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Experimental Study On Use Of Scba And Ggbs Ash By Partially Replacement With Cement And Addition Of Steel Fibers 2%

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ABSTRACT

This present takes a look at gives with check element in the opportunity of SCBA (Sugarcane bagasse ash and GGBS over cement with an addition of Steel fibers in M40 grade concrete. The usage of Bagasse ash (dissipate made from sugar industries)and GGBS as cement in part replacement in concrete with addition of steel fibers progressed the electricity of the blocks, which gives a fantastic option to environmental issues related to waste manage .The brunt of bagasse powder content material as a partial substitution of cement has investigated on bodily & mechanical houses of toughened concrete, which includes compressive power, split tensile energy.

The blocks have been experienced for flexure & compression in a dry & a saturated condition. The exams have been accomplished at 7, 14 and 28 days for partly changed inside the ratio of 0%, 20%, 30, 40 %, & 50% through wt of cement in concrete and addition of metal fibers. by way of which reduce environmental problems related to cement production and ash production.

KEY WORDS: Sugarcane Baggase Ash (SCBA), Granulated Blast Furnace Slag (GGBS), Steel fibers, concrete

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I. INTRODUCTION

Concrete usually consists of cement, aggregates, water and in time, mineral and chemical admixtures. Cement, each in mortar and urban, is the maximum essential detail of the infrastructure can be a long-lasting creation fabric. But, frequently essential for the worldwide warming during the commercial manner CO_2 is cement manufacturing includes extensive CO_2 emissions, which have called the greenhouse fuel emitted due to heating of limestone ($CaCO_3$ – CaO+ CO_2) to get calcium oxide (CaO), that's the principle oxide inside the OPC. To lessen emission, numerous hints can be observed within the cement enterprise.

One powerful manner to lessen the environmental collision is to apply mineral admixtures, as fractional cement substitute every in concrete & mortar, so that you can have the capability to lessen charges, preserve strength and reduce waste emission. Mineral admixtures are observed in numerous office works in nature, which includes sugarcane bagasse ash and GGBS. the utilize of mineral admixtures improve compressive power, pore structure & permeability of mortars & concrete due to the fact the complete porosity reduce with the boom in the hydration moment

1.1 SCBA (Sugarcane Bagasse Ash)

Bagasse is a chief derivative of the sugar enterprise, that's utilized in the identical enterprise as an electricity supply for sugar mechanized. Sugarcane consists of 25%–30% bagasse; whilst enterprise improved sugar is about the 10%. Bagasse is likewise utilized as an uncooked fabric for papermaking sense of its fibrous consistency, & approximately 0.three heaps of paper may be made from one ton of bagasse. In Pakistan, about 70 sugar generators fabricate an expected 14 million plenty of bagasse yearly, which is specially used as energy supply.[3]

1.2 GGBS (Granulated Blast Furnace Slag)

Granulated Blast Furnace Slag is obtained by way of hastily chilling (quenching) the molten ash from the furnace with the help of water. All through this system, the slag gets fragmented and converted into amorphous granules (glass), assembly the requirement of IS 12089:1987 (manufacturing specification for granulated slag applied in Portland Slag Cement). The granulated slag is floor to favored fineness for producing GGBS.

1.3 HOOKED STEEL FIBER

By the use of hooked steel fibers, it improves ductility and provides elasticity in concrete. As we added 2% of steel fiber, to improve the properties of concrete and high-stress resistance. Aspect ratio is L/d 50

