Experimental Investigation on Concrete By Replacing Cement By Kankar And Coarse Aggregate By Coconut Shell

Ramakrishnan D[1], Sri Sutharsan R[2], Rahul V[3]
[1] Assistant professor, Dept of Civil Engineering
[2, 3]Dept of Civil Engineering
[1, 2, 3] Sri Ramakrishna Engineering College, Tamil Nadu, Coimbatore- 22.

Abstract- *In this project we have used kankar and coconut shell as replacement material of cement and coarse aggregate, it describes the effect of the kankar as compensating material with cement on the peak stress because during olden days people uses kankar and limestone to build the structure strong , good finish of wall as plastering agent and for long durability of structures. The scope of this project is to construct structures using tradition material for economy purpose. The Compressive and tensile strength were investigated. The high cost of conventional construction material affects economy of structure. With the increasing concern over excessive exploitation of natural aggregates, synthetic lightweight aggregate produced from environmental waste is a viable new source of structural aggregate material. It is becoming more difficult to find natural resources. Therefore the coconut shell as partial replacement for coarse aggregate in concrete is studied. The density, compressive and tensile strength of concrete are tested. This paper summarize that the compressive and tensile strength of concrete when replacing cement by 100% and coarse aggregate by coconut shell by 0%, 10%, 20% and 30%. The tests were carried out and the results obtained suggested that the replacement more than 20% leads to lightweight aggregate concrete.*

I. INTRODUCTION

Kankar or kunkur is a sedimentological term derived from Hindi, occasionally applied in India and the United States to detrital or residual rolled, often nodular calcium carbonate formed in soils of semi-arid regions. It forms sheets across alluvial plains and can occur as discontinuous lines of nodular Kankar or as indurated layers in stratigraphic profiles more commonly referred to as hardpan or duricrust. The cement is replaced 100% by kankar which is mixed with treated water. The treated water consist of materials such as haritaki powder, baelfruit, egg white, and aloevera gel. Therefore these mixtures used to yield high strength concrete of M25 grade. and provide a low temperature concrete. The exploitation of coarse aggregate is high so the cost of these resource get increased. Therefore using coconut shell as an alternative materials in place of coarse aggregates in concrete which is a sustainable construction material. The chemical composition of coconut shell is similar to wood and contains 33.61% cellulose, 36.51 % lignin and 0.61% ash.

OBJECTIVES

- To determine the optimum percentage of replacement of coarse aggregate by coconut shell.
- To yield low temperature concrete by replacing 100% of cement by Kankar which can be used for construction of high strength structures such as dams and bridges etc.
- To increase the compressive strength and tensile strength of the concrete.
- To reduce usage of coarse aggregate in concrete by partial replacement of coarse aggregate by coconut shell.

II. MATERIALS USED

• Kankar. • Cement. • Haritaki powder. • Bael fruit. • Egg white. • Aloevera gel. • Coconut shell

KANKARK

ankar or kunkur is a sedimentological term derived from Hindi, occasionally applied in India and the United States to detrital or residual rolled, often nodular calcium carbonate formed in soils of semi-arid regions. It forms sheets across alluvial plains and can occur as discontinuous lines of nodular Kankar or as indurated layers in stratigraphic profiles more commonly referred to as hardpan or duricrust.

CEMENT

A cement is a binder, a substance used for construction that sets, hardens, and adheres to other materials to bind them together. Cement is seldom used on its own, but rather to bind sand and gravel aggregate together. Cement mixed with fine aggregate produces mortar for masonry, or with sand and gravel, produces concrete. Concrete is the most

widely used material in existence and is only behind water as the planet's most-consumed resource. Cements used in construction are usually inorganic, often lime or calcium silicate based, which can be characterized as non-hydraulic or hydraulic respectively, depending on the ability of the cement to set in the presence of water .

HARITAKI POWDER

Haritaki is an ayurvedic herb derived from the seeds of Terminalia Chebula tree. It is a drupe-like fruit, oval in shape with size varying between 2 – 4.5 cm in length and 1.2 – 2.5 cm in breadth having 5 longitudinal ridges. Depending upon its variety, it turns green – blackish in color when ripens. It is powdered well and mixed with the water in the proportion of 10g per litre.

BAEL FRUIT

The fruit pulp has detergent action and gum enveloping the seeds is most abundant in wild fruits and especially when they are unripe. It is commonly used as a household glue and is employed as an adhesive by jewelers. It is mixed with lime plaster for waterproofing wells and is added to cement when building walls. Artists add it to their watercolors, and it may be applied as a protective coating on paintings.

EGG WHITE

Egg white is the clear liquid (also called the albumen or the glair/glaire) contained within an egg. Egg whites contain about 56% of the protein in the egg. These denatured proteins gather together where the air and water meet and create multiple bonds with the other unraveled proteins, and thus become a foam, holding the incorporated air in place, because the proteins consist of amino acids; some are hydrophilic (attracted to water) and some are hydrophobic (repelled by water). This process is called coagulation

ALOEVERA GEL

Aloevera is a succulent plant species of the genus aloe. An evergreen perennial, it originates from the Arabian Peninsula but grows wild in tropical climates around the world and is cultivated for agricultural and medicinal uses. In this project it is used as a bonding agent.

