TO INVESTIGATE THE STRENGTH PROPERTIES OF CONCRETE MIX HAVING REPLACEMENT OF SAND WITH SAW DUST WITH ADDITION OF JUTE FIBERS

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Abstract – *In our day to day life, the technology takes place of almost everything. Technology and its applications should be like Go Green. Many researchers have found that the replacing the cement and other ingredients in the concrete would reduce the global warming impact. In our study, we use saw dust which would partially replace the sand content with the addition of jute fibers. The saw dust in replacement of sand i.e. fine aggregates were used as 0 to 50% with an uniform increment of 10% along with addition of jute fibers as 0 o 2% with the uniform increment of .5%. samples were prepared using these replacements accordingly and used to determine the strength parameters of the concrete mix. Fresh and hardened properties of the mix were find out. In the conclusion of this study, it is generally find that the optimum strength gain is achieved at certain percentage replacements and additons to enhance the concrete parameters. The overall results of the study were within the permissible limits.*

Key Words: Concrete, Workability, Strength, Replacements, Saw Dust, Sand, Jute Fibers, Tensile Strength, Flexural Strengh, Compressive Strenght.

1.INTRODUCTION

With the development of our country, different industries of country inturns grow. Construction industry plays very important role in the infrastructure development of the country. Construction of buildings, bridges, flyovers, under water construction, etc. is familiar areas of this industry. From very start of the agies, construction takes places in different forms. And with these modern approaches, construction industry reaches at great heights. As construction grows very rapidly, the materials required to fulfil these consumptions also inneed largely. With the demand of such materials, production of these increasingly.

We have already known to this fact, concrete is heterogeneous mixture of cement which acts as binder, fine aggregates, coarse aggregates and most important that is water. Concrete is defined as hard mass prepared by mixtures of above mentioned ingredients in finite proportion as required. Sometimes, admixtures will be added in it enhance its properties upto certain levels. Several admixtures are available in the market and will be used in concrete as per the requirement or demand of the work. Concrete is hard rock mass, found good in compression and weak in tension. It means concrete effectively manage the compressive loads on it but if we found tension forces on it, it generally loose its strength. In order to resist tension forces, we used Reinforcements i.e. steel bars of specified dia as per the work requirements. Production of cement and natural resources are used large amount for the production of concrete which impact our environment badly with the emission of harmful gases. Many researchers have found numerous ways to reduce such impacts to certain level. In our study, we used waste materials i.e. Saw Dust which partially replace the fine aggregates up-to certain content effectively. Along with this replacement, we used Jute fibers which helps to enhance the tension behaviour of the concrete up-to certain content. The usage of these waste products helps to manage the waste products along with the re-usage of such materials for better future products. The combination of these two materials has shown the good results on the strength properties of the mix. Further studies, can also made on such combinations to have indepth study.

2. LITERATURE

Sriram et al. (2021) investigated the use of granite powder and sawdus as partial replacements for cement and fine aggregate in concrete. They found that using granite powder at 10% of cement by weight was the most effective in increasing compressive and flexural strength. The 10% ratio of granite slurry and sawdus had great compressive strength, tensile strength, and flexure strength compared to 20% and 30% ratios. This suggests that locally available granite slurry and sawdus can be a good partial replacement for concrete, improving compressive, tensile, workability, and flexure characteristics while offsetting the overall cost of concrete.

Jang et al. (2022) studied sustainable self-compacting concrete (SCC) properties using activated jute fibers and mineral waste powder. They found that mineral powders and jute fibers significantly improved SCC processability and mechanical properties. The combination of 0.1% jute fiber and 75mm zeolite powder provided the best mechanical properties.

S. Tiwari et al.'s (2020) demonstrates the use in demonstrating how, in the significant example, an enlarged measure of jute Fibre lowered the rut value. Comparing corrosive restoring to standard relieving, compressive strength also decreased. Additionally, each and every considerable blend's compressive and elastic properties were increased by jute fibre.

Thomas Joseph Odero et al. (2020) conducted the experiment by substituting sawdust for 5%, 10%, and 25% of the amount of sand. In this study, the moisture content, specific gravity, fineness modulas, and aggregate grading of sawdust and sand were examined along with the compressive tensile and flexural strength of SC and OC after 7 and 28 days. While adding more sawdust to the concrete mixture increases the strength after 7 days, adding less sawdust increases the strength after 28 days. The results revealed that when the sawdust content increased and replacements went past 10%, the compressive strength declined noticeably. We can clearly see from the aforementioned study that sawdust can be utilised in field purposes if it makes up 10% of the total volume of fine aggregate.

