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EFFECT OF LOW-DENSITY POLYPROPYLENE FIBRE ON MECHANICAL PROPERTIES OF M20 GRADE CONCRETE

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ABSTRACT

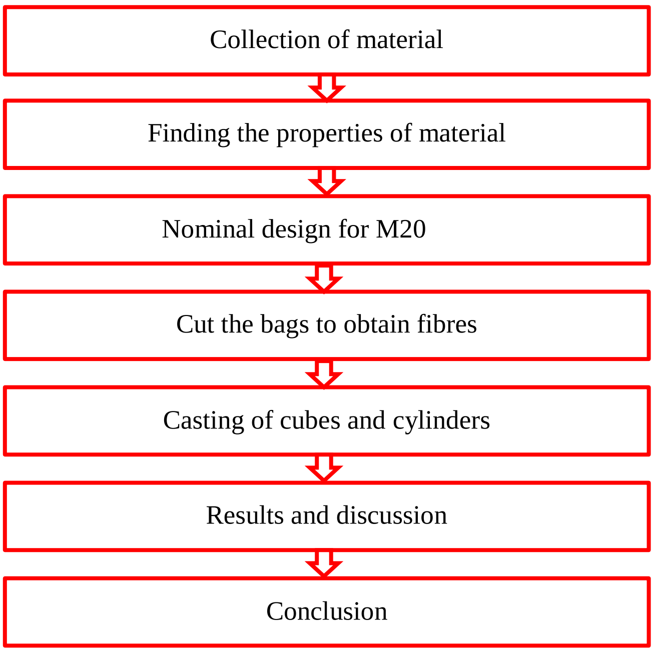
The LDPP fibres which are extracted from waste cement bags, where the LDPP fibres have elastic properties up to some extent. In this view the study emphasized on the usage of LDPP fibres which is used as an additive to the concrete (M20) nominal mix in various (0.0%, 1.0%, 1.5%, 2% and 2.5%) proportions which may increase the tensile properties as well as compressive strength. In order to achieve the desired strength various tests on concrete on compression and tensile strength and young's modulus are carried out. After conducting the tests, the obtained are compared with the M20 nominal grade concrete.

Keywords: LDPP Fibre, Nominal Design, Compression, Split Tensile, Young's Modulus,

I. INTRODUCTION

Concrete is used to construct structures that need to last longer. The main advantage is that it has all kinds of good mechanical properties. The main disadvantage is that concrete develops microcracks during hardening. Therefore, fibres are added to concrete to overcome these disadvantages. Concrete that contains cement, water, fine and coarse aggregates, and discontinuous fibres is called fibre-reinforced concrete (FRC). Unreinforced concrete has low tensile strength and low elongation at break. These deficiencies are traditionally addressed by adding rebar or prestressing steel. Reinforcing steel is continuous and specifically placed in the structure to optimize performance. Fibres are discontinuous and generally randomly distributed in the concrete matrix. Fibres are used in structural applications with traditional reinforcement. Because of the flexibility of manufacturing processes. Fibre reinforced concrete can be an economical and useful building material. One of the fibres used here is low-density polypropylene (PP), also known as LDPP, is a polymer used in a wide range of applications. These fibres have good alkali resistance.

II. METHODOLOGY



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III. EXPREMENTAL INVESTIGATION AND DISCUSSION

The size of the cube specimens used to obtain the compressive strength for with and without low density polypropylene (LDPP) fibres specimens was 150 mm IS: 516 standards. Cylindrical specimen (150 mm dia. and 300 mm height) was used in split-tensile strength test IS: 5816 standards. Cylindrical specimen (150 mm dia. and 300 mm height) was used in young's modulus strength test IS:516. Some tests which are used in this project are compressive test, split tensile test, slump cone test and young's modulus test

NOMINAL MIX DESIGN

Table 1: nominal M20 mix design

MIX	1.0:1.5:3.0:0.45

SLUMP TEST OR WORKABILITY

Table 2: slump results

Mix	Slump(mm)	Remarks
1.0:1.5:3.0:0.45	170	Without fibers
1.0:1.5:3.0:0.45	260	With fiber

