The Utilization of Natural Jute Fiber For The Stabilization Of Subgrade Soil

AITHARJU PRITHVIRANI
M.TECH Student (Highway engineering)
Dept of Civil Engineering
Guru Nanak Institute of Technology
Hyderabad, TS, India.

Dr S SREENATHA REDDY
Professor
Dept of Mechanical Engineering,
Guru Nanak Institute of Technology
Hyderabad, TS, India.

S MADAN MOHAN
Professor
Dept of Civil Engineering
Guru Nanak Institute of Technology
Hyderabad, TS, India.

MALLIKARJUN PATIL
Associate Professor
Dept of Civil Engineering
Guru Nanak Institute of Technology
Hyderabad, TS, India

Abstract: **Sub grade soil is an essential part within the pavement structure because it provides support for that pavement from beneath. The qualities of sub grade soil are very important in the perception of pavement structure. Elevated earth can be a composite material that's a mix of soil and reinforcement, placed to address the developed tensile stresses plus it enhances the resistance within the soil for the finest stress. To look for the optimum moisture content and maximum dry density for soil A and Soil B additionally to soil jute fiber mix. To uncover rise in strength through the use of jute fibers as being a backing material by transporting out Unconfined Compressive strength test (UCS) and CBR test. To look for the optimum fiber content for soil A and soil B using unconfined compressive strength test (UCS) and California Bearing Ratio test. To look for the Optimum morality and soaking length of NaOH solution to help with fiber. To look for the sturdiness Qualities within the Jute fiber elevated with Soil A and soil B. Objective of reducing pavement thickness on poor sub grade new techniques of construction and soil stabilization are really continuously investigated.**

Keywords: **Jute Fiber; Reinforced Soil; Subs Grade Soil;**

I. INTRODUCTION

The primary reason behind the sub grade should be to give sufficient support for that pavement. Sub grade should possess sufficient stability under adverse climate and loading condition. Pavement needs top quality material getting sufficient strength and sturdiness qualities. The development cost may be reduced substantially by choosing local materials including local soils for regarding the lower layers of streets. Appropriateness of materials may be judged based on strength and sturdiness [1]. Poor natural soils ensure they are practically unacceptable for many civil engineering construction activities including road streets. In such cases natural soils receive several types of materials to improve their engineering qualities. The entire process of enhancing the engineering qualities of soil is known as soil stabilization which has been quite effectively present in many engineering problems. Elevated earth could be a composite material that's a mix of soil and reinforcement, superbly placed to address the developed tensile stresses plus it enhances the resistance within the soil for the finest stress. The fundamental highlights of elevated earth would be the friction concerning our planet and reinforcement, by way of friction our world transfer for that reinforcement the forces built-inside our planet mass. The attempts are increasingly being designed to really result in the concept popular but nonetheless it takes much to get moved out in this connection. In our good status for soil stabilization, the idea and principle of soil reinforcement was produced by Vidal. Elevated soil structure might be economical alternative for conventional sloped embankment, gravity walls or RC cantilever walls when right of strategy is restricted, foundation the weather is weak nor conventional walls may be built nor embankments with slopes.

II. METHODOLOGY

Jute plant existence is grown mostly inside the genetic delta inside the eastern part of the Indian subcontinent. People knowledgeable about consume its leaves like a vegetable furthermore to children herbal remedy. Its potential as an important natural fiber-source is really a subsequent find. Jute plant has a erect stalk with leaves. It thrives in hot and moist climate specifically in places where rain reaches plenty. It evolves three meters in 3 levels and matures within four to six a couple of days Jute has coarse natural bats fibers lounging inside the peripheral layer in the stem [2]. The fibers are removed within the derive from the flower obtaining a unique process proven to as Retting. Retting usually includes tying the plants in bundles and immersing them in progressively flowing or stagnant water for roughly 2 to 3 days. The whole process of wetting makes fiber extraction easy from jute stem since it softens and dissolves the sticky substances, especially pectin. Extraction is finished

