WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

A Partial Replacement of Coarse Aggregate by Seashell in Concrete and using Grass as a Fibre

Ms. Jayasri.J[1], Ms. Sivagami.T[2], Ms. Arthi.P[3] Ms. B.Vinodhini.M.E.,[4]

[1,2,3] Final Year Student,
[4]Assistant Professor, MRK Institute of Technology,

ABSTRACT:

Seashell contains large amount of calcium content and the rough texture of the seashell make suitable for the partial replacement of coarse aggregate in concrete which provides economically alternative for not only the coarse aggregate in concrete but also the materials used in concrete such as sand and cement also. Seashell are mostly available in coastal areas and also available in food industries. Cocktail seashell is the type of seashell used in this project. The proposed cubes and cylinders with the replacement of coarse aggregate by seashell with the varying percentage of 5%, 10%, and 15% and adding the sundried napier grass(elephant grass) as a fibre of 15 gm each 15*15*15 cm cube were tested for compressive strength and tensile strength. Compare the strength and durability of the proposed concrete to the nominal grade of M20 concrete..

Keywords: seashell, napier grass, compressive strength, tensile strength

Scope of the project:

In the modern construction world, the demand for construction material is increased. By replacing the coarse aggregate by seashell leads to decrease the demand for coarse aggregate.

The availability of seashell is free and easy in coastal areas.

Hence this concrete gives equal compressive strength as nominal grade of concrete with 5 % replacement of seashell.

It is cost effective.

It is lighter than the normal concrete.

1. Introduction:

The concrete is heavily used as construction materials in modern society, with the growth in urbanization and industrialization and its demand is increased day by days. In order to minimize the negative impact of concrete, the use of the waste materials. Our project deals with the partial replacement of coarse aggregates by seashell. slump test has also been conducted to study the effect of various mixing ingredients toward the workability of concete. specimens of 150*150*150mm has been cast and cured in water until 28 days. All the experiments are conducted accordance to the existing standard. The design mix employed a water/cement ratio of 0.5, a concrete mix ratio 1:1.5:3 varying percentage of 5%,10%,15%,600mm river sand as fine aggregates and granite 20mm as coarse aggregates.

Laboratory test showed that a true slump of achieved for all mix as a decrease in workability was observed with seashell additions. Compressive strength declined with increasing percentage of seashells at all curing ages (7, 14 and 28 days).

2. Materials used in concrete:

(a)Coarse aggregate:

Coarse aggregate are any particles greater than 0.19 inch, but generally range between 3/8 and 1.5 inches in diameter. Gravels constitute the majority of coarse aggregate used in concrete with crushed stone making up most of the remainder.

(b)Fine aggregate:

Fine aggregates are usually sand or crushed stone that are less than 9.55mm in diameter. Typically the most common size of aggregate used in construction is 20mm. A larger size, 40mm, is more common in mass concrete. Larger aggregate diameters reduce the quantity of cement and water needed.

(c)Cement :

Cement is the most commonly used construction material that has both adhesion and cohesion properties due to which can make bonding and bind particle of solid matters into a compact durable solid mass. cement is mainly classified into two categories on the basis hardening and settling mechanism.

(d)Seashell(cocktail) :

Seashell can be used in the construction industry as one of the concrete incredients. They can be recycled and processed to be used as fine aggregate, coarse aggregate, filler or cement replacement. It is mostly available in seashore. It has a great mechanical properties including high toughness and hardness. It act as the binding material in concrete.

Fig 2.1: Cocktail shell

(e) Napier grass (elephant grass):

Napier grass are used in concrete as fibre. It is the natural fibre has one of the lowest densities compared to those of other conventional natural fibres. The average tensile strength of napier grass fibre was greater than those of bamboo and coir fibre.

3.Material preparation:

Prepration of seashell for concrete:

Seashell has been cleaned by warm water mixed with vinigar for three times and it should be completely sundried. Seashell only used in concrete after finishing those steps. It will lead to increases the binding properties of seashell.

