

Effect of FlyAsh and Fibre on Engineering Property of Black Cotton Soil

Kuldeep Singh Chouhan
ME Scholar
Jabalpur Engineering College, Jabalpur

Prof. Rajesh Jain
Associate Professor
Jabalpur Engineering College, Jabalpur

Abstract

Soil is a base of structure, which actually supports the structure from beneath and distributes the load effectively. If the stability of the soil is not adequate then failure of structure occurs in form of settlement, cracks etc. Expansive soil also known as black cotton soil is more responsible for such situations and this is due to presence of montmorillonite mineral in it, which has ability to undergo large swelling and shrinkage. To overcome this, properties of soil must be improved by artificial means known as in present study soil sample containing 0%, 9, 18, 27, of flyash & determine the value CBR test strength of soil & when get maximum strength to use same content sugar cane fiber 2%, 4%, 6% fibre means cut sugar cane fibre 1.5 cm and mix with fly ash. The test result showed significance decrease expansive behaviour of black cotton soil the California bearing ratio from 1.19 to 5.65 & unconfined compression ratio from 0.66 to 1.43 kg/cm² maximum dry density reached from 1.66 to 2.11 gm/cc also conduct the triaxial test of soil to determine the value of soil c & Φ all the test conducted as per relevant is code of practice.

Keywords: Flyash, Sugarcane Fibre

I. INTRODUCTION

Soils with low-bearing capacity can be strengthened economically for building purposes through the process of soil stabilization using different types of stabilizers. Our country covers vast soils deposits of expansive soils in central part; it covers large areas of Maharashtra, Madhya Pradesh, Karnataka, Andhra Pradesh, Telangana, Tamil Nadu and Gujarat. These soils are formed from basalt and rock traps. These soils are quick suitable for growing cotton. Black cotton soil are the clays of high plasticity, they contain mineral called montmorillonite, as the shear strength of the soil is quite low, soils are highly compressible with low bearing capacity. It is extremely difficult to work with these soils. In this investigation it can be seen that flyash and bagasse fibre has tendency to improve the engineering characteristics of black cotton soil. The term soil improvement is used the technique which improve the index property and other engineering characteristic of weak soil in India expansive soil cover 0.8×10^6 Km² which approximately 1/5 of its surface area. These soil contain montmorillonite mineral due to this they swell and shrink excessively with change of water content. The fly ash easily available in thermal power plants i.e. Sarni & Veersingpur (M.P.). The fly ash as use a stabilization material effectively. Sugar cane fibre is second material to stabilization of soil. It is easily available at Juice Center and Sugar Factories. The fibre cut 0.5cm as stabilization material.

II. LITERATURE REVIEW

There are number of studies on the use of industrial waste materials to improve the performance of weak soils.

Ali and Koranne (2011) presented the effect of stone dust and fly ash on characteristics of fly ash. They concluded that there is a marked improvement in the properties of expansive soil if stone dust and fly ash is mixed in equal proportions. There is a significant control in the swelling behaviour of the expansive clay.

M. Chittaranjan, M. Vijay, D. Keerthi studied the 'Agricultural wastes as soil stabilizers'. In this study Agricultural wastes such as sugar cane bagasse ash, rice husk ash and groundnut shell ash are used to stabilize the weak sub grade soil. The weak sub grade soil is treated with the above three wastes separately at 0%, 3%, 6%, 9%, 12% and 15% and CBR test is carried out for each per cent. The results of these tests showed improvement in CBR value with the increase in percentage of waste.

TABASSUM KHAN (2012) PERFORMANCE soil mix with flyash & nylon fibre she used to fly ash content 10%, 20% & 40%. And get value of CBR 1.69, 4.60, 3.50 & 3.35 both material mixed with soil

HARSHITA BAIRAGI (2014) Soil mix with Jute fibre content 0/1%, 2%, 3%, 4% & 5% and get value CBR 1.8% to 4.1 % and UCS value 1.09% to 1.35%.