manually adopted by washing and drying out, to really increase the risk for fibers suitable for commercial use. Jute research clothing is regularly trying to improve retting techniques. This type of waste Jute material enables you to definitely certainly enhance the sub grade strength inside the soil. Soil: In India, soils has already established proper proper care of into six group mainly alluvial soil, marine soil, late rite and lateritic deposits, expansive soils, sand dunes and boulder deposits. Through getting an average 1 laky sq km area is incorporated by lateritic soil deposits, 3 lakh sq km area is incorporated by Black cotton soil and 5 lakh sq km area is incorporated by sand dunes. Being poor in mechanical characteristics, it has been putting challenges to civil engineers to enhance its characteristics using the need which is different from site to site. During last 25 years or so roughly, much work remains done on strength deformation behavior of fiber elevated soil and includes been determined certainly that inclusion of fiber in soil improves the overall engineering performance of soil. Among the notable characteristics that enhanced are greater extensibility, small insufficient publish peak strength, isotropy in strength and insufficient planes of weakness. Utilization of natural material for instance Jute, coir, sisal and 4 bamboos, as reinforcing materials in soil is prevalent for pretty much any extended serious amounts of they are abundantly contained in many nations. Soil Improvement Technique: Numerous ground improvement techniques are recommended for individuals fundamental concepts of structures on such soil deposits. The development techniques can broadly be classified into four groups as: Conventional practices, Stabilization techniques, Techniques based on analytical and structural design approaches and Innovative techniques. Reinforcement communicates when using the soil through friction and adhesion. The practicing engineers are selecting this process for stabilization of thin soil layers, repairing not efficient slopes, soil strengthening within the footings plus earth retaining structures. Using natural materials, for instance bamboo, jute and coir as soil reinforcing materials remain prevalent for pretty much any extended with time several South Asian nations. Their primary advantage is that they are where you live available and they're of affordable. Synthetic fibers for instance polypropylene, polyester, polyethylene and glass fibers can also be utilized as reinforcing materials [3]. The fiber-elevated soil functions just like a composite material. The thought of reinforcing soil masses by including some form of fiber was used by early civilizations which used soil coupled with straw or other available fiber to enhance sturdiness and strength inside the dried brick utilized as building materials. Randomly distributed fibers offer strength isotropy and limit potential planes of weakness that could develop parallel to oriented reinforcement. Hence, there's any excuses for soil improvement by utilizing fiber, through which we are able to utilize where you live available destabilized soil for that construction purpose which will we stabilized. The present analysis focuses on utilization of naturally available Coir and Jute fiber in offering soil-reinforcement for soil, they are susceptible to accelerate the whole process of improving stability and make use of an even more effective solution inside the soil. Using natural materials for instance jute, cotton, coir, sisal etc. as reinforcing materials in soil started noisy . nineties. The main advantage of these things is that they are where you live supplied with practically little cost. They are biodegradable and thus will not create environmental problems. Ale natural fibers to consider water and also to degrade before lengthy are its prime property which provides them a benefit inside the man-made materials. Reliance on pulverization: A pre-requisite to effective stabilization is during inclusion of stabilizer, the world should be inside the reasonably pulverized condition [4]. Whereas light textured soils are often friable, and therefore easy to pulverize, this is not so inside the situation of expansive soils, which are soft and sticky when wet but very hard when dry. Techniques of pulverization: Using manual work. Using heavy farming machinery for instance ploughs tractors of 110 H.P etc. Using light farming machinery via Tractors of roughly 50 H.P., Mould Board Ploughs (made up of three furrows) Disc Harrows (made up of 20 saucer created DVDs obtaining a die of roughly 25 cm). Concepts of Soil Stabilization: Various techniques are broadly-acquainted with stabilize soil combined with the method should be verified inside the lab when using the soil material before implementing it chilling out. Evaluating the world characteristics in the area inside your ideas. Exercising is know for soil which must be modified to get the design value. Pick the effective and economical method of stabilization. Enabling the stabilized soil mix sample and testing it inside the lab for intended stability and sturdiness values. Mechanism of stabilization: The over dependence on industrially manufactured soil improving additives (cement, lime, Jute, coir etc) have stored the cost of construction of stabilized road financially high. Problematic soils for instance expansive soils are often knowledgeable about foundation engineering designs for roads, embankments, retaining walls, backfills etc. Expansive soils are available in semi - arid parts of tropical and temperate climate zones and they're abundant, where the annual evaporation surpasses the precipitation which is found all over the world. Thus, the possibility utilization of Jute fiber will considerably decrease the cost of construction additionally to lessen and sometimes eliminate the environmental hazards caused.

