

The Effect on Strength of Concrete by Partial Replacement of Cement and Fine Aggregate with Flyash, Granite Powder and Plastic Fibres

V. Divyasri , B.K.Chaitanya, S.Ramlal



Abstract: The rapid growth of the population leads to a requirement of infrastructure this leads to scarcity of raw material for construction such as cement and sand. The other hand pollution growing due to thermal power plants, granite polishing unit and plastic waste this need to be removed. This gives an idea of using this compound as a raw material in concrete making. This concept found to effective minimizes disposal of fly, granite power and plastic wastes, and leads towards Green Building Concepts. In this investigation of M25 grade normal concrete is made by cement, sand, and aggregate which is tested and compared by special concrete. The concrete mix is prepared as per 10262 -2019 by adding replacing small amount of Fly ash in place of cement OPC 53 grade, and fine aggregate is prepared by partial replacing with granite powder (0%,10%,20%,30%)and another mix is prepared by adding 0.5 nylon fiber, partial replacement of fine aggregate with granite powder (0%,10%,20%,30%)specimens are casted . The casted specimens are tested for split tensile strength and compressive strength 7, 14 and 28 day's respectively and these results also compared with each other. It is observed that compressive strength and split tensile of concrete at 28days of curing show max value when compared with normal concrete. When the percentage of granite powder increases to 30% it shows that a decrease in both split tensile strength of concrete and compressive strength. When we added fiber to the concrete there is an increase in compressive strength and split tensile strength but there is a not much increase in compressive strength but increase in split tensile strength

Keywords: fly ash, granite powder, nylon fibers, M25 grade concrete, Compressive strength and Split- tensile strength

I. INTRODUCTION

Plastic waste is a series problem due to low biodegradability and produces pollution when it burns in the open atmosphere it causes air pollution, it also pollutes land and water. Fly ash produced in coal-burning industries and granite is produced in granite polishing industries. Granite powder and fly ash cause air pollution and water pollution which cause series health

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problem to human such as respiratory problem and cancer. These problems lead to think of an alternate way to solve these problems. Such kind of way is using this waste as a partial replacement of cement and fine aggregate .fly ashes have good binding properties that can be utilized as cement partial replacement. It also increases the workability of concrete decrease the required w/c ratio. The granite powder can replace with the fine aggregate and adding plastic fiber to the concrete improves the split tensile strength of the concrete. The combined action of fly ash 10%, granite powder varying percentage 0,10,20,30 and plastic waste as fibres0.5 and fly ash 10% granite powder varying percentage 0,10,20 and 30 checked for mechanical properties such compressive strength and split tensile strength after 7days, 14 days and 28 days curing in pond.

II. OBJECTIVE

The main objective of this study is to make M25 grade of concrete with 10%, 20%, and 30% Replacement of fine aggregate with granite powder, 10% of cement replacement by fly ash, 0.5 percentage of nylon fibers added to concrete by weight of cement making various specimens and cylinders check the compressive and split-tensile strength of concrete for 7, 14 and 28 days. Compare & evaluation of the obtained

III. LITERATURE REVIEWS

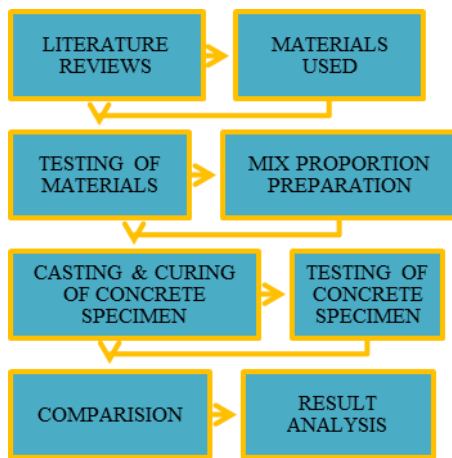
T. Felixkala et al. In this paper they had checked for parameters of the granite powder as a replacement of sand and useful properties such as split tensile strength compressive strength, and elasticity modulus. They also shown the results of both drying and plastic shrinkage of concrete with the granite powder concrete sample were nominal than those of normal concrete samples. They tested the probability of utilizing granite powder as a replacement of sand and full replacement of the sand. Partial Replacement of the cement with silica fume, slag, fly ash and superplasticizer in concrete. The granite powder replaced to the weight of sand 0%, 25%, 50%, 75% and 100% used in the concrete and cement was added with silica-fume 7.5%, slag 10%, fly ash10% and 1 percentage superplasticizer. The outcome of the curing temperatures at 26oC and 38oC with the 0.4 water to binder ratio on mechanical properties, plastic and drying shrinkage strain of the concrete were studied results are compared with the natural fine aggregate.

