



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 4, April 2023

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

ijirset@gmail.com

www.ijirset.com

Effect of Date Seeds on Properties of Black Cotton Soil

Prof. Vaijwade Sujit M.¹, Prof. Sogarwal Akash M.², Prof. Ghatol Chaitanya B.³

Assistant Professor, Department of Civil Engineering, School of Engineering and Technology, MGM University, Chhatrapati Sambhajnagar, Maharashtra, India^{1,2,3}

ABSTRACT: Infrastructure is a major sector that propels the overall development of the Indian economy. For good foundation and pavement, soil plays an important role. Expansive soils like black cotton soil always create problems in the foundation. To make the soil to be stronger the addition of different waste materials to the soil will be an innovative technique for more stabilization. Soil stabilization is a process which improves the physical properties of the soil, such as increasing shear strength, bearing capacity etc. which can be done by the use of controlled compaction or addition of different waste materials. In this study the date seeds used as the stabilizing waste material. First we have determine the basic properties of the soil such as liquid limit, plastic limit, shrinkage limit, standard Proctor test, California bearing ratio (CBR). The replacement of the soil by waste date seeds was carried out in stages of 5%, 10%, 15% and 20%. Then with the replacement of date seeds tests such as Standard Proctor test, California bearing (CBR) test, were studied. A comparison made between the black cotton soil and black cotton soil with the replacement of plastic by various percentages.

KEYWORDS: Stabilization, Date Seeds, Standard Proctor Test, California Bearing (CBR) test, etc.

I. INTRODUCTION

Black cotton soils are inorganic clay of medium to high compressibility and form a major soil group of India. Black cotton soil is organic clay of medium-high compressibility and constitutes as a major soil group in India. These soils are mainly characterized by high swelling and shrinkage properties. Black cotton (BC) soil covers about 25% of the total area of India and mainly occurs in central part and western part of India. Because of its high shrinkage and swelling properties, the BC soil has been a huge challenge to the highway engineers. In dry condition, BC is hard but loses its strength in wet condition. Due to alternate wetting-drying process vertical movement occurs in the soil mass, this vertical movement further develops and leads to pavement failure in the form of settlement, heavy depression, cracking etc. In India, about one-fifth of the land area, mostly in and around the Deccan plateau, is covered with these soils. Design of problem-free and economical foundations in these soils continues to pose challenge to civil engineers. To overcome these problems we need to improve the properties of black cotton soil. Date seeds is the waste material used in present work.

II. OBJECTIVES OF THE WORK

1. To determine the optimum dosage of date seeds required to stabilize the black cotton soil.
2. To study the basic geotechnical properties of natural and treated soil.
3. To determine the strength obtained after stabilizing the black cotton using date seeds.
4. To evaluate the alterations in the strength parameters of treated and natural soil sample by California Bearing Ratio test (CBR) with 5%, 10%, 15% and 20% of date seeds.

III. MATERIALS AND TESTING

1. Materials:

a) Black Cotton Soil:

In the present study work, black cotton soil sample was collected from Beed Bypass area, Chhatrapati Sambhajnagar. The soil was collected from a depth of 1m from the ground level. The soil was then dried. All the tests were done as per IS-2720. The Properties of the Black Cotton soils are given in Table 1.

Table No. 1 Properties of Black Cotton Soil

Sr. No.	Properties of Soil	Values
1	Liquid Limit	62.16
2	Plastic Limit	32.45
3	Plasticity Index	29.71
4	Specific Gravity	2.67
5	Maximum Dry Density (gm/cc)	1.43
6	Optimum Moisture Content (%)	24.5
7	California Bearing Ratio(CBR)	1.72

b) Date Seeds:

The date seed are cleaned by washing with normal water, dried in direct sunlight, and crushed to required size i.e less than 4.75 mm. The tests were carried out on date seeds to obtain their physical properties. The obtained results are shown in Table 2. The date seeds are mixed in different percentage like 5%, 10%, 15%, and 20% with natural soil.

