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Strength and Corrosion Investigation of Concrete Elements using Sisal Fibres and Aloe Perfoliata Gel

Jayaraman Ariyagounder[1]

[1]Assistant Professor, Department of Civil Engineering Bannari Amman Institute of Technology, Sathamangalam-638401, India.

Abstract : Artificial fibres and natural fibres is an alternative for reinforcement of steel rod or rebar due to fast growing construction industry and reduce the cost of the construction. Now days recently developed the flexural strength using natural fibres such as sisal fibres, coconut fibres, banana fibres, Juet fibres etc. In this paper reported that using the sisal fibre and Aloe Perfoliata gel for development of flexural strength and corrosion resistance in concrete elements. Sisal fibres and aloe perfoliata gel various percentage of adding in concrete and found which type of percentage has given higher strength. Various percentage such as 1% , 1.5 % , 2%, 2.5% 3% etc and using M20 grade of concrete and 0.45 water cement ratio. The high tensile strength, flexural strength and durability is achieved by 1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibres.

Kew words : Sisal fibres, Aloe Perfoliata Gel, M – Sand, compressive strength, tensile strength, flexural durability, corrosion.

I Introduction

The fibres reinforced concrete (FRC) is used to increase the tensile strength and flexural strength and toughness of concrete. It involves use of short discrete randomly distributed fibres within the concrete mix. The nature of concrete is strong in compression side week in tension side. The development of tensile and flexural strength of concrete, we are adding the sisal fibre. This also reduced the plastic shrinkage cracks. The natural product of the sisal fibre that is accessible in the fields and if this might replace the in reinforcement in the concrete it would be aenormous change in the construction i n d u s t r y. Concrete is durability, versatility and sustainability, and economy have made it the world's most widely used construction material. The concrete is produced four to five tons per year per person worldwide. The United Statesreported 1.7 tons produced the concrete per year per person. Concrete made with different types of cement has certain characteristics; it is week in tension but strong in compression and tends to be brittle. The weakness in tension be capable of be beat to some extent by the addition of aenough volume of certain fibres. The use of fibres also alters the behaviour

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of the fibre matrix composite after it has cracked, thereby improving its toughness. The concept of using fibres to improve the characteristics of construction materials is very old. When concrete cracks, and randomly oriented fibres start functioning, arrest cracks formation and propagation, and thus improve strength and ductility.Most of embodied energy is produced by the burning of fossil fuels, which increases the amount of carbon dioxide (CO2) in the atmosphere, causing the temperature of the earth to rise which is linked to climate change. By use of plant derived products in construction may reduce the emission of this embodied energy and at the same time strength of these concrete is also maintained by use of sisal fibre 2.5%, 5% & 10% aloevera gel which are added in the proportion of 2% to the weight of cement and quantity of water. Sisal fibre is low cost eco-friendly product and is abundantly available, easy to transport. The objective of this research is to experiment on the use of sisal fibre and natural resin as an enhancement of concrete. From our project we had seen that there is considerable increase in strength of concrete by adding sisal fibre and Aloe Vera in concrete. This paper reported that the , the various percentage of replacement fiber used. The 28days compressivestrength, tensile strength and flexural strength is increased by 15 % replacement of sisal fiber reinforced concrete, compare than conventional concrete. Using M25 grade of concrete and the aspect ratio of sisal fiber is 1:20. The compressive strength is increased about the 13.8%, 21%, 16.3 %, for the 1%, 1.5 % and 2 % fiber replacements respectively compared to conventional concrete by **Venkateshwaran Yogesh Ravindra Suryawanshi (etal)** he reported that using composite fibre reduce the cement content and produced the calcium hydroxide is very low using potential aging of composite fibres. The young's modulus is reduced and stress level also increased. The noted that hysteresis stress strain and matrix level composite fibrics. Finally the test result isevaluated such as crack patterns, deflection, stress value, strain and flexural stress. The flexural strength also calculated by three point bending configuration. Ductile behaviour also increased by glass fibre composite section and also increased ultimate compressive strength compared to the conventional concrete. **Development** of tensile strength, compressive strength, flexural strength and plastic shrinkage in the pre hardened state of mortar mixes was discussed by influence of sisal fibres. In the projects has highly highlighted durability properties, creep and drying shrinkage of concrete. The sisal fibre is highly mineral content compare than sysnthical fibre. The sysnthical fibre was evaluated in the report, the results is highly energy, low mineral content and gives high strength compare than other than other type of materials by **Romildo Dia. Mrs. S. Srigeethaa (etal) she** is suggested that, the compressive strength has developed by perfoliata gel is added as various percentages such as 10 % , 20% and 30 % of water reduction for preparation. Because of using some corrosion inhibitor create toxic exposure whereas green inhibitors are eco-friendly, no toxic compound are present and affordable cost. In this paper various experimental study were made with aloe perfoliata gel isaddedas chemical admixture with various percentage (10%,20%,3%) of water reduction for preparation. The paper discuss about the effect of aloe perfoliata as a green inhibitor and their harden properties of concrete. This project is planned and designed according to IS Method. **Enhance** of compressive strength, split tensile strength, workability of concrete, flexural strength is developed by addition of Aloe vera and jute fibre. The compressive and tensile strength has increased about the 23% and 33% compare than the conventional concrete. Further studied about the Aloe vera jute fibre is increased the hardening and setting of concrete, reduced the crack width of concrete and also absorbed that the results, the water absorption also increased compared to the conventional concrete. Finally this paper reported that the compressive strength and tensile strength of concrete is developed using 2% of Aloe vera resin and 2% jute fibre by **V.Anujayasree (etal).**

The 28 days compressive and split tensile strength concrete has increased compare than the conventional concrete using Aloe vera resin and 1% jute fibre by **B.MuhuMalini (etal)Shanmugavel.T (etal)**,they are presented Aloe vera and waste tin fibres used as fibres in concrete. The following conclusions are arrived from the basis of conducting experimental investigations. The workability of Concrete when Aloe Vera used as a fibre in concrete, was more when compared to ordinary concrete. Aloe Vera fibre does not alter any tensile and flexural strength of concrete, but it gain to increase the compressive strength.The maximum compressive strength of Aloe Vera fibre with 15% of fly ash. 4. The replacement of 15% fly ash to cement gives the same result when Aloe Vera fibre used. **Seyed Mehdi Zahrai(etal)** this paper reported that, theSilica fume as a manufactured pozzolan among the best admixtures partly substituted for cement has been used in the concrete in powder or gel form. In order to have better understanding of the impact of this pozzolan on the concrete performance produced by conventional Portland cement, the effects of two silica-fume gels under commercial names of AP2RC and P1RB on the concrete strengths were studied in this paper. The results indicated that introducing AP2RC and P1RB gels of 3% and 5% (with respect to the cement weight), respectively, were associated with 34% and 66% increase in tensile strength, 33% and 53% improvement in

compressive strength and also 2% and 5% rise in flexural strength of the concrete, when compared to those of control sample. **A.Jayaraman, (etal)**this paper presented that, theConcrete using various combinations of lime stone filler and lateritic sand as complete replacement for conventional river sand fine aggregate. It is found that 0.55 water/cement ratio, the enhanced higher compressive strengths, tensile strength and good workability for M25 mix, proportion. Specifically compressive and tensile strength ranged from 23.06 -36.2 N/mm^2 and 9.06 -11.5 N/mm^2 for the mixes

II Objectives of project

Development of high strength concrete elements, crack free payment, plastic shrinkage and corrosion resistance of concrete structures by natural sisal fibre and natural Aloe vera gel.

