



The Incorporation of Waste Sawdust in Light Weight Concrete Production

KEYWORDS

Optimum Compressive Strength, Curing, Water/Cement Ratio, Saw Dust, Cow dung.

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ABSTRACT

This research aims to find out the optimum compressive strength of concrete produced with partial replacement of cement with cow dung and fine aggregates with sawdust. The concrete mix of 1:1:2 was prepared using water/cement ratio of 0.65 with 0%, 2%, 4% and 6% cow dung and 6% sawdust were used concurrently as partial replacement for fine aggregates. The different compressive strength developed were at 28 days curing. The specific gravity values of cement, cow dung, stone dust (fine aggregates) and sawdust are 3.13, 1.33, 3.00 and 1.25 respectively. It was also discovered that as curing age increases, the compressive strength increases in fact accelerates and increase in percentage replacement caused a corresponding decrease in the compressive strength.

I. INTRODUCTION

Sawdust is a by-product of cutting, grinding, drilling, sanding, or otherwise pulverizing wood with a saw or other tool; it is composed of fine particles of wood. Certain animals, birds and insects which live in wood, such as the carpenter ant are also responsible for producing the saw dust. Sawdust has a variety of other practical uses, including serving as mulch, as an alternative to clay cat litter, or as a fuel. Until the advent of refrigeration, it was often used in icehouses to keep ice frozen during the summer. Sawdust can be used as alternative substitute for fine aggregate in concrete production. Before using the saw dust it should be washed and cleaned. Because of large amount of barks are present which can affect setting time and heat of hydration of cement. Also, the agricultural and industrial wastes pose great hazard to environment and man as a result of improper management even when these wastes are burnt, they release carbon-monoxide to atmosphere which depletes the ozone layer. If these wastes are processed, they may be suitable for construction purpose. Base on these two major points given above, there is a need to investigate the use of alternative building materials which are locally available such as sawdust, cow dung, wastes from demolished building, palm kernel shell, mining wastes etc that can be used in concrete production Concrete obtained from sawdust and cow dung is a mixture of sawdust and cow dung gravel with certain percentage of water to enhance the workability and full hydration of the cement which provide great in bonding of the concrete. Sawdust and cow dung concrete is light in weight and it has satisfactory heat insulation and fire resisting values The most important aspect and main target of the experiment are proving that sawdust-cement- cow dung -gravel mixtures can prove to be more lightweight and cost efficient. Since sawdust and cowdung is already waste then the cost would go down as well as weight cause of its extremely light unit weight.

II. SCOPE AND OBJECTIVE:

- The purpose of the present dissertation work is summarized as the following objectives:
- To evaluate performance of light weight concrete.
- To evaluate several laboratory specimen.
- To make concrete production as cost effective.
- The implementation of waste sawdust can not only decrease environmental damage, but also can save the concrete materials.
- It has many advantages over traditional concrete, such as low bulk density, better heat preservation and heat insulation property.
- It has lower pollution for our environmental impact. it is also ecofriendly.
- A paradigmatic use of waste sawdust and cow dung

III. MATERIALS AND METHODS

Cow dung: This is obtained from the cow excreta. It was sundried and grounded to fine powder form like cement. The grounded cow dung particles were sieved through 90microns and used for concrete production without further treatment.

The percentage replacements for cement were varied from 0%, 2%, 4% and 6%. The cow dung was obtained.

Sawdust: It was obtained from saw mill industry and sieved and retained on sieve aperture of 600microns, sundried, then kept in waterproof bags and used without further treatment. The percentages of replacements of fine aggregates by sawdust were 6%.

Cement: Portland cement was used for this research work and it was found to confirm with the requirements of IS 10262:2009

Water: The water used for this work is potable, clean and free from any visible impurities. It confirmed to IS 10262 :(

2009).

Fine aggregates: The fine aggregates used for this work is stone dust. It was retained on a 600microns sieve. The impurities were removed and found confirmed to the requirements of IS 10262: (2009).

Coarse aggregates: Granites were used for this work of size12.5mm. They are free from debris and other impurities. They are angular in shape. The tests carried out on these materials are slump test, sieve analysis, specific gravity and compressive strength

Slump test: The most widely used test for determine the workability of concrete. The test is a measure of the resistance of concrete to flow under its weight. The apparatus used is a hallow cone shaped mould test.

Compressive strength test: The compressive strength of concrete is one of the most important and useful properties of concrete. The primary purpose for design concrete is to resist compressive strength in structural members.

Hence it is the role of a concrete designer to specify the expected characteristics strength of concrete/mix proportion to enable it resist external force.