III. OBJECTIVE OF STUDY

- 1) To use agricultural and industrial waste bagasse fiber and fly ash as a stabilizing material and to solve the problem of waste disposal.
- 2) To evaluate the strength characteristics of black cotton soil is mixed with 18% fly ash for different proportions of bagasse fiber in replacement of 2%, 4%, , 6%.

- 3) To study the results of replacement and concentration on future use.

IV. MATERIAL USED WITH SOIL

A. Flyash

Fly ash collected from veersinghpur thermal district Shahdol M.P. power plant there flyash is waste material in plant

B. Bagasse fiber

Bagasse which is commonly known as sugarcane fiber is the waste product and can be collected easily from any juice centre. There bagasse fiber is waste material.

V. METHODOLOGY

- 1) Fly ash mix with soil and get maximum strength of soil with the help of CBR test.
- 2) After getting maximum strength of soil at add baggasse fibre increase more strength of soil.

BC Soil + 0% fly ash = CF0
 BC Soil + 9% fly ash = CF1
 BC Soil + 18% fly ash = CF2
 BC Soil + 27% fly ash = CF3
 BC Soil + 18% fly ash+2% Fiber = CF4
 BC Soil + 18% fly ash+ 4% Fiber = CF5

Table – 1
Methodology

Sl No.	OMC %	MDD Gm/Cm ³	CBR %	UCS (Kg/Cm ²)	Triaxial test C((Kg/Cm ²) Φ	
UNIT	%	Gm/Cm ³	%	(Kg/Cm ²)	C((Kg/Cm ²)	Φ
CF0	21	1.66	1.19	.66	1.2318	5.453
CF1	22	1.61	1.51	1.01	.7792	10.389
CF2	25	1.58	3.61	1.14	0.0472	8.774
CF3	28	1.46	1.59	1.23	.5731	18.080
CF4	13.86	2.09	4.3	1.34	0.7659	7.928
CF5	12.53	2.11	5.65	1.43	.09085	3.75

