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EXPERIMENTAL INVESTIGATION ON THE VARIOUS PROPERTIES OF PEAT SOIL BY ADDING COW DUNG ASH AND BANANA LEAF ASH

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Abstract

The most common type of organic soils is peat soils, which have been built up over ages in wetlands by the accumulation of partially digested and unrecompensed plant leftovers. The other type of organic soil is muck, which also forms as a result of the buildup of organic soil materials, but in which the sources of the materials are obscure and the contents are rather well degraded. In order for deep organic soils or Histosols to develop, the substratum must be saturated or submerged in addition to the total absence of free oxygen. On the other hand, a peat land is a sizable area of peat land. Peat lands make up more than 50% of all wetlands in the world; they occupy 3% of the planet's surface in terms of land and freshwater. Peat soils can grow in mires (bogs, fens), swamps, marshes, and pocosins, among other forms of wetlands. All regions have peat soils; however they are more common in the Northern Hemisphere's cold and temperate zones. Peat lands cover 12.2 million hectares (m ha) of land in Africa, 23.5 million ha in Asia.

1. INTRODUCTON:

. Plant debris that has partially decomposed forms peat soils in anaerobic, water-saturated environments. They live in peat lands (also called bogs or mires). About 3% of the earth's surface is made up of peat lands, which can be found both in temperate (Northern Europe and America) and tropical areas (South East Asia, South America, South Africa and the Caribbean) 1.

Histosols are a subclass of peat soils. These are soils with a lot of organic stuff. Moisture content and temperature both have an impact on peat formation. The rate of microbial breakdown of plant matter is hindered in very saturated anaerobic soils, leading to excessive carbon buildup. Peat formation is sped up in cooler climates because microorganisms take longer to decompose plant matter. The amount of carbon in peat soils

Cow dung is the waste product (faeces) of the bovine animal species. It is also referred to as cow pats, cow pies, or cow manure. These species include yaks, water buffalo, bison, and domestic cattle (sometimes known as "cows"). The undigested remnant of plant materials that has passed through the animal's digestive system is known as cow poo. Mineral-rich stool matter is the consequence. Greenish to blackish in hue, it frequently darkens quickly after being exposed to air. Manure made from cow dung, which is typically dark brown in color, is frequently used (agricultural fertilizer). Cow dung has the potential to dry out and remain on the pasture, creating an area of grazing space that is unappealing to livestock if it is not recycled into the soil by species like earthworms and dung beetles.

MATERIALS REQUIRED:

- **Banana leaf ash**

- **Peat soil**

Cow Dung ash

Physical Properties of PEAT Soil

1. The majority of plant remains are still visible, and the water in the peat is clear.

The water is transparent but has a light brown color, and the plant remains have scarcely broken down.

3. Water is murky and brown; small amounts of plant debris have degraded.

4. The water is clean and the plant remains are highly degraded; around half of the peat can flow between the Fingers.

Chemicals Properties of PEAT Soil

1. It consists of biological elements, ash elements, and elemental makeup.

2. C, H, O, N, and S are the five fundamental components of peat.

3. Peat's characteristics often fall somewhere between those of coal and wood.

4. Highly decomposed peat resembles lignite in terms of elemental proportion Zn, while lowly decomposed peat approximates that of wood.

PROPERTIES OF BANANA LEAVES ASH:

Banana leaf ash functions adequately as a cheap stabilizing agent for substandard uses, according to the study. Optimum CBR values can be reached by adding 4 % banana leaves ashes by weight of soil to the natural soil sample. Increased lateritic soil strength stabilized by banana leaf ashes.

PROPERTIES OF COW DUNG ASH

Cow dung ash is notable for having a high concentration of alkaline compounds including calcium (30.6%) and potassium (5.56%), which are mostly to blame for slugging and fouling occurrences. The high roughage content is to blame. Cow dung contains a lot of organic matter and is nutrient-rich. It has a 3 percent nitrogen content, a 2 percent phosphorous content, and a 1 percent potassium content (3-2-1: NPK)

3. OBJECTIVE

ON ADDITION OF COW DUNGS ASH TO THE SOIL

1. The farm's soil health and core potential will improve with the addition of cow manure.

2. In addition to helping farmers increase their production, these practices foster sustainable biodiversity and improve the soil's ability to retain water for a long period.

