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Influence of Substituting Fine Aggregate with Red Soil in Concrete Mixtures

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ABSTRACT: Concrete is being manufactured with mixture of cement, fine aggregate and coarse aggregate with suitable ratio of water content. Although it is unavoidable material but had some drawbacks of over depletion of particular materials such as conventional river sand and the environmental concerns associated with the extraction of crushed aggregate sand have prompted the exploration of alternative materials for concrete production. By mitigating reliance on diminishing natural resources and minimizing ecological footprint, this research aims to contribute to the advancement of sustainable construction practices. This project investigates the viability of utilizing red soil as a substitute for fine aggregate in concrete mixtures. Through a series of laboratory experiments and field trials, we evaluate the mechanical properties, durability and environmental impact of red soil based concrete.

KEYWORDS: Concrete, Fine aggregate replaced by red soil, substituting fine aggregate, concrete admixtures.

I. INTRODUCTION

Utilization of alternative materials called as admixtures in construction has become a paramount consideration in the quest of sustainable and eco-friendly practices within the civil engineering domain. For a good reason, concrete is the material which is most widely used for construction next to water because of its strong, durable and versatile nature and with a wide range of application. There are many researches are also going on replacement conventional ingredients of concrete with new one to reduce the over exploitation of natural aggregates. In the case of aggregates used in concrete, fine and coarse aggregates are taken from crushed rocks from mountains. Destruction of rocks and mountains for construction are increased drastically in recent years. These reaches promote to find alternative material for fine aggregate in concrete mix adding to some extend percentages aggregates in place of conventional fine aggregate. Soils are produced by natural disintegration of rocks naturally. Soil covers the top layer of the Earth surface and supports the growth of vegetation, and it can also be used for concrete. The idea of this project was attempt to use soils which are available in nearby area to replace fine aggregate in concrete. Red soil IS replaced in place of fine aggregate by the percentage of 2.5%, 5% and 7.5%.

II. LITERATURE REVIEW

S. Rahman, T. Farnaz, T. Islam experimented strengths of concrete by partially replaced sand with red soil. 5%, 10% and 7.5% sand was replaced and the strength are tested. The compressive strength was decreased 10.44% at 5% replacement, 10.55% at 10% replacement and 23.51% at 15% replacement respectively. Split tensile strength are also decreased at consecutive percentage of replacement. They concluded with statement of as percentage of replacement increases, the soil particles utilises water and makes concrete less strength due to its water absorbing nature.

James Alexander. S and Antony Godwin studied about the red soil behaviour in cement concrete. Experimenting flexural strength, the actual value stops 3.67 – 4.04 N/mm² in plain concrete. But in concrete replaced with red soil, it has a better result up to 5.88 – 6.06 N/mm². For plain concrete the actual value of split tensile test stops 7.11 – 7.42 N/mm² but in concrete replaced with red soil it has a good result in strength. 8.48 – 9.2 N/mm². In compressive strength the values are 13.6 – 16.8 N/mm² but in experimented red soil mixed concrete it has the result values are 19.6 – 25 N/mm².

TamilSelvi. M and Dasarathy. A. K in his experiment 25%, and 50% replaced Fine Aggregate with soil. The compressive strength reduces for 50% replacement but increased for when steel fibres are added to it. Replacement of 0 to 25% and compressive strength of 50 and were above 25Mpa and above the mean strength of target and these locally available soil are can be used for concrete production.

T.S. Thandavamoorthy in his study for utility of making concrete from soil alternative to river sand made the comparison of specific gravity and fineness modulus. Form various tests conducted on soil concrete as per the test procedure, the properties of local soil are alike to the conventionally using river sand and experimental investigation has results that the soil can as well be used as fine aggregate in production of concrete in the place of river sand.

III. EXPERIMENTAL INVESTIGATION

M25 grade of concrete was made with mix design calculation as per IS 10262:2019 code. Material used for the process and their corresponding specific gravity are given in the table. Additionally the fine aggregate was partially replaced with locally available red soil in the percentage of 2.5%, 5% and 7.5%.

Table.1 Specific gravity of materials used for concrete

S.No	Materials	Specific gravity
1	Cement	3.15
2	Fine aggregate (M-sand)	2.64
3	Red soil	2.70
4	Coarse aggregate	2.68

Ordinary Portland Cement was used in this experiment to made cubes, cylinders and prisms. Crushed angular aggregate with size of 20mm are used. Conventional fine aggregate (Manufactured sand) was used and red soil was partially replaced.

Mix designs calculation are carried out as per IS 10262:2019 code. The trail mix are listed below.

Table.2 Mix ratio

S.No	% of replacement of red soil	Ratio
1	0%	1 : 1.48 : 2.56 (C : F.A : CA)
2	2.5%	1 : 1.44 : 0.03 : 2.56 (C : F.A : RS : CA)
3	5%	1 : 1.40 : 0.07 : 2.56 (C : F.A : RS : CA)
4	7.5%	1 : 1.36 : 0.11 : 2.56 (C : F.A : RS : CA)

IV. RESULT AND DISCUSSION

The results got from testing of concrete specimen are as follows

- For 2.5% replacement of F.A with red soil the compressive strength is just increased when compared to the conventional one. Also considering the flexural strength gives good result but split tensile strength decreases.
- For 5% replacement of F.A with red soil, compressive strength and as well as split tensile values got decreased and the flexural strength got increasing result.
- For 7.5% replacement of F.A with red soil compressive strength and as well as split tensile values are in decreasing graph but still flexural strength increased.
- The result are show in the graph. The graph is based on the 28 days result of compressive strength, split tensile and flexural strength.