II. LITERATURE SURVEY

The use of bagasse ash and lime as the partial replacement of the cement at 10%. The blocks were experienced for flexure & compression in a dehydrated & a dripping wet state. The tests were performed at 7, 14 & 28 days of time in order to estimate the special effects of the addition of lime & SCBA on the mechanical properties of the compacted soil blocks. It changed into additionally accomplished that mixture of SCBA & lime as a substitute for cement inside the stabilization of firmed soil blocks appears to be promising opportunity whilst thinking about issues of strength consumption and pollutants.[10] The pozzolanic & protective material consequences of a lingering SCBA in mortars. First of all, have an effect on of particle length of SCBA on the packing density, the pozzolanic hobby of SCBA & compressive power of mortars modified into analyzed. Similarly, the behavior of SCBA become as compared with the insoluble material of equal packing density. The consequences imply that SCBA may categories as a pozzolanic material, however, that its interest relies upon notably on its particle length and fineness.[11] Discovering approximately sustainability, creation vicinity has to be part of the player in using dissipate materials for the advantages of business enterprise. The concept of converting dissipates substances into a minute software programs make contributions to sustainability & greening the earth. A component from that, studies have to completed to encourage dissipate cloth into financial & helpful advent substance A idea of going inexperienced need to be followed in preference to simply thinking of the fast manufacturing because of the whole challenge plan. This paper encourages bagasse as a stabilizer for production material in three processes which can be on concrete energy improver, a concrete retarder & composite brick [4]. The sugarcane bagasse had been combined & mixed with 30MPa concrete with positive fraction also tested for compressive, flexural, water absorption along with saturation. From the checks, it indicates that the sugarcane bagasse gives a pleasant effect to concrete. Consequently, using sugarcane bagasse may be considered as an idea for the making use of desecrating cloth for sustainable technique.[2] This document BA has been chemically & bodily characterized as well as somewhat modified inside the fraction of O%, 10, 15, 20, 25% and 30% by using a manner of a weight of cement in concrete. The houses in favor of glowing concrete are experienced like hunch cone test & for hardened concrete compressive energy at the age of 7,28,56& 90 days. by means of looking at end result mean that the power of concrete growth up to 15% SCBA alternate with cement.[1] The consequences of delicate sugarcane pulp ash (SBCA) as the partial replacement

for cement on the homes of new and hardened concrete. The observe proven that SCBA suggests promising effects of its use as a cement substitute cloth (CRM). The capability of SCBA as a CRM became observed because of its chemical composition, fineness and nicely-managed combustion technique. the delivery of pulp is also a fantastic indicator for the assets provider of SCBA as CRM. Inside the world, a few 1500 Mt of sugarcane is yearly created, that yields a few 40– forty-five % pulp while juicing extraction in sugar generators. In this take a look at, SCBA content material was varied from five to five hundredth as the partial alternative of cement. The outcomes of SCBA at the workability, compressive power, cacophonous lastingness and bond power of concrete have been investigated. The outcomes confirmed that the addition of SCBA (5–50% content) augmented the droop rate of latest concrete. The mechanical residences (compressive electricity, cacophonous lastingness, and bond strength) of concrete made from 5-30% SCBA showed a lower priced sweetening inside the ends in contrast with the only hundred cement concrete.[9]

III. MATERIALS AND METHODOLOGY

For the current investigation for the high strength concrete of M 40 grade mix design with GGBS and steel SCBA with appropriate following materials were used to prepare the mix
Cement: Ultra Tech (02/17) (MM/YY)
Fine Aggregates (sand): Shahapur pit
Coarse Aggregates: Size 20mm downsize
Water: Portable water
SCBA: Waste from sugar cane
GGBS. Waste from molten iron
Super plasticizer: FosRoc (CONPLAST SP 430)

3.1Cement:

OPC 53 Grade Ultra Tech cement confirming to IS: 12269:1987 be taken for use in this investigation obtained from Sai Agency near Basweshwar Hospital.

3.2 Fine aggregate:

Natural river sand was taken from Shahapur pit having a Specific gravity of 2.39. Natural sand conforming to zone II, fineness modulus of 1.75 was used. With conforming to IS specifications IS 383- 1970. Experiments on fine aggregate are performed on Government Polytechnic College Kalaburagi

3.3 Coarse aggregate:

The coarse aggregate 20mm nominal size was used. The total coarse was tested according to Indian standard detail Seems to be: 383-1970. The different test results are shown in the table below.

Sl.no	Content	Particulars
1	Specific gravity	2.80
2	fineness modulus	6.9
3	Free surface moisture	NIL
4	Size of crushed aggregate	20mm down size
5	Water absorption	1.34%
6	Aggregate crushing value	13

3.4 Water

Water used for equally blending along with curing must be free from harmful amount of poisonous substances. Filtered water is usually considered first-class for mixing moreover curing concrete.