Fig.1.Compaction

III. MATERIALS USED

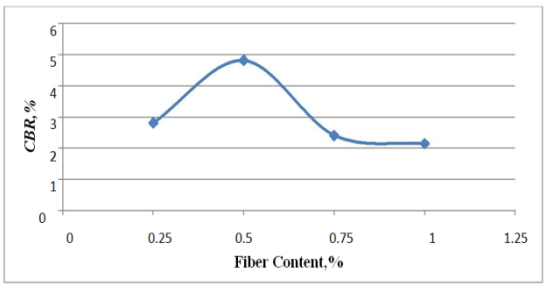
The Jute fiber reinforcement is required to raise the pressure and sturdiness of poor sub grade soil. The laboratory studies managed to move on selected soil additionally to soil given different rates of jute fiber in four stages. The first stage of experimental work was moved to look for the essential engineering qualities of soils like wet sieve analysis, Atterberg limits, compaction test, CBR and UCS tests. Second stage comprised of working the optimum aspect ratio within the Jute fiber. Within the third stage involves working the optimum fiber content by transporting the California Bearing Ratio (CBR) ensure unconfined compressive strength test. 4th stage includes working the durability qualities of soil elevated while using the Jute fiber due to the NaOH, by transporting out Freeze and thaw test. Soil types: Inside our study 2 types of soils via soil A and soil B representing typical clayey soil (Black cotton soil) and silty soil (Red soil) are viewed. The fundamental engineering qualities of every single soil like wet sieve analysis, Liquid limit and Plastic limit, optimum moisture content, maximum dry density and strength qualities like California Bearing ratio and unconfined compressive strength were determined. Our world A was collected from Gundlapalli village nearNalgonda. Soil B was collected from Gurrampode Mandal, Nalgonda district Telangana. Qualities of Jute Fiber based in the study: The diameter within the jute thread varies between .5 mm to 10 mm. These fibers are frequently accessible inside the threaded form [5]. They are robotically woven fibers with very fine threads. Jute market is most likely the first industries in India, has typically been helpful for packaging. Nonetheless its flexibility arrives light now carrying out a world had begun looking for remedies in order to save the weather. Jute could be a coarse natural bast fiber. Aspect Ratio of jute fiber: A fiber's aspect ratio is identified as its length divided by its diameter. Extended, thin fibers frequently provide superior qualities, but they are more pricey to create and could be a challenge to disperse evenly within the composite material.

Results of Physical Properties of Soils

Colour	Soil A	Soil B
Particle Size Distribution:		
Gravel, %	0.22	0.0
Sand, %	48.16	22.09
Silt and Clay, %	51.89	77.93
Atterberg's Limits		
Liquid Limit, %	37	54.7
Plastic Limit, %	18	24.59
Plasticity Index, %	22	30.03
Standard Compaction Test		
Maximum Dry Density, (kN/M^3)	1.89	16.09
Optimum Moisture Content, %	15.30	24.03
CBR, % (soaked)	2.56	1.29
Unconfined Compressive Strength (kN/M^2)	70.33	61.56

Test results of CBR for soil A with varying percentage of fiber

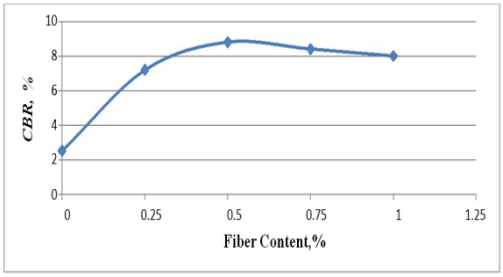
Sl No	Particulars	CBR % (Soaked)	CBR % (Un soaked)
1	Soil Alone	1.29	3.86
2	Soil +0.25 % of $JuteFibre_{14}$	2.82	12.06
3	Soil +0.5 % of $JuteFibre_{14}$	4.82	13.65
4	Soil +0.75 % of $JuteFibre_{14}$	2.42	9.24
5	Soil +1.0 % of $JuteFibre_{14}$	2.16	3.88



Soaked CBR for soil A with varying percentages of Jute fiber

Test results of CBR for soil B with varying percentage of fiber

Sl No	Particulars	CBR % (Soaked)	CBR % (Un soaked)
1	Soil alone	2.56	5.62
2	Soil + 0.25 % of Jute fiber$_{43}$	8.23	11.64
3	Soil + 0.50 % of Jute fiber$_{43}$	8.83	15.26
4	Soil + 0.75 % of Jute fiber$_{43}$	8.44	10.04
5	Soil + 1.00 % of Jute fiber$_{43}$	8.04	8.84



Soaked CBR for soil B with varying percentages of Jute fiber

IV. CONCLUSION

The progres within the values of OMC and MDD of soils with a few other rates of fiber is minimal. But adding fibers for the soil modified the compaction qualities within the mix significantly. Inclusion of jute fiber for the soil, improves the potency of soil. The optimum jute fiber for your selected soils is .5%. The optimum morality of NaOH and soaking period for soil A and soil B treat with jute fiber are 1.5M and 6hours correspondingly. Soil A initially didn't possess sufficient strength that need considering just like a sub grade material on backing with Jute, the CBR strength enhanced by four folds. Through Jute fiber given NaOH just like a reinforcing material in soil A, the crust thickness within the Pavement decreases by 8.53%, during comparison for the crust thickness of pavement built on soil elevated with jute fiber. During soil B, the crust thickness within the flexible pavement reduces by 52.29% during comparison while using the Untreated soil B.

