



## STUDIES ON THE PARTIAL REPLACEMENT OF FINE AGGREGATE WITH GROUND NUT SHELL ASH IN CONCRETE

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### Abstract

**In this experimental research evaluated by the possible of ground nut shell ash as a fine aggregate replacing material. Five various concrete mixes with the ground nut shell ashes replacement of 0%, 5%, 10%, 15% 20% and 25% to the fine aggregate were prepared for M<sub>20</sub> grade of concrete with water to binder ratio of 0.50. The characteristics of these concrete mixes have been analyzed both at the fresh and hardened concrete state. The experimental test results of the present research indicate that up to 20% replacement of the fine aggregate by ground nut shell ash attain higher compressive strength, split tensile strength and lower water absorption test at the ages of 28, 60 and 90 days.**

**Keywords: ground nut shell ash, compressive strength, split tensile strength, water absorption**

### INTRODUCTION

The construction industries are mainly relies on traditional materials such as cement, hard Broken stone and sand for the preparation of cement concrete. Cement concrete is the universally adopted and most consumable man made activities materials (T.R.Naik,2008). It is great activities and relatively economic benefits fulfilling wide range of necessary to prepared the concrete is better than other construction materials(Sashidar and Rao,2010). The concrete is the manufacturing process is not only a good valuable products but also a socio economic development activities an important source of employment. (Naik2008), formerly the agricultural and industrial waste materials are

creating waste management and surrounding employment problems. So that the utilization of agricultural and industrial wastes are gift of other traditional materials in construction field both practical and economic benefits. The waste materials have normally no commercial value and being locally available only for transportation charges is minimum (Chandra and Berntsson, 2002). The major contribution of waste materials in construction industry to conservation of natural resources and protect the surrounding environment (Ramezaniapur, Madhikhani and Ahmadhibeni, 2009). Some of the waste products utilized to concrete in high pozzolanic characteristics which have been studied for utilization for blending cements inclination of fly ash (Wang and Baxter 2007). Lee et al 2005, in their research sulfate attack and role of silica fume in resisting strength loss in up to 10 – 15 %. ( Hossain, 2005), in their experimental research studied about the Val conic ash and pumice based on blended concrete.( Raheem et al 2010, raheem et al 2011) , in their experimental study the properties of corn cob ash a blended material in concrete and thermal conductivity of corn cob ash in cement mortar. The ground nut industries produce waste such as ground nut shell ash which are usually dumped in the open site by affecting of surrounding without any economic benefits. The purpose of making to prepared efficient utilization of local available materials. in this research was carried out the experimentally analyzed the partial replacement of fine aggregate with ground nut shell ash in compressive strength, split tensile strength and water absorption of concrete as well as to

analyze the suitability of ground nut shell ash as a structural materials.

- To study the factors influence of ground nut shell ash on the compressive strength, split tensile strength and water absorption of concrete with selected ground nut shell ash as a fine aggregate.

**II OBJECTIVES**

The main objectives of this research was carried out the partial replacement fine aggregate in place of the ground nut shell ash.

- To obtained the various properties of fine and coarse aggregate.
- To determine the strength properties of harden concrete like compressive strength, split tensile strength and water absorption.
- Main objective to know about the ground nut shell ash replaced by the fine aggregate.

**III MATERIALS**

The ordinary Portland cement 43 grade was utilized for the current research and locally available for the ground nut shell ash and river sand with free from deleterious materials. The various properties of cement, fine aggregate, coarse aggregate and ground nut shell ash as shown in given table 1,2 and 3

**.Table 1 Properties of cement**

SINo	Properties	value
1	Specific gravity	3.02
2	Fineness modulus	4.5
3	Standard consistency	30 %
4	Initial setting time	45 minutes
5	Final setting time	425 minutes

**Table 2 Properties of fine aggregate & coarse aggregate**

Sl No	Properties	FA value	CA value
1	specific gravity-	2.65	2.68
2	fineness modulus	2.72	5.50
3	water absorption	0.55%	.50%
4	Size of particle	Upto4.75mm	20mm and above 4.75mm

**IV METHODOLOGY**

In this experimental research carried out to analyzes the strength and durability properties of concrete cubes M20grade of concrete mixes

with flaky and elongated aggregates (12.5mm to 20mm) and normal aggregate with five mixes ratio of mix condition.

**Table 3 Properties of ground nut shell ash**

SINo	Properties	value
1	Specific gravity	2.86
2	Fineness modulus	13
3	Bulk unit weight	0.67 tonne per m <sup>3</sup>
4	Colour	grey
5	Surface area in kg/m <sup>2</sup>	935

**Table 4 Mix proportion for concrete Fine aggregate replacement by ground nut shell ash**

Sl.no	Type of concrete	Description of concrete
1	Go	River sand concrete
2	G1	5% replacement by GNSA
3	G2	10% replacement by GNSA
4	G3	15% replacement by GNSA
5	G4	20% replacement by GNSA
6	G5	25% replacement by GNSA

### V METHODS OF TESTING

The finishing of each curing period a total of triplicate concrete specimen were tested for each concrete cube properties .the compressive strength test was evaluated on the 150mm cube specimens, while the split tensile strength test was carried out to 150mm diameter with 300mm of cylindrical specimens as per IS specification. The water absorption test was carried out on the 100mm diameter with 50mm thick cylindrical disk specimen to obtained the water absorption of concrete specimen, which were pre requisite in microwave oven for 24hrs and cooled down the room temperature for one day to successful y bring about a constant moisture level.