3.5 Superplasticizer

Conplast SP430 conforms with BS 5075, BS: EN 934-2 and with ASTM C494 as group A and sort F, counting on dose used

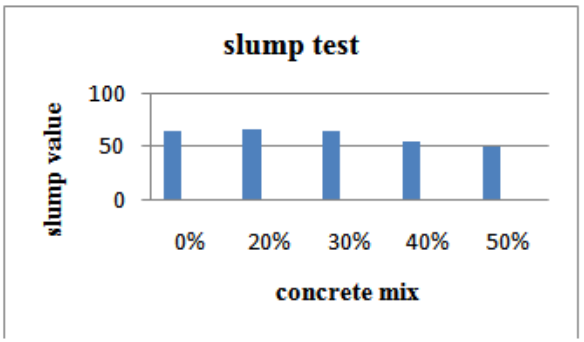
IV. RESULTS AND DISUSSION

4.1Fresh State of Concrete Tests Results

4.1.1 Slump test

Table 5.1.1 Slump Cone Test outcome for M40 Grade Cement Concrete at different percentage of replacement

Sl no	% of fibers	% of SCBA	% of GGBS	Slump value (mm)
1	2%	0%	0%	65
2	2%	5%	15%	68
3	2%	10%	20%	66
4	2%	15%	25%	55
5	2%	20%	30%	50

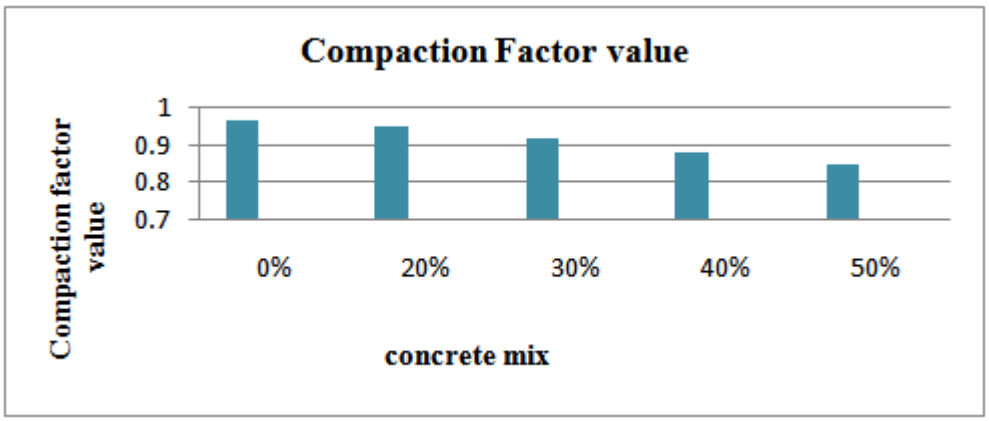


Graph 1 Calibration Slump Value

4.1.2 Compaction Factor Test

Table 5.1.2 Compaction factor Values

Sl no	% of Fibers	% of SCBA	% of GGBS	Comp.factor value (mm)
1	2%	0%	0%	97
2	2%	5%	15%	95
3	2%	10%	20%	92
4	2%	15%	25%	88
5	2%	20%	30%	85