III. QUANTITY OF MATERIALS ADDED

S.NO	MATERIALS	QUANTITY OF ADDITION
1.	Aloevera gel	10g/lit
2.	Bael fruit	10g/lit
3.	Haritaki powder	10g/lit
4.	Egg white	2eggs for 10 litre

FERMENTATION OF WATER AT DAY 35

TABLE.5.1.1. SPECIFIC GRAVITY CHART

S.NO	MATERIALS	SPECIFIC GRAVITY
1.	COARSE AGGREGATE	2.70
2.	FINE AGGREGATE	2.50
3.	COCONUT SHELL	1.30
4.	FERMENTED WATER	0.9604
5.	KANKAR	2.60
6.	CEMENT	3.15

FIG.5.1.1. SPECIFIC GRAVITY TEST

TABLE.5.1.2. PENETRATION VALUE

S.NO	PERCENTAGE OF WATER	PENETRATION VALUE	FINAL PENETRATION VALUE
1.	24%	0	6
2.	26%	2	
3.	28%	6	

FIG.5.1.2. STANDARD CONSISTENCY TEST

TABLE.5.1.3. pH VALUE

S.NO	NO OF DAYS	pH VALUE
1.	1	5.89
2.	50	3.46
3.	105	3.45

TABLE.5.1.4. EXPERIMENTAL INVESTIGATION

REPLACING MATERIALS	COMPRESSIVE STRENGTH (Mpa) AT 7TH DAY	TENSILE STRENGTH (Mpa) AT 7TH DAY
100% KANKAR	0.35	0
50%KANKAR + 50% CEMENT	7.43	0.8
50%KANKAR + 50% CEMENT + 10% COCONUT SHELL	7.79	1.27
50%KANKAR + 50% CEMENT + 20% COCONUT SHELL	9.71	4.29
50%KANKAR + 50% CEMENT + 30% COCONUT SHELL	6.89	1.02

5.2. COMPARISION OF COMPRESSIVE STRENGTH AT 7TH DAY

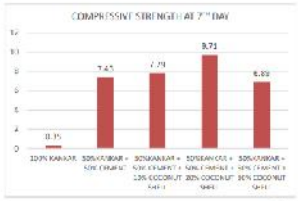

FIG.5.2. COMPRESSIVE STRENGTH OF SPECIMEN ON 7TH DAY

5.3. COMPARISION OF COMPRESSIVE STRENGTH AT 7TH DAY

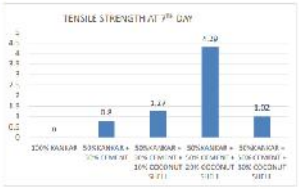

FIG.5.3. TENSILE STRENGTH OF SPECIMEN ON 7TH DAY

IV. CONCLUSION

Kankar is a material which is a binding agent like cement and it is used in olden days for traditional method construction of buildings like temples even it is used for the construction of dam structures. Therefore by replacing 100% of cement by kankar by following MIX DESIGN A we expected the result will gives higher compressive and tensile strength than cement. So we decided to cast the concrete of M25 grade. By analyzing the results, replacing 100 % cement gives lower compressive and tensile strength it does not attend the peak stress when compared to cement. So we replaced the cement to 50% by kankar by following MIX DESIGN B and then we proceed to replace coarse aggregate upto 30% by coconut shell to avoid the wastage of coconut shell. Hence the kankar cannot be used for concrete it can be used only plastering purpose and by using kankar we have experienced that optimum percentage of replacement of coarse aggregate is 20%.

REFERENCES

[1] Arvind kumar, Amid kumartomar "Replacement of cement in concrete with rice husk ash." SSRG International Journal of Civil Engineering (SSRG-IJCE) – volume 3 Issue 7 – July 2

[2] P.Vipul Naidu, Prawan Kumar Pandey. "Replacement of cement in concrete. International Journal of Environmental Research and Development." ISSN 2249-3131 Volume 4, Number 1 (2014), pp. 91-98 © Research IndiaPublications. http://www.ripublication.com/ijerd.html.

[3] M.Kamesh, T.Karthik, M.Ramakrishnan, S.Sanjaykumar. "Experimental project on concrete partial replacement of cement by prosopsisjuliflora ash." International journal of recent technology and engineering (IJRTE) ISSN: 2277-3878, Volume-6 Issue-1, March 2017.

[4] Rinki.K.Khot, R.S.Deotale, Abhijeet.R.Narde. "To Study The Partial Replacement of Cement By FA&RHA and Natural Sand by Quarry Sand in Concrete." IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 11, Issue 2 Ver. II (MarApr. 2014), PP 61-68 www.iosrjournals.org.

[5] Vinod Goud, Niraj Soni. "Partial Replacement of Cement with Fly Ash in Concrete and Its Effect." IOSR Journal of Engineering (IOSRJEN) www.iosrjen.org ISSN (e): 2250-3021, ISSN (p): 2278-8719 Vol. 06, Issue 10(Oct. 2016), ||V2|| PP 69-75.

[6] Kaushik Rahate, Rahul, Kelkar,Sudhakar Singh, MayureshKhajanwadkar. "Replacement of Coarse Aggregate by using Naturally Available Materials." International Journal of Engineering Research & Technology (IJERT). http://www.ijert.org ISSN: 2278-0181 Vol. 6 Issue 04, April-2017.32

[7] olufemis s. awogboro,afeez a. bello,oladipupo s. olafusi "partial replacement of coarse aggregate in concrete with waste glass." Researchgateindian publication february 2016 ISBN: 978-2902-58-6 Volume 4.

[8] G.Sai Chand, P. Ravi Kumar. "Partial replacement of aggregate with ceramic tile in concrete" International journal of engineering research-online vol.5., issue.3, 2017 may-june.

[9] Suchithra S, Manoj Kumar, Indu V.S "Study on replacement of coarse aggregate by e- waste in concrete" International Journal of Technical Research and Applications e-ISSN: 2320-8163, www.ijtra.com Volume 3, Issue4 (July-August 2015), PP. 266-270.

[10] Shrikant M. Harle "Partial replacement of coarse aggregate with coconut shell in the concrete." Journal of Research in Engineering and Applied Sciences. JREAS, Vol. 2, Issue 01, Jan. 2017