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AN EXPERIMENTAL STUDY ON PROPERTIES OF CONCRETE WITH ADDITION OF SISAL FIBRE

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Abstract— ***This project was deals with the mechanical strength properties of sisal fiber reinforced concrete for a mix proportions of M25. This concrete has some changes in the strength and toughness of concrete due to the addition of sisal fibers. Fiber has low density, no health risk, increased specific strength and modulus, less cost. The purpose of this project is based on the investigation of the use of sisal fibers in structural concrete to enhance the mechanical characteristics of concrete.***

I. INTRODUCTION

The ordinary Portland cement concrete is a brittle material. It has very low tensile strength, ductility and poor resistance to cracking. Due to poor tensile strength in concrete internal micro cracks are developed which possess brittle in nature it will develop and opens up when load is applied.

The addition of small closely spaced and uniformly dispersed fiber to concrete can act as a crack arrester and improves its properties. This is type of concrete, which can also be defined as the concrete containing fibrous materials which increases its structural performance. Sisal fiber in concrete, mortar and cement paste can enhance most of the engineering properties such as toughness, flexural strength and resistance to fatigue, impact, thermal shock and spalling. The physical properties of this fibre have no deteriorations in a concrete medium. Sisal is a fiber obtained from a plant called sisal comes under family of Asparagaceae. Their green tissues are scrapped by hand or machine and dried clean the fiber with impurities. It produces stiff and strong fibers. The fibers of sisal are of 4 to 12μ diameter and the length of 45 to 160cm are available. These are the natural fibers which are ecofriendly and also cost efficient. The mixes of proportion of sisal fiber to concrete is depends on its own properties. The choice of selection of natural fiber was from varies literatures studies, research papers.

II. MATERIALS USED

Cement:

The cement used was Ordinary Portland cement (43grade) conforming to IS:12269-1987 with a specific gravity of 3.12

Fine Aggregate:

The sand used for experimental program was locally procured and conforming to zone I. The sand was first sieved through 4.75 mm sieve to remove any particles greater than 4.75mm. The fine aggregates were tested as per Indian Standard Specifications IS:383-1970.

Coarse Aggregate:

The natural broken stone (coarse aggregate) used for the study was of 20mm size maximum. The size of Aggregates bigger than 4.75mm.

Water:

Water plays a vital role in achieving the strength of concrete. For complete hydration it requires about 3/10th of its weight of water. It is practically proved that minimum water-cement ratio 0.5 is required for conventional concrete. Water participates in chemical reaction with cement and cem`ent paste is formed and binds with coarse aggregate and fine aggregates. If more water is used, segregation and bleeding takes place, so that the concrete becomes weak, but most of the water will absorb by the fibers. Hence it may avoid bleeding. If water content exceeds permissible limits it may cause bleeding. If less water is used, the required workability is not achieved.

Sisal Plant:

Sisal is a strong leaf fibre obtained from the leaves of the plant Agavesisalana. The plant is a monocotyledonous perennial shrub that grows in the tropical and sub-tropical regions of the world. It is one of the most extensively cultivated hard fibres in the world due to the ease of cultivation of sisal plants, and is quite easy to grow in all kinds of environments. The major producer of sisal fibres are Mexico (120ktons), Brazil(125 k tons), Tanzania(26k tons), Kenya(22k tons), Madagascar (10k tons), China (25k tons) per annum. In India, it is mainly grown or cultivated in the arid and semi-arid regions of Andhra Pradesh, Bihar, Orissa, Karnataka, Maharashtra and West Bengal.

The sisal plant looks like an overgrown pineapple plant with a pineapple-like bole (a short, stocky trunk) from which the leaves extend. For a matured plant, the bowl is about 50cm in height and about 20cm in diameter (fig. a).The leaves can attain a length of upto 2m, the leaves which may be as broad as12cm are tipped with sharp, highly lignified spines of about 1.0-1.5cm long. The outside of the sisal leaf consists of a well-developed epiderm is with a waxy surface. This epidermis contains cut in, waxes and carbohydrates. Initially, all leaves grow vertically on the plant but with age they fan out gradually. The matured leaves are those closest to the ground containing the coarse stand the longest fibres.

Sisal Fiber:

Fiber is extracted by a process known as decortications, where leaves are crushed and beaten by a rotating wheel set with blunt knives, so that only fibers remain. In India, where production is typically on large estates, the leaves are transported to a central decortications plant, where water is used to wash away the waste parts of the leaf.

III. TEST METHODS

The cubes of 150x150x150 mm size and cylinders of 150mm dia 300mm height were tested for compression, and split Tensile. Tests were done as per codes of Bureau of Indian Standards. The test for compressive strength on cubes were measured at 7, 14 and 28days of curing.