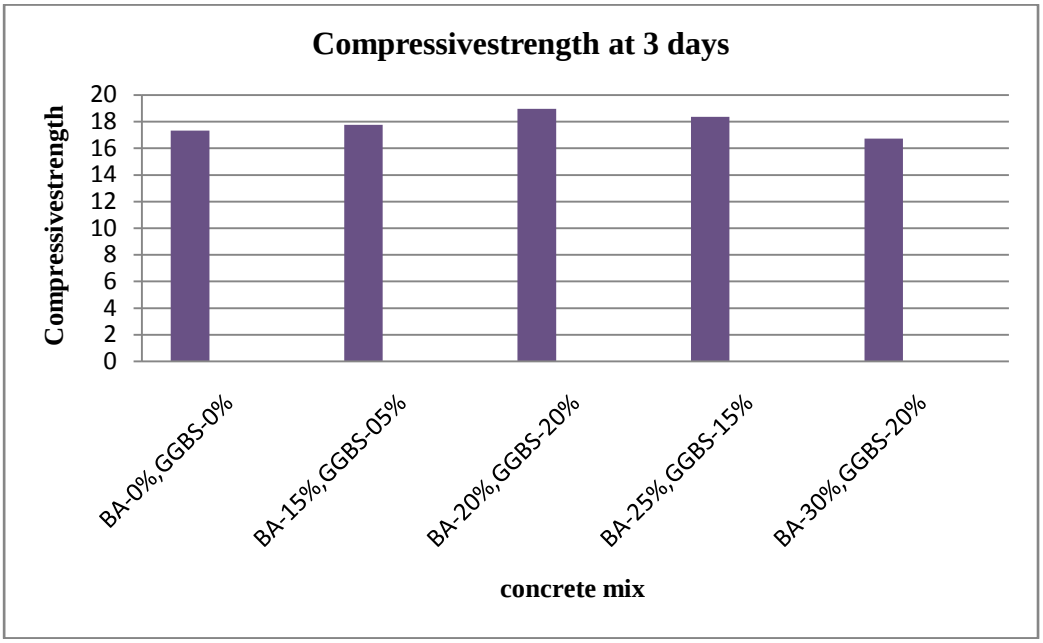


Graph 2 Calibration Compaction Factor Value

4.2 COMPRESSIVE STRENGTH RESULT

Table 4.2.1Compressive Strength Test Out Come for M40 Grade Concrete at Age 3

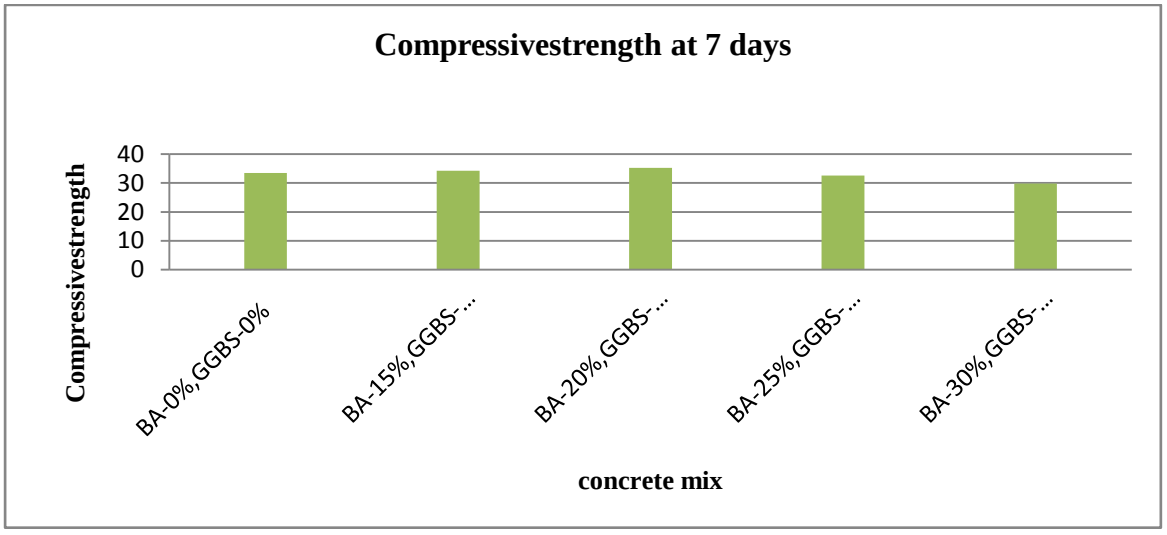
SL NO	Description	Replacement Variations		Compression strength(N/mm2) 3 Days			
		BA(%)	GGBS(%)	1	2	3	Average
1	Conventional concrete	0	0	17.33	16.88	16.88	17.03
2	Concrete with 15% BA & 05% GGBS	15	05	17.77	18.22	17.33	17.77
3	Concrete with 20% BA & 10% GGBS	20	10	19.11	18.66	19.11	18.96
4	Concrete with 25% BA & 15% GGBS	25	15	18.66	18.22	18.22	18.36
5	Concrete with 30% BA & 20% GGBS	30	20	17.33	16.44	16.44	16.73