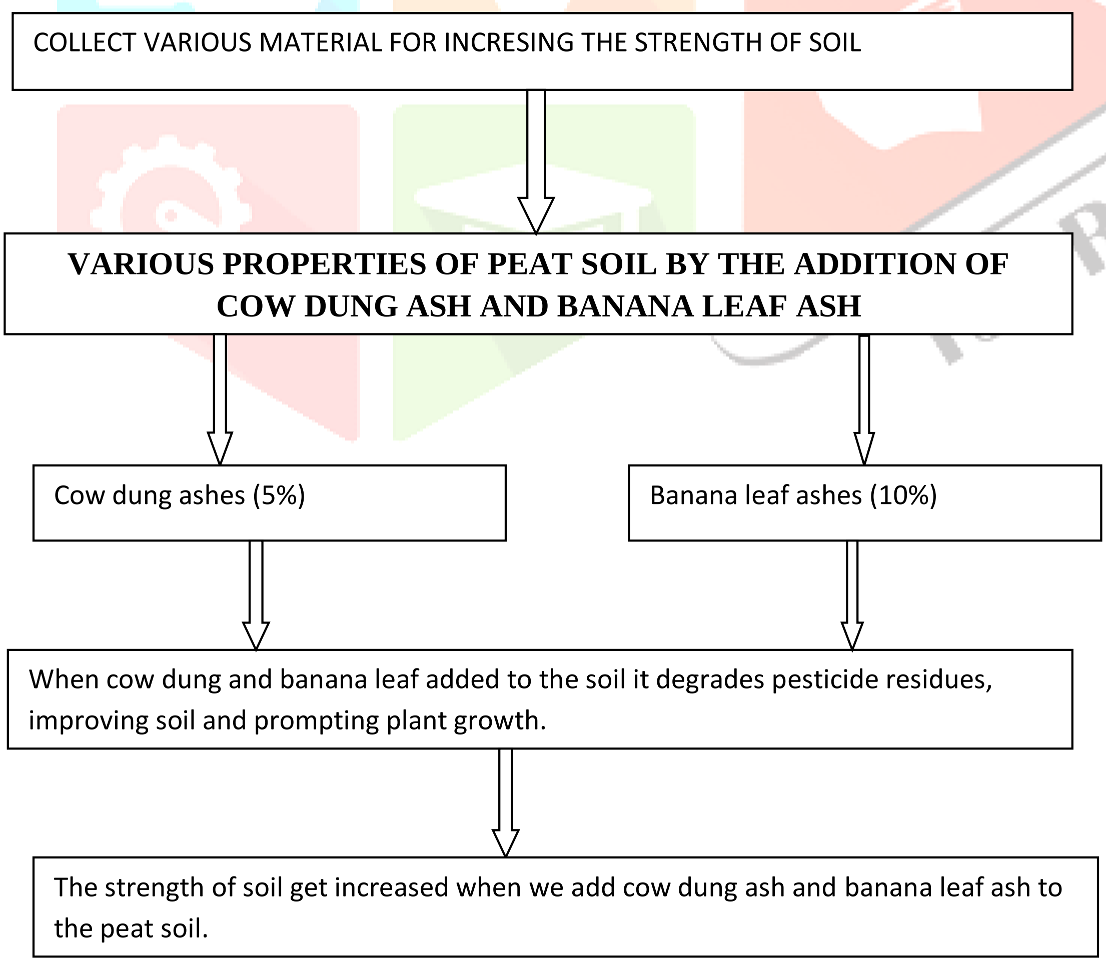
3. As a result, the crop resists wind and water erosion and remains healthy.

4. Cow manure is increasingly widely employed to satisfy the desires of those who prefer organic food.

ON ADDITION OF BANANA LEAF ASH TO THE SOIL

However, banana leaves are eco-friendly, which is why they disintegrate easily with soil and prevent soil pollution. The results of the banana stem and leaf organic fertilizer include the degradation of pesticide residues, improvement of the soil, and stimulation of plant development.

