

COCONUT SHELL AS AGGREGATE IN CONCRETE

Wagdare Nagesh Rajshekhar¹, Patel Faizan Mohsin², Hajare Akshay Govind³

^{1,2}Student of Diploma in Civil Engineering Department Vishveshwaryya Abhyantriki Padvika Mahavidyalay, Almala, Maharashtra, India 413520.

³Lecturer in Civil Engineering Department Vishveshwaryya Abhyantriki Padvika Mahavidyalay, Almala, Maharashtra, India 413520.

Abstract- Properties of concrete with compressive strength of concrete were studied. Coconut shell (CS) is used as aggregate in concrete. Now-a-days there is large use of aggregate is increasing day by day so rather than using coarse aggregate in concrete, natural material coconut shell shall be used for some construction. Coconut shell is a waste material from coconut and it is quite strong like aggregate. In that two mixes were made first one with aggregate and second one with replacement of aggregate i.e. with coconut shell. The cubes were made on site and tested under compressive testing machine and results were obtained. The main advantage of CS concrete is that it

is light in weight.

Key Words: Coconut shell, cs, coarse aggregate, replacement, light weight concrete.

1. INTRODUCTION

The project idea develops from the very fact that there is tremendous use of coarse aggregate is increasing day by day. Coarse aggregate is made up of stone quarries, gravel in the river. So we used coconut shell which is locally available material, in concrete as replacement of it.

In civil engineering construction, using alternative materials in place of coarse aggregate in concrete production makes concrete as sustainable and environmental friendly construction material. Coconut shell is being hard and not easily degrade material. If it is crushed to size of sand can be put in shall material to substitute sand. There were many experimental work conducted to improve the properties of concrete by putting new materials, whether it is natural material or recycled material or synthetic material in concrete mix. The high cost of conventional building materials is a major factor affecting housing delivery in India. There is an advantage of using coconut shell that it is biodegradable.

2. Experimental Investigation

2.1 Materials

The constituents, materials used in the investigation were collected from local sources. Ordinary Portland cement used which was fresh. Normal aggregate of size 20 mm is used as coarse aggregate. Specific gravity of coarse aggregate was 2.65 coconut shell where broken into two pieces with the help of hammer. The shells were collected from a local temple and air dried for 3 to 5 days in a dry place. Sand used in the project was collected from a local supplier.

2.2 Mix proportions

In order to investigate compressive strength of coconut shell concrete two mixes were made. One with Coconut shell and other with aggregate. The materials were mixed with proportions and six cubes were casted. Three cubes of normal concrete and three cubes of CS concrete. Free water cement ratio was maintained constant at 0.6 for all concrete mixes.

2.3 Mixing, Compaction and curing

The concrete was mixed in a tray of 50kg capacity. The mixing time kept 3-4 min. All the materials cement, sand, aggregate and CS gently mixed with each other and compacted with the help of tamping rod. Specimens were prepared and kept 24 hours for undisturbed condition. After 24hours the specimen were remoulded and immersed in a curing tank which was fully filled with fresh water. Curing was for 3,7 and 28 days for six cubes respectively.



Fig: mixing of materials

3. Testing

3.1 Compressive Strength test

Compressive Strength of concrete is most important parameter and hence this test is one of the most important test. Six cubes were tested under compressive testing machine at 3,7and 28 days each of curing. Load should be applied gradually at rate of 140kg/cm² per minute till specimen fails. Load at failure divided by area of specimens gives compressive strength of concrete. The load applied to cube until it broken into pieces .The readings noted down and further discussed in results and conclusion. The value of load in KN is converted into N/mm².

4. Results

Results of experiment of compressive strength is mentioned in following table.

- For normal concrete

Sr. no.	Days	Compressive Strength
01	3 days	4.26N/mm ²
02	7 days	6.04N/mm ²
03	28 days	10.80 N/mm ²

Average compressive strength – 7.03 N/mm²

- For coconut shell concrete

Sr. no.	Days	Compressive Strength
01	3 days	3.27N/mm ²
02	7 days	6.25N/mm ²
03	28 days	7.54N/mm ²

Average compressive strength- 5.68 N/mm²



Fig: Compressive strength test on Coconut shell concrete

5. CONCLUSIONS

The above data shows coconut shell can be used in place of normal aggregate however performance of coconut shell aggregate concrete is little lower than normal aggregate concrete. The main points of this study are

1. As the CS percentage increased density of concrete decreased.
2. The compressive strength of coconut shell concrete of 3,7 and 28 days are 3.27 N/mm², 6.25 N/mm² and 7.54 N/mm² and average strength was 5.68 N/mm².
3. As CS percentage increased seven days strength gain also increased with corresponding 28 days curing strength.
4. From overall study CS is a natural waste product it is easily available from temple, grocery shops. Rather than using aggregate coconut shell can be used in construction.

6. Advantages

- Coconut shells are more resistant towards crushing, impact and abrasion.
- Easily available in local areas like temple, grocery shops etc.
- Producing concrete by reducing cost of material.
- It has excellent workability as compared to conventional concrete.
- It promotes green construction.
- Coconut shells are light in weight as compared to normal aggregate.
- It increases speed of construction.
- There is no need of treating coconut shells before usage.

7. REFERENCES

1. Apeksha Kanojia, S.K. Jain: "Performance of Coconut Shell as Coarse Aggregate in Concrete: A Review" (2015), International Research Journal of Engineering and Technology (IRJET), Volume: 02 Issue: 04 July 2015.
2. Amarnath Yerramala, Ramachandrudu C: "Properties of Concrete with Coconut Shells as Aggregate Replacement"(2012) International Journal of Engineering Inventions, Volume 1, Issue 6 (October 2012).
3. B.Damodhara Reddy, S. Aruna Jyothy, Fawaz Shaik: "Experimental Analysis of the Use of Coconut Shell as Coarse Aggregate"(2014). IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), Volume 10, Issue 6 (Jan, 2014).
4. Ajay Lone, Aniket Deshmukh, Pandit Jadhav, Rahul Patil, Pritee Mistry: "Test on Coconut Shell as Partial Replacement of Coarse Aggregate in Cement Concrete" (2016). International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169 Volume: 4 Issue. Basri H.B. et al (1999), "Concrete using waste oil palm shells as aggregate", International Journal of Cement and Concrete research, pp 619-622.
5. Joseph Khedari et al (2001). "New lightweight composite construction materials with Low thermal conductivity" International Journal of Cement & Concrete Composites, 65-70.
- 6 Mannan. M.A. and Ganapathy. C (2002). "Engineering properties of concrete with oil Palm shell as coarse aggregate", International Journal of Construction and Building Materials, pp 29-34.