

Study of Utilization of Coconut Husk, Jute Fibers and Human Hairs as a Fiber Reinforcement in Concrete

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Abstract— India is a developing rural area and in various producing nations like India economical construction along with economical construction material plays a lively part in the growth of the nation. Waste material in construction can meet a fantastic role to make it economical and long-lasting due to some of its specific properties relevant to building materials. This dissertation shows comparative and experimental work on the usage of coconut husk, jute fibers and human hairs as fiber reinforcement in concrete. Human hair is a human body waste, jute fiber is a natural fiber and coconut husk is an uppermost portion of coconut which is likewise a waste material. In this project human hairs, jute fibers and coconut fibers are added in concrete by weight of cement in the ratio of 0.5%, 1%, 1.5%, 2%, 2.5 and 3%. Workability, flexural strength and compressive strength test are performed on concrete and their solution is being measured and compared. For this project M30 and M40 concrete is applied.

Key words: Coconut Husk, Human Hair, Jute Fiber Fiber, Concrete, Workability, Compressive Strength, Flexural Strength

I. INTRODUCTION

Concrete is mostly used material in construction industry as main component. As we know that concrete is weak in tension hence it should be reinforced either with steel or different types of Fibers so that tensile strength of concrete can be increased and to make concrete strong, durable and less susceptible to tension. Coconut Fiber is agricultural waste material which can be used as a Fiber in concrete. Human hairs are considered as a waste material in most parts of the world and its accumulation causes many environmental problems; however, it can also used as fiber in concrete. The objective of study is to conduct comparative study between the properties of concrete, by adding human hairs, jute fibers and coconut husk up to 3% at an interval of 0.5% by weight of cement in concrete, with the plain cement concrete and their like compressive strength and flexural strength and workability is determined.

II. MATERIAL AND METHODOLOGY

Coconut Husk is collected from various temples. Generally used coconut is collected and then husk is removed from it. Nominal length of husk used for this project varies from 20 mm to 40 mm. collected husk is cut in desired length and then it is submersed in water for 24 hours, after 24 hours husk is removed and it is mixed in concrete in wet form up to 3.00% at an interval of 0.5%. Human hair is collected from various barber shops and ladies parlor. Nominal length of hair used for this project varies from 20 mm to 40 mm. collected hair is cut in desired length and then it is

submersed in water for 24 hours, after 24 hours hair is removed and it is mixed in concrete in wet form up to 3.00% at an interval of 0.5%. Jute fibers is collected from local areas, nominal length of the jute fiber is used for this project is varies from 20 mm to 40 mm. . collected jute fiber is cut in desired length and then it is submersed in water for 24 hours, after 24 hours hair is removed and it is mixed in concrete in wet form up to 3.00% at an interval of 0.5%. along with this PPC cement, natural sand and crushed stone is used as binder, fine aggregate and coarse aggregate is used with clean water which is collected from municipal waste. In this project M30 and M40 grade of concrete is evolved, Mix design of concrete is done as IS 10262 : 2009, mix designation of concrete mix is given in table 1 and 2. For this study slump cone test is performed to check the workability of the concrete, compressive strength and flexural strength test is also performed for that 15*15*15 cm cube and 70*15*15 cm beam is casted and curing is done clean water at room temperature.

Material	Content	Mix Name
Jute Fibers	0.50%	A1
	1.00%	A2
	1.50%	A3
	2.00%	A4
	2.50%	A5
	3.00%	A6
Coconut Husk	0.50%	B1
	1.00%	B2
	1.50%	B3
	2.00%	B4
	2.50%	B5
	3.00%	B6
Human Hairs	0.50%	C1
	1.00%	C2
	1.50%	C3
	2.00%	C4
	2.50%	C5
	3.00%	C6
Control Mix	0%	CC

Table 1: Mix Designation of M30 Concrete

Material	Content	Mix Name
Jute Fibers	0.50%	AA1
	1.00%	AA2
	1.50%	AA3
	2.00%	AA4
	2.50%	AA5
	3.00%	AA6
Coconut Husk	0.50%	BB1
	1.00%	BB2
	1.50%	BB3
	2.00%	BB4

	2.50%	BB5
	3.00%	BB6
Human Hairs	0.50%	CC1
	1.00%	CC2
	1.50%	CC3
	2.00%	CC4
	2.50%	CC5
	3.00%	CC6
Control Mix	0%	CC

Table 2: Mix Designation of M40 Concrete

III. RESULT AND DISCUSSION

A. Slump Cone Test

Fig 1-2 shows result of workability of M30 concrete, result shows when jute fibers are added in concrete it has been observed that when jute fiber is added in concrete, slump of the concrete is decreased, coconut husk also decreased slump of the concrete, human hairs decreased slump of the concrete. Fig 3-4, shows result of slump cone test result of M40 concrete and likewise M30 concrete, slump of the concrete decreased when jute fibers, human hairs and coconut husk is added in concrete.