4. METHODOLOGY:



STEPS

1. Collecting the cow dung and the banana leaf from the waste.

2. Burn it completely and make it completely in ashes form.

2. Add the cow dung ash and banana leaf ash to the soil.

3. Test a soil in the laboratory.

4. Then it will improves the soil quality

5. LITERATURE SURVEY

S.NO	AUTHOR	TITLE	CONCLUSION
1.	Mahadeva swami mallana	Adsorption of toxic dye from aqueous solution on cow dung ash	It provides all of the surface and chemical characteristics of the cow compost ash adsorbent.
2.	Nurmrgawati numegawati	Effects of bottom ash and cow dung ash n chemical properties of sol at new established rice field.	The study's use of composted cow dung and bottom ash was unable to lower the Fe and Mn levels in newly planted rice fields. Cow dung application raises pH, exchangeable cation (K, Na, Ca), ash saturation, and lowers exchangeable H.
3.	C.H Azhari	The Bio adhesion of banana leaves as soil remover at elevate temperatures	• When heated ironing comes into contact with a fresh banana leaf, the moisture in the leaf gives the surface a smooth feel. As a result, the leaves elastomerically deform, creating a high real area of contacts, which ultimately increased the adhesive forces between the soil (stain) on the metal and the leaves. •With the application of stress and heat, the banana leaf's average surface roughness and adhesive force decrease.
4.	Aisha wazir, Zishan Gull, Manzoor Husain	Comparative Study of Various Organic Fertilizers Effect on Growth and Yield of Two Economically Important Crops, Potato and Pea	According to the results of the current study, both potato and pea crops responded better to various household organic fertilizers in terms of growth and yield.
5.	Emka Seguin Nnochiri,Olumide Moses organdie	Geotechnical Properties of Lateritic Soil Stabilized with Ground-Nut Husk Ash	•With the addition of 10% GHA by weight of soil, the liquid limit and plasticity index values significantly decreased from 36.50% to 31.20% and from 19.30% to 16.48%, respectively. •With the addition of Gha, the treatment of the lateritic soil led to a general drop in Maximum

			Dry and an increase in moisture content.

6. Results and discussion

Liquid limit test results:-

The liquid limit is the amount of water at which soil begins to behave like a liquid. A clay sample is put in a regular cup, and a groove is made with a spatula to determine the liquid limit. Up till the separation disappears, the cup is dropped. From this sample, the soil's water content is determined. Liquid limit test standard values. A portion of soil that has been sliced by a groove with conventional dimensions will flow together for a distance of 1.25 cm when subjected to 25 blows in a standard liquid limit device. This is known as the liquid limit. The soil's strength at its water content is approximately 0.17 N/cm.sq. (17 gms/sq.cm).

Apparatus required

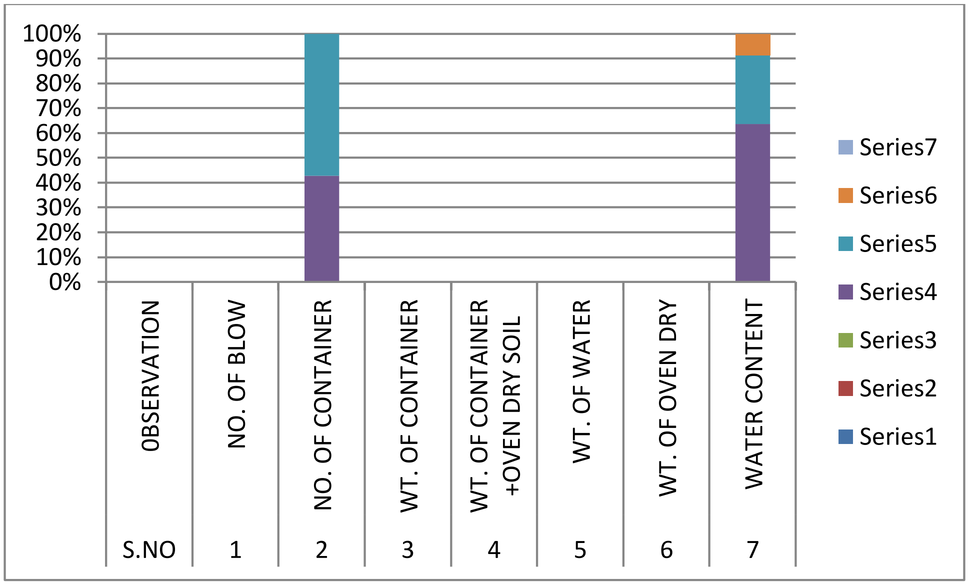
1. Casagrande Apparatus
2. Grooving tool
3. Blow counter
4. ASTM type tool

Procedure for liquid limit test

• Place 30 to 40 g of the specified soil that has been through a 425 micron IS sieve in an evaporating disc.
To make a paste, add water. Give the soil enough time so that water can permeate the entire quantity of soil.
• Using the spatula, remove a little amount of the paste and place it in the cup of a liquid limit device that is calibrated for 10 mm blows.
• Using the typical grooving tool, cut the vertical groove. (The ASTM tool for sandy soils and Casagrande's tool for clays).
• Apply blows by turning the standard device's crank at a rate of two rotations per second, and record the quantity of blows for a groove at the bottom that is 12 mm closer.
• Take a sample of soil with a representative thickness