III Material Collection

3.1 Cement : Portland pozzolanic cement 53 grade conforming to IS 8112 – 1989, and specific gravity of cement is found to be 3.15. The properties of cement given in Table 1.

Table 1 Properties of OPC Cement

Physical properties of cement		
Fineness, m^2/kg	314	Minimum 300
Initial setting time(minutes)	110	Minimum 30
Final setting time(minutes)	160	Maximum 600
Standard consistency	26.4	-
Soundness, Le Chatelier, mm	1.0	Maximum 10
Mechanical properties of cement (Compressive strength, Mpa)		
3-days	23	Minimum 16
7-days	30	Minimum 22
28-days	40	Minimum 33

Chemical properties of cement

Component	**Results (%)**	**Requirements of IS:1489**
Sio_2	21.8	-
$A1_20_3$	4.8	-
Fe_20_3	3.8	-
CaO	63.3	-
$S0_3$	2.04	Maximum 3
$Mg0_3$	0.91	Maximum 6
Na_20	0.21	-
K_20	0.46	-
CI	0.06	Maximum 0.1
P2O5	<0.05	-
Loss of ignition	1.36	Maximum 5
Insoluble residue	17.96	-

Table 2 Sieve analysis of River sand and M- Sand

IS sieve designation	River sand% Passing	M- sand% Passing
4.75 mm	99.43	98.1
2.36mm	95.84	98.23
1.18mm	66.27	43.35
600nm	47.27	29.6
300um	30	23
150um	9.27	5.3

3. 2 Fine aggregate : Locally available river sand having bulk density 1762 kg /m^3 is used and the specific gravity 2.73 and fineness modulus of river sand is 3.01

3. 3 Manufactured sand : M-Sand is replaced is fully replacement of river sand .It is collected from BAG Groups Coimbatore, India. The bulk density of manufactured Sand 1460 kg/m^2 and the specific gravity 2.43 and fineness modulus of rive Sand is 2.8. The sieve analysis is given in table .2

3. 4 Course aggregate : Considering all the above aspects, blue granite crushed stone aggregate of 12.5mm as maximum size and of typical particle shape "average and cubic" are used as the course aggregate for the present investigation. The aggregates are tested as per the procedure given in BIS: 2386- The bulk density of coarse aggregate 1660 kg/m2 and the specific gravity 2.83 and fineness modulus of coarse aggregate 6.73

3.5 Water : Water used for mixing and curing was potable water, which was free from any amounts of oils, acids, alkalis, sugar, salts and organic materials or other substances that may be deleterious to concrete or steel. The pH value should not be less than 6.

3.6 Sisal fibre : The plants look like giant pineapples, and during harvest the leaves are cut as close to the ground as possible. The soft tissue is scraped from the fibres by hand or machine. The fibres are dried and brushes remove the remaining dirt, resulting in a clean fibre. Sisal produces sturdy and strong fibres. Sisal fibre is one of the prospective reinforcing materials that its use has been more experiential than technical until now. Sisal fibres conditioned in a sodium hydroxide solution retained respectively 72.7% and 60.9% of their initial strength after 420 days. The physical and chemical properties of sisal fibre given in table .3 and sisal fibre and sisal plant shown in figure.1

Figure .1 Sisal plant and sisal f

Figure 1.a Cutting of water

Figure 1.b HCL Solution

Figure 1.a, 1.b cutting process of sisal fibre

Figure 1.c Preparation of pickling solution

Figure 1.d Immersed in pickling solution

Figure 1.e Cleaning of trap water

Figure 1.f Drying of sisal fibre by sun rise

Figure 1.c , 1.d and 1e - cleaning process of sisal fibre

Table .3 Physical and chemical properties of Sisal fibre

Physical and chemical properties of Sisal fibre	
Cellulose (%)	41.6 – 62.6
Hemi Cellulose (%)	9.2 – 14.6
Lignin (%)	11.4 – 19.5
Density	1.28 – 1.42
Tensile strength	126 -860
Tensile modulus	4.6 -16.8
Elongation	1.54 – 3.85
Fiber diameter	145 - 440
Water absorption (%)	76.7%

3.6.1 Cutting of Sisal fibre

Sisal fibre reinforced concrete by cutting 10-30 mm fibres and casting hem into the beam. He found an immense increase in the tensile strength and toughness when continuous fibres were used. The Cutting of Sisal fibre shown in Figure 1.a& 1.b

3.6.2Preparation of pickling solution

Mixing of 100ml HCL solution with 1liter of trap water

The sisal fibre first in treated in boiling water than immersed in pickling solution 30minitus. After 30minutes take the fibre from the pickling solution the cleaned by trap water .The biodegradable contamination of particles are treated by pickling solution.

3.6.3 Cleaning of Sisal fibre

In this work, sisal fibre treated by boiling water and pickling solution, than washing was used as the reinforcing agent in ordinary Portland cement (OPC) concrete.The cleaning treatment process of Sisal fibre shown in figure 1.c, 1. d and1. E

3.7 Aloe Vera Gel

The aloe Vera gel maintains the moisture content in stem. AloeVera gela preparation of leaf pulp from the parenchyma tissue of the plant Aloe Vera (Liliaceous). Aloe Vera gel contains carbohydrate polymers, such as glucomannans or pectic acid, and various vitamins and essential amino acids, as well as other organic and inorganic compounds.Balances skins PH levels, to prevent a bacteria friendly high PH. The Aloe vera gel plant and cutting of plant stem shown in Figure .2 & Physical and chemical properties of Aloe vera gel given in table .4

Figure .2 Aloe vera gel plant and cutting of plant stem

Table .4 Physical and chemical properties of Aloe vera gel

Physical and chemical properties of Aloe vera gel	
Moisture (g / 100)	99.3
Protein	1.0
Fat	0.65
Phenolic compound	82.7
DPPH radical scavenging activity	67.51
PH	4.64

IV. **Experimental Investigation**

The mix ratio is prepared for M 30 for both conventional and also **sisal fibers &**Aloe Vera Gelconcrete. The **fibers &** Aloe Vera Gel add concrete in different percentages. The materials are then mixed thoroughly before adding the prescribed quantity of water and then mixed further to produced fresh concrete. Water cements ratios of 0.4 were adopted. The specimen is prepared for compressive strength for cube size (150 x 150 x 150 mm. The cylinder of height 30 cm and 15 cm diameter is prepared for tensile strength totally 48 cubes and 48 cylinders are made. The specimens are tested for 7 days, 14 days and 28 days with each proportion of conventional and fibers & Aloe Vera Gel add concrete. (50x50x50) mm mortar specimen were prepared for durability test and corrosion test totally 36 cube are made .(500 x 100 x10 0) mm concrete specimen are casted for flexural strength of concrete specimen preparation and mixing of concrete specimen is shown in figure 3.1,3.2 and 3.3,




3.0 Experiential set up of slump cone test results

Specimen Details

S1 = Conventional details
S2 = M – Sand concrete
S3 = M – Sand concrete + Added (1 %of Aloe Perfoliata Gel + 2.5% of Sisal fibers)
S4 = M – Sand concrete+ Added (1.5 % of Aloe Perfoliata Gel + 5% ofSisal fibers)
S5 = M – Sand concrete+ Added (2 % of Aloe Perfoliata Gel + 10 % of Sisal fibers)

V Result and Discussion

5.1properties of Fresh Concrete:

Three different properties of fresh concrete that were analysed are Slump, Compaction factor and Vee Bee Degree.

