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A Study on Partial Replacement of Cement with Coconut Shell Ash and Egg Shell Powder in M-45 Grade Concrete

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***Abstract*— In this study development of concrete by making an efficient mix design with few mineral admixtures tends for high strength concrete. The development of the mix design method plays a key role in concrete technology. It involves the process of experimental determination of the most appropriate concrete mixtures to achieve maximum resistance with at least economic costs. This study represents the influence of (CSA) and egg shell powder. (CSA) and egg shell powder mixed in cement concrete for the workability and strength for concrete, adding few percentages of (CSA) and egg shell powder into ordinary Portland cement with removing that much percentage of ordinary Portland cement 5% to 25% by total weight of OPC. In this study total Twenty-four trial mix, control mix and variation mix were prepared for and M45 of concrete to find out Compressive strength 7 days and 28 days by cube, Flexural strength 28 days by beam & Splitting Tensile strength 28 days by Cylinder, then strength was found on the basis of result (CSA) and egg shell powder concrete compared to normal concrete**

***Index Terms*— High strength concrete, compressive strength, mix design, (CSA) and egg shell powder workability, flexural strength, splitting tensilestrength.**

I. INTRODUCTION

1.1 Aim of ThisStudy

• To obtain the resistance of grades M45 and M50 with the replacement of cement by CSA and egg shell powder.

• Main aim of this study is to use of CSA and egg shell powder as mineral admixture which was partially replaced for effect onworkability.

• In this work the following properties of concrete were worked out such as Compressive strength, Flexural strength and Split tensile strength for M45 & M50 grade of concrete by using (CSA) and egg shell powder.

• To compare the engineering properties of improved concrete for M45 & M50 (partially replacement) samples with conventionalconcrete.

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• To compare the engineering properties of improved concrete and find out its eco- friendly property and economiccondition.

• To provide economical concrete by using waste material as mineral admixture and reduce the emission of CO2 by decreasing productivity ofcement.

II. LITERATURE REVIEW

S. Ramanagopal, B. Mahalingam, P. Sreehari, K. Mohammed Haneefa have studied on fresh and hard concrete and mechanical properties of concrete with 30% Fly ash and egg shell powder replace by cement, and reduction in compressive property and flow is based on microstructure and porosity growth. Geopolymer concrete provides high chemical resistance and save thermal problem. They reduce shrinkage and thermal conductivity.

• Fly ash and egg shell powder add in concrete make light weight concrete that type concrete use in partition wall and that wall have good thermal insulation and sound resistance.

Nidhi Relan, Dr. A K Saxena have studies on concrete properties influence by the egg shell powder replace by cement. In this study cement replace by egg shell powder 0%,5%,10%,12.5%,15%,20% and 25%interval.

• In this study 12.5% interval proved better compressivestrength.

• Concrete provide good workability with egg shell powder compare to the control mix of concrete GradeM35.

• Finely grounded SCBA can be utilized in concrete and is liable for higher compressive strengths than control mix concrete

Santosh Kumar Karri, G.V.Rama Rao, P. Markandeya Raju have studied on Effect of M20 and M40 grade concrete replace of cement with ground granulated blast furnace slag (GGBS) by replacing cement interval 30%, 40%, 50%. Specimen tested for mechanical properties. Durability studies with sulphuric acid and hydrochloric acid.

• Increase workability of concrete when increases GGBS interval inconcrete.

• Achieve maximum compressive strength M20 and M40 grade when add the GGBS in concrete and split tensile strength of concrete is improve when cement withGGBS.

• The flexural strength of concrete is also increased when the cement is replaced by GGBS at 40% replacement, the flexural strength ismaximum.

K. Gopi Sankar, Dr. G. V. Rama Rao have studied effect on concrete strength determining mechanical strength when compared with control concrete mix of M30 when replaced the cement with admixtures Sugar Cane bagasse ash, Ground Granulated Blast Furnace Slag & Waste Wood Ash in increasing proportions equally (0%,30%(10+10+10),36%, 42%,48%,54%) in weight.

- 30% Portland cement replaced with Sugar Cane ash Admixtures without any effect on the desirable properties ofconcrete.
- Replacement with Sugar Cane ash development of characteristic strength, less early heat of hydration resulting in less thermal shrinkagecracks.

III. Proportion of CSA and Sugarcane Bagasse Ash with Control Mix

In control mix, cement has two variations with (CSA) and Egg shell powder. Variation was to to replacement0% to 25% (CSA) and egg shell powder of the weight of cement at interval of 5% concrete mixes for M45.