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Gencel et al. They were studied the monofilament polypropylene fibers are added to the self-compacting concrete. The study was done with two cement contents of 350 and 450 kg /m³ as well with four fiber contents of 3, 6, 9 and 12 kg/ m³. The results have shown that the compressive strength, split tensile strength, Elastic modulus, flexural strength have increased significantly up to 9 kg/m³ of fiber

Murahari, Rama Mohan Rao have studied the effects of polypropylene fibers on the strength properties of fly ash based concrete, worked on strength properties of concrete containing polypropylene fiber, and class C fly ash. Concluded that, a flexural strength of concrete gradually increases with the adding of Polypropylene fiber and there is an increase in flexural strength as compared with normal plain concrete without fibers.

IV METHODOLOGY



IV MATERIALS USED

- Cement – In this study, ordinary Portland cement grade 53.
- Granite powder – which near to Tekkasli .
- Fly ash – NTPC Shimachalam(grade C)
- Coarse Aggregates - 20mm angular shaped aggregates are used.
- fibers- Crimped nylon fibers

V. TESTING OF MATERIALS

A. CEMENT:-

TESTS	TEST RESULTS	IS CODE
Specific gravity	3.12	IS:8112-1989 3.1 to 3.16
Fineness	95.30%	IS:4031(part-4):1996 Passing grater than 90%
Initial Setting Time	46min	IS:12269 (2013) 30min is Minimum
Final Setting Time	5hr45min	IS:12269 (2013) 600min is Maximum

B. FINE AGGREGATE:-

TESTS	TEST RESULTS	IS CODE
Specific gravity	2.67	IS 2386-1968 (part 3)
Fineness modulus	2.26	
Sieve analysis	Zone-3	

C. COURSE AGGREGATE:-

TESTS	TEST RESULTS	IS CODE
Water observation	0.45%	IS 2386 (part-4)1963
Specific gravity	2.8	IS 2386 (part-3)1963

D .FLY ASH

Specific gravity fly ash = 2.1

E.GRANITE POWDER

Specific gravity Granite Powder = 2.75

COMPRESSIVE STRENGTH RESULTS

MIX ID	MIX ID	7days	14days	28days
Gp(0)	Fly ash(0%)	18.74	26.35	30.5
Gp(10%)	Fly ash(10%)	21.76	28.65	32.57
Gp(20%)	Fly ash(10%)	23.02	31.3	35.00
Gp(30%)	Fly ash(10%)	17.84	24.32	29.47

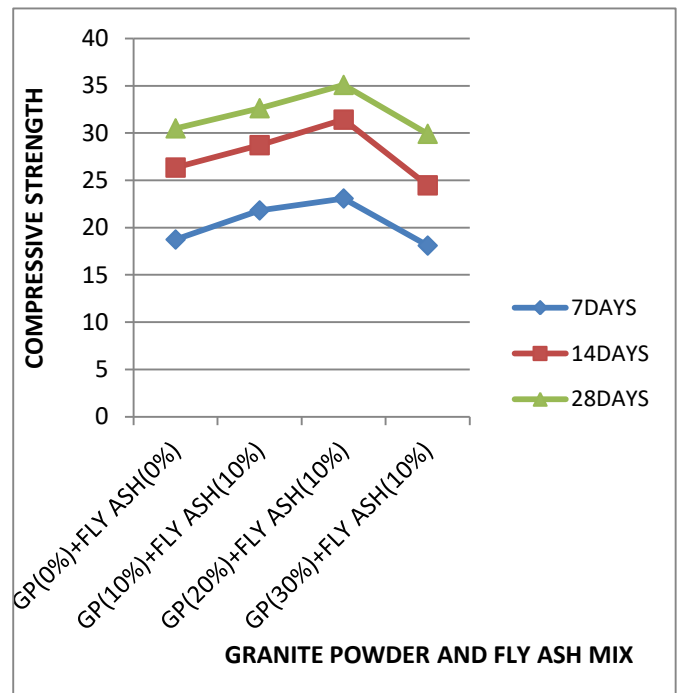


FIG 1 MIXE VS COMPRESSIVE STRENGTH COMPRESSION TEST RESULT FOR CONCRETE SPECIMENS (0.5PLASTIC FIBER)

MIX ID	MIX ID	7days	14days	28days
Gp(0)	Fly ash(0%)	18.74	26.35	30.5
Gp(10%)	Fly ash(10%)	22.82	28.72	32.63
Gp(20%)	Fly ash(10%)	23.08	32.42	35.09
Gp(30%)	Fly ash(10%)	18.10	24.47	29.92