### VI RESULTS AND DISCUSSION

The experimental test results were various test performed the given table 5 and shown in figures 1, 2 and 3.

#### (VI) A Compressive strength

The compressive strength test results from the various mixes for 28days,60 days and 90days given table 5and shown in figure 1. It can be seen from the figure that the compressive strength test results of concrete cube specimens at 20% replacement of ground nut shell ash were higher than those at 0% of GNSA. Furthermore incremental of GNSA percentage results in degreases the various strength properties of concrete specimens.It is pointed out that the rate of increase of strength of mixes with GNSA is higher at lateral days that may be due to pozzolanic properties of GNSA.

**Table 5 test results on ground nut shell ash concrete**

Designation	compressive strength in N/mm <sup>2</sup>			split tensile strength in N/mm <sup>2</sup>			water absorption in %		
	28day s	60da ys	90day s	28day s	60days	90days	28days	60days	90days
Conventional 0%	21.65	22.80	23.50	2.80	3.10	3.20	2.75	2.55	2.40
5%	22.75	23.20	24.20	3.10	3.45	3.75	2.65	2.40	2.30
10%	23.40	24.10	25.30	3.50	3.80	4.00	2.55	2.45	2.35
15%	24.35	25.10	25.90	3.70	3.85	4.10	2.50	2.40	2.30
20%	24.40	25.20	26.00	4.10	4.20	4.55	2.40	2.20	2.15
25%	18.20	18.50	18.75	2.60	2.65	2.70	3.50	3.40	3.30

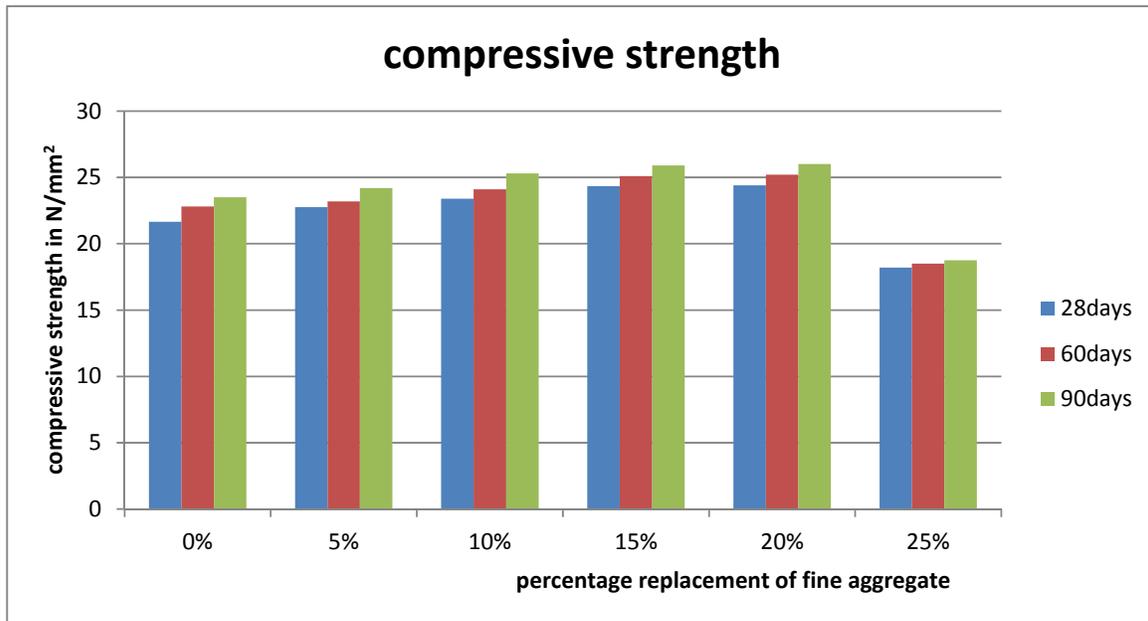


Figure 1 compressive strength for Fine aggregate replacement in GNSA concrete

**VI (B) Split tensile strength**

The split tensile strength test results for all the various mixes for 28days,60days and 90dyas curing for given table 5 an d shown in figure

2.When the effect of GNSA split tensile strength was obtained. It was observed that the success of split tensile strength of mixes as decrement in the partial replacement of GNSA.