COMPRESSIVE TEST

Table 3: compression test results

Group no.	LDPP Fibre content %	Compressive strength (cubes) in N\mm²	
		7 days	28 days
1	0.0	27.5	39.1
2	1.0	28	40.3
3	1.5	29.1	41.4
4	2.0	31.4	42.5
5	2.5	30.5	42.1

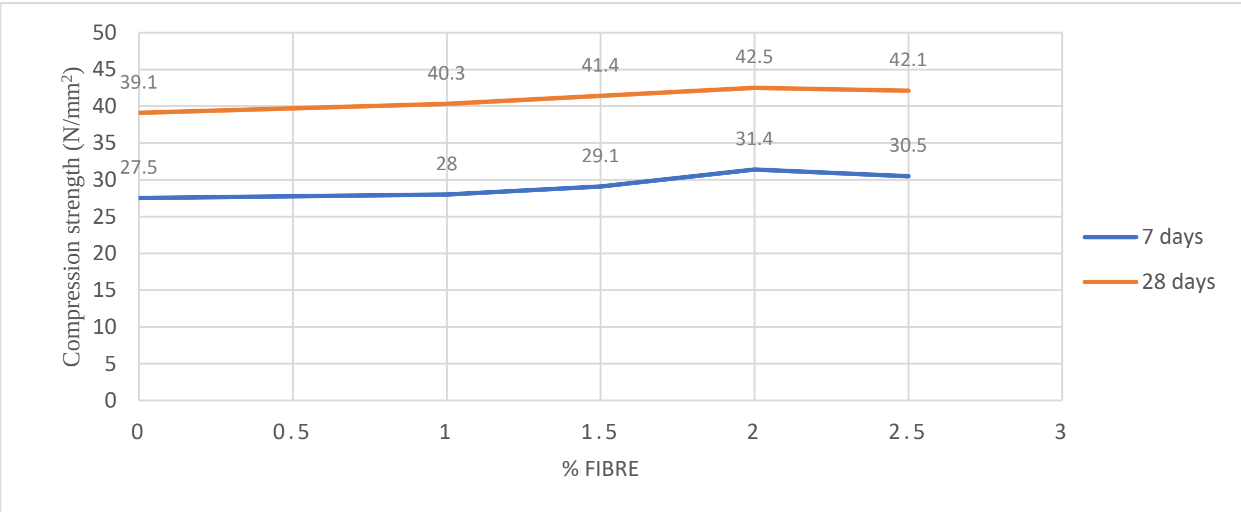

Fig-1 comparison graph for compressive strength

SPLIT TENSILE TEST

Table 4: split tensile test results

Group no.	LDPP Fibre content %	Split tensile strength (cylinders) in N\mm²	
		7 days	28 days
1	0.0	5.6	6.9
2	1.0	5.8	7.4
3	1.5	6.0	7.7
4	2.0	6.3	8.9
5	2.5	6.1	8.5