5.1.1 Slump test is for measuring consistency of concrete which can be employed either in laboratory or at site of work. It does not measure all factors contributing to workability, nor is it always representative of the placebility of the concrete. The pattern of slump indicates the characteristic of concrete in addition to the slump value. If the concrete slumps evenly it is called true slump. If one half of the cone slides down, it is called shear slump. In case of a shear slump, the slump value is measured as the difference in height between the height of the mould and the average value of the subsidence. The **Experiential set up of slump cone test results** shown

in Figure .3 and the slump value for conventional concrete and high strength concrete value of as shown in Figure 3.1. The slump test value is given in table .5

Table .5 Slump value of fibre concrete

S.No	Mix Designation	Slump Value
1	S1	80
2	S2	84
3	S3	90
4	S4	100
5	S5	100

5.1.2 Compacting factor test

The Experimental set up of compaction factor and slump cone test as shown in figure.4

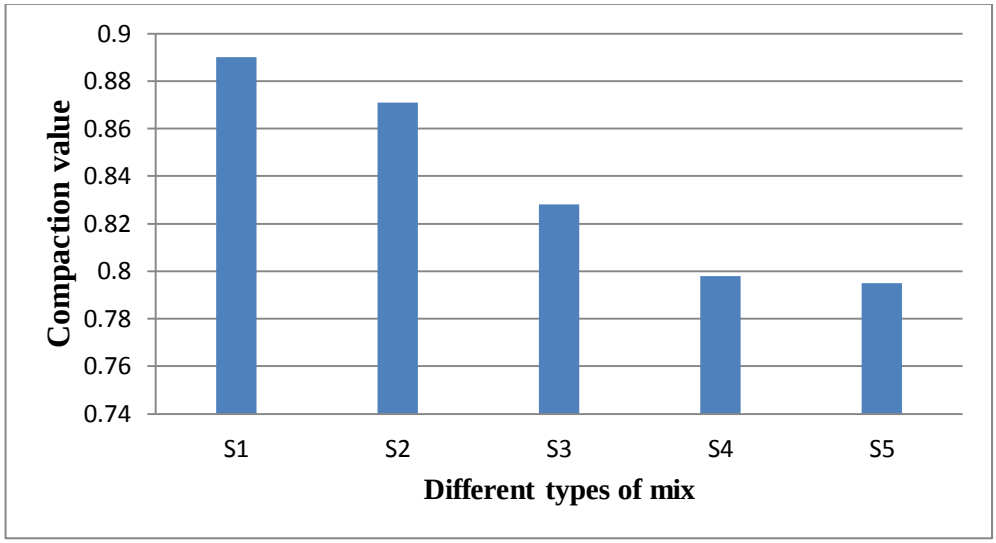

Figure 4.1 compaction test results

W1 = Weight of cylinder
W2 = Weight of cylinder + partially compacted
W3 = Weight of fully compacted

Compaction factor = (W2 –W1) / (W3 –W1)

Compacting factor test is designed primarily for use in the laboratory but it can also be used in the field. It is more precise and sensitive than the slump test and is particularly useful for concrete mixes of very low workability as are normally used when concrete is to be compacted by vibration. The compaction factor of river sand is found to be greater when compared to fibre concrete. Even though, the compaction factor is lower than River sand, S3 mix is also comfortable workable. The compaction factor results are shown in figure.4.1 and presented in table .6

Table 6 Compaction Value

S.No	Mix Designation	Compaction Value
1	S1	0.89
2	S2	0.871
3	S3	0.828
4	S4	0.798
5	S5	0.795

5.1.3 Vee bee test

Vee bee is a good laboratory test to measure indirectly the workability of concrete. The latest IS 456 recommends the values of workability in terms of Vee Bee time in seconds. This method of test is used for very dry concrete whose slump value cannot be measured by slump test. The slump is measured in terms of Vee Bee seconds. It is the time required in seconds for concrete to change its shape from slump cone shape to cylindrical shape and is known as Vee Bee degree. The Vee Bee degree of mix of with river sand is higher than Vee Bee degree of mix with fibre concrete. This shows that mix with S1 mix is highly workable other mix.

5.2 Properties of Hardendt Concrete

The Compressive and tensile strength of concrete are presented in table 7 and8.

Table 7 Compressive strength of concrete

S.No	Type of mix	3 Days Strength N /mm^2	7Days Strength N /mm^2	14 Days Strength N /mm^2	28 Days Strength N/mm^2
1	S1 - Conventional mix	11.10	18.65	21.22	23.45
2	S2 -M –Sand Mix	10.12	16.54	19.12	22.33
3	S3 = M- Sand concrete + Added (1 % of AloePerfoliata Gel + 2.5% of Sisal fibers)	10.09	17.46	20.11	23.20
4	S4 = M- Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5 % of Sisal fibers)	11.18	19.37	22.22	23.12
5	S5 = M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1 % of Sisal fibers)	13.12	21.20	23.66	25.10

Table 8 Tensile strength of concrete

S.No	Type of mix	3 Days Strength N /mm^2	7 Days Strength N /mm^2	14 Days Strength N /mm^2	28 Days Strength N/mm^2
1	S1 - Conventional mix	1.90	2.52	2.82	3.1
2	S2 -M –Sand Mix	1.72	2.19	2.36	2.87
3	S3 = M- Sand concrete + Added (1 % of AloePerfoliata Gel + 2.5% of Sisal fibers)	1.82	1.92	2.43	2.91
4	S4 = M- Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5 % of Sisal fibers)	2.00	2.59	3.36	3.55
5	S5 = M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1 % of Sisal fibers)	2.21	2.41	3.11	3.31

5.2.1 .Compressive strength of concrete

3 - Days compressive strength of concrete.

The 3 days compressive strength of M –Sand Mixconcrete and M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers) more or less equal. The M- Sand concrete mix is 10.2 and 30.12 % of

compressive strength is reduced when compared to the normal river sand and M- Sand concrete + Added 2 % of Aloe perfoliata Gel + 1 % of Sisal fibers concrete. The compressive strength of conventional concrete and M- Sand concrete + Added (1.5 % of Aloe perfoliata Gel + 1.5 % of Sisal fibers concrete is more or less same. The results are presented in Figure.5