1) M 30 Concrete

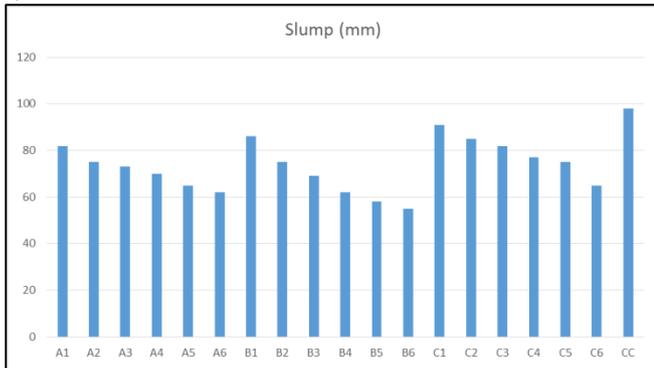


Fig. 1: Result of Slump Cone Test of M30 Concrete

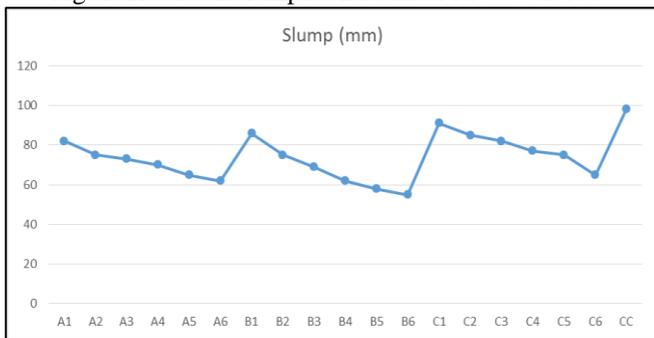


Fig. 2: Result of Slump Cone Test of M30 Concrete

2) M 40 Concrete

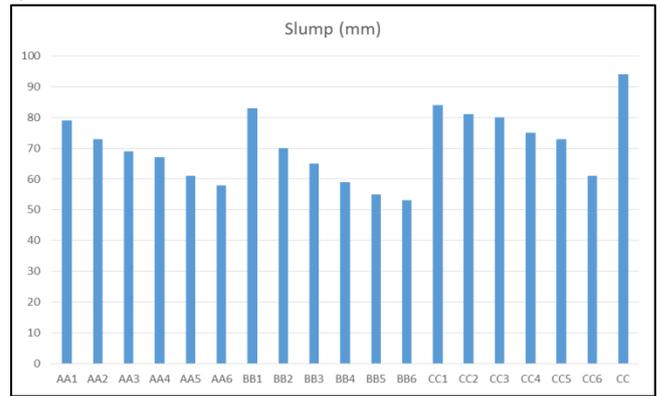


Fig. 3: Result of Slump Cone Test of M40 Concrete

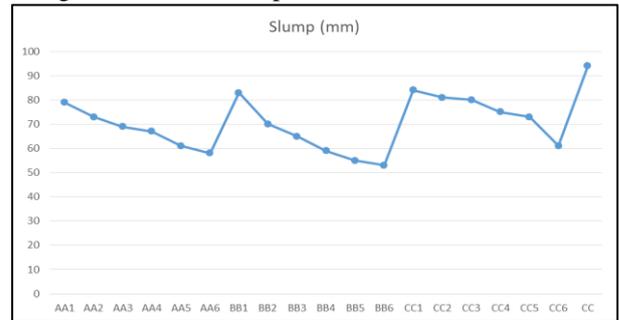


Fig. 1: Result of Slump Cone Test of M40 Concrete

B. Compressive Strength Test

Compressive strength of the concrete cube is tested in compressive strength testing machine, after 7 and 14 days of curing, it has been observed that when jute fibers is added in concrete M30 and M40 concrete compressive strength is decreased when content of jute fibers is added in mix of M30 and M40 concrete. Coconut husk and human hairs also decreased the compressive strength of the concrete when content of coconut husk is increased in concrete. Result of compressive strength of M30 concrete is given in Fig 5-6, and result of compressive strength of M40 concrete is given in Fig 7-8.

