AN EXPERIMENTAL INVESTIGATION ON NATURAL SOIL STABLIZED WITH RED-MUD & RANDOMLY DISTRIBUTED POLYTHENE.

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ABSTRACT:-
The aim of my investigation is to improve the engineering properties of black cotton soil/weak soil, which is one of the major soil deposit of India. Black cotton soil is a type of soil with poor share strength and high swelling & shrinking properties. By stabilization using industrial wastes red-mud and waste polythene we will make soil capable of caring load, increase the strength and baring capacity of the black cotton soil/weak soil. Red-mud is a industrial wastes, which is produced by the aluminum industries about 100 million ton's /year globally. It create a major environmental problems when it is dumped in open space. Polythene is one of the most dangerous environmental problem, there is only option to save our environment from polythene stop production. & re-use of polythene is to be done in large scale. In this investigation red-mud is used for enhancing baring capacity and polythene is used for better compressive strength. Black cotton soil sample was mixed with 10%, 15% and 20% of red mud and blended with polythene by 0.2%, 0.3% and 0.5% for every red-mud mix. Result was observed optimum for soaked CBR value at 20% of red-mud & 0.2% of polythene when mixed with black cotton soil sample.
KEY WORD'S:- Black cotton soil, red-mud, polythene, soil stabilization, MDD/OMC, CBR & environment safety.

1.INTRODUCTION:-
Now-a-day's construction work is increased rapidly, and construction work on black cotton soil is a challenging task for civil engineering department to handle. When structure need to be constructed over black cotton soil, the soil unable to fulfill the desire properties required for the construction work. To fulfill these properties stabilization is required to be done. Stabilization is only method to gain desire properties for civil work of any weak soil.

1.1 Stabilization
Stabilization is a process where physical properties of soil is enhanced by mixing another type of soil. Or by any other stabilizing materials . Stabilization also increases strength and durability and improve load baring capacity to support pavement and foundation. Stabilization process are mechanical process of stabilization & chemical process of stabilization.
Mechanical process:- this process of stabilization change only the physical properties of weak soil, through compaction, soil mix and by mixing other additives.
Chemical process:- this process of stabilization is done by adding chemical mix to enhanced the engineering properties of weak soil.

2. MATERIAL AND IT'S PROPERTIES

2.1 Black cotton soil:- in India 20% of total land is covered by black cotton soil, That's why we can say that the black cotton is a major soil deposit of India. It is mainly found in central India like Maharashtra, Madhya Pradesh & Chhattisgarh. Black cotton soil is mainly consist of clayey material and have tendency to hold water. Because of this properties, it easily shrink in dry and in rainy season it easily start to swell. In this investigation black cotton soil sample is collected from the beside of our college campus Raisan road Bhopal, Madhya Pradesh. The test result of the collected sample of index and engineering properties are shown in Table-(1)

Table:-1: characteristics of black cotton soil sample determined in laboratory test are:-

S.NO	PROPERTY	VALUE
1	Specific Gravity	2.64
2	Liquid Limit (%)	48.94
3	Plastic Limit (%)	30.34
4	Plasticity Index (%)	18.60
5	Optimum moisture Content (%)	13.70
6	Maximum Dry Density (g/cc)	1.882
7	California Bearing Ratio	2.52

Table-1

2.2 Red-mud :- It is a type of industrial wastes which is produced by the aluminum industries. Which is generated in the formation of alumina from Bauxite in Bayer's process .Red-mud sample for this investigation is collected from the construction site of NHAI near Raisan road Bhopal Madhya Pradesh. Index and engineering properties are shown in Table-(2)

Table:-2: properties of red mud are :-

S.NO	PROPERTY	VALUE
1	Specific Gravity	3.0
2	Atterberg's Limit	NP
3	Optimum moisture Content (%)	26.90
4	Maximum Dry Density (g/cc)	1.69
5	California Bearing Ratio	3.3
6	Permeability (cm/sec)	$1.12x10^{-5}$

Table-2

2.3 Polythene:- polythene is one of the most harmful and non bio-degradable substance. Polythene is very harmful to us and for our environment. polythene are the mainly used plastic all over the world, it is mainly used for carry bag's and packing. In this investigation we are going to use (LDPE) low density polythene. which is collected from our surrounding. Properties of LDEP are shown in Table –(3)

Table:-3: Properties of polythene:-

PROPERTY	
Chemical Formula	$(C_2H_4)_n$
Density	0.88-0.96 g/cm^3
Melting point	105-115°C
log^P	1.02620
Magnetic susceptibility	$-9.67x10^{-6}$

Table-3

3. LITRATURE REVIEW:

Show many studies ware carried out for black cotton soil stabilization with different additives and materials & results for CBR value. Previous study of stabilization by red-mud, flyash, cement and granite dust are respectively. (a) Malagihal in 2014study red-mud. (b)Mishra (2014) study abut flyash. (c) Modak (2012) study about cement (d)Hind studies about granite dust as stabilizer in year 1999.(e) Babitha in year 2017 study soil stabilization using plastic