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AUTHOR's PROFILE

Aitharaju Prithvirani B-Tech: Panineeya institute of technology and science, JNTUH 2013 M-Tech: Gurunanak institute of technology , jntuh 2014-2016 Project Title: THE UTILIZATION OF NATURAL JUTE FIBER FOR THE STABILIZATION OF SUB-GRADE SOIL.

Dr. S.SREENATHA REDDY, Principal & Professor at **Guru Nanak Institute of Technology under JNTUH, Hyderabad. Dr. S.SREENATHA REDDY** obtained **B.Tech, Mechanical Engineering** from JNTU, Hyderabad, **M.Tech.- Heat power, Refrigeration & Air conditioning** from JNTU, Hyderabad and **Ph.D**. Faculty of Mechanical Engineering from JNTUA . **Dr. S.SREENATHA REDDY** held various administrative posts and developed the Institution with his projects and developmental activities. Notable among his awards i.e **National award** like **Jawaharlal Nehru memorial prize** for best research publication, issued Institution of Engineers on the occasion of **Inauguration 27 th Indian Engineering Congress at New Delhi in the year 2012** and **"Bharat Vidya Shiromani Award"** and a "Certificate of Education Excellence" for Outstanding Achievements in the field of Education given by International Institute of Education & management on 22 nd December 2014 at **New Delhi & Glory of Education of Excellence Award is issued by IIEM on 4 th March 2015 at New Delhi. Dr. S. Sreenatha Reddy received award as Best Academic Administrator from Centre for Advanced Research and Design under Venus International Foundation on 5 th July 1972.**

Dr. S. Sreenatha Reddy is well known internationally for his outstanding research in .Mechanical Engineering. He has also proposed a model using first principles of Thermodynamics to predict the complex Diesel Engine. In particular, he has made important contributions to the analysis and design of Internal Combustion Engine. In his work, **Dr. S. Sreenatha Reddy** combines modern process modeling concepts with advanced experimental techniques. He has also developed new technologies like **Exhaust Gas Recirculation (EGR) and Magnetic Fuel Conditioning system** for reducing harm emissions**.** It promotes the exchange and mutual enrichment of knowledge in international dialogue via conferences, like the Frontiers of Research Symposia and other meetings.

Dr. S. Sreenatha Reddy Earlier worked as Principal, Head of both the Aeronautical & Mechanical department, coordinating R&D cell for Mechanical Research and Development Board (MRDB) & Aeronautical Research and Development Board (ARDB) projects, TPO, NSS Coordinator, developing courseware and implementing ISO 2001 and NBA Accreditation.

Dr. S.SREENATHA REDDY published 79 International & National reputed Journals & 12 International & National Conference papers. **Dr. S.SREENATHA REDDY** is a member of governing body in prestigious institution of GNIT. He also served as Expert Committee Member of AICTE for scrutinizing project reports internally as well as the member in the Board of Reviewers for the Institution of Engineers journal. Also He is a Editorial Board Member of International Journal of Sciences and Engineering Technology. He is the member fellow of as many professional bodies in the field of Mechanical Engineering and Technical Education.

Prof. S.Madan Mohan received his Bachelor of Technology degree in Civil Engineering from JNTUCE Hyderabad in 1998. In 2001 he received his Master's Degree in Structural Engineering from University College of Engineering Osmania University, Hyderabad. He joined Gurunanak Institute of Technology as a faculty where he is a Professor and Head of the Civil Engineering Department with a total experience of 17 years in field of Research, Designing and education. He is guiding M.tech Thesis work in field of Civil/ Structural Engineering. He has papers published in National Conferences and International Journals.

Associate Prof. Mallikarjun Patil He received his Bachelor of Engineering degree in Civil Engineering from SLN College of Engineering (Raichur). In 2015 he received his Master's Degree in Highway Engineering from, University Visvesvaraya College of Engineering (UVCE), Bangalore University, Bangalore. He joined as assistant professor in GNIT.