Graph 3 Compressivestrength at 3 days

Table 4.2.2 Compressive Strength Test Out Come for M40 Grade Concrete at Age 7

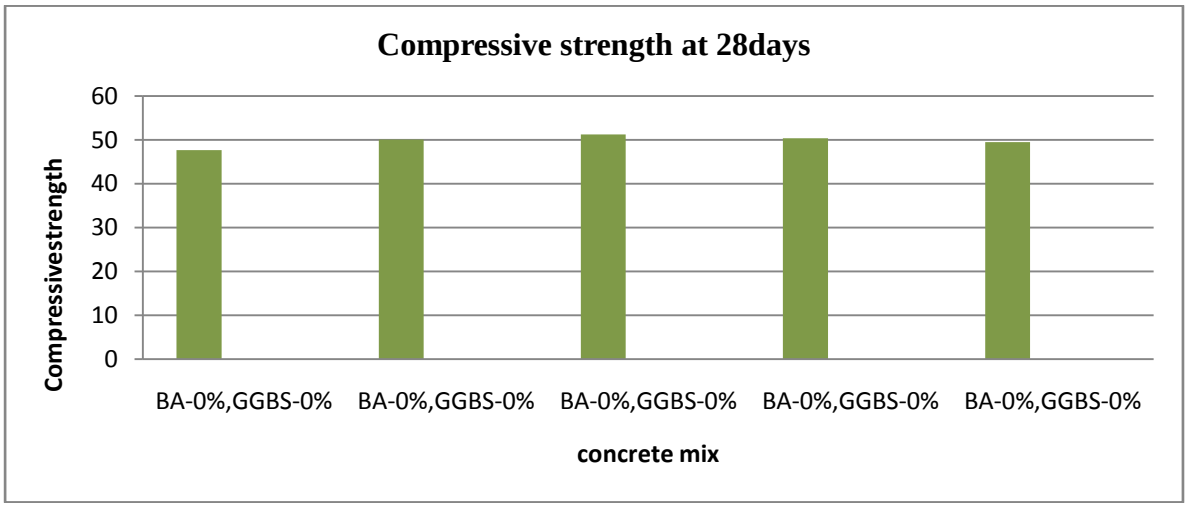
SL NO	Description	Replacement Variations		Compression strength(N/mm2) 7 Days			
		BA (%)	GGBS (%)	1	2	3	Average
1	Conventional concrete	0	0	33.33	33.77	33.33	33.47
2	Concrete with 15% BA & 05% GGBS	15	05	35.55	33.77	34.22	34.22
3	Concrete with 20% BA & 10% GGBS	20	10	36.00	34.66	35.11	35.25
4	Concrete with 25% BA & 15% GGBS	25	15	33.33	32.88	31.55	32.58
5	Concrete with 30% BA & 20% GGBS	30	20	31.11	29.33	28.88	29.77



Graph 4 Compressivestrength at 7days

Table 4.2.3 Compressive Strength Test Out Come for M40 Grade Concrete at Age 28

SL NO	Description	Replacement Variations		Compression strength(N/mm2) 28Days			
		BA (%)	GGBS (%)	1	2	3	Average
1	Conventional concrete	0	0	44.44	48.88	49.77	47.69
2	Concrete with 15% BA & 05% GGBS	15	05	49.70	50.22	50.22	50.04
3	Concrete with 20% BA & 10% GGBS	20	10	51.11	51.11	51.55	51.25
4	Concrete with 25% BA & 15% GGBS	25	15	50.66	50.22	50.22	50.36
5	Concrete with 30% BA & 20% GGBS	30	20	49.33	49.77	49.33	49.47