Fig 3.1:Cleaning of cocktail shell with vinegar

Preparation of napier grass for concrete:

The napier grass should be collected from the field and sundried for 5 to 7 days and then make the grass completely dry which is suitable for concrete making. The grass is cutted into small piece of 5cm mixed with concrete.

Fig 3.2: Dry napier grass

4.Test on marerial

(a)Specific gravity test on coarse fine aggregate

This test used to measure the strength and quality of materials.

Fig 4.1: For coarse aggregate

Fig 4.2: For fine aggregate

(b)Sieve analysis

Sieve analysis test conducted for fine aggregate , coarse aggregate and seashell.

Fig 4.3

fig 4.4

Fig 4.5

- ✓ 600µm sieve used for analysis of fine aggregate shown in fig 4.3
- ✓ 20mm sieve used for analysis of both coarse aggregate and seashell shown in fig 4.4 and 4.5.

5.Concrte mix design

Mixing proportion of the concrete per m^3 is given below the table

	Cement(kg/m^3)	**Fine aggregate(kg/m^3)**	**Coarse aggregate(kg/m^3)**	**Seashells(kg/m^3)**	**Water(kg/m^3)**	**Grass(gm/m^3)**
Seashells (0%)	**492.5**	**605.7**	**1096**	**_**	**197**	**150**
Seashells(5%)	**492.5**	**605.7**	**1041.2**	**54.8**	**197**	**150**
Seashells (10%)	**492.5**	**605.7**	**986.4**	**109.6**	**197**	**150**
Seashells(15%)	**492.5**	**605.7**	**931.6**	**164.4**	**197**	**150**

Table 5.1

Mix ratio (1:1.23:2.2)

6. Test for fresh concrete:

(a) Slump test:

Slump cone test is conducted for fresh concrete mix to find the durability and strength of the concrete.The consistence of the concrete mix is also measured in this test. True slump occurs.

Fig 6.1: Slump cone test

Fig no 6.2 : True slump

7. Test on hardened concrete:

(a)Compressive strength test:

The load is gradually applied to the cube specimen in the size of 150*150*150mm.The concrete cube is casting in molds, it was cured for 7, 21, 28 days.

The below table gives detail about the percentage of replacement of seashell with the various percentage of 0%,5%,10%,15% and also gives the compressive strength of the concrete cured for 7,21and 28 days.

Concrete mix	7days of curing	14 days of curing	28 days of curing
Seashells(0%)	17.27	20.75	25.89
Seashells(5%)	17.43	20.86	26.2
Seashells(10%)	18.36	21.68	27.472
Seashells(15%)	19.57	22.17	29.5

Table 7.1: compressive test result for proposed concrete

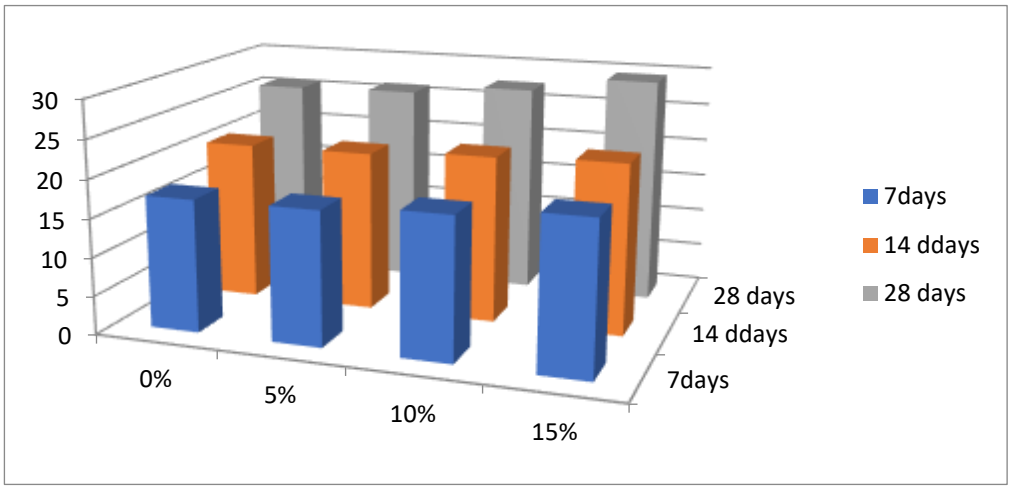

Fig 7.1 compressive strength N/ mm^2

(b)Split tensile test:

Split tensile test is conducted to find the tensile strength of the concrete. Concrete usually have lower tensile strength and it is brittle in nature . The test for split tensile strength is very important to find the amount of load at which the concrete cylinder will break completely. In this method, the cylinder specimen which measures 150mm dia and 300mm height in used.

Concrete mixes	7 days of curing (N/mm^2)	21 days of curing (N/mm^2)	28 days of curing (N/mm^2)
Seashell(0%)	5.73	5.95	6.24
Seashell(5%)	5.03	5.98	6.67
Seashell(10%)	4.74	4.51	5.68
Seashell(15%)	5.01	5.47	6.56

Table 7.2 split tensile strength of concrete

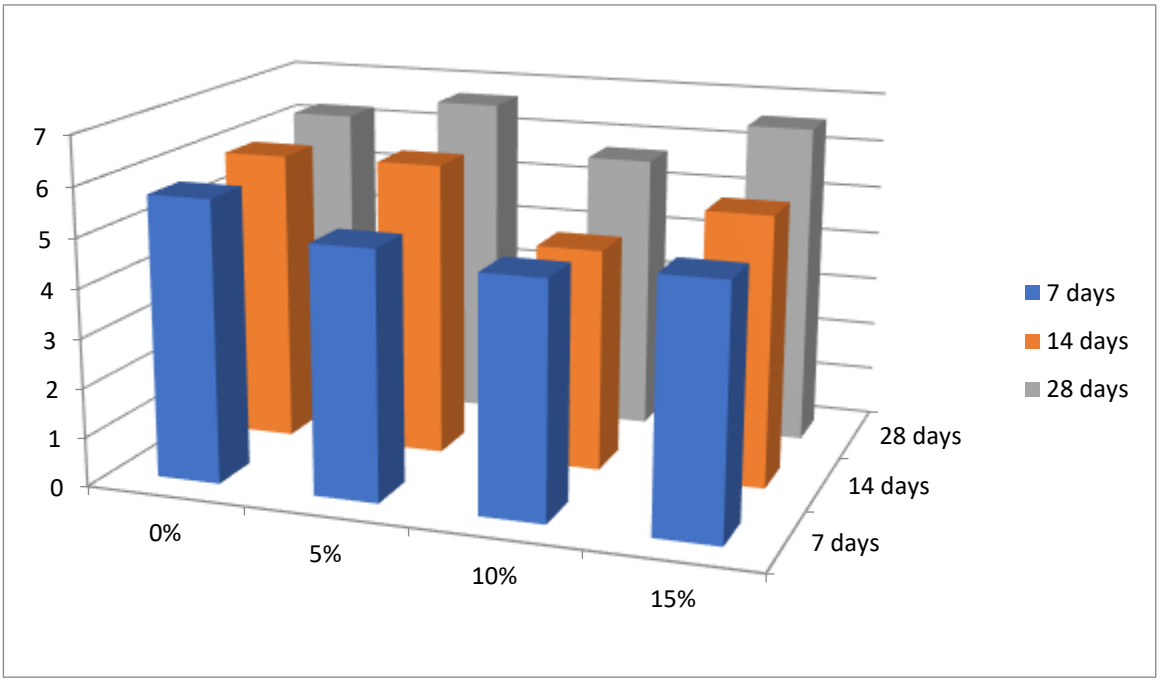

Fig 7.2 split tensile strength

Conclusion:

Seashell is used as one of the best replacement for materials used in concrete such as cement, coarse aggregate and fine aggregate. In this project, seashell is replaced for coarse aggregate in varying percentage of 0%, 5%, 10% and 15. By increasing thepercentage of seashell in concrete leads to increases the compressive strength of concrete. Using grass as a fibre increase the permeability of a concrete, which affects the strength of the concrete.