Observation table:

S.NO	OBSERVATION	SAMPLE NUMBER		
1.	No. of blows	19	20	21
2.	No. of container	3	4	-
3.	Wt. of container	20 g	20 g	20 g
4.	Wt. of container + oven dry soil	49.5g	50g	52.5g
5.	Wt. of water	7g	5.5g	3.5
6.	Wt. of oven dry soil	22.5g	24.5g	29g
7.	Water content	2.8%	1.22%	0.38%



Standard proctor test results:

The soil's compaction characteristics, as determined by the standard Proctor test, were represented by a maximum dry unit weight (dmax) of 19.3 KN/m3 and an ideal water content (w opt) of 9.5%.

Procedure for standard proctor test;

Take sufficient quantity of representative soil, air dry & pulverize it with a rubber mallet

Sieve the soil through No: 4 sieve & reject the coarser material.

2. Take about, 3 kg of soil, add water to bring its water content to about 5% below the estimated optimum moisture content.
(For coarse-grained soil 4% initial water content & for fine-grained soil 10% initial water content is preferable).Then Mix it thoroughly.

3. Clean the mold, measure its diameter & height & weigh it without the collar.

4. Fit the collar & compact the moist soil in three equal layers by the rammer with evenly distributed blows to each layer.

Use 25 blows for 4 inches diameter & 56 blows for 6 inches diameter mold to the total height of mold with collar.

5. Remove the collar and use a straight steel edge to cut the compacted soil level with the top of the mould.

Clean the base plate and molds outside before weighing it.

6. Remove the dirt from the mould, split it, and take a sample of around 100 gram to determine the water content.

7. Smash the dirt lamps then combine them with the remaining soil in the tray.

Repeat the compaction process for each increment of added water until the bulk of the compacted soil reduces. Add additional water to increase the water content by 2 to 3%.

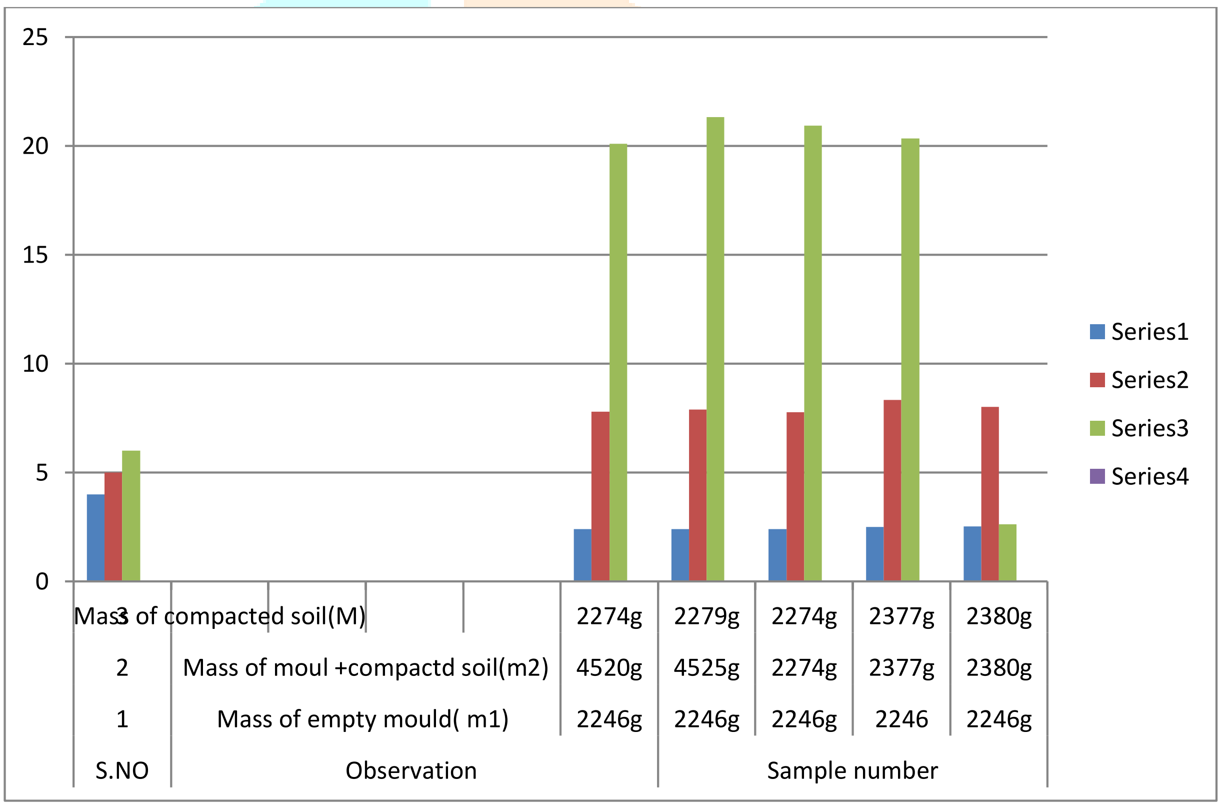
8. Determine the dry density and water content for each path.

