International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 10 Issue: 08 | Aug 2023 www.irjet.net p-ISSN: 2395-0072

TO STUDY THE STRENGTH PARAMETER OF THE CONCRETE PREPARED BY USING RICE HUSK AND GLASS FIBER

Raj Kumar[1], Saurabh Gupta[2]

[1]M.tech Student, Department of Civil Engineering, Arni University
[2] Assistant Professor, Department of Civil Engineering, Arni University

---

Abstract – The main objective of this study is to focus on the utilization of the waste produced after the harvesting of the rice i.e. rice husk with addition of glass fiber as the admixture in developing concrete. It is used as pozzolanic material for a long time because it is rich in silica. India being an agro economy, the waste from the harvesting of the rice is produced in huge quantity, after studying its properties it has been found it contains cementious properties. This study is an attempt of utilization of these properties of rice husk in the developing concrete with an aim of utilization of the waste and produced economical alternative for the ingredient of concrete. This study attempts to study the behaviors of the concrete produced by the partial replacement in a varying percentage of (5%, 10%,15%) of the cement with the addition of the admixture in the varying percentage of 1%, 2%, 3%. It is observed for the different percentage variation of the strength is different and after reaching the optimum value over the combination of glass fiber and rice husk there is sudden decrease of the strength whose result are discussed in the work. For the study we have perfomed various test over the different material and the analysis is done on the basis of compressive strength and flexural strength.

Keywords: Rice husk, Glass fiber, M20, Mix Design.

1. INTRODUCTION

Over the period of time concrete is becoming the man made material with increasing utilization in every field of development. In India being a developing nation the dependence over the concrete has increased. As more dependence leads to more utilization of the natural resource required for the production of the concrete which is directly depleting our natural resources. With that consideration, we will have to find the alternative in the form of ingredients of the concrete. The utilization of the waste from various field such as industries, agriculture etc in the preparation of the concrete either fully or partial is done.

This experimental study describing the utilization of the agriculture waste such as rice husk replacing the binder ingredient of the concrete with addition to the admixture as glass fiber in varying percentage of the cement by weight is done.

2. MATERIAL

The materials used in this work are broadly classified as base material, filler material, binders and admixtures. Both inert and reactive materials are used for this study. The various materials used in this work are discussed with their properties and with the test results as follows.

2.1 Cement: Ordinary Portland cement of 53 grade was used in this study which was provided by Ambuja Cements Ltd.

2.2 Aggregates: For this experiment combination of the fine aggregate and coarse aggregate are used. The fine aggregate was collected from nearby river which is tributary of beas who is having maximum size of 4.75mm as resulted after sieve analysis whereas the coarse are collected from the nearby crusher having proper grading such that the gravel passing through 20mm sieve IS sieve and retained on 4.75mm sieve.

2.3 Rice husk

Rice husk ash used was obtained from rice mill located in Kangra. The Specific gravity of used rice husk ash after the experiment is found to be is 2.2 and bulk density is 105.9kg/m3 RHA which is produced after burning of Rice husk (RH) in the controlled manner. The ash produced after burning posse's pozzolanic property which is similar to the same required for the production of the cement.

Indian Standard code of practice for plain and reinforced concrete, IS 456- 2000, presence of Silica content in the ash increases with higher the burning temperature as used for the traditional production of the cement. Rice husk ash has slight black in color.

3. Methodology

For the experiment a nominal mix of grade M20 is prepared with the appropriate proportion of the ingredient such as aggregate, cement, water, admixture etc as per the norms.

After that, partial replacement of the cement is done with the rice husk varying percentage of 5%, 10%, 15% of weight of cement and mix is prepared with the addition of the glass fiber as the admixture in the varying percentage of 1%, 2%, 3%.

The compressive strength and the flexural strength of the sample are checked by performing various test in lab related to them. Cubes of size 150mmX150mmX150mm and beam of 750mmX150mmX150mm are casted to check the compressive strength with normal curing. In this experiment, comparison of the compressive strength of the concrete prepared without any alteration i.e. nominal mix of grade M20 is prepared and compared with the concrete of the same grade prepared by the partial replacement of the cement with the varying percentage of 5%, 10%, 15% of weight of cement and mix is prepared with the addition of the glass fiber as the admixture in the varying percentage of 1%, 2%, 3% with normal curing for 28 days is done is calculated.

