

# An Experimental Study on Strength of Concrete by Using Bagasse Ash as Partial Replacement of Cement

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**Abstract:** Bagasse ash, one of the waste, is used in this study. The reason to choose the Bagasse ash to develop a novel method to transfer it to valuable product and to solve the problem of dumping the tons of bagasse waste. The importance of this alternatively stone replacement to reduce bagasse waste that is hard to lapse and in addition to reducing the pollution of nature, it also saves cost and apply the concept of Reduce, Reuse and Recycle. Concrete is most widely used construction material in the world. To solve environmental issue like deposition of waste product, recycling or reuse of waste product, I am using Bagasse ash to make eco-friendly concrete. Due to growing environmental awareness, the world is increasingly turning to researching properties of waste and finding solution on using its valuable components parts so that those might be used as secondary raw material in other branches. Green building is an increasingly important global concern and a critical way to conserve natural resources and reduce the amount of materials going to our landfills. Large quantities of waste are generated from sugar factories. Today the construction industry is in need of finding effective materials for increasing the strength of concrete structures with low cost, and with less environmental damage. This research is aimed at addressing such issues by investigating the possibility of using bagasse ash to partially substitute for cement in concrete production. The compressive strength properties at different percentages replacement of cement with bagasse ash were investigated in laboratory. By replacing cement with 0%, 4%, 8% and 12% of the bagasse ash in concrete is studied. To ensure the success of this study, the materials to be used are as coarse aggregate, cement, sand, water and bagasse ash. In addition, there are two trial mixes to be made i.e., 1) Ordinary Concrete, 2) Concrete with addition of bagasse ash for M-30 grade of concrete. These samples are compared with Ordinary Concrete with Crush Sand.

**Keywords:** Bagasse ash, compressive strength, workability.

## 1. Introduction

Due to rapid industrialization and urbanization in the Country, lots of infrastructure developments are taking place. This process has in turn led questions to mankind to solve the problems generated by this growth. The problems de-coarse are acute shortage of constructional materials increased dumping of waste products. Hence in order to overcome the above said problems waste products should be employed as construction

material. The construction industry is in need of finding effective materials for increasing the strength of concrete structures with low cost, and with less environmental damages.

Bagasse ash is a very versatile material. Due to the industrial revolution, and its large-scale production bagasse ash seems to be a cheaper and effective raw material. To solve environmental issue like deposition of waste product, recycling or reuse of waste product, I am using Bagasse ash to make eco-friendly concrete. Due to growing environmental awareness, the world is increasingly turning to researching properties of waste and finding solution on using its valuable components parts so that those might be used as secondary raw material in other branches. Therefore, utilizing bagasse ash in concrete production not only solves the problem of disposing this ultra-light solid waste but also helps preserve natural resources.

### A. Significant of the Project

- To reduce the space required for landfill of bagasse ash.
- To diminish the pressure on exploiting the natural resources.
- To introduce the potential of bagasse ash as replacement of cement.

## 2. Methodology

### A. Materials Used

#### 1) Cement

Cement is a well-known building material and has occupied an indispensable place in construction work. There is a variety of cement available in market and each type is used under certain condition due to its special properties such as colour and composition of cement. The function of cement is first to bind the sand and coarse aggregates together and second to fill the voids. Although cement constitutes only about 10 percentage of the volume of the concrete mix, it is the active portion of the binding medium and the only scientifically controlled ingredient of concrete. Locally available cement is used. Like PPC (Ultra Tech- Cement).

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2) *Fine aggregate*

Crush Sand is also known as Artificial Sand. Only sand manufactured by Crusher is cubical and angular in shape. There is standard specification for Fine Aggregates (Sand). It is divided in four gradations Zone-I, Zone-II, Zone-III & Zone-IV. Generally, the size of the aggregate lesser than 4.75 mm is considered as Fine Aggregate.