Ranjan Kumar Gupta (2021) explored the use of Waste Ceramic Powder as an alternative concrete-based cementitious material. Waste ceramic waste is a major waste material in civil engineering and construction materials, and has become an effective material in concrete. The study replaced Ordinary Portland Cement 53 Grade with crushed ceramic waste tile powder at different percentages. The Paver Block Test was conducted to evaluate compressive strength properties of paver blocks and compare them with conventional paver blocks.

Pramodini Sahu et al. (2020) suggested. In this study, the evaluations of the jute fiber-supported concrete are completed by taking into account various fibre rates, as well as the compressive strength and modulus of break value observed. This research suggested that the compressive strength value for jute fibre was substantially different from that for plain concrete cement.

2.1 Objectives of Study

1. To use waste products as construction materials and find the optimum usage of saw dust and jute fiber in the concrete mix.
2. To find out the workability of the concrete mix using saw dust and jute fiber.
3. To determine the mechanical properties like compressive strength, split tensile strength and flexural strength of the mix using saw dust and jute fibers in the mix.
4. To compare the test results of saw dust and jute fiber based concrete and normal concrete.

3. MATERIALS

3.1 Cement

43 Grade Ordinary Portland Cement is used in our study, generally obtained from local distributors.

3.2 Fine Aggregates

Locally available river sand is used in our study.

3.3 Coarse Aggregates

Local Crusher available 20mm aggregates used in our study.

3.4 Saw Dust

Table 3.1: Chemical Composition of Saw Dust

Chemical properties	Value
Alumina	9.85
Silica	62.87
Calcium	10.35
Iron	4.45
Potassium	1.71

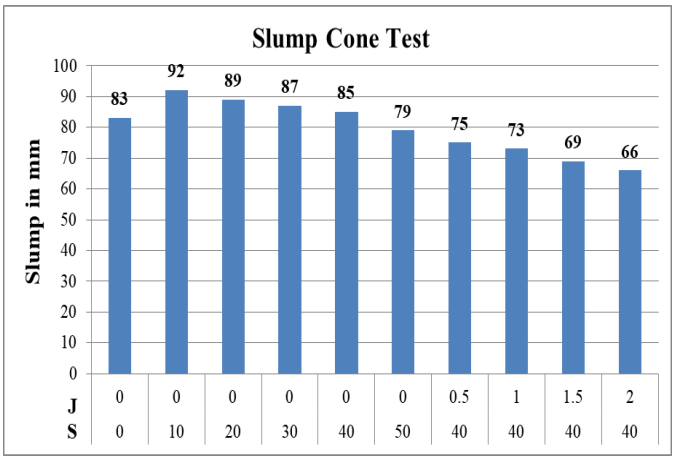
3.5 Jute Fibers

Table 3.2: Properties of Jute Fibers

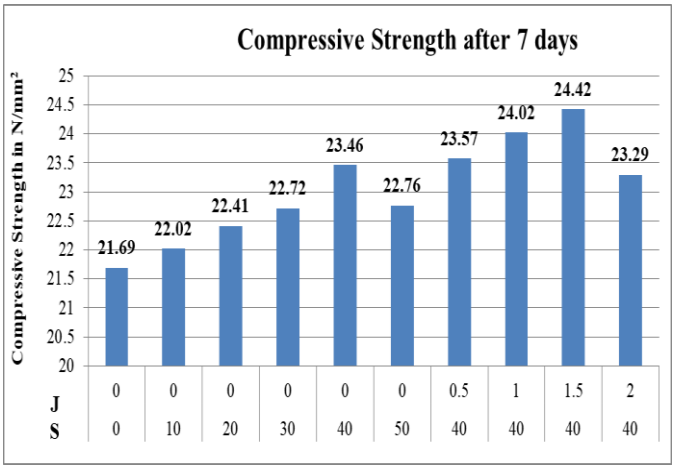
S.NO.	Chemical	Composition
1	Cellulose	65.2%
2	Hemicellulose	22.2%
3	Lignin	10.8%
4	Water soluble	1.5%
5	Fat & Wax	0.3%