3. TESTING AND RESULTS

The concrete mix was designed for M20 grade and the mix design was done. Mix design for concrete was made considering the properties of constituents of concrete. Different concrete mixes with varying percentage of 5%, 10%, 15% of weight of cement and mix is prepared with the addition of the glass fiber as the admixture in the varying percentage of 1%, 2%, 3% with normal curing for 28 days is done is calculated.

Cubic and beam specimens of 150 mm and 750mm size were casted for compressive strength test and flexural strength and tamping was done as per Indian standard. The cubes and beams were casted in stainless steel moulds and wet cured at standard temperature until the time of test. The cubes were cured for 28 days

3.1 VARIATION IN STRENGTH AT DIFFERENT REPLACEMENT LEVEL OF RICE HUSK

Different concrete mixes with varying percentage of 5%, 10%, 15% of weight of cement and mix is prepared and tested with the addition of the glass fiber as the admixture in the varying percentage of 1%, 2%, 3% with normal curing for 28 days is done

3.1.1 COMPRESSIVE STRENGTH

Test specimens of size 150 *150* 150 mm were prepared for testing the compressive strength concrete. The concrete mixes of varying percentages (5%, 10%, 15%) of rice husk and addition of admixture glass fiber in the varying percentage (1%, 2%, 3%) of as partial replacement of cement were cast into cubes for subsequent testing.

Sr. No.	% of Glass Fiber	% of Rice Husk	No. of Cubes	Compressive Strength after 28 days (in N/mm^2)	Average Compressive Strength after 28 days (in N/mm^2)
1	0%	0%	1	21.40	20.86
			1	20.29	
			1	20.30	
2	1%	5%	1	22.60	23.26
			1	23.40	
			1	23.80	
	1%	10%	1	22.40	21.40
			1	20.10	

			1	21.70	
	1%	15%	1	17.60	16.53
			1	15.20	
			1	16.80	
3	2%	5%	1	25.60	25.066
			1	26.20	
			1	23.40	
	2%	10%	1	19.70	18.73
			1	17.60	
			1	18.90	
	2%	15%	1	16.30	15.433
			1	14.40	
			1	15.60	
4	3%	5%	1	16.40	17.53
			1	18.70	
			1	17.50	
	3%	10%	1	12.20	11.93
			1	11.30	
			1	12.30	
	3%	15%	1	8.70	8.967
			1	9.80	
			1	8.40	

Table 4.1 Compressive Strength after 28 days (in N/mm²)