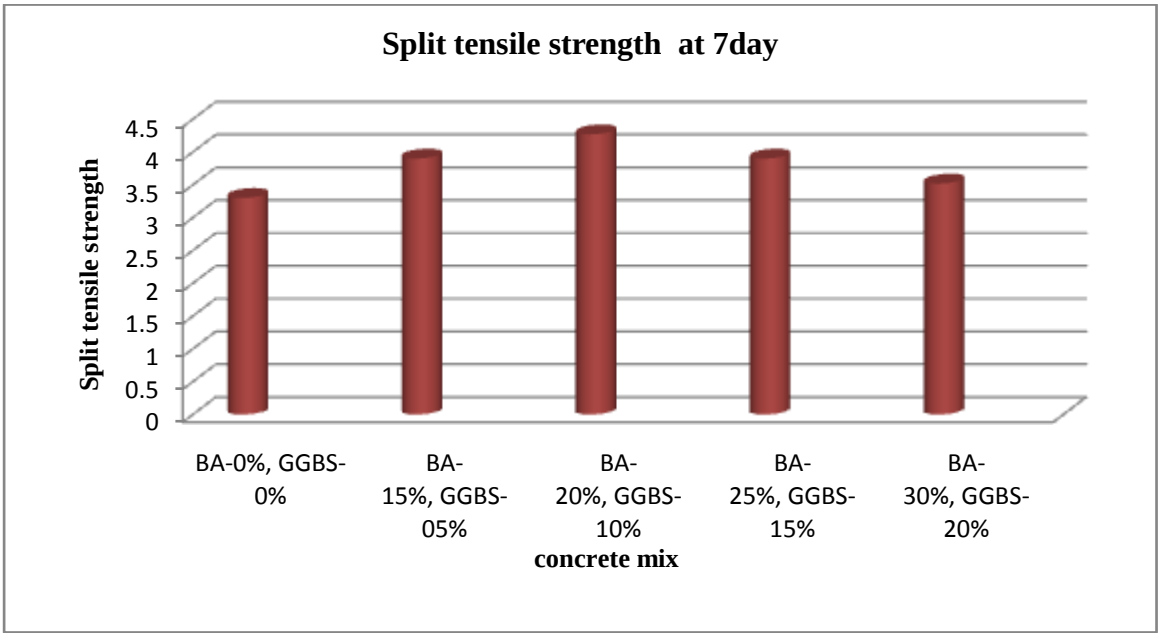


Graph 5 Compressivestrength at 28days

4.3 Split Tensile Strength Result

Table 4.3.1 Split Tensile Strength Test Out Come for M40 Grade Concrete at Age 7

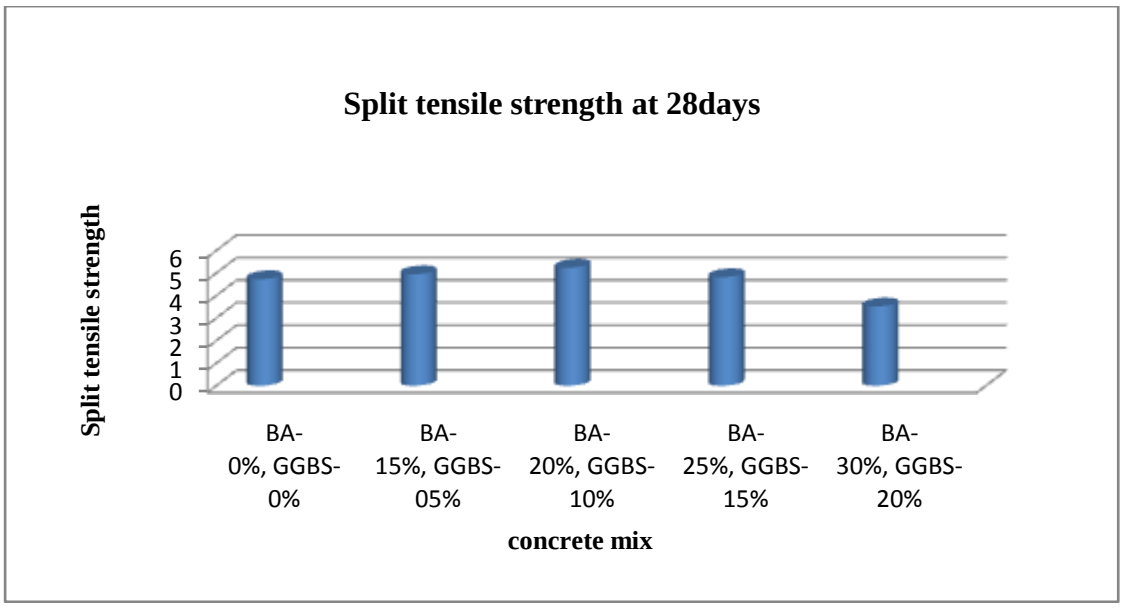
SL NO	Description	Replacement Variations		Split Tensile Test(N/mm^2) 7 Days			
		BA (%)	GGBS (%)	1	2	3	Average
1	Conventional concrete	0	0	3.3	3.40	3.3	3.3
2	Concrete with 15% BA & 05% GGBS	15	05	3.92	4.0	3.80	3.90
3	Concrete with 20% BA & 10% GGBS	20	10	4.32	4.22	4.28	4.27
4	Concrete with 25% BA & 15% GGBS	25	15	4.0	3.90	3.80	3.90
5	Concrete with 30% BA & 20% GGBS	30	20	3.52	3.6	3.44	3.52



