Oxide (CaO)	8.69	62
Aluminium Oxide (Al2O3)	5.93	5.03
Magnesium Oxide (MgO)	6.74	2.06
Sodium Oxide (Na2O)	9.02	0.19
Potassium Oxide (K2O)	15.73	0.40
Sulphite (SO32-)	6.21	1.43

TESTING OF MATERIAL:

SPEACIFIC GRAVITY OF FINE AGGRGATE

The Apparatus is Pycnometer

W1(weight of pycnometer)=0.450kg

W2(weight of dry sand)=0.790kg

W3(weight of water +sand)=1.365kg

W4(weight of water +pyconometer)=1.175kg

Specific gravity = (w2-w1)/(w2-w3)-(w3-w4)

The specific gravity of fine aggregate is 2.26

SPECIFIC GRAVITY OF COARSE AGGREGATE:

The apparatus is pycnometer

W1 (weight of pycnometer) =0.450kg

W2(weight of dry aggregate)=0.810kg

W3(weight of water + dry aggregate)=1.415kg

W4(weight of water +pyconometer)=1.191kg

Speacific gravity = (w2-w1)/(w2-w3)-(w3-w4)

The speacific gravity of fine aggregate is 2.60

Material Used:

Cement - 53 grade opc cement

Fine aggregate - M sand

Coarse aggregate -20 mm sieved aggregate

Physical properties material:

Material	Specific Gravity
Cement	3.18
Fine Aggregate	2.7
Coarse Aggregate	2.6
Ground nut shell ash	2.25

MIX PROPORTION :

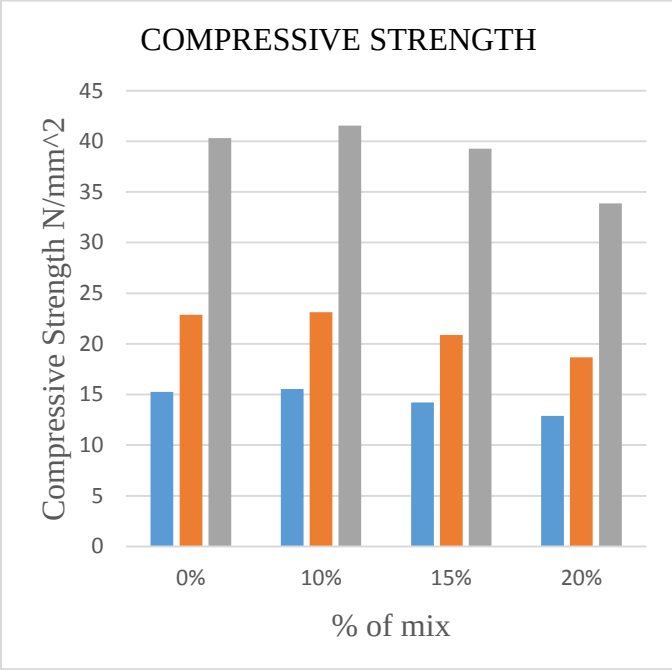
Cement	Fine Aggregate	Coarse Aggregate
465kg	662.52kg	1138.94kg
1	1.42	2.44

COMPARITION OF TESTS:

COMPRESSIVE TEST:

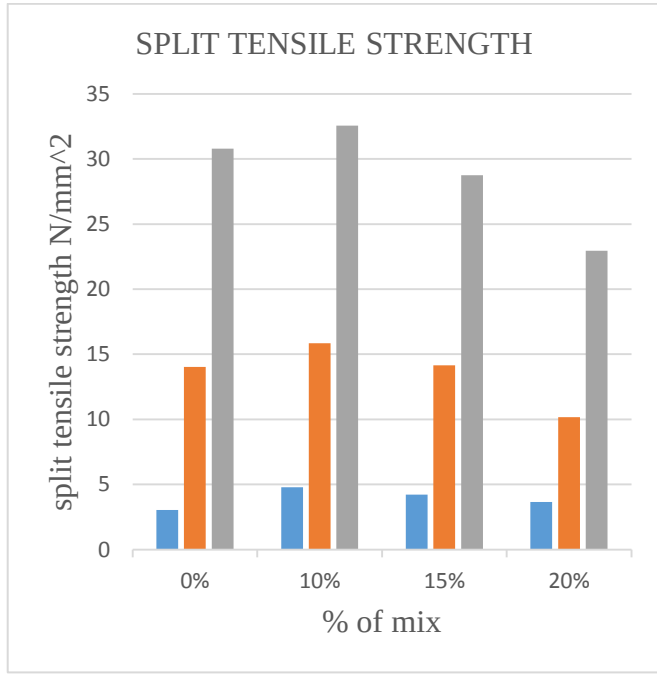
S.NO	% of GSA & SSP	CURING (days)	COMPRESSIVE STRENGTH (N/mm^2)
1	10%	7 14	15.55 23.11

		28	41.55
2	15%	7 14 28	14.22 20.58 39.26
3	20%	7 14 28	12.88 18.66 33.86



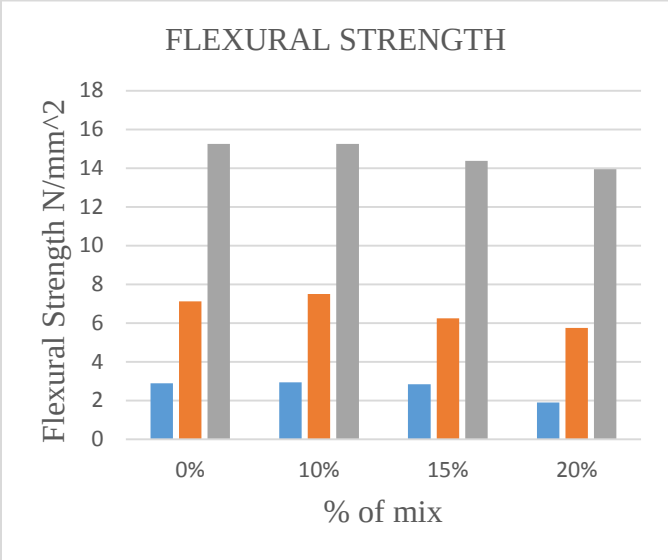
SPLIT TENSILE STRENGTH :

S.NO	% of GSA & SSP	CURING (days)	COMPRESSIVE STRENGTH (N/mm^2)
1	10%	7 14 28	4.79 15.84 32.56
2	15%	7 14 28	4.22 14.14 28.75
3	20%	7 14 28	3.65 10.18 22.96



FLEXURAL STRENGTH:

S.NO	% of GSA & SSP	CURING (days)	COMPRESSIVE STRENGTH (N/mm^2)
1	10%	7 14 28	2.95 7.5 15.25
2	15%	7 14 28	2.84 6.25 14.38
3	20%	7 14 28	1.9 5.75 13.94



CONCLUSIONS:

From the results of the various tests performed, the following conclusions can be drawn.

- Groundnut shell and sea shell powder is a suitable material for use as a puzzolana, since it satisfied the requirement for such a material.
- Concrete becomes less workable as the Groundnut shell percentage increases meaning that more water is required to make the mixes more workable. This means that Groundnut Shell Ash concrete has higher water demand.
- But when sea shell powder is added to the Groundnut shell and partially replacing cement increases the compressive strength. It is due to the sea shell contains more amount of calcium content. The compressive strength generally increases with curing period and decreases with increased amount of Groundnut shell Ash. Only 10% GSA substitution is adequate to enjoy maximum benefit of strength gain.
- The compressive strength of also increases with the combination of sea shell powder up to 15% to 20% weight of cement.
- The effective utilization of these sea shell wastes which are available almost free of cost and in abundance will not only reduce their pollution tendency but will help in reducing the amount of cement used in concrete work.

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