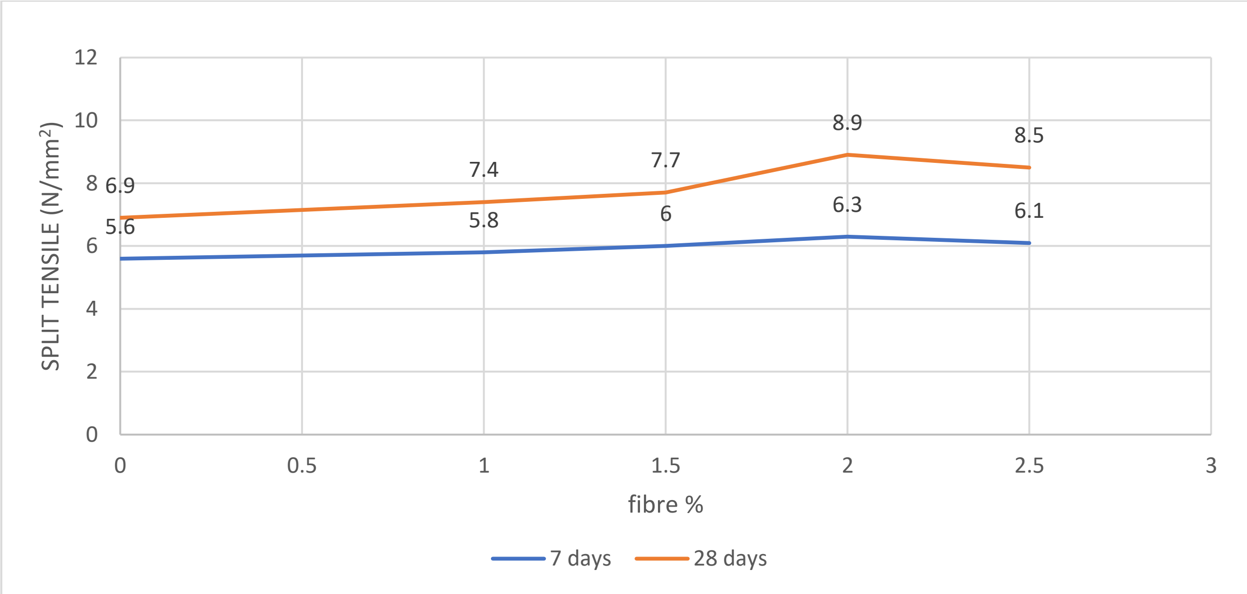

Figure 2: Effect of various contents of fibres on the splitting strength

YOUNG'S MODULUS TEST

Figure 3: Young's modulus testing machine

Table 5: young's modulus results

Group no.	LDPP Fibre content %	Young's modulus (cylinders) in N\mm²	
		7 days	28 days
1	0.0	16.6	22.9
2	1.0	13.3	13.8
3	1.5	13.6	14.5
4	2.0	21.1	26.1
5	2.5	10.2	15.6