Table No. 2 Properties of Date Seed

Sr. No.	Properties of Date Seed	Values
1	Specific Gravity	1.16
2	Water Absorption (%)	4.5
3	Moisture Content (%)	18
4	Loose Bulk Density (gm/cc)	0.68
5	Compacted Bulk Density (gm/cc)	0.72

2. Testing:

For the experimental study we have utilized the black cotton soil and date seed materials. To know the properties of soil sample various tests was conducted and results were summarised as follows:

1. Specific Gravity
2. Moisture Content
3. Liquid limit
4. Plastic limit
5. Standard proctor test
6. California bearing ratio (CBR)

IV. EXPERIMENTAL RESULTS**1. Standard Proctor Test:**

The standard proctor test was conducted with normal soil and by replacing by replacing soil with 5%, 10%, 15% and 20% and results obtained is given.

Table No. 3 Standard Proctor Test Result

Sr. No.	Particulars	Standard Proctor Test	
		OMC (%)	MDD(gm/cc)
1	Soil Sample	24.5	1.43
2	Soil + 5% date seed	24.2	1.62
3	Soil + 10% date seed	23.8	1.85
4	Soil + 15% date seed	23.4	1.95
5	Soil + 20% date seed	23.2	1.92

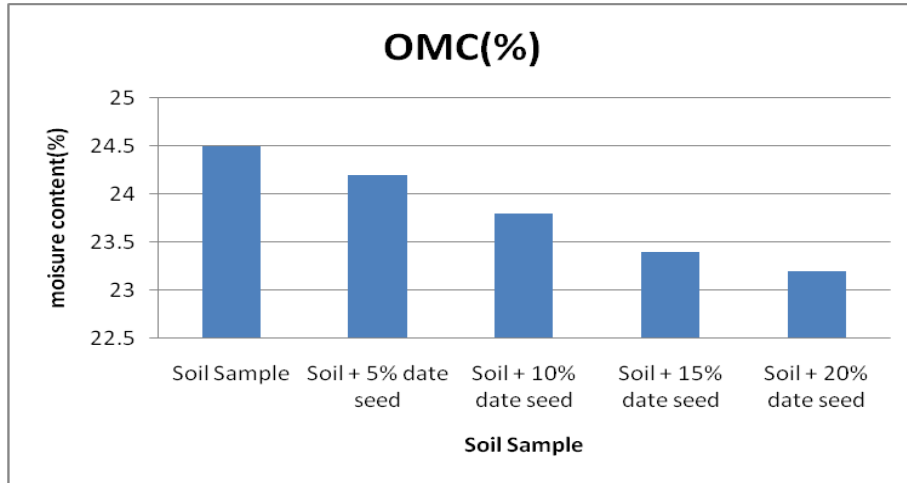


Fig. 1 Variation of Optimum Moisture Content of soil with Date Seed

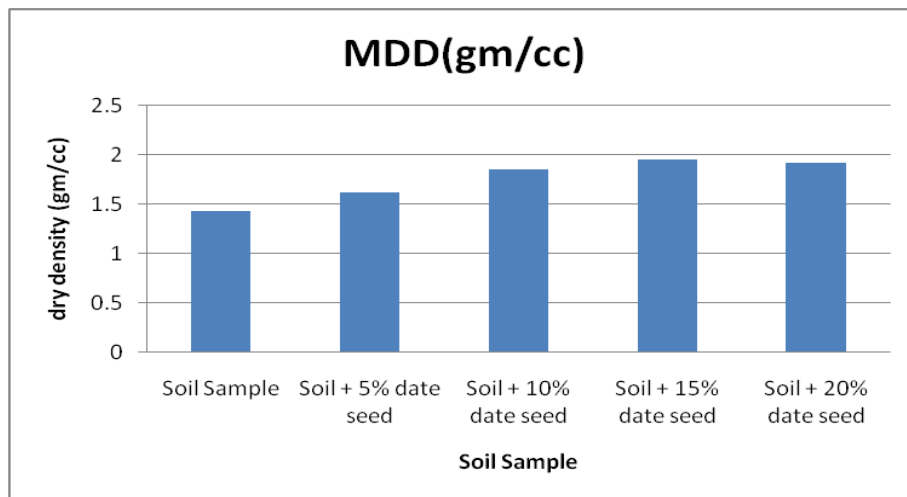


Fig. 2 Variation of Maximum Dry Density of soil with Date Seed

2. California Bearing Ratio Tests:

California Bearing Ratio Tests was conducted with normal soil and by replacing by replacing soil with 5%, 10%, 15% and 20% and results obtained is given. The CBR value increase with increase in percentage of date seeds in soil.