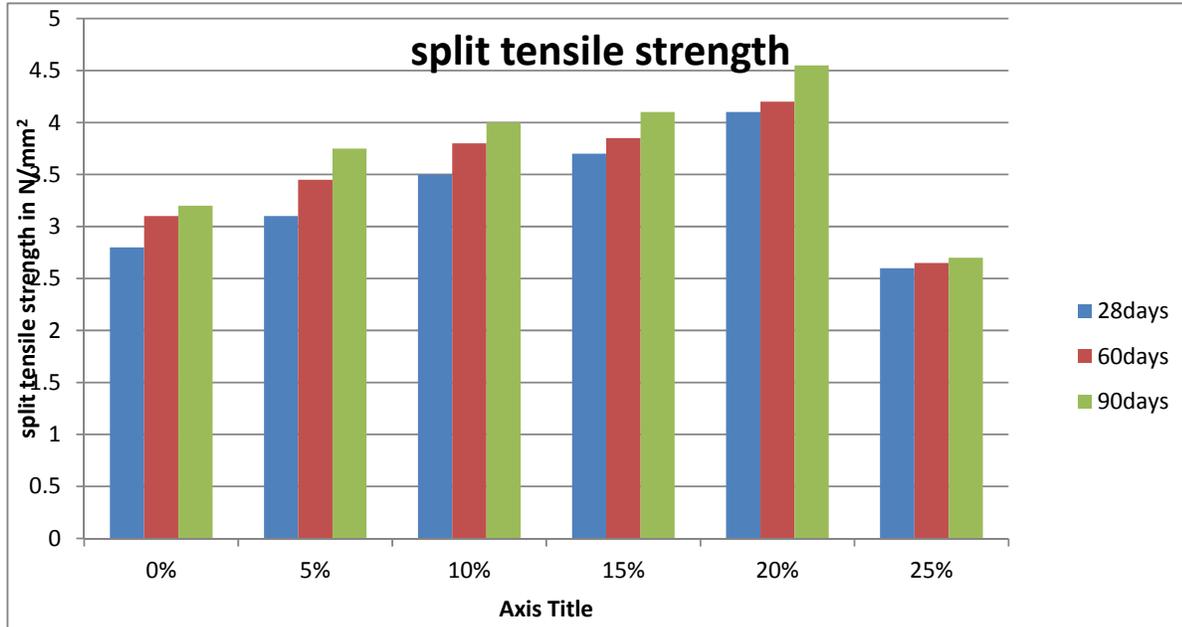


Figure 2 Split tensile strength for Fine aggregate replacement in GNSA concrete

**VI(C) Water absorption**

The Water absorption of test results for all the various mixes for 28days,60days and 90dyas curing for given table 5 an d shown in figure 3.When the effect of GNSA Water absorption

was obtained. It was observed that the development of Water absorption of mixes as decrement in the partial replacement of GNSA was increased up to 20%.

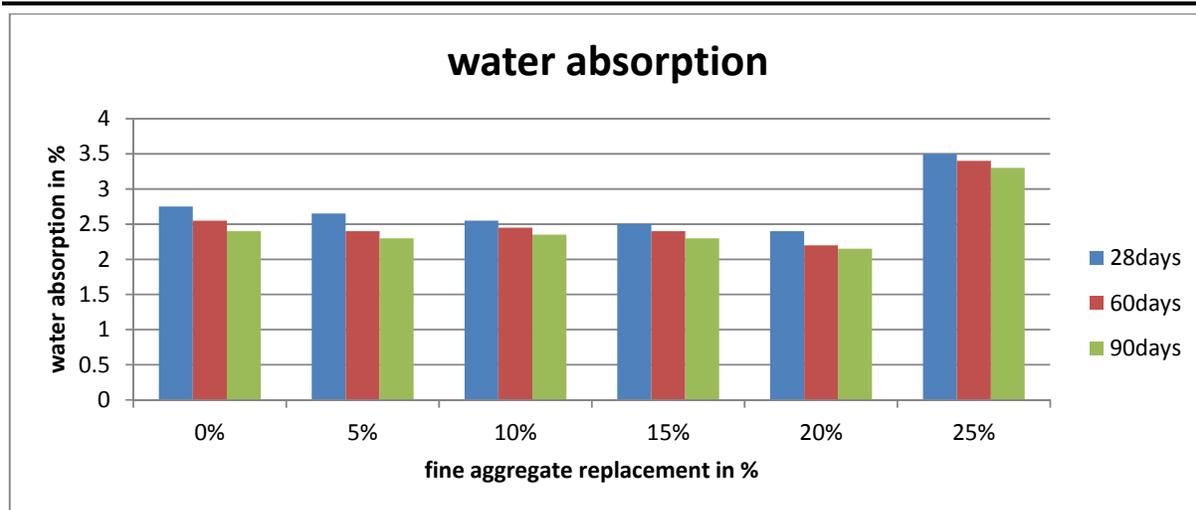


Figure 3 Water absorption for Fine aggregate replacement in GNSA concrete

## VII Conclusion

The experimental investigation concerning the following conclusion can be drawn as follows

1 The partial replacement of fine aggregate up to 20% can be effected with a GNSA without considerable loss of strength properties.

2 The compressive strength and split tensile strength test results represent that the strength of the finer with up to 20% of ground nut shell ash increase at later days (90days) as compared to 28days that may be due to pozzolanic properties of GNSA.

3 the water absorption of GNSA concrete test results shows that increases the GNSA to decrease water absorption properties of concrete.

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