Effective Performance of Different Types of Agro Waste Ashes in Concrete

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Abstract – Cement is a one of the innovative material in civil engineering. Production of cement creates lot of environmental problems, cement as a binder material cannot be avoided fully, but partially it can be replaced by various materials. Lot of research are under process to replace alternate material for cement. To achieve this goal in these work Different types of agro waste ashes such as rice husk ash, sugarcane bagasse ash, palm oil fuel ash, and coconut coir pith ash were used. In this work different types of ashes were replaced with cement for 15% and 25% and strength such as tensile and flexural strength is carried out. Mix design was done for M20 Grade of concrete as per IS 10262:2009 .Palm oil ash and sugarcane ash showed good increase in strength.

Index Terms – Environmental problems, Agro Waste Ashes.

1. INTRODUCTION

During recent times, many works have been conducted for using the different types of agro waste ashes such as rice husk ash, sugarcane bagasse ash, palm oil fuel ash, coconut coir pith ash. From previous researches material such as fly ash has been successfully used, in the same way to eliminate the waste and to find an alternative material for cement different types of ashes were tried out

The main Objectives of This work was to examine the fresh properties of rice husk ash, sugarcane bagasse ash, palm oil fuel ash, coconut coir pith ash in concrete and to find the tensile strength and flexural strength in concrete

Concrete is the construction material that always expose to the environment and chemical attack that can caused damage on it structure.

In recent years, studies are carried out by various researchers using waste generated from the agricultural and industrial activities as partial replacement of cement in making concrete [11]

[9] States that the utilization of rice husk ash as mineral admixture in concrete provides several advantages. Its incorporation as supplementary cementations material has led to increase in compressive strength of concrete. Abdullah and Hussin, (2006) states that the palm oil fuel ash is a by-product produced in palm oil mill. After palm oil is extracted from the palm oil fruit, both husk and shell of palm oil are burned as fuel in the boiler of palm oil mill. Generally, after combustion about 5% palm oil fuel ash by weight of solid wastes is produced.

2. MATERIALS

Cement

Ordinary Portland cement of 53 grade was used as per refer IS 12269. Specific gravity was found to be 3.15

Fine Aggregate

River sand free from impurities was used as fine aggregate as per IS: 383-1970. The size aggregate is less than 4.75 was used. It is collected from local available area.

Coarse Aggregate

The aggregate tested as per IS: 383-1970 and result are within the permissible limits. Size of coarse aggregate used was 20mm

Water

Potable water free from impurities was used as per IS Specification

Palm oil fuel Ash

An oil palm industry is production of biomass fuel and precursors of food product. In an oil extraction processing, the oil palm produces a considerable amount of solid waste by-product in the form of fibres, nut shells, empty fruit bunches. The shells and fibres are used as fuel for a steam production in the oil palm mill. After combustion in the steam boiler, oil palm ash is a by-product from the steam boiler as a biomass fuel. The sample was collected from the industry. After collected the ash was sieved through IS sieve size 90µm and then used

Sugarcane baggasse Ash

Sugarcane is one of the major crops grown in India Sugar cane Ash was obtained by burning sugarcane waste. Size was found less than 90micron

Coir pith Ash

The ash is the product of burning coir pith waste. Coir ash of size less than 90micron was used

Rice husk Ash

Rice is the major production in India, by burning rice husk ,rice husk ash can be obtained. It is sieved in 90micron sieve .

METHODOLOGY

Sugarcane ash, palm oil ash, rice husk ash and coir ash was replaced for 15% and 25%As per IS: 516-1959 recommendation tensile strength and flexural strength was done. The test specimen were cast and tested after 7, 21, 28 days.