Graph 6 Split tensile strength at 7day

Table 4.3.2 Split Tensile Strength Test Out Come for M40 Grade Concrete at Age 28

SL NO	Description	Replacement Variations		Split Tensile Test(N/mm^2) 28 Days			
		BA (%)	GGBS (%)	1	2	3	Average
1	Conventional concrete	0	0	4.80	4.66	4.75	4.73
2	Concrete with 15% BA & 05% GGBS	15	05	4.90	5.00	4.95	4.95
3	Concrete with 20% BA & 10% GGBS	20	10	5.4	5.20	5.12	5.24
4	Concrete with 25% BA & 15% GGBS	25	15	5.0	4.82	4.66	4.82
5	Concrete with 30% BA & 20% GGBS	30	20	4.33	4.25	4.12	4.23

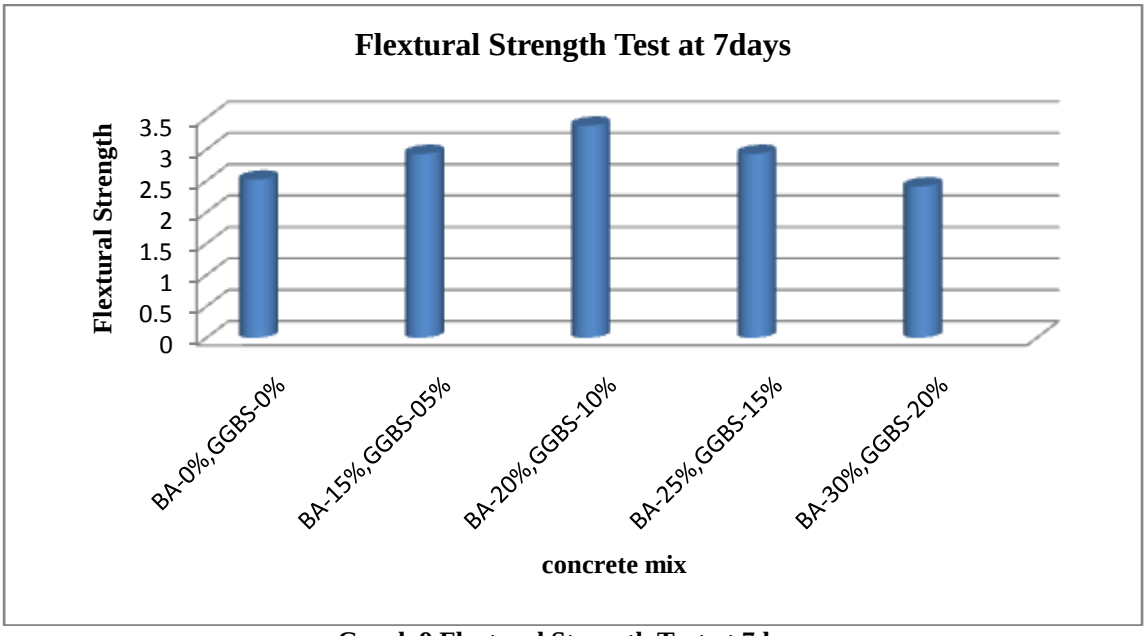


Graph 7 Split tensile strength at 28days

4.4 Flextural Strength Test

Table 4.4.1 Flextural Strength Test Out Come for M40 Grade Concrete at 7days

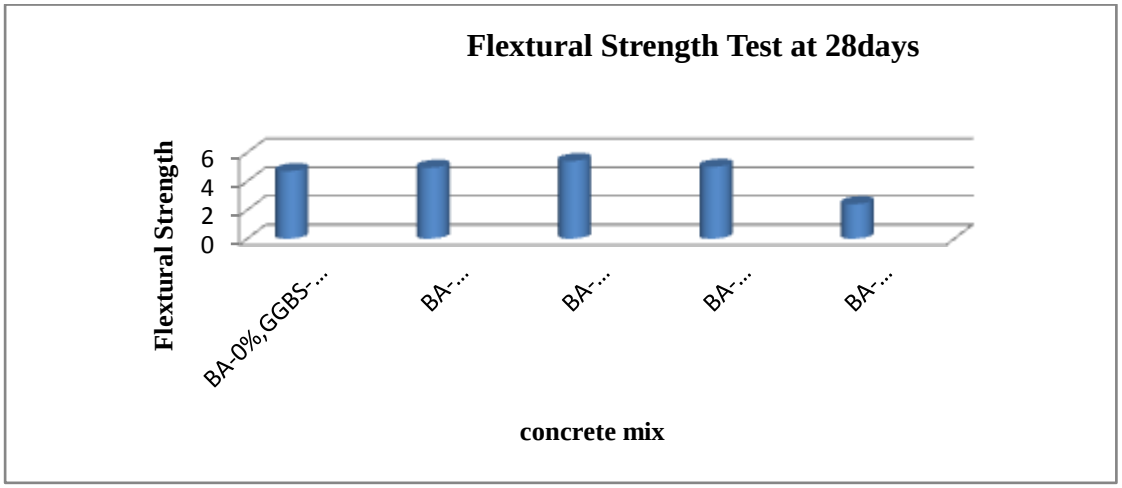
SL NO	Description	Replacement Variations		Flextural Strength N/mm^2			
				7 Days			
		BA(%)	GGBS (%)	1	2	3	Average
1	Conventional concrete	0	0	2.44	2.50	2.62	2.52
2	Concrete with 15% BA & 05% GGBS	15	05	3.0	2.95	2.85	2.93
3	Concrete with 20% BA & 10% GGBS	20	10	3.20	3.50	3.44	3.38
4	Concrete with 25% BA & 15% GGBS	25	15	2.92	2.88	3.0	2.93
5	Concrete with 30% BA & 20% GGBS	30	20	2.32	2.42	2.50	2.41



Graph 9 Flextural Strength Test at 7days

Table 4.4.2.Flextural Strength Test Out Come for M40 Grade Concrete at 28days

SL NO	Description	Replacement Variations		Flextural Strength N/mm^2			