3) *Water*

Water fit for drinking is generally considered fit for making concrete. Water should be free from acids, oils, alkalies, vegetable or other organic impurities. Water is used for mixing, curing purpose should be clean and portable, fresh and free from any bacteria and desire matter confirming to IS 3025-1964 is used for mixing. Soft water also produces weaker concrete. Water has two functions in concrete mix. Firstly, it reacts with the cement to form a cement paste; secondly it serves as a vehicle or lubricant in the mixture of fine aggregate and cement. Water is a key ingredient in the manufacturer of concrete. Ordinary tap water is used for concrete mix.

4) *Bagasse ash*

Bagasse ash obtained from Sugar Factories. bagasse ash is versatile material for recycling. The bagasse ash obtained from sugar factories was used in this experimental program. Bagasse ash obtained from Sugar Factories. bagasse ash is versatile material for recycling. The bagasse ash obtained from sugar factories was used in this experimental program.

B. *Casting of Specimen*

Test specimens of Cubes of size 150mm x 150mm x 150mm will prepared using the standard moulds. The samples are cast. The samples are remoulded after 24hrs of casting and kept in a water tank for 7 and 28 days curing. A total of 24 specimens cast for testing the properties such as compressive strength, and flexural strength.



Fig. 1. Compression testing machine set up

24 cube samples of size 150mmx150mmx150mm for different percentages of bagasse ash in partial replacement of cement will be casted. The concrete mixes are 0%, 4%, 8%, 12% bagasse ash with partial replacement of cement. All cubes will

be casted in one lift and consolidated using tamping rods. After final setting of cubes, the cube moulds will be removed and cubes will be kept in water tank for curing up to 7 and 28 days.

After final setting of cubes, the cube moulds will be removed and cubes will be kept in water tank for curing up to 7 and 28 days.

Table 1  
Number of cubes casted for 7 days and 28 days

% of Bagasse Ash	No. of Cube Cast	
	7- Days	28-Days
0	3	3
4	3	3
8	3	3
12	3	3

3. **Workability**

The workability of M30 grade of concrete is measured by widely used empirical test i.e., slump test with w/c ratio 0.40 for addition of different percentage of bagasse ash.

Table 2  
Slump values for different percentage of mix

% of Bagasse Ash	Slump value (mm)
0	82
4	77
8	70
12	60

4. **Experimental Methodology**

A. *Compressive Strength Test*

The result of compressive strength After 7 days and 28 days are recorded. Result indicates that as we increase percentage of bagasse ash from 0% to 4% its compressive strength increases after further increment in percentage of bagasse ash there is loss in compressive strength. That means we can replace up to 4% cement by bagasse ash.

5. **Experimental Results**

A. *Compressive Strength Test*

Table 3  
Results of compressive strength

% of Bagasse Ash	Compressive Strength (N/mm <sup>2</sup> )	
	7- Days	28- Days
0	24.10	37.87
4	24.67	37.87
8	17.86	34.42
12	10.84	13.76

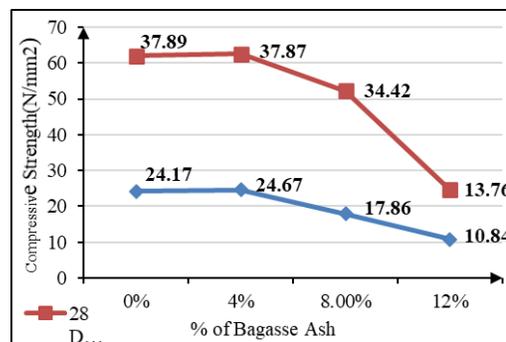


Fig. 2. Compressive strength at 7 and 28 days

## 6. Conclusion

1. It is observed that with increase in percentage of bagasse ash workability decreases.
2. Bagasse ash concrete is cheaper than conventional concrete.
3. Current study concluded that bagasse ash can replace cement up to 4%.
4. The use of bagasse ash in concrete is possible to improve its compressive strength.
5. The results of the slump tests of bagasse ash as cement in concrete mixtures, these results indicate that the slump value of fresh concrete is prone to decrease with increasing the ash cement ratio.
6. The slump was about 82 mm for concrete without any bagasse ash and the slump was about 77 mm for replacement of 4% bagasse ash as cement in concrete.

## References

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