Table 1 Replacement of OPC by % (CSA) and Egg shell powder forM45

S.No	Mix Name (OPC+CSA+ESP)	cement (Kg)	CSA(Kg)	ESP	Coarse Aggregate(Kg)		Fine Aggregate (Kg)	Water (Kg)	Admixture (Kg)
					20mm	10mm			
1	(100+0+0)	492.5	0	0	672.66	448.45	653.47	167.45	8.86
2	(95+2.5+2.5)	467.87	13.54	11.08	672.66	448.45	653.47	167.45	8.86
3	(90+5+5)	443.25	27.08	22.16	672.66	448.45	653.47	167.45	8.86
4	(85+7.5+7.5)	418.62	40.63	33.24	672.66	448.45	653.47	167.45	8.86
5	(80+10+10)	394	54.17	44.32	672.66	448.45	653.47	167.45	8.86
6	(75+12.5+12.5)	369.37	67.71	55.40	672.66	448.45	653.47	167.45	8.86

IV. RESULTS AND ANALYSIS

Table 2 Slump on **Replacement** of OPC by CSA and Egg shell powder For M45 Grade

S.No	Mix (Cement+CSA+SA)	Slump (mm)
1.	(100+0+0)	125
2.	(95+2.5+2.5)	137
3.	(90+5+5)	152
4.	(85+7.5+7.5)	156
5.	(80+10+10)	161
6	(75+12.5+12.5)	164

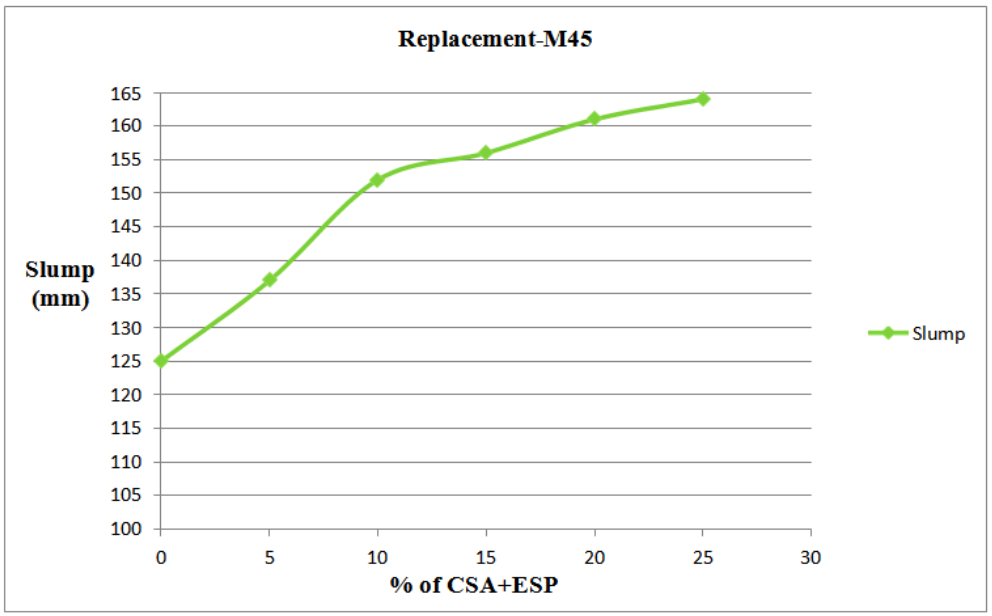

Fig. 1 Affect of CSA and Egg shell powder on Slump of Concrete (M45) on Replacement

CompressiveStrength

The compressive strength of CSA mixes was measured with cube specimen of size 150mm(length) x 150mm(width) x 150mm(depth).

Table 3 7 & 28 Days Compressive Strength of Cube on **replacement** of CSA and ESP into OPC For M45Grade

S.No	Mix (Cement +CSA+SA)	Compressive Strength(N/mm^2)	
		7 Days	28 Days
1	(100+0+0)	36.38	53.31
2	(95+2.5+2.5)	36.93	54.48
3	(90+5+5)	38.57	54.83
4	(85+7.5+7.5)	38.57	55.57
5	(80+10+10)	36.74	54.86
6	(75+12.5+12.5)	32.16	52.22