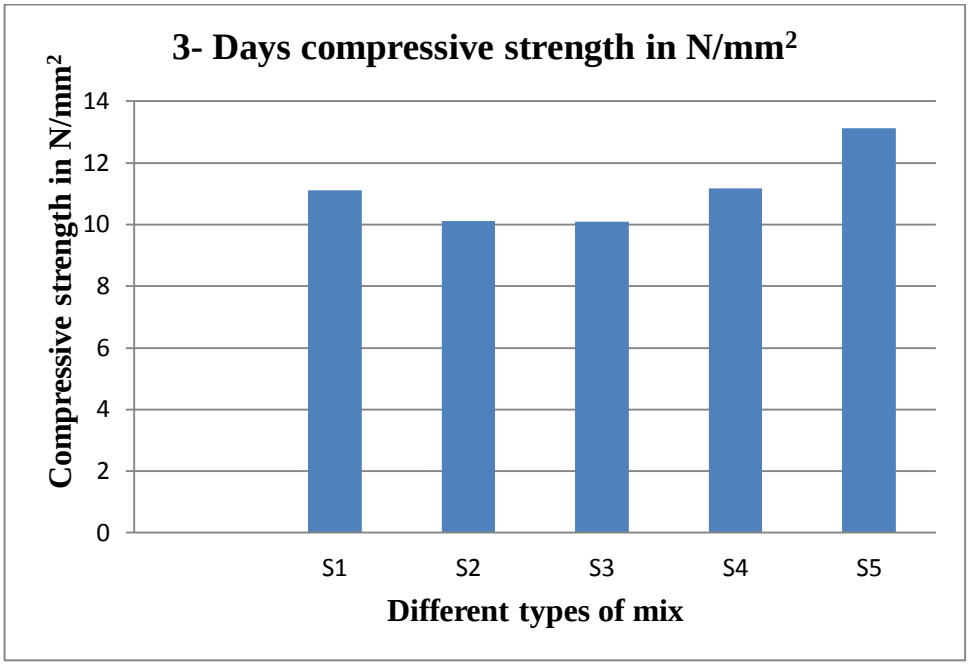

Figure 5, 3 – Days compressive strength of concrete

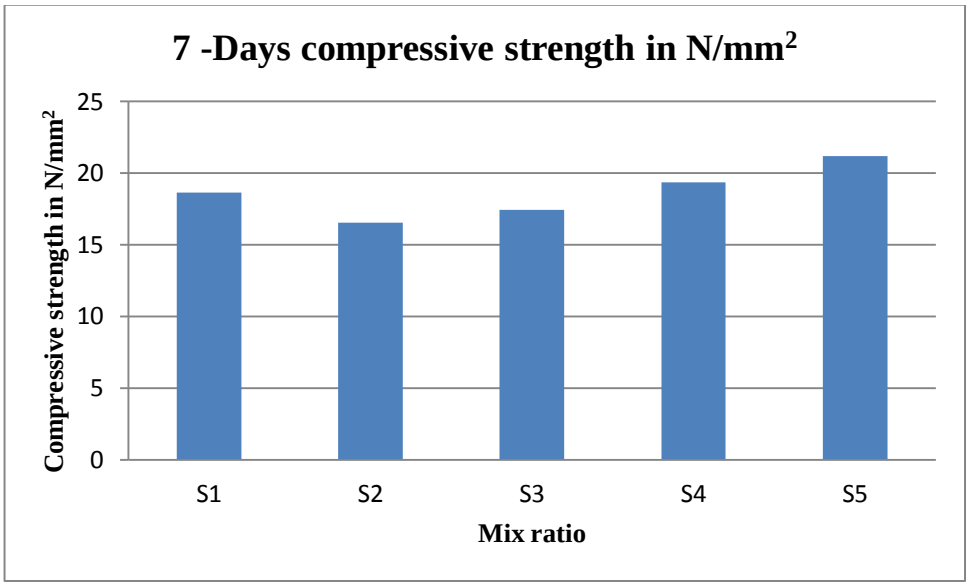

Figure 5.1 7 - Days compressive strength

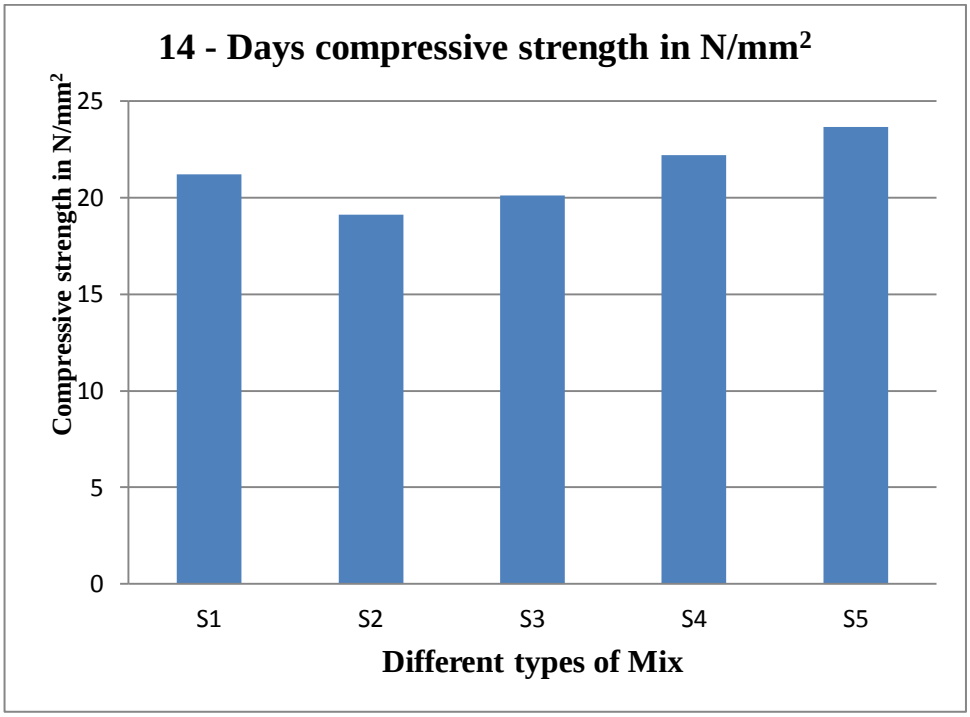

Figure 5.2 - 14 Days compressive strength of concrete.

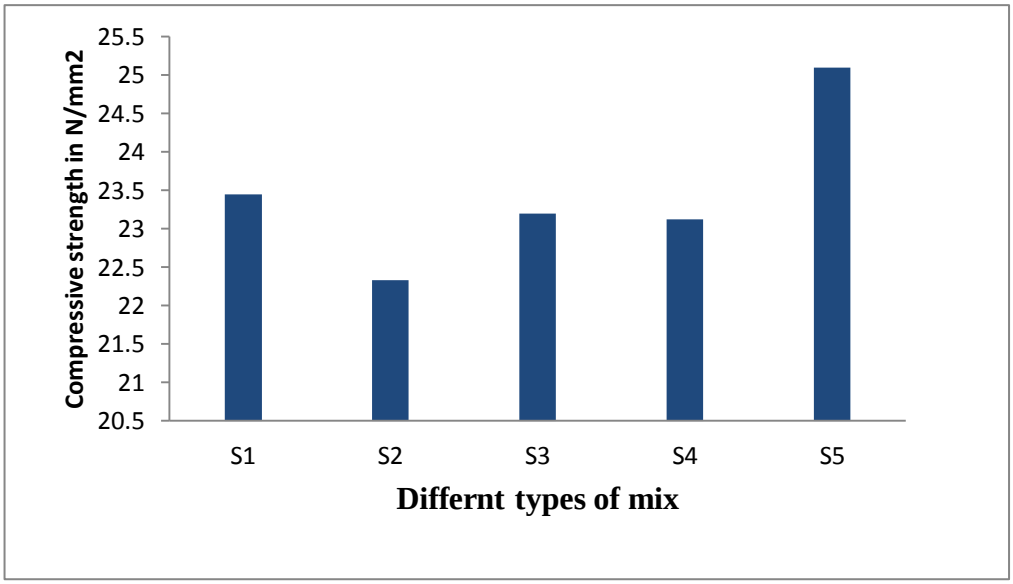

Figure 5.3 - 28 Days compressive strength of concrete

7 - Days compressive strength of concrete.