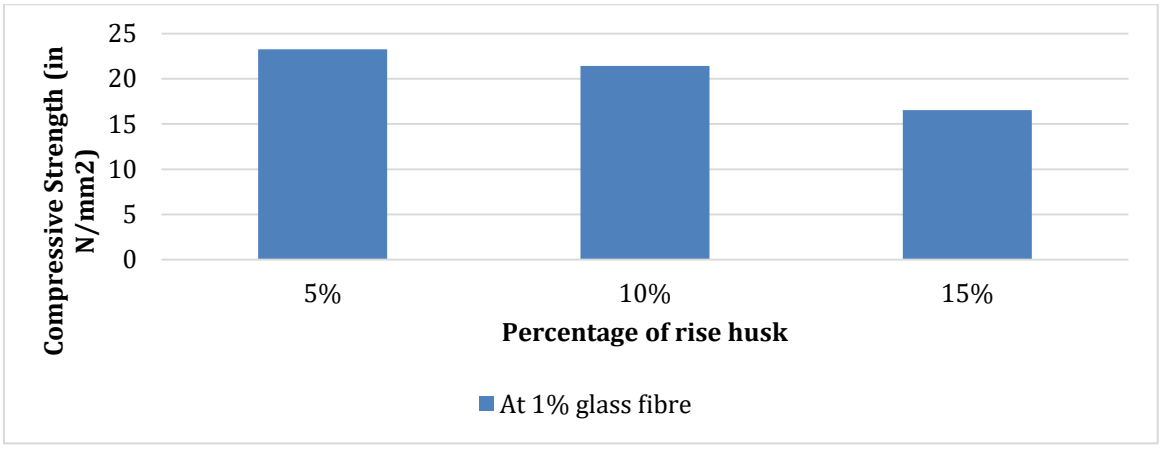

Figure 1 Compressive Strength (in N/mm²) after 28 days at 1% Glass Fibre

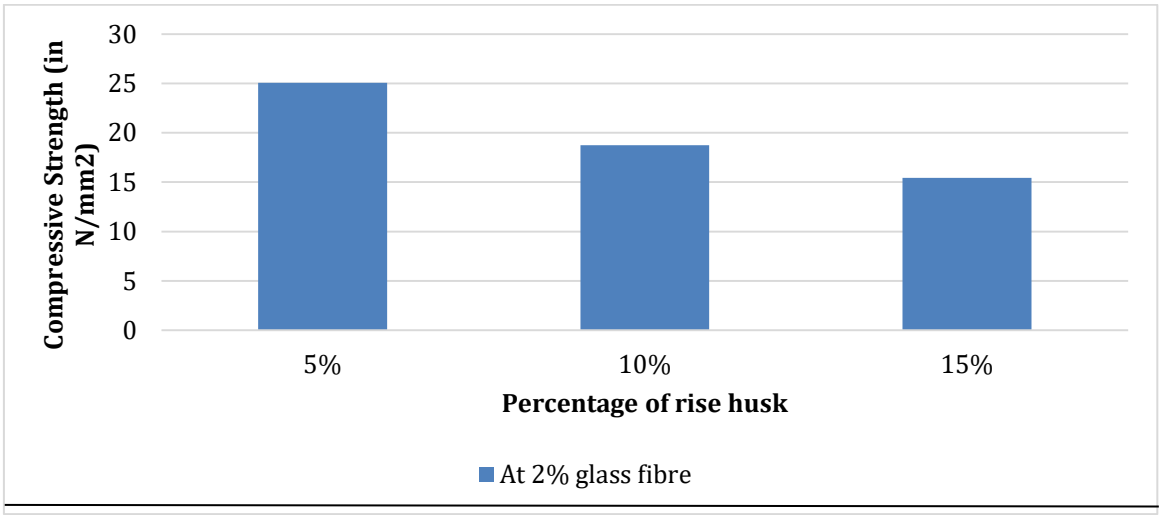

Figure 4.2 Compressive Strength (in N/mm²) after 28 days at 2% Glass Fibre

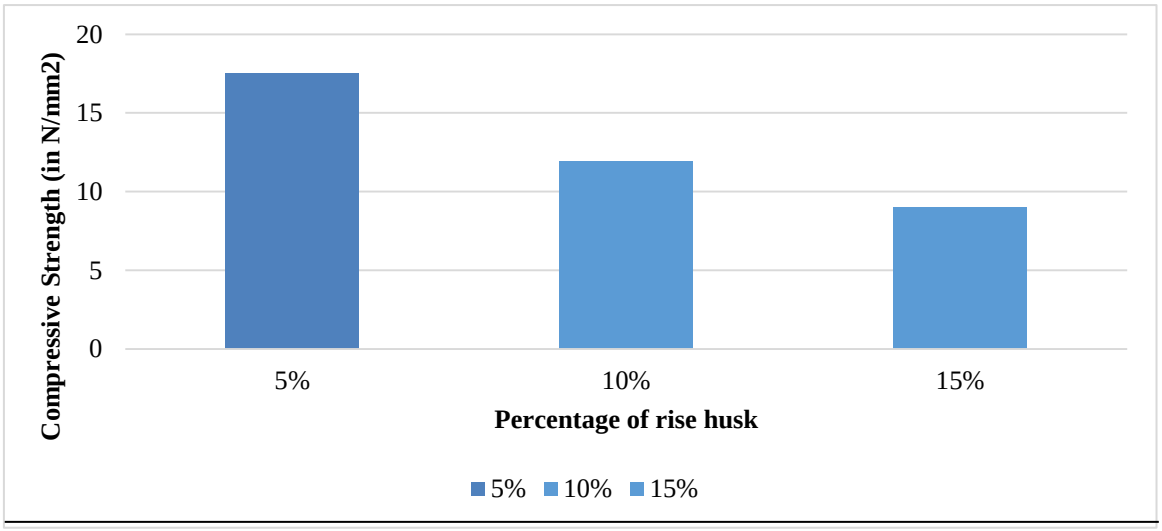

Figure 4.3 Compressive Strength after 28 days (in N/mm²) at 3% Glass Fibre

4.3 FLEXURAL STRENGTH TEST

Test specimens of size 750 *150* 150 mm beam were prepared for testing the flexural strength concrete. The concrete mixes of varying percentages (5%, 10%, 15%) of rice husk and addition of admixture glass fiber in the varying percentage (1%, 2%, 3%) of as partial replacement of cement were cast into beam for subsequent testing.

Sr. No.	% of Glass Fiber	% of Rice Husk	No. of Cubes	Flexural Strength after 28 days (in N/mm²)	Average Flexural Strength after 28 days (in N/mm²)
1	0%	0%	1	3.20	3.30
			1	3.10	
			1	3.60	
2	1%	5%	1	3.80	3.90
			1	4.20	

			1	3.70	
	1%	10%	1	4.60	4.53
			1	4.90	
			1	4.10	
	1%	15%	1	3.20	2.83
			1	2.60	
			1	2.70	
3	2%	5%	1	4.60	5.0
			1	5.30	
			1	5.10	
	2%	10%	1	2.70	2.733
			1	2.90	
			1	2.60	
	2%	15%	1	2.30	2.26
			1	2.40	
			1	2.10	
4	3%	5%	1	2.20	2.16
			1	2.00	
			1	2.30	
	3%	10%	1	1.60	1.73
			1	1.90	
			1	1.70	
	3%	15%	1	0.80	0.80
			1	0.90	
			1	0.70	

Table 4.2 Flexural Strength after 28 days (in N/mm²)