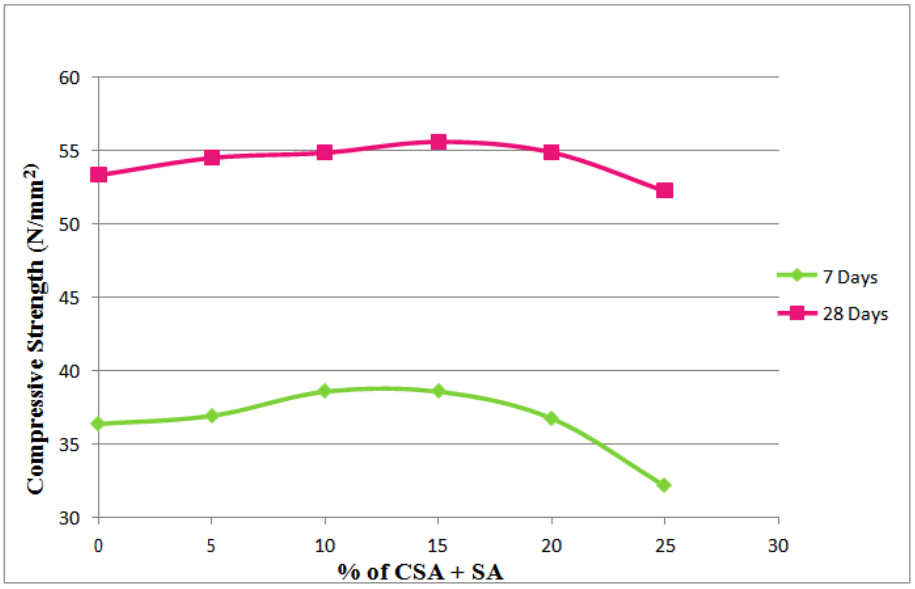

Fig. 2Affect of CSA and ESP on Concrete of M45 Grade on Replacement for 7 & 28 Days Compressive Strength of Cube
Flexural Strength

The Flexural strength of CSA mixes was measured with beam specimen of size 700mm(length) x 150mm(width) x 150mm(depth).

Table 4 28 Days Flexural Strength of Beam on **Replacement** of OPC by CSA and Egg shell powder

For M45 Grade

S.No	Mix (Cement + CSA+SA)	Flexural Strength(N/mm^2)
1	(100+0+0)	7.33
2	(95+2.5+2.5)	8.10
3	(90+5+5)	8.32
4	(85+7.5+7.5)	8.76
5	(80+10+10)	7.97
6	(75+12.5+12.5)	7.43

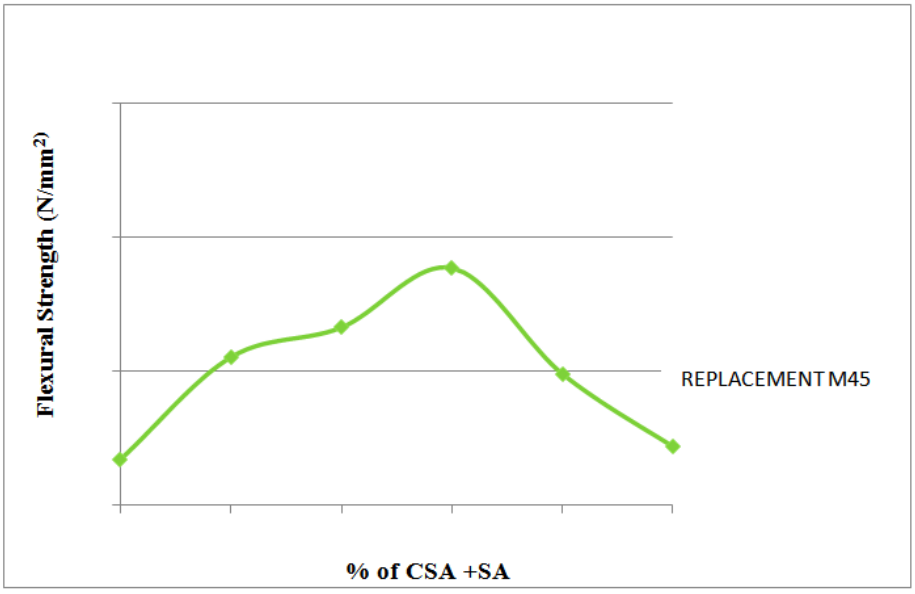

Fig. 3 Affect of CSA and Egg shell powder on Concrete of M45 Grade on Replacement for 28 Days Flexural Strength of Beam

V. CONCLUSION

By evaluating the results of Slump test, Density test, Compressive Strength test, Flexural Strength test. Following conclusions have beendrawn

a) Tabulated of Result

S.No.	Test	M45 Results
1	Slump	Slump was higher (Partial Replacement of CSA and egg shell powder)compare to control mix M45
2	Density	Density was Higher (Partial Replacement of CSA and egg shell powder)Compare to control mix M45
3	Compressive Strength	Compressive strength in Partial replacement 5.4% was greater then control mix M45

4	Flexural Strength	Flexural strength in Partial replacement 15% was greater then control mix M45

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