The 7 days compressive strength ofM –Sand Mix concrete and M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers) more or less equal..M –Sand Mixconcrete is 13.5 and 28.12 % of compressive strength is reduced when compared to the normal river sand and M- Sand concrete + Added 2 % of Aloe Perfoliata Gel + 1 % of Sisal fibers concrete. The compressive strength of conventional concrete and M- Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5 % of Sisal fibers concrete is more or less same. The results are presented in Figure.5.1.

14 - Days compressive strength of concrete.

The 14 days compressive strength of M –Sand Mixconcrete is9.52% , 13.5% and 22.83 % of compressive strength is reduced when compared to the conventional concrete , M- Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5 % of Sisal fibers concrete and M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1. 0 % of Sisal fibers) concrete. The compressive strength of conventional concrete and M-Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers)concrete is more or less same. The results are presented in Figure.5.2

28 - Days compressive strength of concrete.

The 28 days compressive strength of M –Sand Mix concrete is 5% and 12 % of compressive strength is reduced when compared to the normal river sand and M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1. 0 % of Sisal fibers) concrete. The compressive strength of M- Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5 % of Sisal fibers concrete &M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers) concrete is more or less same. The results are presented inFigure.5.3

5.2. 2 Tensile strength of concrete

The test is carried out conforming to IS 516 -1959 to obtain tensile strength of concrete at the 3 days,7 days, 14 days and 28 days. The cylinders are tested using 1400 tonne capacity HELICO compressive testing machine (CTM).The results are presented in table 8

3 - Days tensile strength of concrete.

The 3 days tensile strength of M –Sand Mix concrete and M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers) more or less equal.M –Sand Mix concrete is 10.40 and 28.40 % of tensile strength is reduced when compared to the conventional concrete and M- Sand concrete + Added 2 % of Aloe Perfoliata Gel + 1 % of Sisal fibers concrete. The tensile strength of conventional concrete and M- Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5 % of Sisal fibers concrete is more or less same. The results are presented in Figure.6