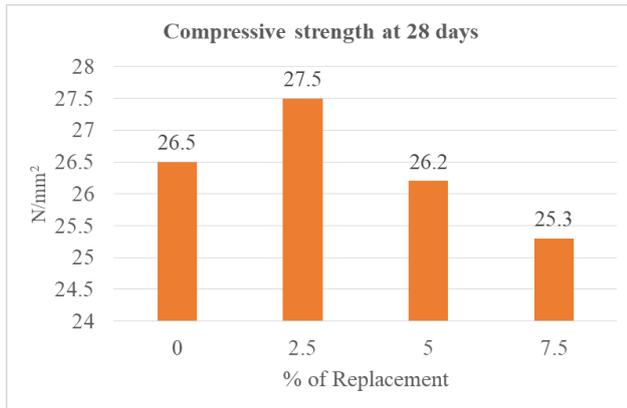


Fig.1 Compressive strength

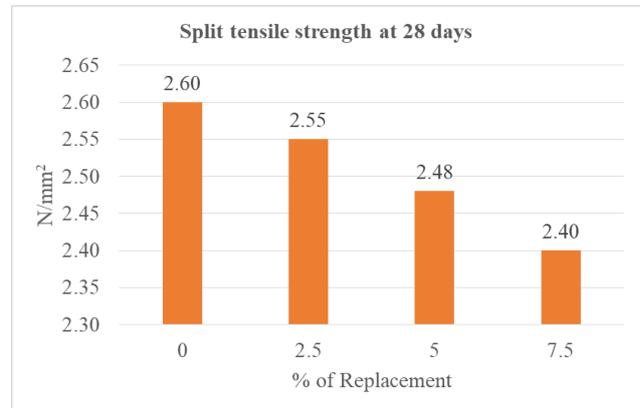


Fig.2 Split tensile strength

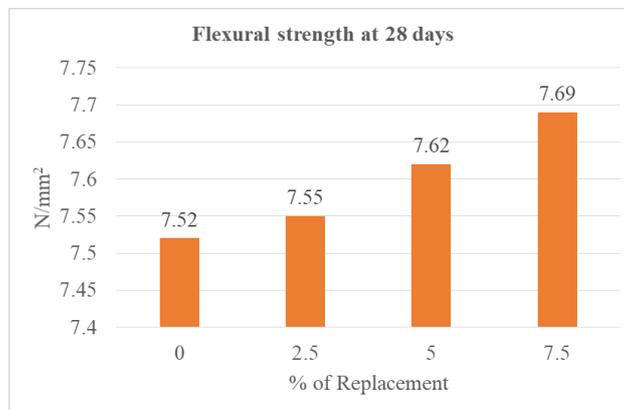


Fig.3 Flexural strength

V. CONCLUSION

From the result we can conclude that the mechanical properties were strongly influenced by the partial replacement of red soil in concrete with Fine Aggregate. The compressive initially increased up to 2.5% replacement and faces continuous decrease with increase in replacement values. The split tensile values are decrease for all replacement variety. Flexure strength perform in increasing order with increase in replacement percentage of red soil. As a result, red soil can be used in concrete at some extend.

REFERENCES

1. TamilSelvi.M, Dasarathy.A.K and Ponkumar Ilango.S (2020) “ Effect of partial replacement of fine aggregate with soil on the strength properties of concrete”. Journal of critical reviews ISSN-2394-5125. Vol.7, Issue 04.2020.
2. Sajedur Rahman, Towhidul Islam and Tasnuva Farnaz (2019) “Experimental investigation of concrete by partial replacement of sand with red soil”International Conference on Engineering Research, Innovation and Education ICERIE 2019, 25-27.
3. T. Sowmyashree (2018) “Partial rpeplacement of fine aggregate by Laterite soil”. Journal of Research. ISSN:2395-7549, Vol.04, Issue 06, 2018
4. Ashwin.S., Aiswaraya.B., R. Praveen, H.R. Shwetha.N and Uttarkar.A (2017),”An expertimental study on concrete with partial replacement of fine aggregate by laterite sand” International Journal of Innovative Research in Science, Engineering and Technology, Vol.6, No.5, pp. 8732-8737.
5. Alexander.J., Godwin.A, and Alexander.S (2016),”Study on the behavior of red soil cement concrete” International Journal of Advances in Mechanical and Civil Engineering, Vol.3 No.3,pp.158-162.
6. R. kamalambigai (2016) “An experimental investigation of concrete by using soil and GGBS as partial replacement of fine aggregate and cement. InternationalConference on current Research in Engineering science and Technology(ICCRST-2016), Department of Civil Engineering M.I.E.T Engineering college, Trichy, India pp.34-38.
7. T.S.Thandavamoorthy (2014),”Feasibility of making concrete from soil instead of river sand” ICI Journal.



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