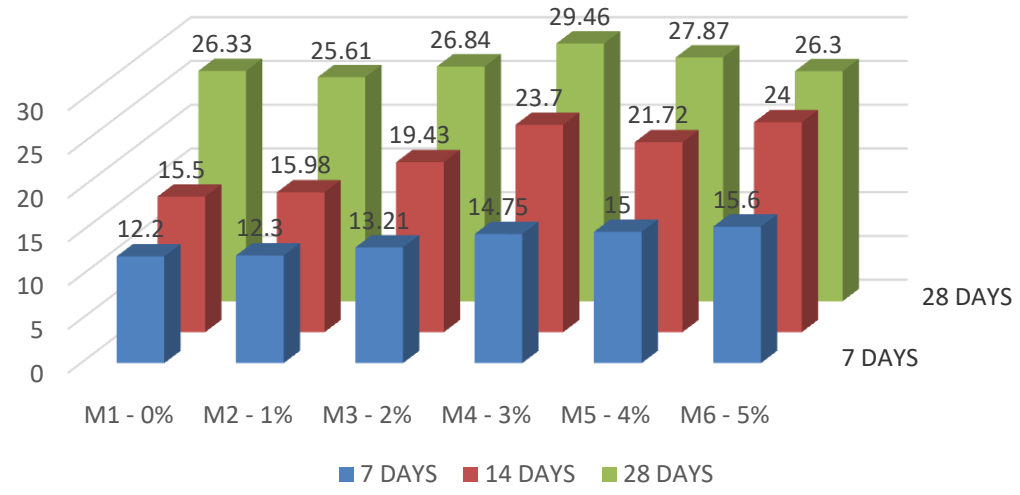
Compressive strength

Sample	7 days	14 days	28 days
M1 – 0	12.2	15.5	26.33
M2 – 1	12.3	15.98	25.61
M3 – 2	13.21	19.43	26.84
M4 – 3	14.75	23.7	29.46
M5 – 4	15	21.72	27.87
M6 – 5	15.6	24	26.3

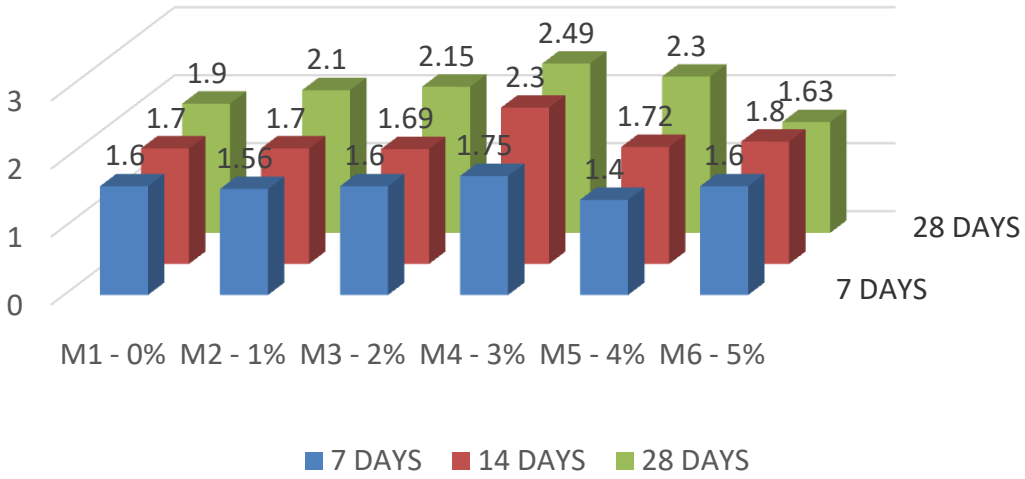
Tensile strength

Sample	7 days	14 days	28 days
M1 – 0	1.6	1.7	1.9
M2 – 1	1.56	1.7	2.1
M3 – 2	1.6	1.69	2.15
M4 – 3	1.75	2.3	2.49
M5 – 4	1.4	1.72	2.3
M6 – 5	1.6	1.8	1.63

COMPRESSIVE STRENGTH



TENSILE STRENGTH



IV. CONCLUSIONS

The study on the introduction of effect of Sisal fibers can be still promising as Sisal fiber reinforced concrete is used for sustainable and long-lasting concrete structures. Lot of research work had been done on sisal fiber reinforced concrete and lot of researchers work prominently over it. This review study tried to focus on the most significant effects of addition of sisal fibers to the concrete mixes. It is observed that bonding between concrete and Fiber is excellent and no sign of delamination is noted. Concrete is strong in compression but weak in tension. The tensile property of concrete can be improved by the addition of small volume of fibers. Addition of fibers not only increases tensile strength but also increases bond strength, decreases permeability, also resists seismic loading as well through its ductility. Toughness of concrete also increases.

By adding this sisal fiber 1%, 2%, 3%, 4% and 5% it is found that there is a increase in properties of hardened concrete. Addition of fibers of 3% shows an increase in compressive strength of about 12%. Addition of fibers of aspect ratio 3% shows an increase in split tensile strength about 31 %

V. REFERANCES

1. Sisal Fiber Reinforcement Of Durable Thin Walled Structures – A New Perspective. - Engr. Flavio De Andrade Silva Dr.Romildo Dias Toledo Filho
2. Tanzania sisal board (A brief introduction of sisal): Article
3. William, J.K.James, H.H.Jefferey, A.M."SISAL FIBER: Structure, Properties, Manufacturing Processes and Applications" pp 15-33 in Handbook of sisal fiber and sisal fiber Composites, Edited by Haruhun G. Karian, Mercel Dekker Inc, New York, 1999.
4. Frank, H.P., Sisal Fiber, Gordon and Breach Science Publishers, 1968. A study on properties of sisal fiber reinforced concrete with different mix proportions and different percentage of fibre addition J. Ritesh 1, b. Harish naik2.
5. The Effect of Adding Different Types of Natural Fibers on Mechanical Properties and Impact Resistance of Concrete Sarmed Fadhil and Mohanad Yaseen.
6. Experimental Study on Sisal Fiber Reinforced concrete With Partial Replacement of Cement by Ground Granulated Blast furnace Slag P. Sathish1, V. Murugesh2
7. Effect of Natural Resin on Strength Parameters of Sandy Soil H. Suha Aksoy and Mesut Gor