1) M 30 Concrete

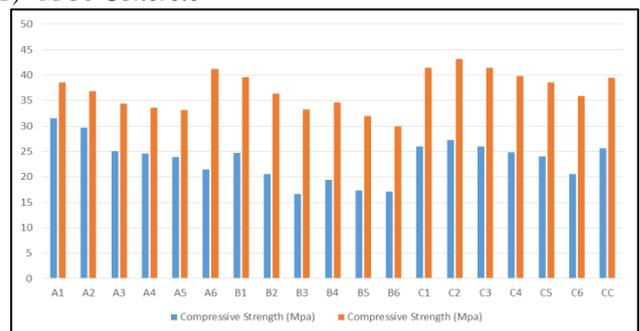


Fig. 5: Result of Compressive Strength of M30 Concrete

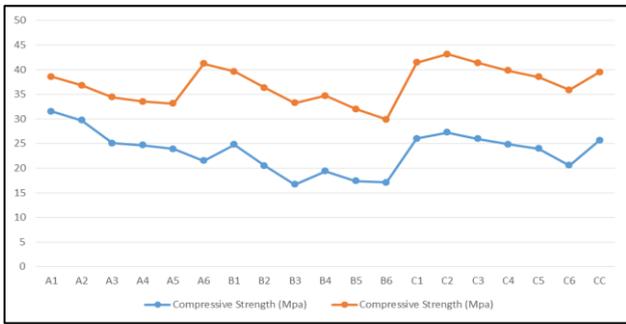


Fig. 6: Result of Compressive Strength of M30 Concrete
2) M 40 Concrete

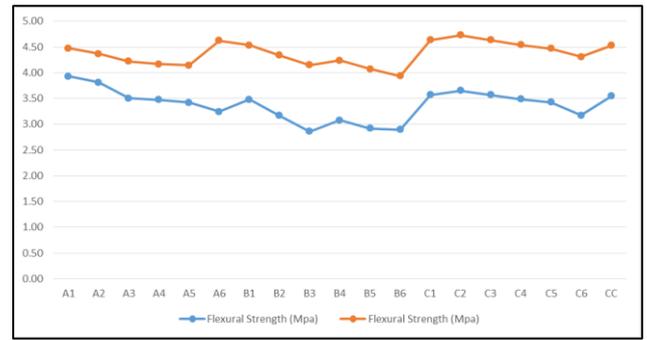


Fig. 2: Result of Flexural Strength of M40 Concrete
2) M 40 Concrete

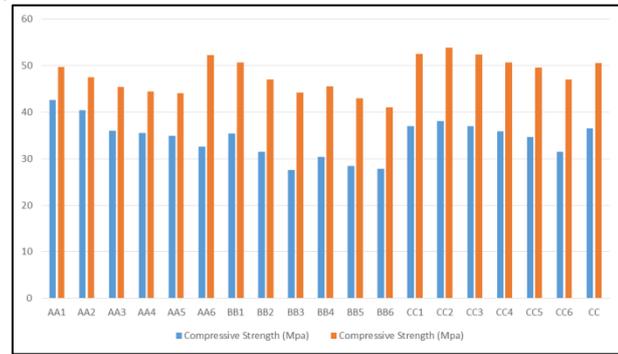


Fig. 7: Result of Compressive Strength of M40 Concrete

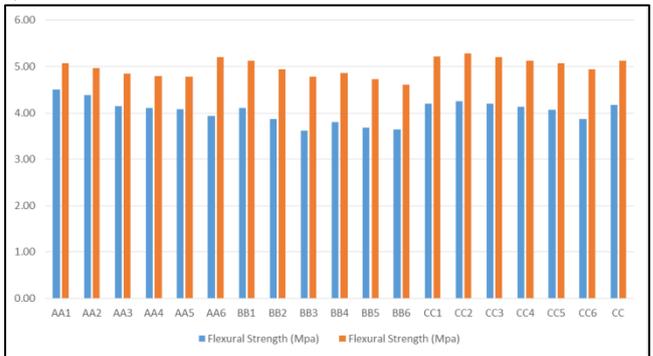


Fig. 3: Result of Flexural Strength of M40 Concrete

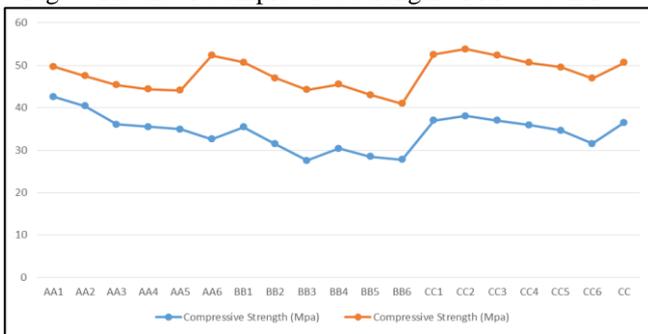


Fig. 8: Result of Compressive Strength of M40 Concrete

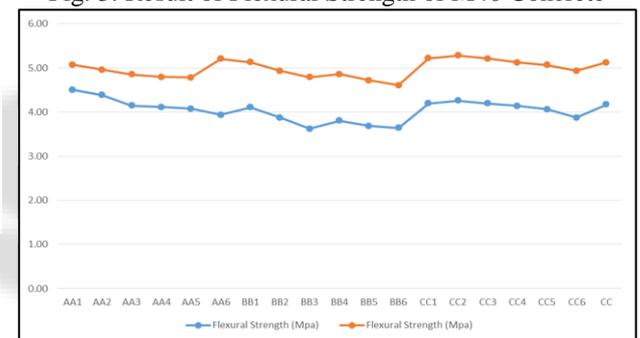


Fig. 4: Result of Flexural Strength of M40 Concrete

C. Flexural Strength Test

Flexural strength of the concrete beam is tested in universal testing machine, after 7 and 14 days of curing, it has been observed that when jute fibers is added in concrete M30 and M40 concrete Flexural strength is decreased when content of jute fibers is added in mix of M30 and M40 concrete. Coconut husk and human hairs also decreased the Flexural strength of the concrete when content of coconut husk is increased in concrete. Result of Flexural strength of M30 concrete is given in Fig 9-10, and result of Flexural strength of M40 concrete is given in Fig 11-12.

1) M 30 Concrete

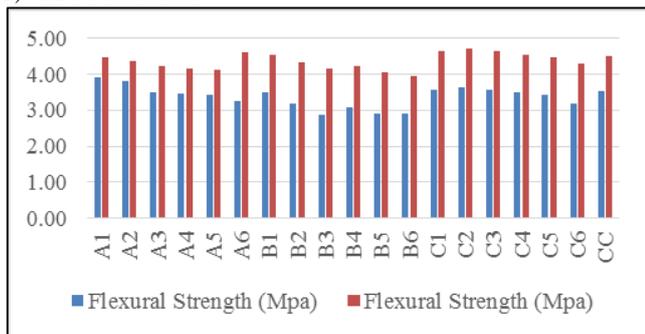


Fig. 9: Result of Flexural Strength of M40 Concrete

IV. CONCLUSION

Study has been carried out on the concrete of grade M30 and M40, when human hairs, coconut husk and jute fibers is added in concrete as fiber reinforcement, following conclusion is drawn from the current study.

Workability of M30 and M40 concrete is checked by slump cone test, when waste material like jute fibers, coconut husk and e-waste is added in concrete as a fiber reinforcement. Result shows that all three waste material reduce workability of the concrete, where M30 control mix concrete gives slump of 98 mm and M40 concrete possess 94 mm, it has been observed that jute fiber reduces slump value of concrete approximately upto 38% when fiber is added upto 3.00%, and coconut husk also decreases the slump value of concrete approximately 43% when coconut husk fiber is added upto 3.00% in concrete. Likewise this material human hair also decreases the workability or slump of the concrete upto 35% when 3.00% of the human hair is added in concrete. Study also says that when grade of the increases slump of the concrete mix decreases.