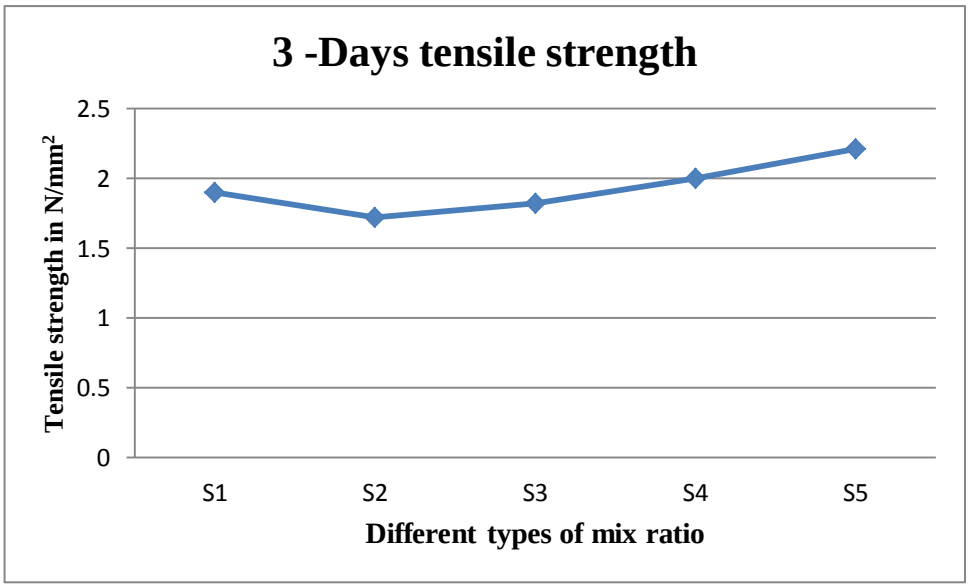

Figure 6 – 3 Days Tensile strength of concrete

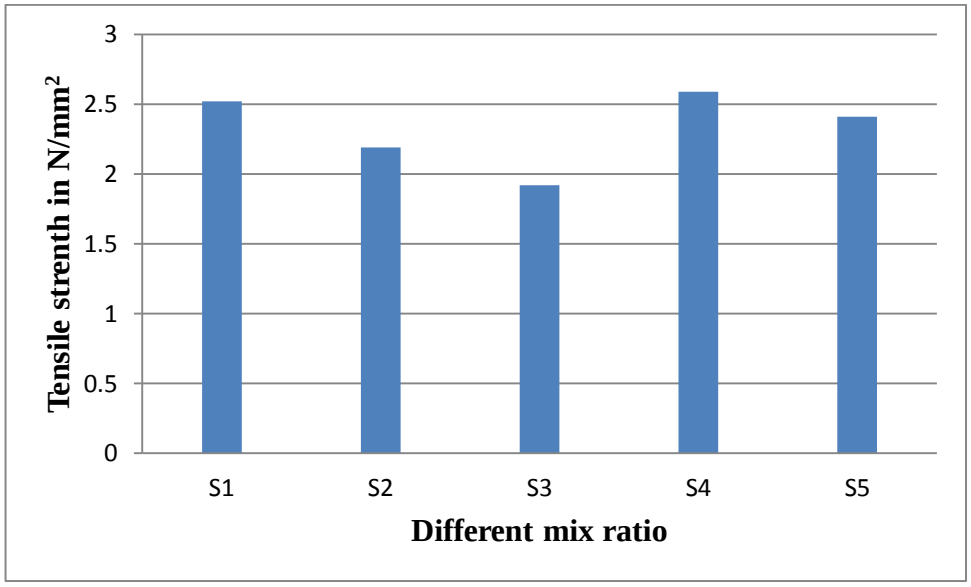

Figure 6.1- 7 Days Tensile strength in N/mm^2

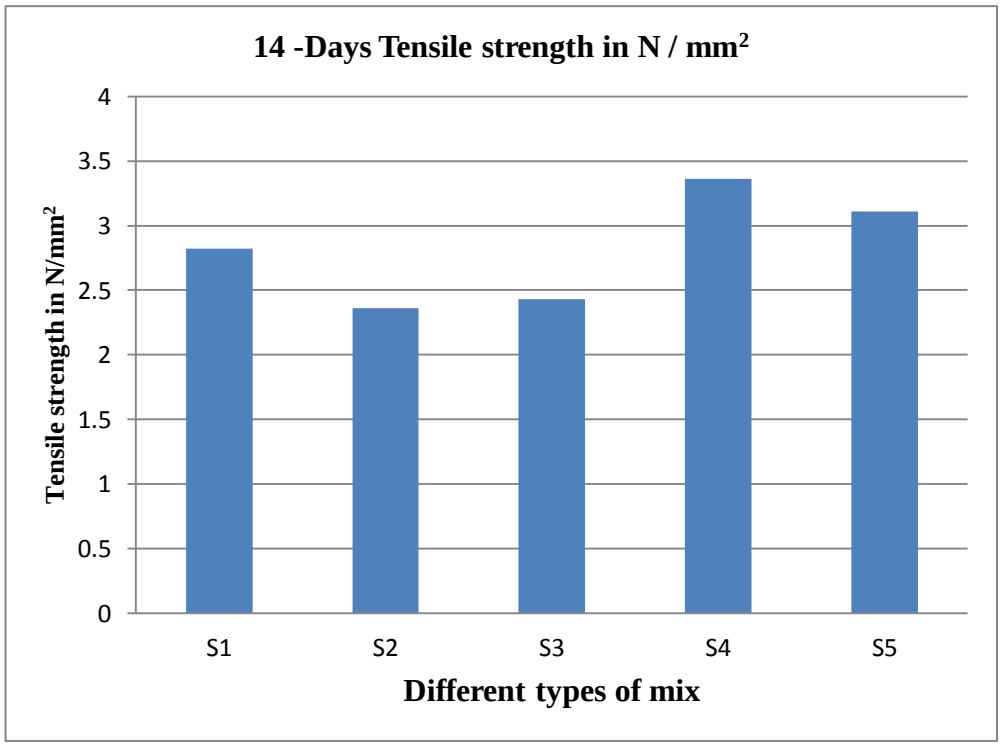

Figure 6.2 14 Days tensile strength of concrete

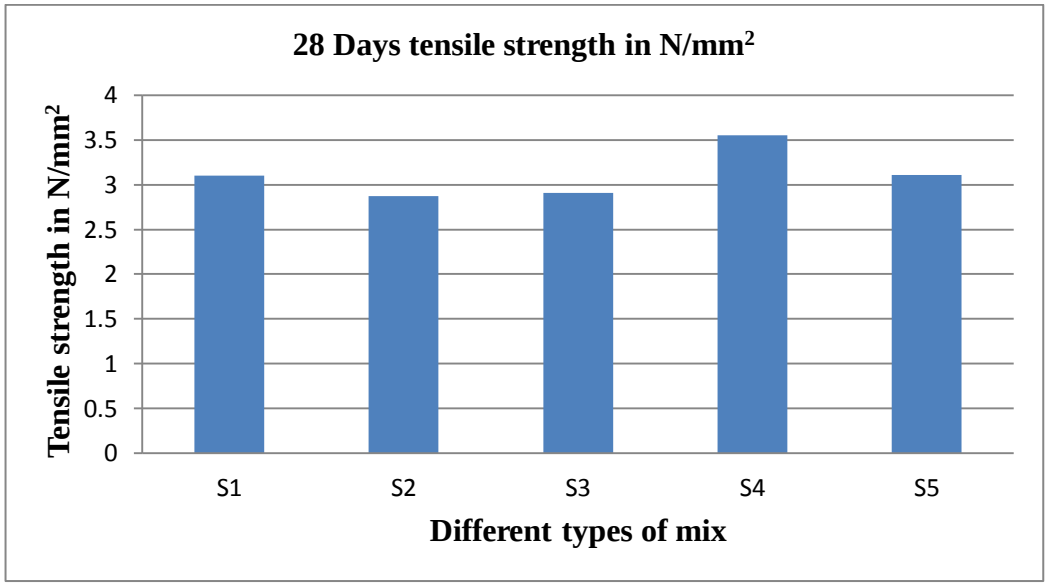

Figure 6.3 28 Days tensile strength of concrete

7 – Days tensile strength of concrete.

The 7 days tensile strength of M –Sand mix concrete is 15.60 and 22.169 % of tensile strength is reduced when compared to the conventional concrete and M- Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5 % ofSisal fibers)concrete. The tensile strength of conventional concrete and M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1. 0 % of Sisal fibers) concrete is more or less same and M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers)concrete is 31.25 % of tensile strength reduced when compared to the conventional concrete. The results are presented in Figure.6.1

14 - Days tensile strength of concrete.

The 14 days tensile strength of M –Sand mix concrete is 19.49 , 42.37 and 31.77 % of tensile strength is reduced when compared to the normal river sand , M- Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5 % of Sisal fibers)concrete and M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1. 0 % of Sisal fibers) concrete . The tensile strength of conventional concrete and M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers) concrete is more or less same. The results are presented in Figure 6.2

28 - Days tensile strength of concrete.

The 28 days tensile strength of M –Sand mix concrete is 8.01 , 23.69 and 15.33 % of tensile strength is reduced when compared to the normal river sand , M- Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5 % of Sisal fibers) concrete and M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1. 0 % of Sisal fibers) concrete .

The tensile strength of conventional concrete and M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers)concrete is more or less same. The results are presented in Figure 6.3

5.2.3 Flexural Strength of concrete

The test is carried out conforming to IS 516 -1959 to obtain flexural strength of concrete at the 7days, 14 days and 28 days are tested using loading frame 750 kN. The results are presented in Figure 7 ,7.1, 7.2 and table.9

