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A Review Study on Sisal Fibre Reinforce Concrete

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Abstract: As we know there are many natural fibres are present in Nature, which are used in concrete to maximize the strength of concrete structure. This fibre is introduced from the plant name as Sisal, the leaves of this plant are used to produce fibre. The production of sisal fibre as compared with synthetic fibre or even with mineral fibre needs much less energy in addition to the Ecological, Social and Economical Benefits. They carried out some test on Beam, Cube And Cylinder to check the feasibility of material for further use in construction. From the test concluded that fibre gives good strength for Cube and Cylinder and not give good strength for Beam without steel and gives good strength with Steel. For optimum dosage of Sisal fibre, the percentage of Sisal is used as 1% for Concrete mix.

Key Words: Sisal fibre, Maximize, Durability, Tensile strength, Bending strength.

I. INTRODUCTION

Natural fibres are useful and easily available reinforcing materials. It is widely used in reinforcing materials due to its various properties. It is somewhat common and traditional; the fibre material helps to improve the tensile and bending strength. It also has ductility and greater resistance against cracking failure. There are main two types of fibres such as Natural and Artificial. Natural fibres are of many types like sisal, coconut, jute, bamboo and wood fibres. These fibres are used for reinforcing the structure and increasing the strength. Sisal fibre is naturally and easily available and it is also economical. Sisal is a crop mainly grown in semi arid climate and poor northeast region of country. Sisal fibres are obtained from the outer leaf skin the inner pulp is removed which contains amount of water in it. Generally a plant produces 200 to 250 leaves and each leaf nearly form 1000 to 1200 fibre bundles. For the conducting of the test, cut the sisal in different length as per the aspect ratio and then mix the fibres in the concrete mix to obtain fibre reinforced concrete.

A. Properties of Sisal Fibre

- 1) Sisal Fibre is exceptionally durable with a low maintenance with minimal wear and tear.
- 2) It is Recyclable.
- 3) Sisal Fibres are obtained from the outer leaf skin, removing the inner pulp.
- 4) It is available as plaid, herringbone and twill.
- 5) Sisal Fibre are Anti static, does not attract or trap dust particles and do not absorb moisture or water easily.
- 6) The fine texture takes dyes easily and offers the largest range of dyed colors of all natural Fibre.
- 7) It exhibits good sound and impact absorbing properties.
- 8) Its leaves can be treated with natural borax for fire resistance properties.

Table 1: Properties of sisal fibres (Mukherjee & Satyanarayana, 1984)

Diameter (µm)	Density (g cm ⁻²)	Cellulose (%)	Lignin (%)	l/d ratio*	Cell wall thickness(µm)	Microfibrillar Angle (deg)
100-300	1.450	70	12	100	12.5	20-25

B. Application of Sisal Fibre

From ancient times sisal has been the leading material for agricultural twine because of its strength, durability, ability to stretch, affinity for certain dyestuffs, and resistance to deterioration in saltwater.

- 1) Sisal is used commonly in the shipping industry for mooring small craft, lashing, and handling cargo.
- 2) It is also surprisingly used as the fibre core of the steel wire cables of elevators, being used for lubrication and flexibility purposes. Traditionally sisal was the leading material for agricultural twine or baler twine. Although this has now been overtaken by polypropylene.

- 3) It is used in automobile industry with fibre glass in composite materials.
- 4) Other products developed from sisal fibre include spa products, cat scratching posts, lumbar support belts, rugs, slippers, cloths and disc buffers.
- 5) Sisal is used by itself in carpets or in blends with wool and acrylic for a softer hand.

II. METHODOLOGY

Sisal fibre is used in the form of discrete pieces in reinforcement concrete. Keeping in the mind-faults, objectives and benefits of fibre it is necessary to compare it with the conventional concrete. The entire ingredients which were used in the mix are weighted by appropriate mode of measurement. The standard moulds filled with three layers in moulds and internal compaction was given with the help of standard steel bar. This compaction has been uniform without any void and honeycombing. After removing the moulds, specimens are tested to verify the strength. The results obtained for fibre reinforced concrete are compared with conventional concrete. The tests are conducted for 3days, 7days, 14days and for 28days.

Table 2. Comparison of Sisal fibre concrete and Normal concrete

Sisal Fibre Concrete	Normal Concrete
It gives better result than Normal concrete as it includes Sisal fibre.	As Fibre is absent the strength could not increase as compare to Sisal fibre concrete.
It is economical as sisal available in abundant quantity in nature.	It is not economical concrete.
By this Fibre the Compressive, Split tensile and Flexure Test gives more strength than Normal concrete.	Normal concrete gives Stable Results of Compressive, Split tensile and Flexure Test.
By using this Fibre Seismic impact will not affect the structure.	This concrete cannot resist the Seismic impact on structure.

III. DISCUSSIONS AND FINDINGS

Many research works are done by the researchers to evaluate the strength of sisal fibre. As the aspect ratio increases with increase in the percentage of fibre, it affects the workability of concrete. The aspect ratio from 60 to 140 increases the strength. As the aspect ratio increases above 140, the strength of concrete decreases. Addition of 1% of sisal fibre gives maximum strength. Increase in the percentage of fibre decreases the workability of mix. Plain concrete are susceptible to the crack formation in the initial stage due to shrinkage. Fibre increases the strength of concrete by preventing crack formation. Fibres act as a barrier to crack, which reduces the crack length and ultimately increases strength of concrete structure.

IV. CONCLUSION

As above study they concluded that the Sisal fibre is a feasible for use in construction work as it gives good strength and it is economical as it available in nature with abundant quantity. As per previous study, it is reliable to make modifications in the concrete to make structure good in all aspects.

- A. We found out that compressive strength as well as tensile strength of specimen will increase by addition of fibre.
- B. Toughness of concrete increase.
- C. By the addition of sisal fibre reinforced concrete gives good result as compared to the conventional concrete.

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