VI. RESULT AND DISCUSSION

A. Optimum Moisture Content (Fig-1)

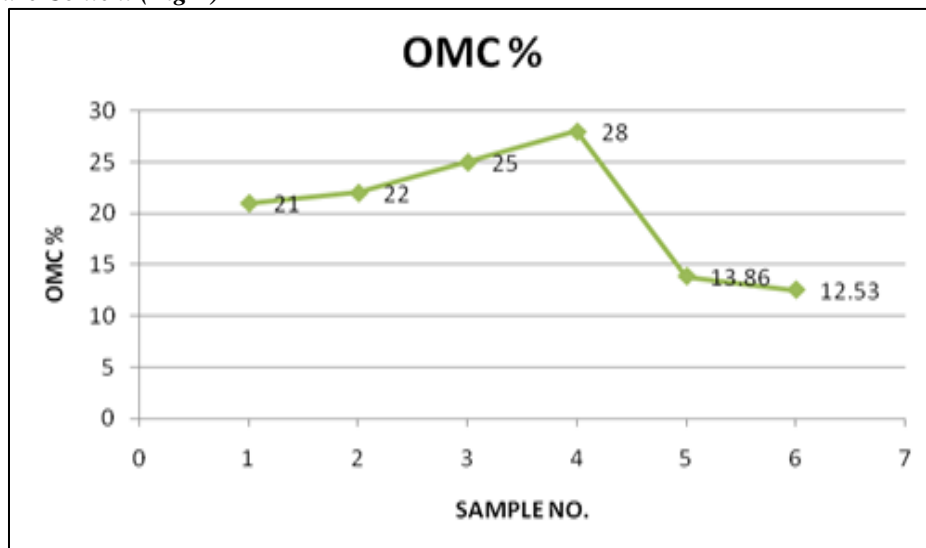


Fig. 1: Optimum Moisture Content

B. Maximum Dry Density (Fig-2)

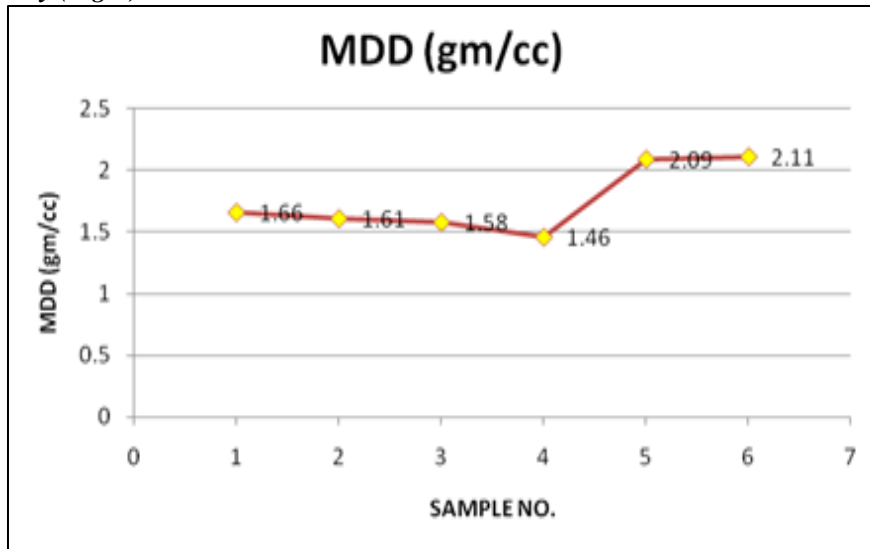


Fig. 2: Maximum Dry Density

C. California Bearing Ratio (Fig-3)

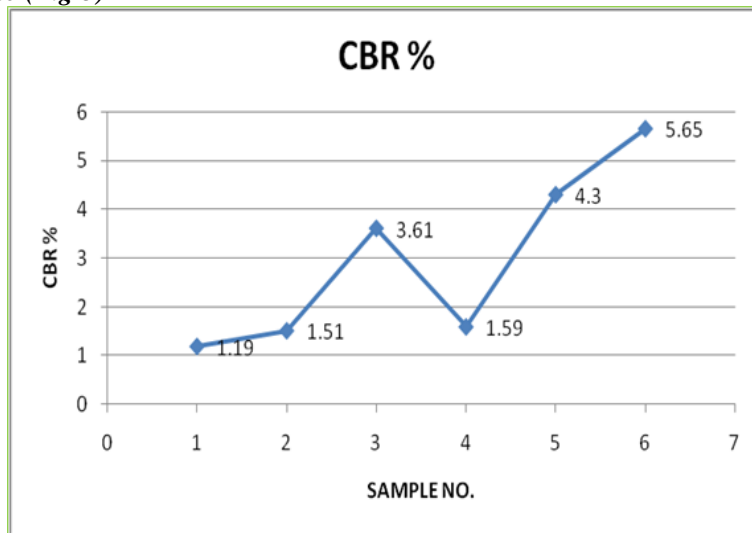


Fig. 3: California Bearing Ratio

D. Unconfined Compression Strength (Fig-4)

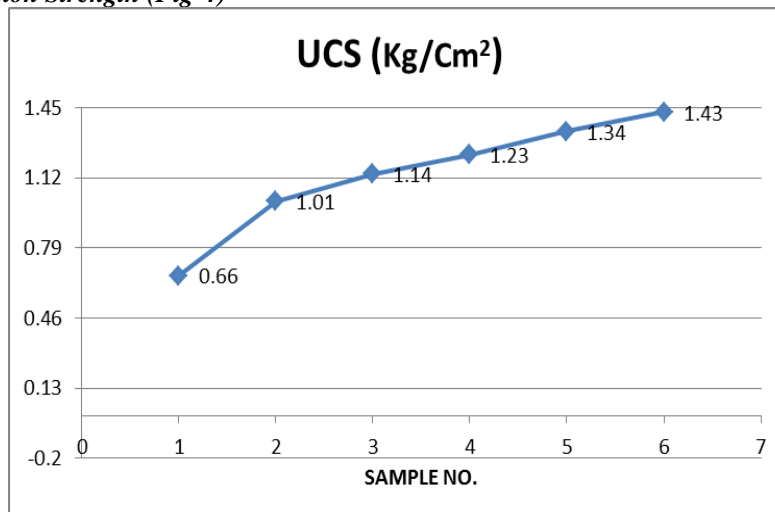


Fig. 4: Unconfined Compression Strength

VII. CONCLUSION

- 1) With Fly ash percentage increased with soil BC soil optimum moisture content decreased from 21% to 12..
- 2) With Fly ash percentage increased with soil The maximum dry density increased from 1.66% to 2.11%
- 3) With Fly ash & sugar cane fibre % with soil increase California bearing ratio from 1.19 % to 5.65 %
- 4) With Fly ash & sugarcane fibre with soil unconfined compression strength increased with soil from $.66 \text{ kg/cm}^2$ to 1.43 kg/cm^2

It means the results showing fly ash & sugarcane fibre is good stabilizing material in BC soil.

REFERENCE

- [1] Determination of liquid plastic Indian standard methods for testing soil IS2720.
- [2] *2+ Ali. M.S. and Koranne. S.S. ;(2011) "Performance Analysis of Expansive Soil Treated With Jute fibres and Fly ash". EJGE Vol. 16 Bund. I, pp. 973-982.
- [3] *3+ Harish kumar K., Muthukkumaran K. ;(2011)"Study on swelling soil behaviour and its improvements"International journal of earth science and Engineering. Volume 04 No. 06 , Pp. 19-25
- [4] IS: 2720 (Part 38) 1976: Compaction Control Test.(Hilf Method)
- [5] IS: 2720 (Part 5) 1970: Determination of Liquid Limit and Plastic Limit.
- [6] *6+ Kumar S., Prasanna M. ;(2012). "Silica and calcium effect on geo-technical properties of expansive soil extracted from rice husk ash" IPCBEE vol.3 2.