MIX DESIGN

The mix design procedure recommended in the IS standard of IS: 10262-2009 was followed. Slump value found was found to be 50mm. Ratio was found to be 1:1.5:3

3. RESULTS AND DISCUSSION

SPLIT TENSILE TEST

Usually testing is done after 7 days, 21 days and 28 days, the days being measured from the time the water is added to the dry ingredients. Test specimens immediately on removal from the water and while they are still in the wet condition, wipe of the surface water. The concrete is not usually expected to resist, the direct tension because of its tensile load and brittle in nature. The cracking is identified in the form of tension failure to determine the maximum tensile load carrying capacity. The test is carried out on a cylindrical specimen of size 150mm dia and 300mm length as per Indian standard. Test results are shown in fig 1 to fig 3.Conventional concrete for 7days curing was found to be 1.66MPa,21 days was found to 2.45MPa and 28days Curing was found to be 3.21MPa .where 'S' indicates sugarcane ash, 'P' indicates palm oil ash, 'C' Indicates coir ash and 'R' Indicates rice husk ash

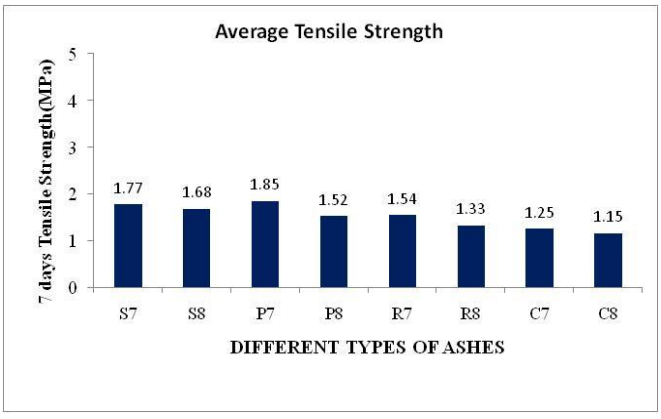

Fig. 1 Tensile strength of different ash concrete at 7 days

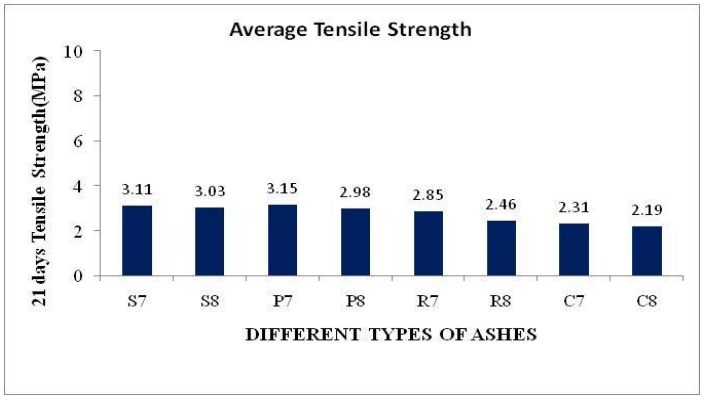

Fig. 2 Tensile strength of different ash concrete at 21 days

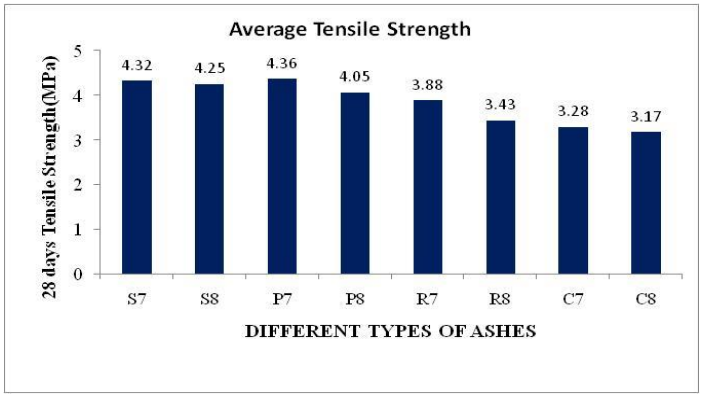

Fig. 3 Tensile strength of different ash concrete at 28 days

Flexure Strength

The resistance of concrete offered to tension under flexural loading is called its flexural strength. Prism of size 100mmx100mmx500mm was cast and cured for 7, 21 and 28 days respectively. Two point loading was done as per IS:516-1959 and test results were shown in fig 4 to fig 6. Conventional concrete for 7days curing was found to be 3.65 MPa, 21 days was found to 5.97 MPa and 28days Curing was found to be 7.18 MPa