Table No. 4 California Bearing Ratio Tests Result

Sr. No.	Particulars	CBR
1	Soil Sample	1.72
2	Soil + 5% date seed	1.96
3	Soil + 10% date seed	2.56
4	Soil + 15% date seed	2.85
5	Soil + 20% date seed	2.76

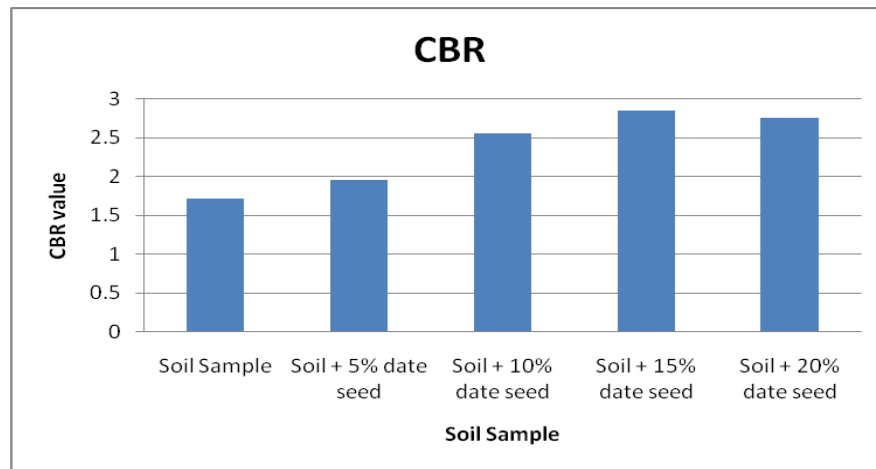


Fig. 3 Variation of California Bearing Ratio of soil with Date Seed

V. CONCLUSION

From the above experimental study we have conclude that,

1. The basic laboratory tests conducted on black cotton soil shows that the soil has low strength and high volume changing property.
2. The high liquid limit of 62.16% and plasticity index of 29.71% concludes that the soil is clayey soil with high plasticity.
3. The dry density of soil increased when 15% of date seed is added after it started decreasing with increase in the percentage of date seed. So an optimum of 15% date seed can be used for increasing density of soil.
4. The CBR value of soil increased with increase of date seed up to 15%, after decreased with further increase in date seed.

REFERENCES

- [1] Abdul Jawad, S. N. (1991). "Characteristics and Chemical Treatment of Expansive Clay in Al-Qatif, Saudi Arabia." *Engineering Geology*, 32(3), 144-159.
- [2] Bolaander, P. (1999). "Laboratory Testing of Non-traditional Additives for Stabilisation of Roads and Trail Surfaces." *Transportation Research Record*, 2(1653), 25-32.
- [3] Katti, R.K. (1978). "Search for Solutions to Problems in Black Cotton Soils", First Indian Geotechnical Society Annual Lecture, Indian Geotechnical Society at Indian Institute of Technology, Delhi.
- [4] Maher, M.H. and Ohashi, H. (1990). "Static Response of Sand Reinforced with Randomly Distributed Fibres", *J. Geotech. Engg. ASCE*, 116(11), 1661-1677.
- [6] Ref. IS: 2720 (Part 2) -1973, for moisture content.
- [7] Ref. IS: 2720 (Part 7) - 1980, for light compaction.
- [8] Ref. IS: 2720 (Part 16) - 1987 (Re-affirmed 2002), for CBR



SJIF Scientific Journal Impact Factor

Impact Factor: 8.423



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  ijirset@gmail.com



www.ijirset.com

Scan to save the contact details