				28 Days			
		BA(%)	GGBS (%)	1	2	3	Average
1	Conventional concrete	0	0	4.56	4.77	4.82	4.71
2	Concrete with 15% BA & 05% GGBS	15	05	4.90	5.00	4.95	4.95
3	Concrete with 20% BA & 10% GGBS	20	10	5.35	5.40	5.50	5.41
4	Concrete with 25% BA & 15% GGBS	25	15	5.00	5.2	5.12	5.01
5	Concrete with 30% BA & 20% GGBS	30	20	4.50	4.34	4.32	4.38



Graph 9 Flextural Strength Test at 28days

V. CONCLUSION

[1]. Concrete additional with sugarcane pulp will add to the placing time of the current concrete for few hours having a betat number of sugarcane pulp used. that is for the reason that, the plant product life within the concrete mingle has concerned the response among the water & cement, thus, slows down the concrete association method

[2]. Compressive strength of concrete of 20% of SCBA and 10% of GGBS is almost 4 MPa more then that of traditional concrete at 28 days.

[3]. Split tensile strength of concrete of 20% of SCBA and 10% of GGBS is almost 1 MPa morer then that of traditional concrete at 28 days.

[4]. Flextural strength of concrete of 20% of SCBA and 10% of GGBS is almost 1 MPa morer then that of traditional concrete at 28 days.

[5]. From this study we can conclude that addition of SCBA and GGBS upto 30% will have considerable increased the strength of concrete.

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