



A Effect on Natural Admixture on Conventional Concrete and FlyAsh Blended Concrete

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Abstract: In the present work, Kadukkai (*Terminalia Chebula*) is used as natural admixture and examined its effect on the properties of conventional concrete and fly ash blended concrete. In detail, the effect of *Terminalia Chebula* on the properties such as compressive strength and split tensile strength of fly ash blended concrete and conventional concrete was investigated. The consistency increased with increase in dosage of natural admixture up to 2% for fly ash blended binders. Various percentages of fly ash such as 10, 20, 30, 40 and 50% and Kadukkai (*Terminalia Chebula*) powder of 0.25, 0.5, 0.75 and 1.0% are investigated. The mechanical properties of the conventional concrete as well as fly ash blended concrete are improved by addition of natural admixture at an optimum dosage of 0.75%. On the other hand, the consistency of fly ash blended concrete increases with increased dosage of natural admixture up to 2%. It has been observed that with the optimum dosage of natural admixture, the fly ash blended concrete achieved the desired strength at 28 days of curing. In a nutshell, the concrete mixture containing 0.75% of natural admixture and 30% of fly ash for M 25 grade of concrete

Keywords: Conventional concrete, Compressive strength, Fly ash, Split tensile strength and *Terminalia Chebula*.

1. INTRODUCTION

Herbal admixtures are eco-friendly and definitely act to increase durability and strength of the concrete. As the need of characteristics such as high performance, high workability, high compressive strength and high durability parameters to the modern structures, attempts have been made to obtain concrete with certain desired characteristics by employing the various types of admixtures (synthetic and natural). Our ancestors have employed various types of herbs as admixtures in construction to improve overall performance of the structure. Herbal extracts such as aqueous extract of Palm jaggery (from *Borassus flabellifer*), Kulamavu (*Persea macrantha*), Pananchikaai (*Cochlospermum religiosum*), Oonjalvalli (*Cissus glauca* Roxb) and kadukkai (*Terminalia chebula*) are being used and tested for its workability, compressive strengths and porosity.

2. OBJECTIVES OF THE PRESENT STUDY

- Evaluation of the effects of Kadukkai (*Terminalia Chebula*) on fresh and hardened properties of concrete mixtures produced using cement and fly ash as binders.
- Optimization of the Kadukkai (*Terminalia Chebula*) dosage.

3. MATERIALS

3.1 Cement

Locally available Ordinary Portland cement of 53 grade for the casting of specimens and confirmed to IS: 12269-1987.

3.2 Fine Aggregate

The specific gravity and water absorption of the sand were 2.8 and 1.5% respectively. Sieve analysis of sand was conducted as per IS 383:1970 and confirmed to zone-II sand.

3.3 Coarse Aggregate

The water absorption and specific gravity of the coarse aggregate were found to be 0.4% and 2.8 respectively.

3.4 Water

The potable water was used throughout the study which satisfies water standards as per IS 456-2000.

3.5 Fly ash

Fly ash was used as an additive of Class C type. The properties of fly ash collected from the Vijayawada Thermal power plant.

4. RESULTS AND DISCUSSION

4.1 Compressive strength

The compressive strength of cube evaluated in compression testing machine and results are furnished in table 1-4

Table1:Compressive strength of fly ash blended concrete

Flyash	Compressive Strength,N/mm ²		
	28 days	56 days	90 days
0%	32.44	35.18	37.71
10%	34.66	37.77	40.53
20%	40.95	44.36	47.64
30%	41.51	45.10	48.41
40%	40.34	43.84	46.93
50%	37.34	40.56	43.66

Table2:Compressive Strength of chebula powder

Chebula Powder %	Compressive Strength,N/mm ²		
	28 days	56 days	90 days
0%	32.44	35.18	37.71
0.25%	40.69	44.20	47.56
0.5%	41.55	45.03	48.59
0.75%	42.43	46.05	49.31
1.0%	39.95	43.40	46.733

Table3:Compressive Strength of concrete with 30% Fly ash+0.75% Chebula powder

Combined replacements	Compressive Strength,N/mm ²		
	28 days	56 days	90 days
0%	32.44	35.18	37.71
30%Flyash+0.75%Chebula powder	46.50	50.61	54.20

4.2 Split tensile strength

The split tensile strength of cast specimens was evaluated in a compression testing machine and results are furnished in table 5.

Table 5:Split Tensile Strength of Fly Ash Blended Concrete

Flyash	Split tensile Strength,N/mm ²		
	28 days	56 days	90 days
0%	2.91	3.16	3.41
10%	3.39	3.67	3.96
20%	3.98	4.32	4.64
30%	4.35	4.74	5.08
40%	3.91	4.24	4.54
50%	3.65	3.97	4.25

Table6:Split tensile strength of Terminalia Chebula blended concrete

Chebula Powder %	Split tensile strength,N/mm ²		
	28 days	56 days	90 days
0%	2.91	3.16	3.41
0.25%	3.98	4.33	4.63
0.5%	4.03	4.37	4.69
0.75%	4.45	4.83	5.18
1.0%	3.87	4.19	4.50

Table7:Split tensile strength with 30%FLYASH+0.75CP

Combined replacements	Split tensile Strength,N/mm ²		
	28 days	56 days	90 days
0%	2.91	3.16	3.41
30%Flyash+0.75%Chebula powder	2.97	3.23	3.45

4.4 Ultrasonic pulse velocity

The UPV test was conducted for the cast specimen's and results are furnished in table 8-10.

Table 8:UPV of fly ash blended concrete

Flyash	UPV(m/s) 28 days
0%	4220
10%	4387
20%	4551
30%	4693
40%	4567
50%	4495

Table 9:UPV of Terminalia Chebula blended concrete

Chebula Powder	UPV(m/s) 28 days
0%	4220
0.25%	4304
0.5%	4398
0.75%	4551
1.0%	4447

Table 10:UPV with 30%FLYASH+0.75CP

Combined replacements	UPV(m/s) 28 days
0%	4220
30%Flyash+0.75%Chebula powder	4858

5. CONCLUSIONS

1. The compressive strength of concrete of normal concrete at 28, 56 and 90 days are 32.44, 35.18 and 37.71 N/mm².
2. The compressive strength of concrete using 30% flyash replacement with cement at 28, 56 and 90 days are 41.51, 45.10 and 48.41 N/mm².
3. The compressive strength of concrete using 0.75% chebula powder replacement with fine aggregate at 28, 56 and 90 days are 42.43, 46.05 and 49.31 N/mm².
4. The compressive strength of concrete using 30% flyash and 0.75% chebula powder 28, 56 and 90 days are 46.50, 50.61 and 54.20 N/mm².
5. The split tensile strength of concrete of normal concrete at 28, 56 and 90 days are 2.91, 3.16 and 3.41 N/mm².
6. The split tensile strength of concrete using 30% flyash replacement with cement at 28, 56 and 90 days are 4.35, 4.74 and 5.08 N/mm².
7. The split tensile strength of concrete using 0.75% chebula powder replacement with fine aggregate at 28, 56 and 90 days are 4.45, 4.83 and 5.18 N/mm².
8. The split tensile strength of concrete using 30% flyash addition with 0.75% chebula powder in concrete at 28, 56 and 90 days are 2.97, 3.23 and 3.45 N/mm².
9. The UPV for normal ,30% fly ash 0.75% of chebula powder and combined 30%flyash and 0.75% chebula powder with total concrete at 28 days are 4220 and 4693,4451,4858 m/s.

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