4. SAMPLE PREPARATION:

4.1 Soil sample were mixed with red-mud and polythene in different percentage they are tabulated down in Table (4)

S.NO	SYMBOL	MIX PROPORTION
1	S1	(BC)+(0%RM)+(0%Polythene)
2	S10A	(BC)+(10%RM)+(0.2%Polythene)
3	S10B	(BC)+(10%RM)+(0.3%Polythene)
4	S10C	(BC)+(10%RM)+(0.5%Polythene)
5	S15A	(BC)+(15%RM)+(0.2%Polythene)
6	S15B	(BC)+(15%RM)+(0.3%Polythene)
7	S15C	(BC)+(15%RM)+(0.5%Polythene)
8	S20A	(BC)+(20%RM)+(0.2%Polythene)
9	S20B	(BC)+(20%RM)+(0.3%Polythene)
10	S20C	(BC)+(20%RM)+(0.5%Polythene)

Table-4

5. RESULTS & DISCUSSION

5.1 The study results are shown in Table (5)

S.NO	SAMPLE	MDD(g/cc)	OMC(%)	CBR(%)
1	S1	1.882	13.70	2.52
2	S10A	1.865	12.02	3.24
3	S10B	1.724	13.66	2.74
4	S10C	1.880	12.15	1.71
5	S15A	1.820	13.73	4.98
6	S15B	1.799	12.84	3.44
7	S15C	1.779	16.35	2.70
8	S20A	1.800	17.72	6.22
9	S20B	1.792	17.13	5.41
10	S20C	1.809	16.59	3.52

Table-5

5.2 Optimum Moister Content

OMC of the black cotton soil sample was 13.70%. The maximum OMC was obtained 17.72 is at 20% of red-mud and 0.2% of polythene. when mixed with soil sample and minimum was 12.02 at 10% 0f red-mud and 0.2% of polythene mixed. around all OMC of mix sample. All the sample further stabilized by red-mud and polythene. More details in fig-1

Fig.1.

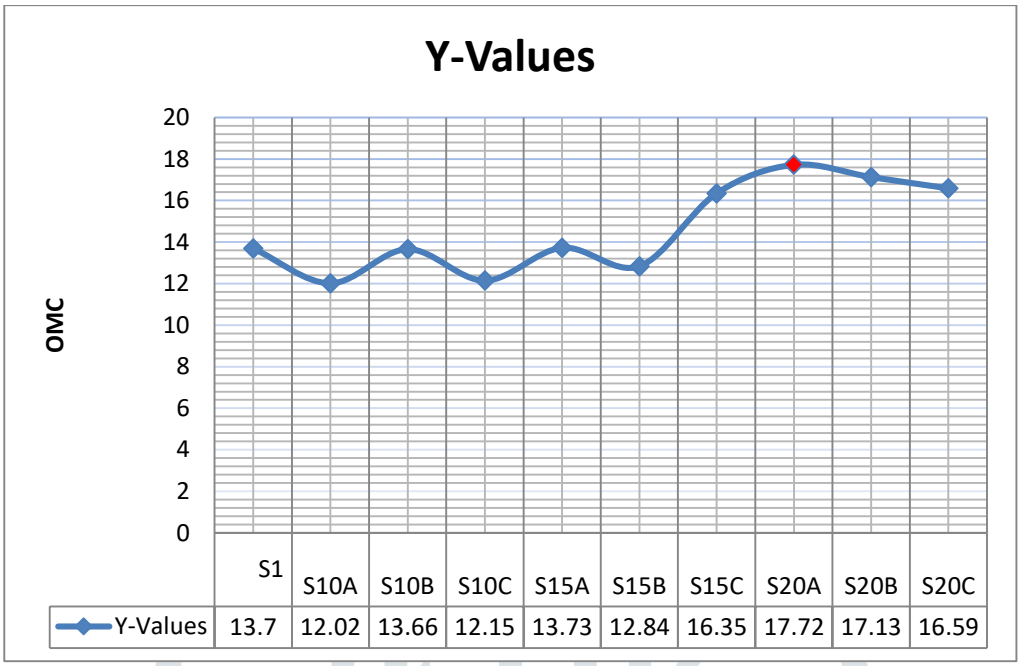

Fig 1 show's the variation between OMC in non treated soil & treated soil sample's.
S20a is the sample with maximum OMC.

5.3 Maximum Dry Density

MDD of black cotton soil was observed 1.882. This was the optimum MDD which we observed in our study for all the sample's. MDD graph show the detail in fig-2