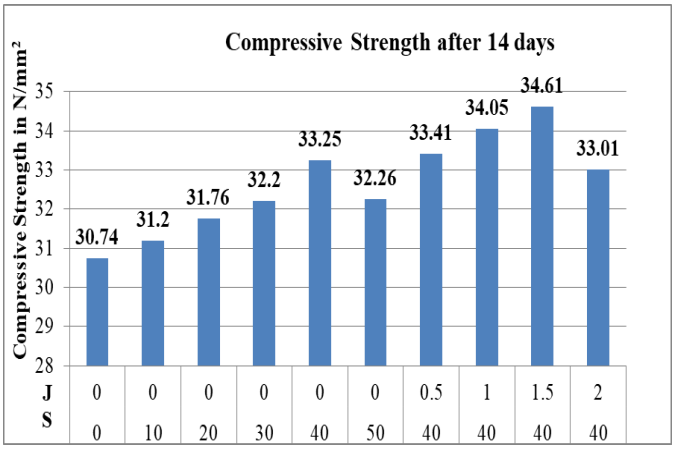
4. RESULTS AND DISCUSSIONS

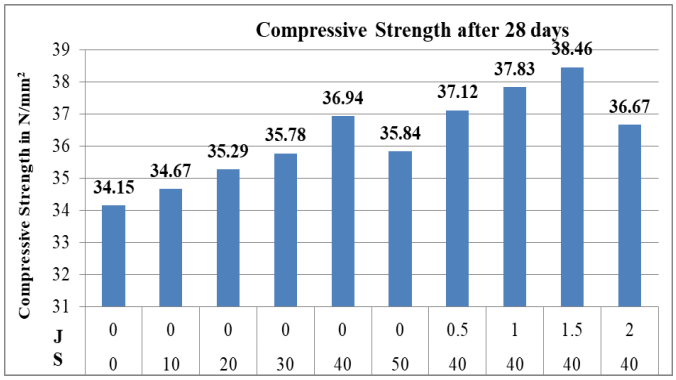
4.1 Slump Test



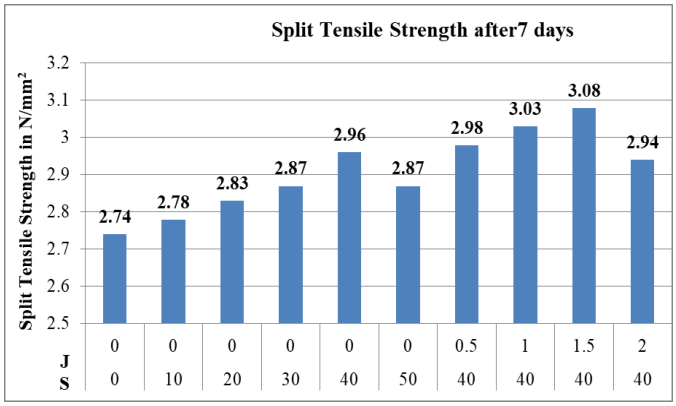
4.2 Compressive Test

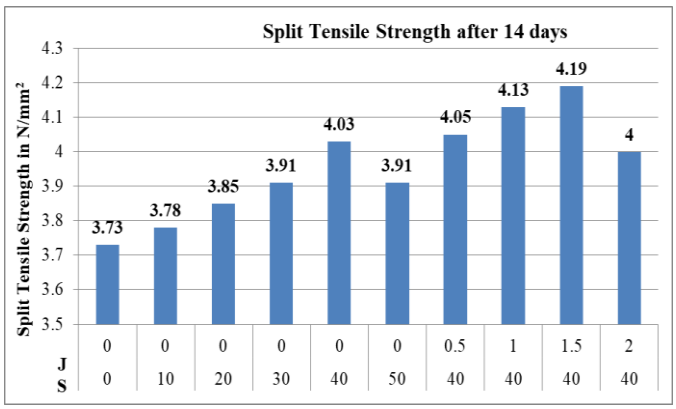


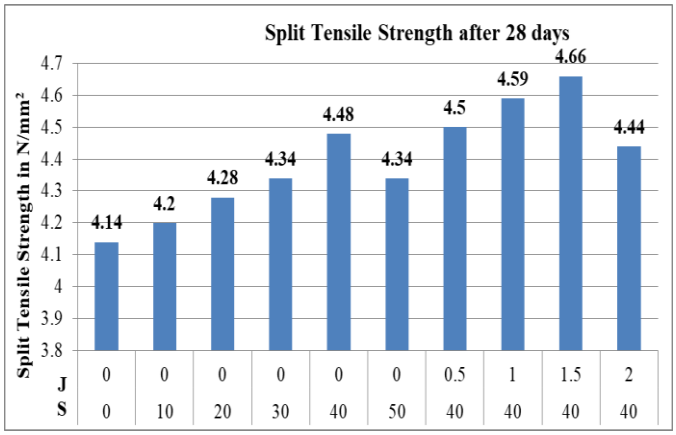




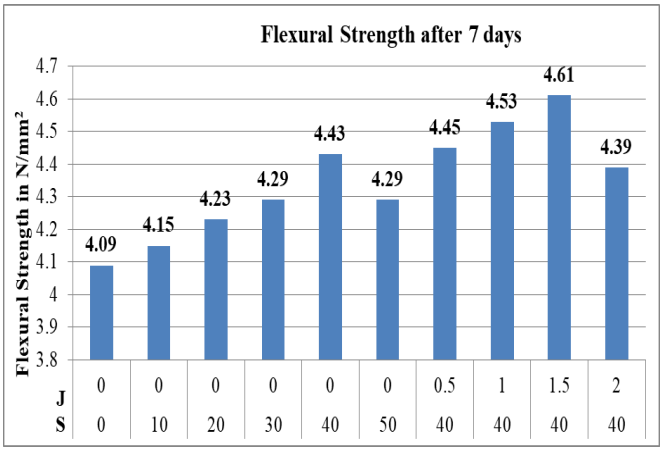
4.3 Split Tensile Test

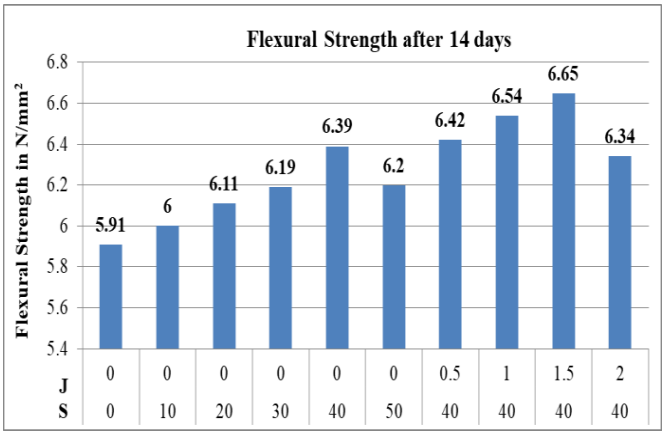


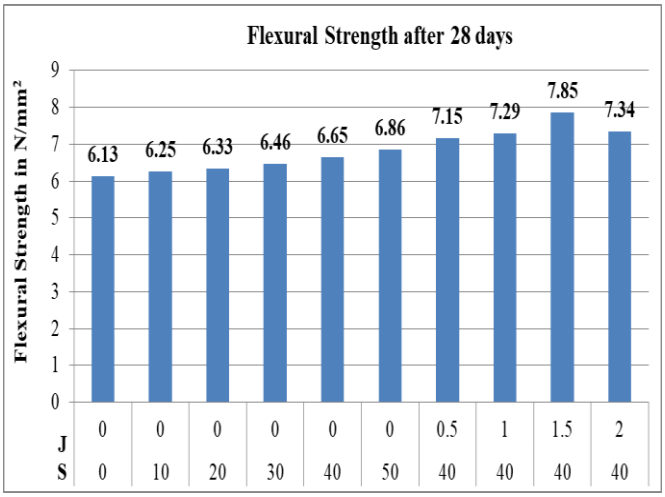




3.5 Flexural Test







5. CONCLUSIONS

1. The wastages as Saw Dust and Jute Fibers will be used as construction materials.

2. The results of workability by Slump test concluded that workability increases with the increase in the Saw Dust content.

3. The workability results also concluded that with the increase in percentage of Jute Fibers, workability of concrete mix decreases. This may be due to higher water absorption property.

4. The Slump value increases 83 mm to 92 mm after that the values gets degraded.

5. The Compressive Strength of Concrete mix after 7days, 14 days and 28 days of curing increases gradually by replacement of sand with Saw Dust with addition of Jute Fibers becomes maximum as 24.42 N/mm², 34.61 N/mm² and 38.46 N/mm² when Saw Dust is 40%, Jute Fibers is 1.5%.

6. The Split Tensile Strength of mix achieves maximum value of 3.08 N/mm2, 4.19 N/mm² and 4.66 N/mm² when Saw Dust is 40% and Jute Fibers is 1.5% are added to concrete mix after 7, 14 and 28 days of curing, respectively.

7. The Ultimate Flexural Strength observed maximum with Saw Dust is 40%, Jute Fibers is 1.5% i.e. 4.61 N/mm², 6.65 N/mm² and 7.85 N/mm² of mix after curing of 7days, 14 days and 28 days, respectively.

6. REFERNECES

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