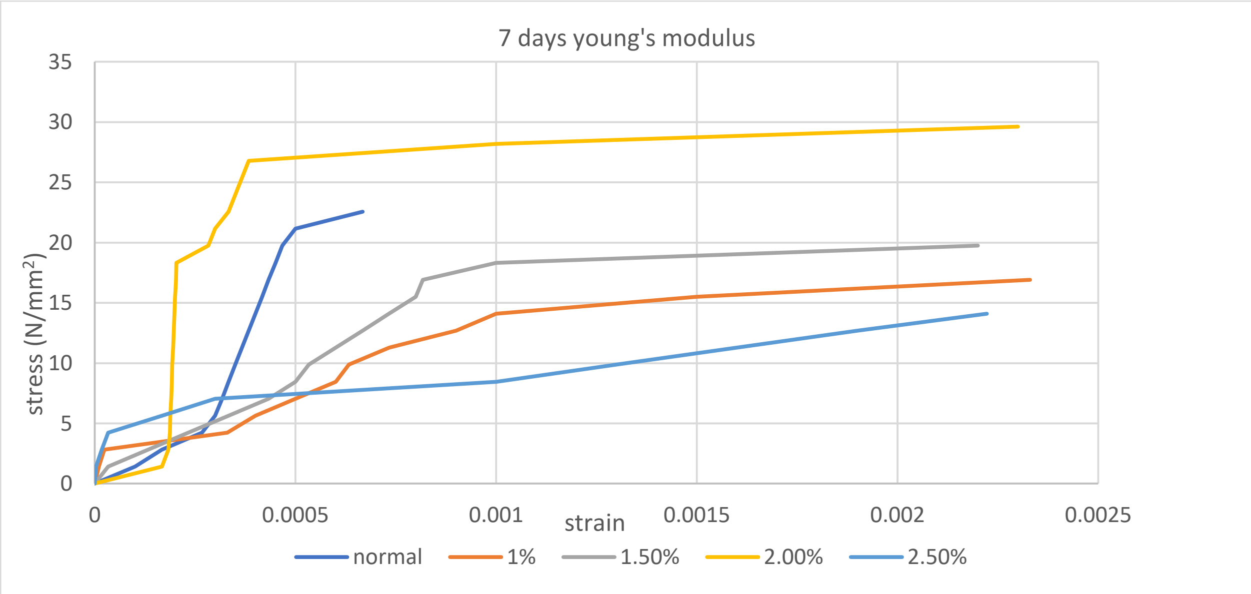

Figure 4: 7 days stress vs strain graph

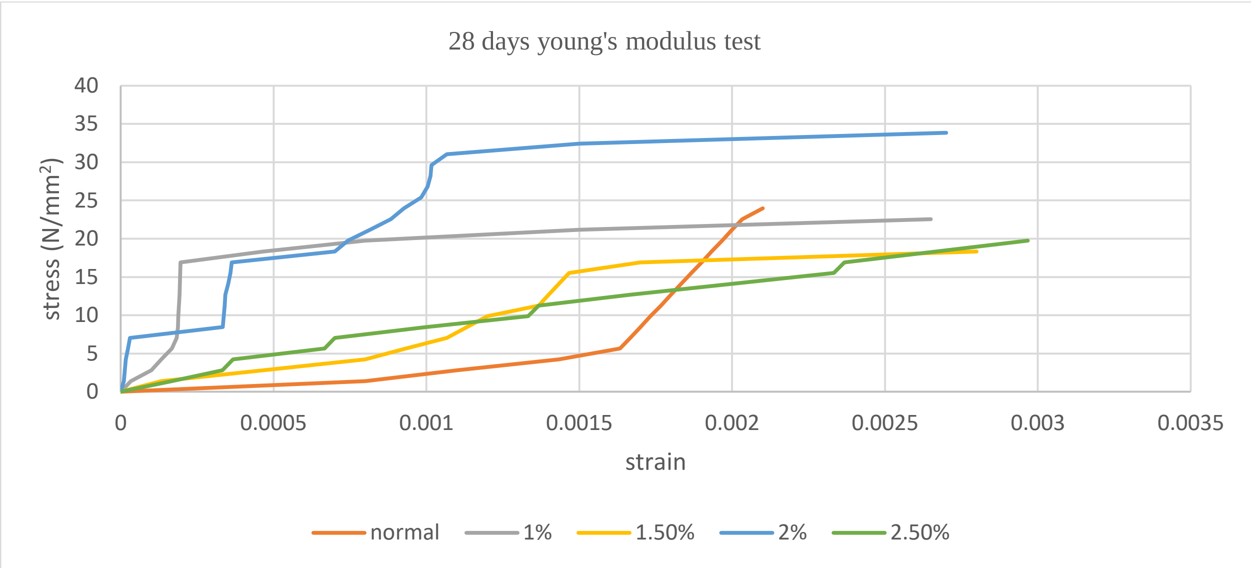

Figure 5: 28 days stress vs strain graph

IV. CONCLUSION

This work is evaluated between (0.0%, 1%, 1.5%, 2%,2.5%) fibres which are nominal mix of M20 grade concrete. And comparison of tests.

❖ Compared to ordinary concrete and LDPP fibre concrete, workability is reduced when fibre is added to concrete.

❖ The 7-day compressive strength of the fibres incorporated into the concrete is increased by up to 2% (0.0%, 1%, 1.5%, 2%), and with a further increase in fibre i.e. 2.5%, the compressive strength decreases.

❖ The 28-day compressive strength of the fibres incorporated into the concrete is increased by up to 2% (0.0%, 1%, 1.5%, 2%), and with a further increase in fibre i.e. 2.5%, the compressive strength decreases.

❖ The 7-day split tensile strength of the fibres incorporated into the concrete is increased by up to 2% (0.0%, 1%, 1.5%, 2%), and with a further increase in fibre i.e. 2.5%, the split tensile strength decreases.

❖ The 28-day split tensile strength of the fibres incorporated into the concrete is increased by up to 2% (0.0%, 1%, 1.5%, 2%), and with a further increase in fibre i.e. 2.5%, the split tensile strength decreases.

❖ In terms of Young's modulus at 7 days and 28 days, as compared to conventional only and 2% fibre concrete increased in strength.

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