Fig-2

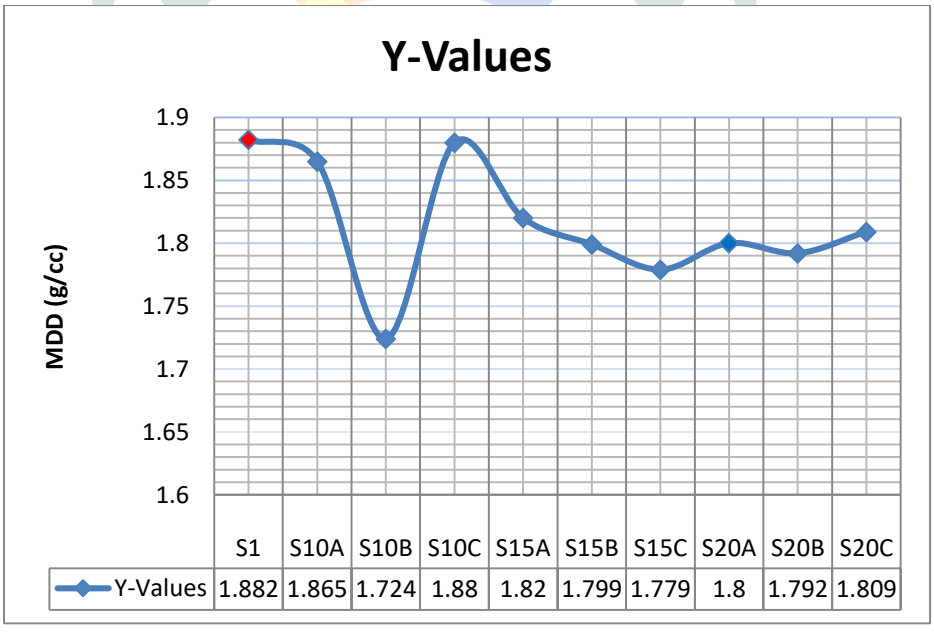

Fig 2. show's the variation between MDD in non treated soil & treated soil sample's.
S1 is the sample with maximum MDD.

5.4 California Baring Ratio

CBR value :

CBR value of black cotton soil is 2.43% and the average CBR value of the red-mud is 3.3%. CBR value of red-mud is higher when compare to the CBR value of soil. But in study we found when (soil + red-mud + polythene) sample's test were performed, the value of CBR is good at 0.2% of polythene. But it goes down when we increase polythene strip percentage in the sample. The optimum value of CBR is at 20% of red-mud & 0.2% of polythene mix with soil . variation shown in chart down in fig.3.

Fig-3

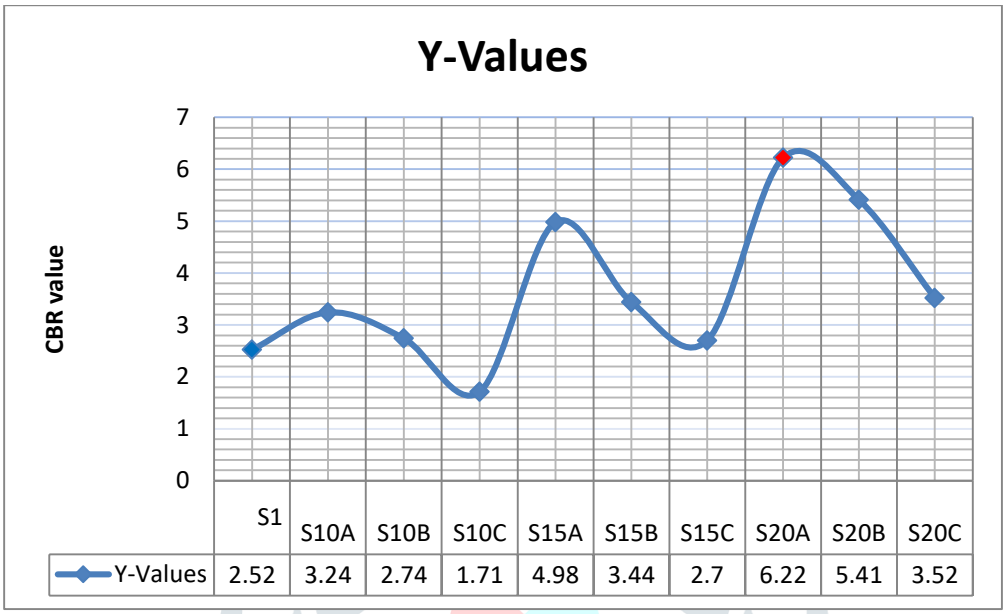

Fig 3. show's the value variation of CBR between non treated soil & treated soil sample's.
S20a is the sample with maximum CBR value.

6. CONCLUSION:

The aim of the study is to utilize the red-mud and polythene for utilization as a stabilizing material, in construction of road and in another construction work. on the basis of this study we observed that red-mud waste can be utilized in soil stabilization as a stabilizer. this utilization of red-mud and polythene may resolve our environmental problem of dumping red-mud and polythene outside.

Based on our study results the following conclusion:-

* Soil sample was stabilized with red-mud mixed with percentage 10%, 15%. & 20% blended with polythene strip percentage 0.2%, 0.3% and 0.5% with each sample of red-mud.
* maximum soaked CBR value was obtained at 20% of red-mud + 0.2% of polythene when mixed with soil sample . after 96 hour soaked value of CBR was 6.3%
* Red-mud can be used in embankment as a filler material. due to it's low permeability.
*Red-mud can be used as sub-grad material for better result due to it's high specific gravity, Density and strength in compare to soil.
* Finally we conclude that red-mud can be used as geotechnical material.
* Further we will conduct UCS test and with same soil sample, red-mud & polythene.

7. REFRENCE:

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