Compressive strength of the M30 and M40 concrete cube is tested in compressive strength testing machine, control mix of M30 concrete possess 39.52 MPa

after 28 days of curing and M40 concrete possess 50.62 MPa after 28 days of curing. Result shows that Jute fibers decreases the compressive strength of the concrete, all mix of the jute fiber give less compressive strength when it is compare to CC mix, but all mix of the jute fiber is useable because they posses compressive strength more than 30 MPa, when coconut husk is added in concrete its 0.5% mix give better compressive strength when it is compare to CC mix, remaining all mix posses lesser compressive strength than CC mix, hence coconut husk gives optimum value of 0.5%. when human hair is added in concrete, its initial four mix posses better compressive strength than CC mix, and remaining mix posses lesser compressive strength comparing to CC mix, human hair concrete also give optimum value of 1.00%.

Flexural strength of the M30 and M40 concrete cube is tested in Flexural strength testing machine, control mix of M30 concrete possess 4.53MPa after 28 days of curing and M40 concrete possess 5.12 MPa after 28 days of curing. Result shows that Jute fibers decreases the Flexural strength of the concrete, all mix of the jute fiber give less Flexural strength when it is compare to CC mix, but all mix of the jute fiber is useable, when coconut husk is added in concrete its 0.5% mix give better Flexural strength when it is compare to CC mix, remaining all mix possess lesser Flexural strength than CC mix, hence coconut husk gives optimum value of 0.5%. when human hair is added in concrete, its initial four mix possess better Flexural strength than CC mix, and remaining mix possess lesser Flexural strength comparing to CC mix, human hair concrete also give optimum value of 1.00%.

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