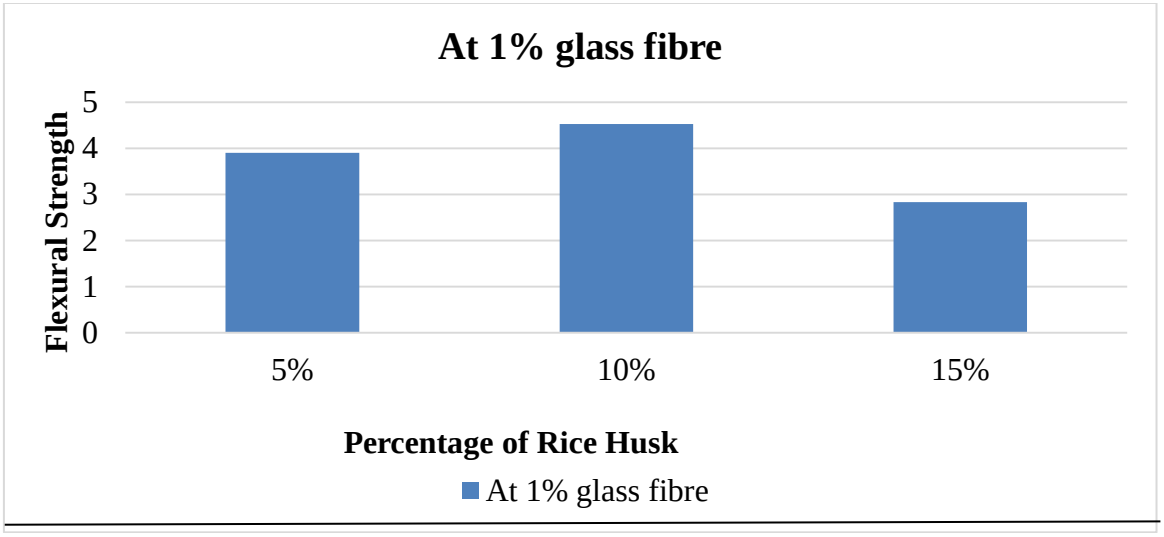

Figure 4.4 Flexural Strength after 28 days (in N/mm²) at 1% Glass Fibre

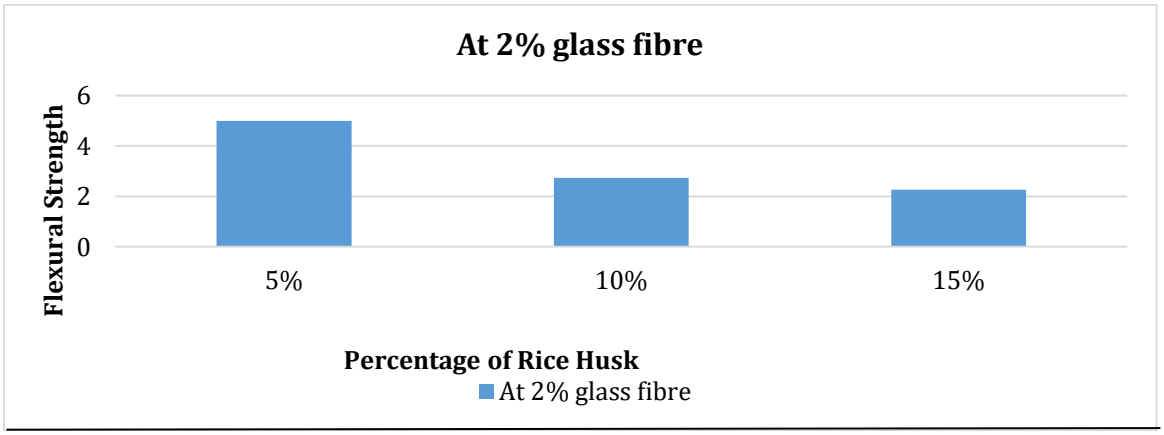

Figure 4.5 Flexural Strength (in N/mm²) after 28 days at 2% Glass Fiber

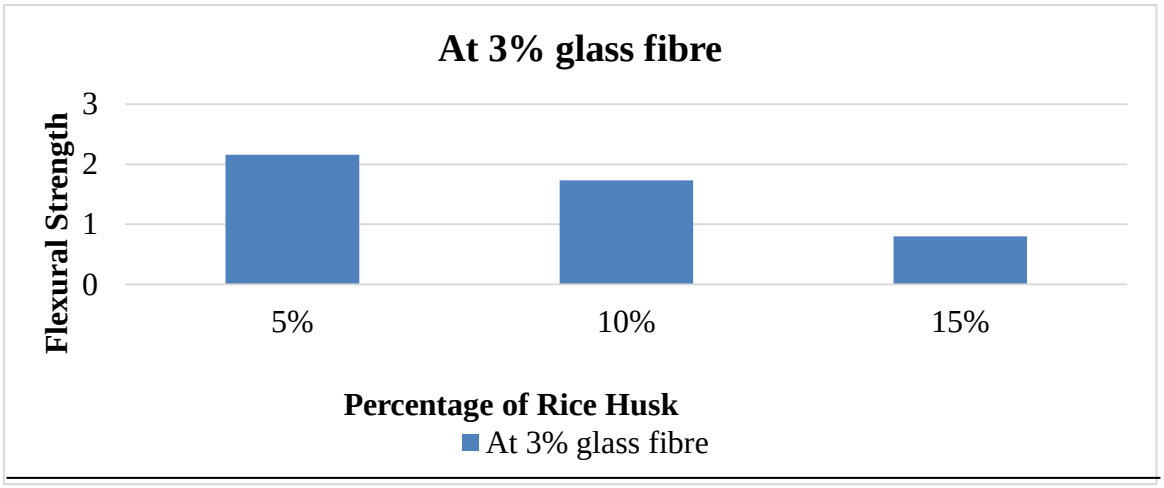

Figure 4.6 Flexural Strength (in N/mm²) after 28 days at 3% Glass Fibre

3.CONCLUSIONS

3.1 COMPRESSIVE STRENGTH

- For M20 concrete the average compressive strength at the end of 28 days for 1% glass fiber and 5% rice husk are 23.26 N/mm².which is maximum and start decreasing after increasing the replacement proportion.
- For M20 concrete the average compressive strength at the end of 28 days for 2% glass fiber and 5% rise husk are 25.066 N/mm² which is maximum and start decreasing after increasing the replacement proportion.
- For M20 concrete the average compressive strength at the end of 28 days for 3% glass fiber and 5% rice husk are 17.53 N/mm² which is maximum and start decreasing after increasing the replacement proportion.