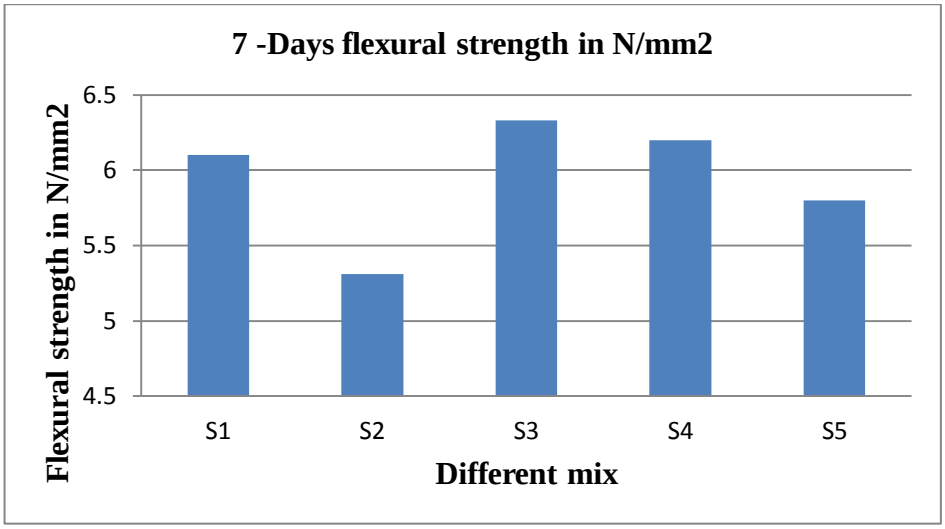

Figure7 , 7 - Days flexural strength of concrete

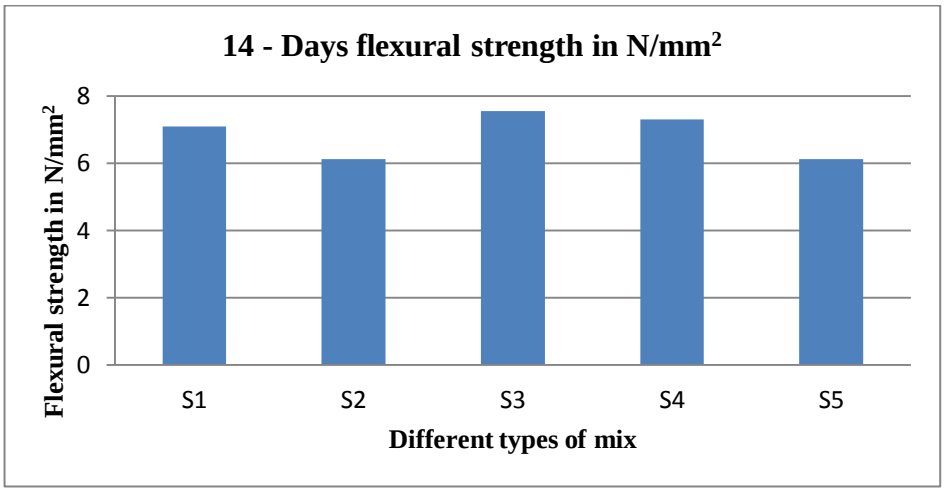

Figure 7.1 14 Days flexural strength of concrete

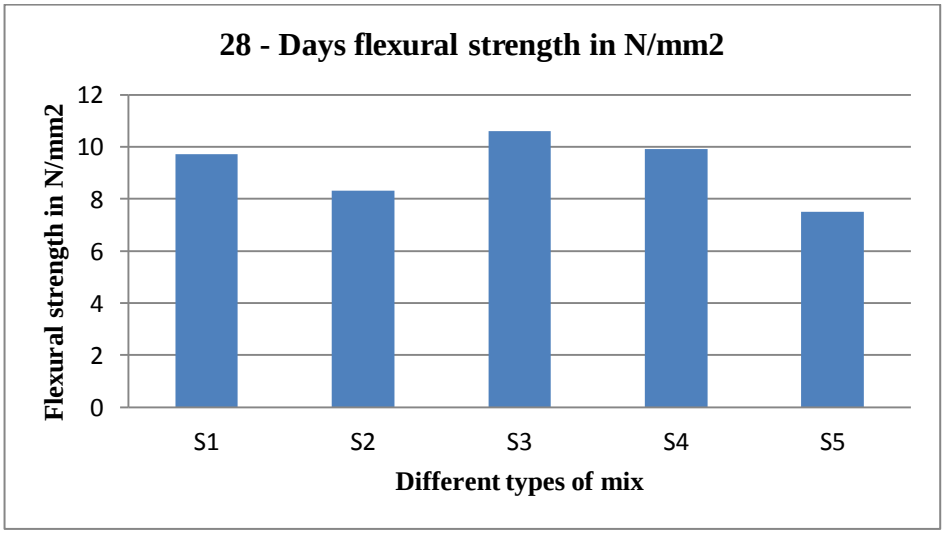

Figure 7.2 28 Days flexural strength of concrete

Table 9 Flexural strength of concrete

S. No	Type of mix	7Days Strength N /mm2	14 Days Strength N /mm2	28 Days Strength N/mm2
1	S1 - Conventional mix	6.10	7.10	9.72
2	S2 -M –Sand Mix	5.312	6.12	8. 32
3	S3 = M- Sand concrete + Added (1 % of AloePerfoliata Gel + 2.5% of Sisal fibers)	6.33	7.55	10.61
4	S4 = M- Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5 % of Sisal fibers)	6.20	7.31	9.91
5	S5 = M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1 % of Sisal fibers)	5.80	6.12	7.51

7 – Days flexural strength

The 7 days flexural strength of M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers)concrete is found to be 6.33 % more than the conventional concrete. The M –Sand Mix concrete, M-Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5% of Sisal fibers) concrete and M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1 % of Sisal fibers) concrete found to be 23.36 %, 3.545 % and 10.48 % of flexural strength is reduced when compared to the M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2. 0 % of Sisal fibers) concrete. Results of this test are show in figure .7

14 Days flexural strength

The 14 days flexural strength of M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers)concrete is found to be 5.06 % more than the conventional concrete. The M –Sand Mix concrete, M-Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5% of Sisal fibers) concrete and M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1 % of Sisal fibers) concrete found to be 21.06 %, 3.282 % and 23.36 % of flexural strength is reduced when compared to the M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2. 0 % of Sisal fibers) concrete. Results of this test are show in figure 7.1

28 Days Flexural strength

The 28 days flexural strength of M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers)concrete is found to be 7.9 % more than the conventional concrete. The M –Sand Mix concrete, M- Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5% of Sisal fibers) concrete and M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1 % of Sisal fibers) concrete found to be 17.29%, 26.98 % and 8.69 % of flexural strength is reduced when compared to the M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2. 0 % of Sisal fibers) concrete. Results of this test are show in figure .7.2

5.2.4. Water absorption test

This test is done as per procedure given in ASTM C 642-97 by oven-drying method. The results are presented in Figure.8and table 10. For this test 50mm x 50mm x 50mm cubes are cast. After 24 hours of remolding, the specimens are kept immersed in water. At the end of 28 days, the specimens are taken from the curing tank and air-dried to remove the surface moisture then taken the initial weight (W1) is taken. The final weight (W2) is taken to the specimens are dried in an oven at a temperature of 100+10o C for 48 hrs, and allowed to cool at room temperature.

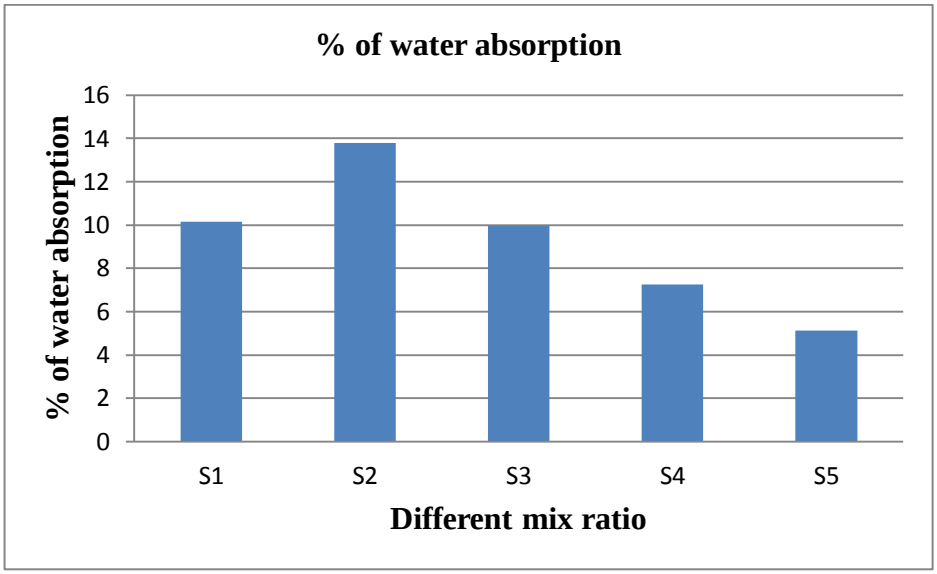

Figure 8. Percentage of water absorption

The 28 days water absorption M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1. 0 % of Sisal fibers) concrete are found to be 49.55 % , 62.65% , 48.96% ,and 29.78% of water absorption is reduced when compared to the conventional concrete ,M- Sand concrete , M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers) concrete and M- Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5 % of Sisal fibers) concrete. M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1. 0 % ofSisal fibers) concrete is best impermeability of concrete compare to other mix ratio. Nano silica is the good durability of concrete. Results of this test are show in table .10

Table 10 % of water absorption of concrete

S.No	Type of mix	% Water absorption test
1	S1 - Conventional mix	10.15
2	S2 -M –Sand Mix	13.79
3	S3 = M- Sand concrete + Added (1 % of AloePerfoliata Gel + 2.5% of Sisal fibers)	9.98
4	S4 = M- Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5 % of Sisal fibers)	7.25
5	S5 = M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1 % of Sisal fibers)	5.12

