

An Investigation in to the Use of Ground Nutshell Ashpowder as Cement Replacement

MR.V.RAGHUPRASATH^a,KAVITHA.K^b,ABDULRAHIM.M^b,JAYARAJA^b,
MUHAMMED FASIL.P^b

^aAssistantProfessor, Department of civil Engineering,

ShreeVenkateshwaraHi-TechEngineeringCollege,Gobichettipalayam,Erode-638455, India

^bUG Scholar, BE Civil Engineering, Department of Civil Engineering, Shree VenkateshwaraHi-TechEngineeringCollege,Gobichettipalayam,Erode-638455,India

ABSTRACT

Concrete plays a prominent role in the construction industry. In the present scenario,thereisashortageofthismaterial so there is a need to find alternatives to replace it in the concrete many waste products which are available freely like a paperwaste,redmud, rice huskandplastic waste can be used.Among all of these, Ground nut shell ashis one of the good waste materials available from the oil industry. It can be used widely for the replacement of cement. The ground net shell contains CaO, SiO₂, Al₂O₃, and Fe₂O₃. This experimental investigation was carried out to evaluate the strength of concrete, in which cement was replaced with ground nut shell ash for cubes, cylinders, and Prisms with different percentageswhichvaryfrom0%to40%at an interval of 15% were performed.

Concrete was batched by weight on adopting a ratio of 1:1.5:3 with water–cementratioof0.4.TheseCubes,cylinders, andprismsweretestedfor7and28daysfor compression, flexural and split tensile strengths. It is observed that 15% replacement ofground nut shell ash shown thehighest strengthvalueswhencompared with other percentages and for 15%

keyword: Groundnut shell ash powder, M20 mix design, OPC 53 grade cement, compressive strength &tensile strength

INTRODUCTION

General

The continuous increase in the price of Portland cement is attributed to the insufficient production rate of the raw materials when compared withthe demand rateintheconstructionindustriesGround

nut shell ash was partially used cement in concrete. Thus, the possible use of agriculture waste Groundnut shell ash (GSA) is one of the potential waste materials to be used for cement replacement.

Scope

To analysing experimental study of ground nut shell ash partially replacement of cement in concrete. The utilization of ground nut shell ash reduces the environmental problems GSA/OPC concrete were cured in cubes of 100mm dimension for 7, 14, 21 and 28 days and the compressive strength and density determined. The groundnut shell ash may be used as a partial replacement of cement.

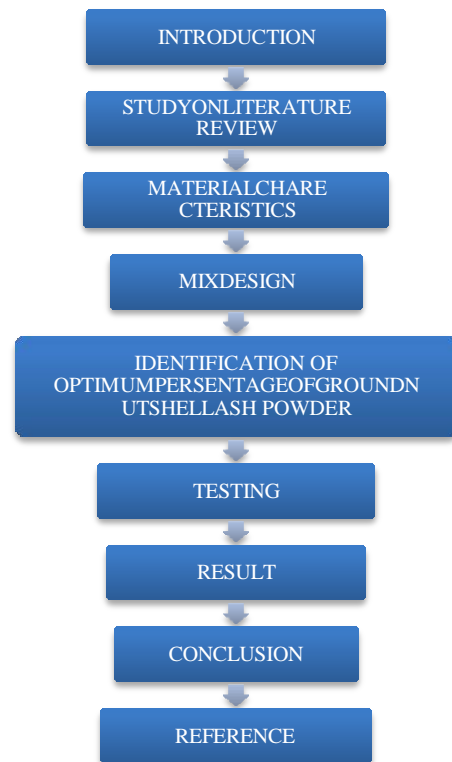
Advantages

the strength of the control was higher, replacement of cement with ash up to 30% would be more suitable than others.

Groundnut

shell ash can be used as a source of fuel for cooking, heating, and electricity generation. Groundnut shell ash (GSA) is one of the potential waste materials to be used for cement replacement. This article includes an experimental investigation on the properties of stabilized earth blocks using GSA as a cement substitute.

METHODOLOGY



MATERIALS CHARACTERISTICS

Cement

Cement is an extremely fine material having adhesive and cohesive properties which provides a binding medium for the discrete ingredients. Cement is several times stronger binding material than lime and clay. OPC cement are using 53 grade cement for concrete.

M Sand

M Sand is known for its uniform and consistent particle size distribution, which is one of its key advantages over natural river sand.

Coarseaggregate

Coarse aggregates are a construction component made of rock quarried from ground deposits. Typically the most common size of aggregate used in construction is 20mm.

Ground nutshell powder

Groundnut shell ash is a by product obtained from the burning of groundnut shells. GSA contains appreciable amount of active silica (SiO₂) and other refractory oxides such as Alumina (Al₂O₃) and hematite (Fe₂O₃).

Water

Water is the key ingredient, which when mixed with cement, forms a paste that binds the aggregate together. The water causes the hardening of concrete through a process called hydration.