3.2 FLEXURAL STRENGTH

- For M20 concrete the average flexural strength at the end of 28 days for 1% glass fiber and 10% rice husk are 4.53 N/mm² which is maximum and after that it start to decrease.
- For M20 concrete the average flexural strength at the end of 28 days for 2% glass fiber and 5% rise husk are 5.0 N/mm² which is maximum and after that it start to decrease
- For M20 concrete the average flexural strength at the end of 28 days for 3% glass fiber and 5% rice husk are 2.16 N/mm². which is maximum and after that it start to decrease

REFERENCES

1. Ankur, Varinder Singh, Ravi Kant Pareek. - Effect of rice husk ash and plastic fibers on concrete strength||, International Journal of Civil and Structural Engineering Volume 6, No 1, 2015.

2. Ronak Prakash Kumar Patel, Jayraj Vinodsinh Solanki, Jayesh Kumar Pitroda, —A Study on Glass Fiber as an Additive in Concrete to Increase Concrete Tensile Strength||, GRA - Global Research Analysis, Volume: 2.

3. Vaishali G Ghorpade —An Experimental Investigation on Glass Fibre Reinforced High Performance Concrete with Silica fume as Admixture||, 35th Conference on Our World in Concrete & Structures.

4. Sathish Kumar. V, Blessen Skariah Thomas, Alex Christopher —An Experimental Study on the Properties of Glass Fibre Reinforced Geopolymer Concrete||, International Journal of Engineering Research and Applications (IJERA), Vol. 2.

5. Shrikant Harle, Sarang Dhawade —Comparison of Glass Fiber Reinforced Concrete & Geopolymer Concrete with Glass Fiber Reinforcement||, IJRET: International Journal of Research in Engineering and Technology.

6. Rama Mohan Rao. P, Sudarsana Rao H, Sekar S.K —Effect of Glass Fibres on Fly ash Based Concrete||, International Journal of Civil and Structural Engineering Volume 1, No 3, 2010.

7. Deshmukh S.H., Bhusari J. P, Zende A. M. —Effect of Glass Fibres on Ordinary Portland cement Concrete||, IOSR Journal of Engineering June. 2012, Vol. 2(6).

8. Rasha Salah Mahdi —Experimental Study Effect of Using Glass Fiber on Cement Mortar||, Journal of Babylon University/Engineering Sciences/ No. (1)/ Vol. (22): 2014.

9. Shwetha P C, Praveena K, Ajith B.T. Chandrashekhar A. —Experimental Study on Partial Replacement of cement by Fly Ash with Glass Fiber Reinforcement||, International Journal of Engineering Research & Technology

10. Yogesh Iyer Murthy, Apoorv Sharda, Gourav Jain —Performance of Glass Fiber Reinforced Concrete||, International Journal of Engineering and Innovative Technology (IJEIT) Volume 1, Issue 6, June 2012.

11. Dr. Mrs. S. A. Bhalchandra, Mrs. A. Y. Bhosle —Properties of Glass Fibre Reinforced Geopolymer Concrete||, International Journal of Modern Engineering Research (IJMER) Vol. 3, Issue. 4, Jul - Aug. 2013.

12. Makarand Suresh Kulkarni, Paresh Govind Mirgal, Prajyot Prakash Bodhale, S.N. Tande —Effect of Rice Husk Ash on Properties of Concrete||, Journal of Civil Engineering and Environmental Techn

13. A. A. Ramezanianpour. M. M. "the effect of rice husk ash o mechanical properties and durability of sustainable concrete", international journal of civil engineering vol.7 NO. 2 2009, 83-91.

14. Avinash Gornal "strength aspects of glass fiber reinforced concrete", international journal of scientific and engineering research volume. 3 Issue7, July -2012 1 ISSN 2229-5518.

15. Gornale, S. Ibahim quadric, S. Mehkood quadric, S. Md Akram Ali, and S. shamusuddin Hussaaini strength Aspects of glass fibre reinforced concrete", International journal of scientific and Engineering Research, vol. 3, no7, 2012.