Table 11 % of acid penetration of concrete

S.No	Type of mix	% Acid penetration test
1	S1 - Conventional mix	9.13
2	S2 -M –Sand Mix	10.15
3	S3 = M- Sand concrete + Added (1 % of AloePerfoliata Gel + 2.5% of Sisal fibers)	11
4	S4 = M- Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5 % of Sisal fibers)	9.23
5	S5 = M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1 % of Sisal fibers)	8.15

5.2.5. Acid penetration test

This test is done as per procedure given in ASTM C 642-97 by oven-drying method. The results are presented in Figure 9. For this test 50mm x 50mm x 50mm cubes are cast. After 24 hours of remolding, the specimens are taken the initial weight (W1) after kept immersed in HCL (pickling solution). At the end of 28 days, the specimens are taken the finial weight (W2) is taken. The 28 days acid penetration of M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1. 0 % of Sisal fibers) concrete is high resistance in permeability and high durability of concrete compare to the other mix ratio. Results of this test are show in table .11

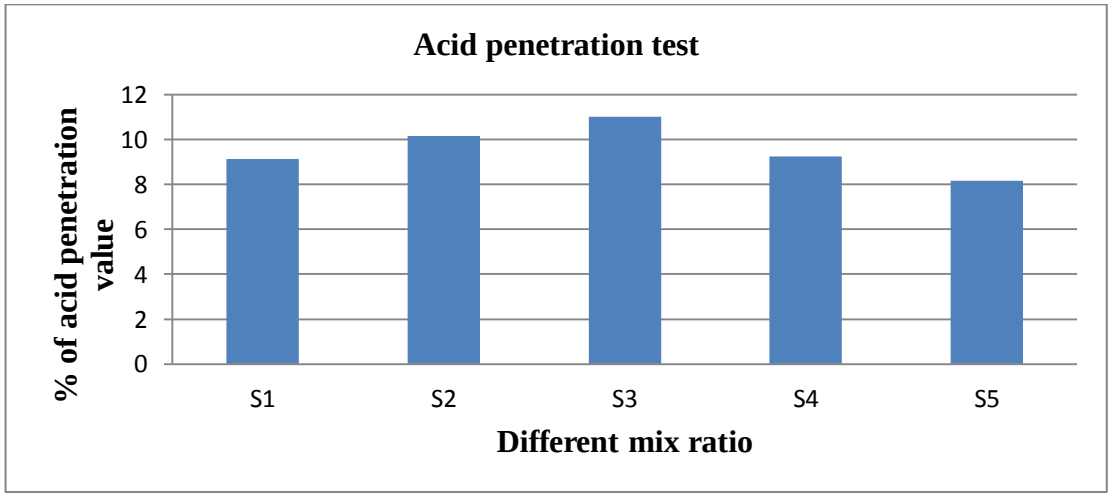

Figure 9 % of acid penetration

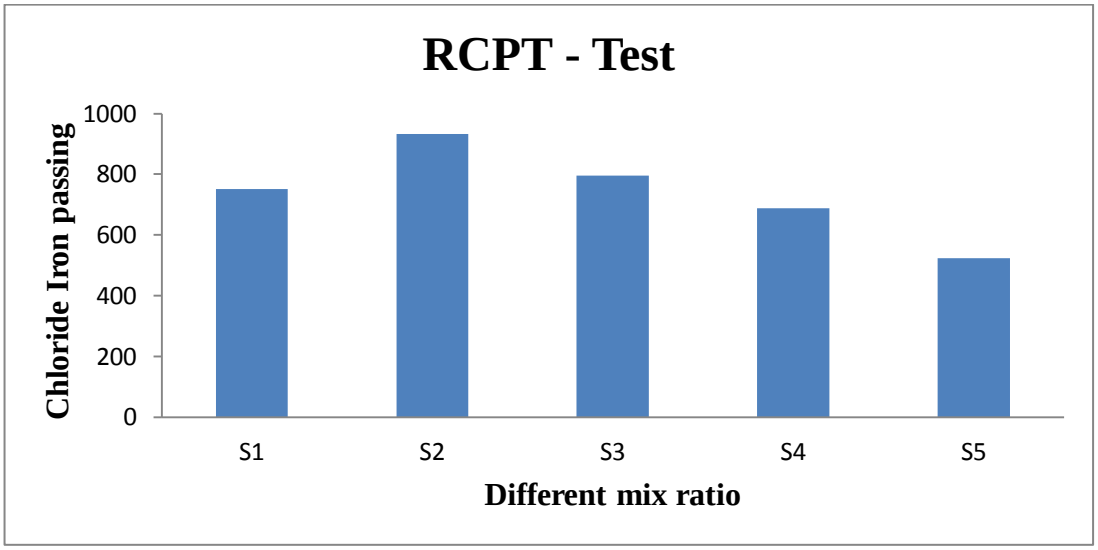

Figure 10. RCPT test of concrete

5.2.6. Rapid chloride penetration test

This test is conducted as per ASTM C1202-09. The results are presented in Figure.10. Concrete disc of size 85 mm diameters and 50 mm thickness average value of three samples. The specimens are carried at different stages, allowed to cure for 28 days and then they are subjected to RCPT test by impressing a voltage of 60v. The permeability of M- Sand mix is very high when compared to the M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1. 0 % of Sisal fibers)concrete and conventional mix. M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1. 0 % ofSisal fibers)concrete is to found 30. 47% ,43.89% ,34.25% and 24.05 % found to be to less than conventional concrete, M - Sand , M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers) concrete and M- Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5 % of Sisal fibers)concrete.

Table 12 RCPT Test of concrete

S.No	Type of mix	% Chloride Ion passing
1	S1 - Conventional mix	752.10
2	S2 -M –Sand Mix	931.86
3	S3 = M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers)	795.28
4	S4 = M- Sand concrete + Added (1.5 % of Aloe Perfoliata Gel + 1.5 % of Sisal fibers)	688.25
5	S5 = M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1 % of Sisal fibers)	522.86

There is a significant improvement in the durability of concrete because of high pozzolanic nature of the nano-silica and its void filling ability. The RCPT values show in table 12.columbs value ≥ 4000 the Chloride Ion high. In between 2000 – 4000 the Chloride Ion moderate,1000 –2000 the Chloride Ion low, In between 100 – 1000 the Chloride Ion very low and ≤ 100 negligible.

The constituents are weighted and the material is mixed by hand mixing. The mixes are compacted using table vibration. The water binder ratio (W/B) adopted is 0.375 concrete and mortar. The specimens are demoulded after 24h, cured in water for 7, 14 and 28 days and then tested for its compressive, tensile and durability test as per indian standards. There is a significant improvement in the strength of concrete because of high pozzolanic nature of the nano silica and its void filling ability.

V. Conclusions

- Addition of M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers) concrete leads to a significance increase in the characteristic strength and workability of concrete.
- M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1. 0 % of Sisal fibers)concrete is to found 30. 47% ,43.89% ,34.25% and 24.05 % found to be to less than conventional concrete.
- The 28 days acid penetration of M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1. 0 % of Sisal fibers) concrete is high resistance in permeability and high durability of concrete compare to the other mix ratio.
- M- Sand concrete + Added (2 % of Aloe Perfoliata Gel + 1. 0 % of Sisal fibers) concrete is best impermeability of concrete compare to other mix ratio.
- The 28 days flexural strength of M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers)concrete is found to be 7.9 % more than the conventional concrete
- The tensile strength of conventional concrete and M- Sand concrete + Added (1 % of Aloe Perfoliata Gel + 2.5% of Sisal fibers)concrete is more or less same.

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