PROPERTIES OF MATERIALS

Cement

Characteristics	Value specified by IS
Specific Gravity	3.13
Consistency (%)	35%
Initial Setting Time	30 (minutes)
Final Setting Time	600 (minutes)

MSand

Characteristics	Value specified by IS
Bulk density	1.78 Kg/m ³
Fineness modulus	2.10
Specific gravity	2.34
Water absorption (%)	2.42

Coarse aggregate

Characteristics	Value specified by IS
colour	grey
Size	20mm
Shape	Angular
Specific Gravity	2.74

Ground nutshell powder

Characteristics	Value specified by IS
Moisture content	9.755
Ash content	3.465
Cellulose	45.101
Hemicellulose	26.816
Lignin	33.600

TESTING

COMPRESSIVE STRENGTH FOR GROUND NUT SHELL ASH

Compressivestrengthafter7daysfor cube

S. No	Mix Description	Compressive strength (N/mm ²)	Average Compressive strength (N/mm ²)
1	Conventional mix	12.49	12.08
		11.67	
2	10%	18.43	18.98
		19.54	
3	15%	21.67	22.065
		22.45	
4	30%	20.45	20.98
		19.90	

Compressivestrengthafter28daysfor cube

S. No	Mix Description	Compressive strength (N/mm ²)	Average Compressive strength (N/mm ²)
1	Conventional mix	26.56	25.23
		23.90	
2	10%	21.78	22.29
		22.80	
3	15%	28.29	29.28
		30.27	
4	30%	24.76	24.15
		23.54	

SPLITTENSILESTRENGTHFOR GROUND NUT SHELL ASH

TableSplittensilestrengthofcylinder for 7 days

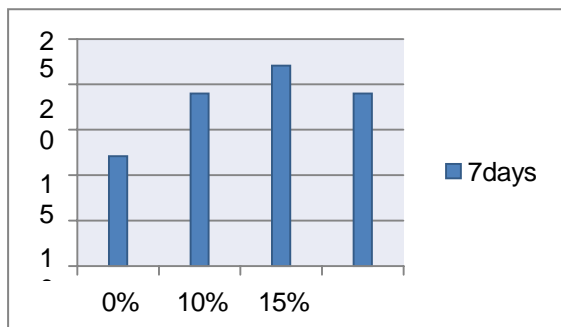
Mix (%)	Splittensile strength (N/mm ²)		Average Split tensile strength (N/mm ²)
	Specimen 1	Specimen 2	
0	2.34	2.78	2.57
10%	2.11	1.98	2.045
15%	2.79	2.90	2.845
30%	1.98	1.95	1.965

Splittensilestrengthofcylinderfor28 days

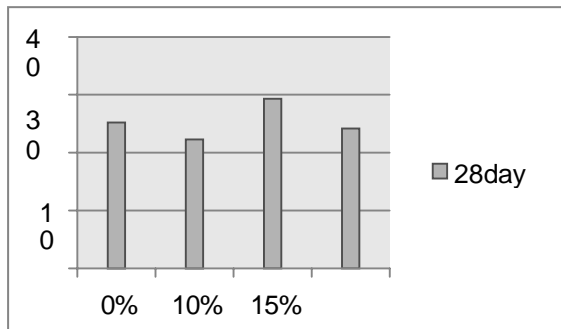
Mix (%)	Split tensile strength(N/mm ²)		Average Split tensile strength (N/mm ²)
	Specimen 1	Specimen 2	
0	2.11	2.99	2.55
10%	2.87	2.98	2.925
15%	3.15	3.18	3.165
30%	2.97	2.87	2.92

RESULT

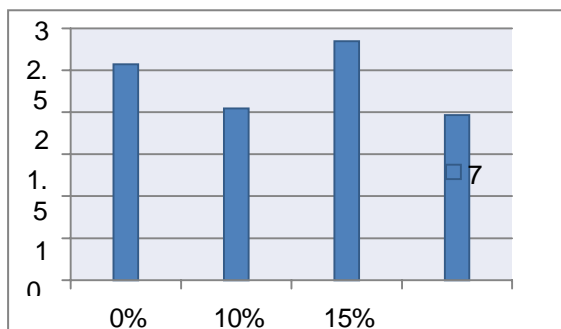
Compressivestrengthafter7daysfor concrete



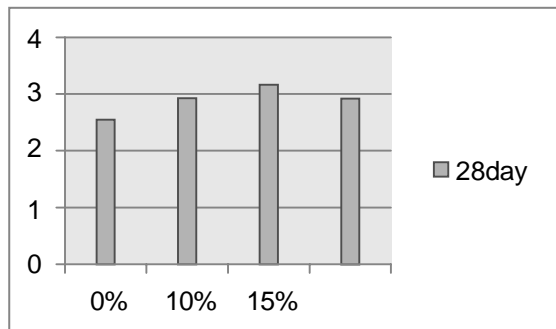
Compressivestrengthafter28daysfor concrete



Splittensilestrengthofcylinderfor7 days



Splittensilestrengthofcylinderfor28 days



CONCLUSION

Inthisproject,anexperimentalstudy hasbeenconductedonconcretebyvarying the percentage of ground nut shell ash powder as 0%, 10%, 15% and 30% respectively to study the increase in the compressive strength of concrete.

COMPRESSIVESTRENGTH

After adding 15% ash powder in the mix,thereisanincreaseinthestrengthof cube after 7 daysBy adding 15%, ash powder there is large amount of increase in strength after 7 and 28 days respectively. The optimum strength of cube is gain at 15% replacement for all 7 and 28 days respectively

SPLITTENSILESTRENGTH

After adding 15% ash powder in themix,thereisanincreaseinthestrength ofcylinderafter7daysascomparedto concretewithout

replacement and after 28 days there is enormous increase in strength as compared to the control mix. By adding 20% ash powder there is large amount of increase in strength after 7 and 28 days respectively. The optimum strength of cylinder is gained at 15% replacement for all 7 and 28 days respectively.

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