- [7] *7+ Rao Ajjarapu Sreerama ;(2011) "Jute Geotextiles application in Kakinada port area" Proceedings of Indian Geotechnical Conference, Kochi.
- [8] *8+ Suresh K. , Padmavathi V., Apsar Sultana ;(2009)"Experimental study on stabilisation of Black Cotton Soil with stone dust and fibers " Guntur India.
- [9] *9+ Shelke A.P. ,Murty D.S.(2011), "Swelling pressure of expansive soil stabilised using EPS Geofom"
- [10] Proceeding of Indian Geotechnical Conference, AI-Refeai, T.O.(1991),"Behavior of Granular Soils Reinforced with Discrete Randomly Oriented Inclusions", Geo-textiles and Geo-membranes, Vol.10, pp-319-333.
- [11] Al-Wahab, R.M., and Al-Ourna, H.H. (1995), Fiber Reinforced Cohesive Soil for application in compacted earth Structure, Geo-synthetics, Vol.16, pp. 433-446.
- [12] *12+ Bauer, G.E. and Fatani, M.N. "Strength characteristics of sand reinforced with rigid and flexible element." Proc. Of 9th Asian Regional Conference on Soil Mech. And Foundation Engg., Bangkok(Thailand), Vol. 1, (1991);pp. 471-474
- [13] Chakraborty, T.K., and S.P. Dasgupta (1996) Randomly reinforced fly ash foundation material. Indian Geotechnical Conference. Volume 1 Madras. India pp231-235.
- [14] *14+ Consoli, N.C., Casagrande, M.D.T and Prietto, P.D.M, (2003), "Plate Load Test on Fibre Reinforced Soil, Journal of Geotechnical and Geo-environmental Engineering", ASCE, Vol.129, NO.10, pp.951-955.
- [15] Dhariwal, Ashok (2003) Performance studies on California bearing ratio values of fly ash reinforced with jute and non woven geo fibers. National seminar on advances in construction materials 2003 pp 45-51.
- [16] fly ash soil mixtures. Journal of Geotechnical and Geoenvironmental Engineering, 127(7), 574-584.
- [17] *17+ Gosavi, M, Patil, K.A, Mittal, S and Saran, S. "Improvement of properties of black cotton soil subgrade through synthetic reinforcement." Journal of institution of Engineers(India), vol. 84, (1991),(1983);pp.257-262