REFERENCES

Chopra, S K. ,Lai. K. (1961) 'The manufacture of super sulphated cement from Indian slag'. Indian concrete J.38; 114.

Bensted , J.,Early (1980) Hydration behavior of Portland cement in water, calcium chloride and calcium formate solution. Silicates industries 45(1) 5-10

Mindess S and Young J.(1981) Concrete: Englewood Cliffs 2nd end: New Jersey Prentice-Hall

British Standard Institution, (1983) BS 1881 – part 116:Testing concrete: Method for determination of flexural strength of concrete beams.

British Standard Institution, (1983) BS 1881 – part 116:Testing concrete: Method for determination of compressive strength of concrete beams.

Pressler, J W.(1984) 'By-product gypsum. In: Chemistry and technology of gypsum, ASTM special technical; Publication, Atlanta, USA.pp 104-116

Ramachandran, V.S.,(1987) 'Hydration of cement-role of triethanolamine' CemConcr Res 6: 622-632

British Standard Institution, (1992) BS 882: specification for aggregate from natural sources for concrete.

Department of Environment,(1992) Design of normal concrete mixes, Building Research Eslablishment,UK

Neville, A.M. and brooks, J . J. (1993) Concrete technology.2nd edn.London: Longman Ghaly , A and Almstead, L. (2009) Concrete.union.edu(Acccessed: 24 February2014).

Neville, A. M.(1995) Properties of concrete.4th edn. England: Longman Groups Limited

Lane and Ozyildrium,1999,Strength development in concrete using GGBS as Portland cement replacement available at:http://www.astm.org /DIGITALLIBRARY /JOURNALS/CEMENT NT/TOC/2121999.htm Accessed on 26 March 2014

Ajdukiewicz, A N., Kluszczewicz, A.(2002) 'influence of recycled on aggregates mechanical properties of high performance concrete'. Cement composition. 24:267-79

Gambhir, M.L.(2004) Concrete technology, 3rd edition, New Delhi, Tata McGraw-Hill

Mannan, M A., Ganapathy, C (2004) 'Concrete from an agriculture waste-oil palm shell(OPS)'. Building and Environment, 38(5), 441-448. http://dx.doi.org /10.1016/j. buildenv.2003.10.007

Topcu,B., sengel. S. (2004) 'Properties of concrete produced with waste concrete aggregates' cement concrete Res. Pract., 4:17-25

Rao, AA. (2005) 'Experimental investigation on the use of recycled aggregates in mortar and concrete'. Thesis submitted to department of civil engineering, Indian institute of technology Kanpur

Pei-wei, G., Xiao-lin, L., Xiaoyan, L., Jei H (2007) Effects of fly ash on properties of environmentally friendly dam concrete.Fuel,86:1208-1211. http://dx.doi.org/10.1016/j.fuel.2006.09.032.

Safiuddin,M., Raman, SN., Zain, M F M.(2007) 'Flowing concretes with quary waste fine aggregates'.J. civil eng.Res.Pract,4:17.24

Givi, A N., Rashid, S A., Aziz, F N A., Selleh,M A M.(2010) 'Contribution of rice husk ash to the properties of mortar and concrete; A review'.J. Am. Sci., 6:157165

MdSafiuddin, Mohd Z.J, Salam M.A Islam M.S, Hashim R,(2010),utilization of solid waste in construction materials 5(13) Available at: http://www.academicjounals.org/IJPS Accessed on: 16 November 2014

Peter W.C.Leung, H.D. Wong (2011), Durability and strength development of granulated blast furnace slag concrete 149(10)pp.17-21 and 69,Available athttp://www.cedd.gov.hk/eng/publications/geo_reports/doc/er258/er258links.pdf Accessed on: 25 March 2014