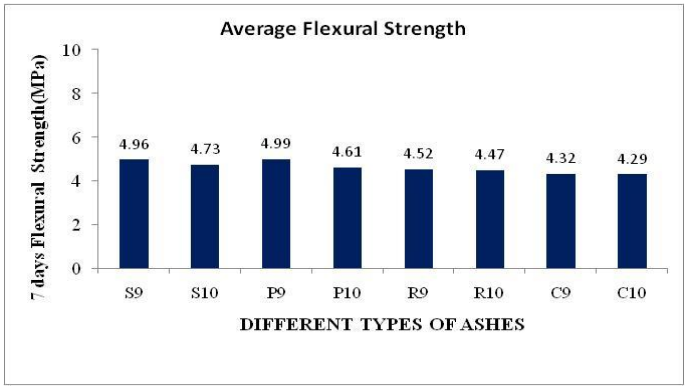

Fig. 4 Flexural strength of different ash concrete at 7 days

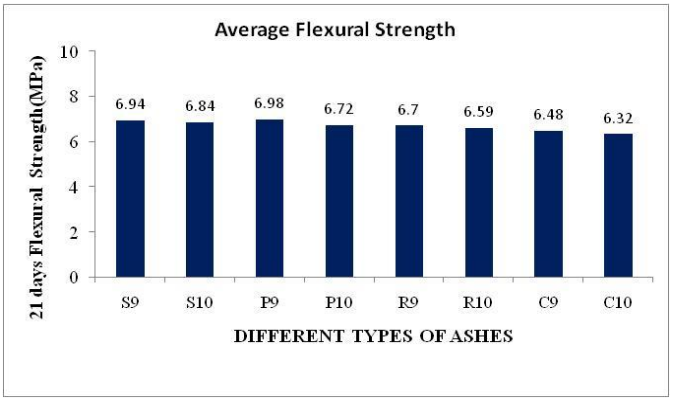

Fig. 5 Flexural strength of different ash concrete at 21 days

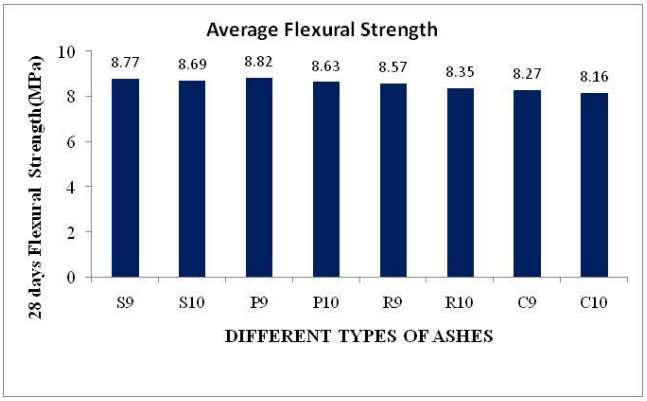

Fig. 6 Flexural strength of different ash concrete at 28 days

4. CONCLUSION

From the experimental work the following results were drawn

- The 15% of different ash concrete was found to give more strength that conventional concrete
- The tensile strength and flexural of different ash based concrete was found to more than conventional concrete in case of sugarcane and palm oil ash
- Tensile strength and flexural strength was found to be increasing in case of palm oil ash and sugar cane ash when compared to control concrete
- Tensile strength and flexural strength was found to be less when compared to control concrete for coir and rice husk ash
- Using of agro waste ashes such as rice husk ash, sugarcane bagasse ash, palm oil fuel ash, and coconut coir pith ash is eco friendly and cost effective
- 15% of replacement of sugarcane bagasse ash, palm oil fuel ash was found to be better in flexural and tensile strength.

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