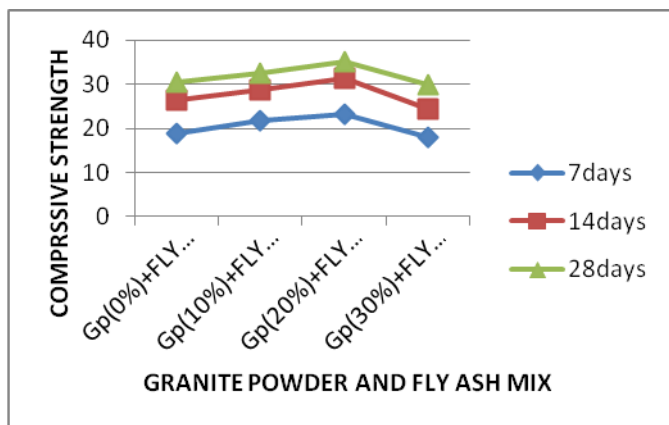


FIG 2 Mix Vs Compressive Strength

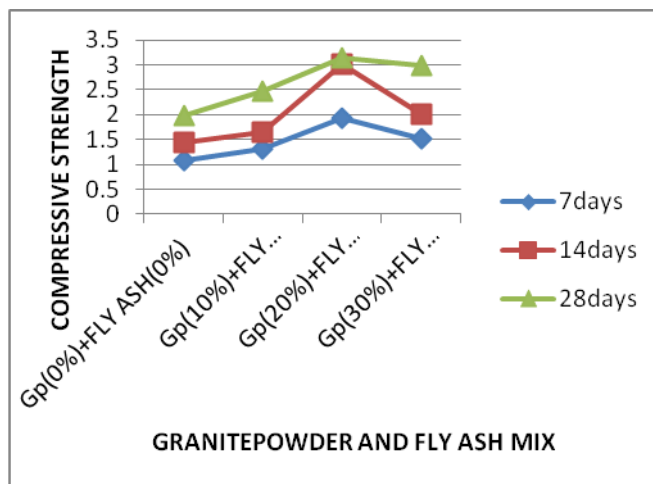


FIG 4 Mixes Vs Split Tensile Strength

SPLIT TENSILE STRENGTH TEST RESULTS

MIX ID	MIX ID	7days	14days	28days
Gp(0)	Fly ash(0%)	1.08	1.45	1.98
Gp(10%)	Fly ash(10%)	1.27	1.58	2.32
Gp(20%)	Fly ash(10%)	1.83	2.81	3.07
Gp(30%)	Fly ash(10%)	1.49	1.98	2.95

FUTURE SCOPE OF THE STUDY

- Investigation can be extended by increasing fly ash percentage.
- Investigation can be tested for flexure strength of concrete etc.
- Investigation can be extended for higher strength concrete grades i.e., M30, M40 etc.
- Investigation can be done for PPC (portland pozzolana cement).

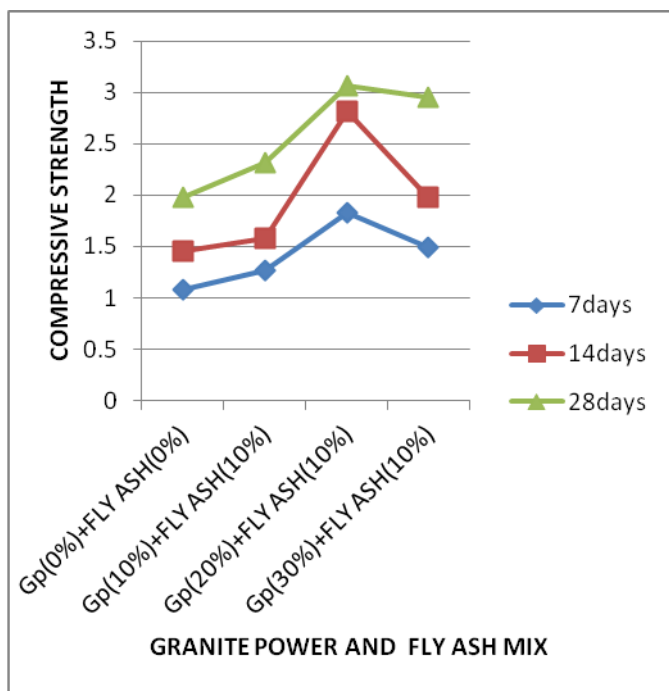


FIG 3 Mixe Vs Split Tensile Strength

CONCLUSIONS

- At 28 days, it shows a higher compressive strength of the concrete specimen. it's obtained at 20% substitute with granite powder.
- Split tensile strength of concrete obtained maximum at 20% replacement of granite powder.
- When fibers are added to concrete at a 0.5 percentage to the weight of concrete, the compressive strength nearly equal to specimen made of granite powder but there is a notable increase in split tensile strength.
- The 20% Granite powder increase compressive strength 14.7% & split tensile strength is 55.05%. when compared with conventional concrete
- When granite powder is combined with Plastic Fibres the percentage of increase in compressive strength is 15.05% and split tensile strength is 58.08%.
- When granite powder is combined with Plastic Fibres, compared with granite powder concrete. The percentage of increase in compression strength of 0.35% and an increase in split tensile strength is 3.03%. Hence the influence of Plastic fibers in compression strength is negligible but highly influences the split tensile strength.

SPLIT TENSILE STRENGTH TEST RESULTS (0.5 PLASTIC FIBER)

		7days	14days	28days
Gp(0%)	FLY ASH(0%)	1.08	1.45	1.98
Gp(10%)	FLY ASH(10%)	1.32	1.65	2.47
Gp(20%)	FLY ASH(10%)	1.94	3.02	3.13
Gp(30%)	FLY ASH(10%)	1.51	2	2.98

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