Sieve analysis: This is a test that is performed to determine the percentage of different grain sizes contain within the material.

The mechanical sieve analysis is performed to determine the distribution of coarser, larger-sized particles. The sieve analysis of this study was carried out on saw dust.

Specific gravity test: This is a test that is performed to determine the density of the soil particle finer than 2mm. At least two specimens, each between 5g and 10g shall be obtained by riffling. The specimens shall be oven dried or sundried at 1050c to 1100c and stored in an airtight container.

Table -1 physical properties of material

Material	Specific gravity	Water absorption	Fineness modulus
Cement	3.13		<100 micron
Fine aggregate	3.00	1%	4.84
Saw dust and cow dung	1.25 and 1.33	0.20%	>600 micron
Coarse aggregates	2.72	0.5%	2.82

IV. EXPERIMENTAL PROGRAM

The saw dust and cow dung were collected from saw mills and its properties were tested. Analysis was carried out in Concrete mixtures. The concrete mix of 1:1.5:3 was prepared using water/cement ratio of 0.65 with 0%, 2%, 4% and 6%.cow dung and 6% sawdust were used concurrently as partial replacement for fine aggregates and cement respectively. The specific gravity values of cement

The specimens were cast and tested to study the possibility of using saw dust and cow dung as a substitute material for sand in concrete .The control mix, Utilizing SD(Saw dust) and cow dung replaced as the fine aggregate, was designed for the cube. Based on the laboratory trials, the mix proportion of the control mix (M25) was finalized and

they were investigated to determine the effect on compressive strength in cubes. The mixture were 0%, 2%,4%, 6%, with different cow dung value and saw dust 6% sawdust replacement in fine aggregate in analyzed. Tests to determine specific gravity, moisture content , water absorption, Bulk density, Compressive strength of cubes, for compressive test 150 x 150 mm cubes were used. A total of 48 specimens were cast and cured in water at room temperature in the laboratory for 3, 7. 14. 28 days. At the end of each curing period, three specimens for each mixture were tested for Compressive strength, and the average was recorded.

Table-2 Mix proportion

Particulars	plain concrete mix	2%	4%	6%
Cement kg/m3	349.25	349.25	349.25	349.25
Sand kg/m3	748.4	733.0	718.4	703.48
Saw dust cow dung kg/m3	0	15.4	30.00	45.00
Coarse agg kg/m3	1478.04	1478.0	1478.0	1478.0
Water kg/m3	146.74	146.74	146.74	146.74

V. RESULTS AND DISCUSSION

From the analysis done on the compressive strength of concrete using 0%,2%,4% and 6% replacement of cement and fine aggregate with cow dung and saw dust respectively. It was observed that the compressive strength of concrete at 0% replacement of cement and fine aggregate with cow dung and saw dust was 29.50N/mm² after curing for 28 days, while the compressive strength of the concrete at 2% replacement of cement and fine aggregate with cow dung and saw dust was 23.84N/mm² after curing for 28 days. It was also observed that the compressive strength of the concrete at 4% replacement of cement and fine aggregate with cow dung and saw dust was 22.46N/mm² after curing for 28 days, while the compressive strength of concrete of the concrete at 6% replacement of cement and fine aggregate with cow dung and saw dust was 21.00N/mm² after curing for 28.

Table-3 Specific gravity test result for different material

Materials	Specific gravity
Cow dung	1.33
Stone dust	3.0
Saw dust	1.25
Cement	3.13

Table-4 Compressive strength at different curing age

Percentage replacement	3 days	7 days	14 days	28 days
0	12.10	19.20	26.2	29.50
2	5.60	17.40	23.80	23.84
4	5.34	17.10	20.30	22.46
6	4.90	15,60	18.52	21.00

V.CONCLUSION AND RECOMMENDATION

From the computed results of table 4 it is obvious that the compressive strength of M25 concrete increases with increase in curing days. Also, the compressive strength of concrete at 0% replacement of fine aggregate with

cow dung and saw dust is greater than the compressive strength of concrete at 2% replacement of fine aggregate, while the compressive strength of concrete at 2% replacement of fine aggregate with cow dung and saw dust is also greater than the compressive strength of concrete at 4% replacement of fine aggregate with cow dung and saw dust. The compressive strength of concrete at 4% replacement of cement and fine aggregate with cow dung and saw dust was greater than the compressive strength of concrete at 6% replacement of fine aggregate with cow dung and saw dust. In other words, the compressive strength of concrete reduces with increase in the percentage of replacement of cement and fine aggregate with cow dung and saw dust (i.e. the higher the percentage of replacement of cement and fine aggregate with cow dung and saw dust the lower the compressive strength of the concrete).

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