9. Plot the compaction curve with dry density as the ordinate and water content as the abscissa.

10. The water content is best measured against the curve's peak.

Observation table:

S.NO	OBSERVATION	SAMPLE NUMBER				
1.	Mass of empty mould(M1)	2246g	2246g	2246g	2246g	2246g
2.	Mass of mould + compacted soil(M2)	4520g	4525g	4520 g	4623g	4626 g
3.	Mass of compacted soil(M)	2274 g	2279g	2274g	2377g	2380g
4.	Bulk density(ρ)=M/V	2.39	2.40	2.39	2.50	2.51
5.	Water content of soil =w%	7.80	7.88	7.76	8.34	8.01
6.	Dry density= $\rho_d = \rho_b(1+w)$	20.10	21.31	20.93	20.33	22.61



Direct shear test:

Shear strength is defined as the maximum resistance that a material can withstand when subjected to shearing, and the direct shear test is an experimental procedure that is **used to determine the shear strength of soil materials**. It is one of the simplest, most common, quickest, and inexpensive tests implemented to derive the strength of a soil.

Test Procedure of Direct Shear Test

1. Collect the soil specimen which is either undisturbed or remolded. The sample should be taken using sampler and Rammer. If cohesion less soil is taking then sampler and rammer are not required.
2. The inner dimensions of sampler should be 60 mm x 60 mm in plan which is also the inner dimensions of shear box. The Thickness of box is about 50 mm while the thickness of sample should be 25mm.
3. Now attach the two halves of the shear box with locking pins and place the base plate at the bottom.
4. Above the bottom plate, Place the porous stone and above it place the grid plate. Plain grid plates are used for untrained conditions while perforated grid plates are used for drained conditions.
5. Now we have base plate, porous stone and grid plate in the shear box. Weigh the box at this stage and note down.
6. After that place the soil specimen above the grid plate. Undisturbed sample is directly transferred to shear box. If sandy soil is using, place it layers wise and tamper the each layer to get the required density.
7. Note down the weight of shear box with soil specimen.
8. Above the soil specimen, place the upper grid plate, porous stone and loading pad one above the other.
9. Proving ring is arranged in such a way that it should contact the upper half of the shear box.
10. Loading yoke is placed on the steel ball of loading pad of shear box.
11. Two dial gauges are fitted one to the container for measuring shear displacement and other one is to the loading yoke for measuring vertical displacement.
12. Now locking pins are removed from the shear box and spacing screws are placed in their respective positions of the box.
13. The upper half of the box is raised slightly with the help of spacing screws. The spacing is decided depending upon the maximum size of particle.
14. Now apply the normal stress which is generally 25 KN/m^2. Also apply the shear load at a constant rate of strain.
15. Now the box starts reacting to loads applied and for every 30 seconds note down the readings of proving ring and dial gauges.
16. If the proving ring reaches maximum and suddenly drops it, means the specimen is failed. Note down the maximum value which is nothing but failure stress.
17. For some soils, failure point is taken at 20% of shear strain.
18. Finally remove the box and measure the water content of the specimen.
19. Repeat the same procedure for different normal stresses of 50, 100, 150,200,250,300,400 kN/m^2

Observation table:

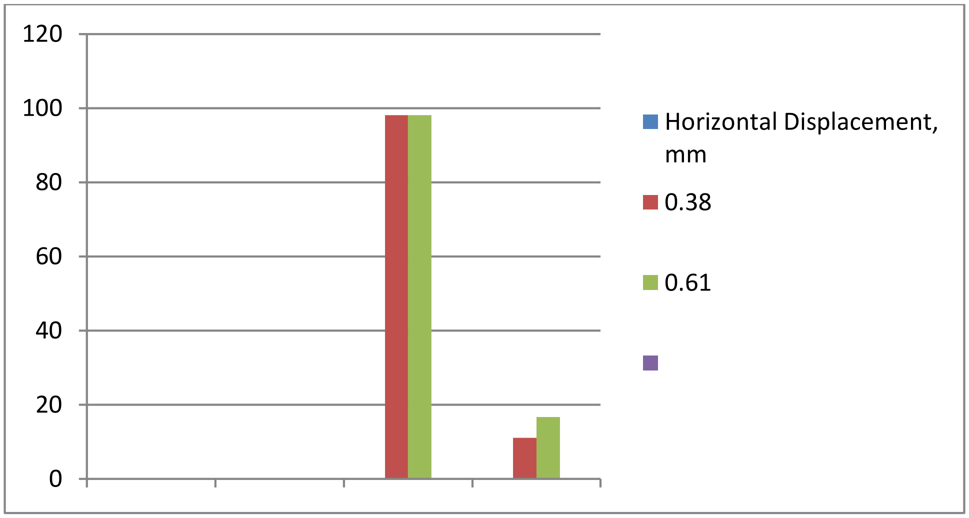
Normal stress=1kg/m^2

Area of sample=366m^2

Rate of loading=0.25mm/min

For normal load: 1 kg/m^2

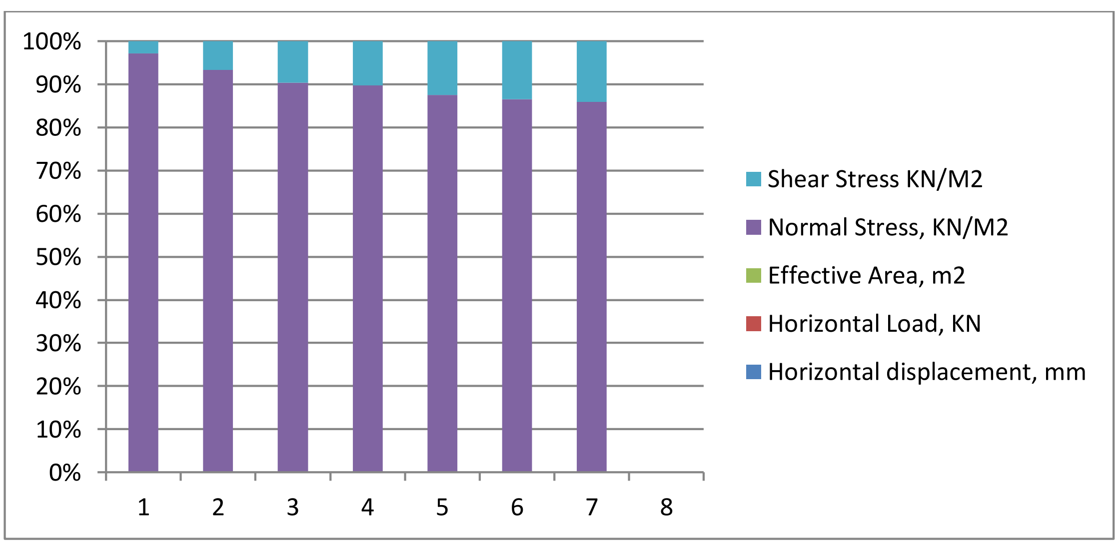
Horizontal Displacement, mm	Horizontal Load, KN	Effective Area, m^2	Normal Stress, KN/m^2	Shear Stress, KN/M^2
0.380	0.040	3.6×10^{-3}	98	11.11
0.610	0.060	3.6×10^{-3}	98	16.67



Graph: Horizontal Displacement vs. Normal Stress

For Normal Load: 4 kg/m^2

Horizontal displacement, mm	Horizontal Load, KN	Effective Area, m^2	Normal Stress, KN/M^2	Shear Stress KN/M^2
0.103	0.0410	3.6×10^{-3}	390.28	11.38
0.240	0.0980	3.6×10^{-3}	390.28	27.72
0.370	0.150	3.6×10^{-3}	390.28	41.67
0.420	0.160	3.6×10^{-3}	390.28	44.44
0.500	0.200	3.6×10^{-3}	390.28	55.55
0.560	0.220	3.6×10^{-3}	390.28	61.11
0.570	0.230	3.6×10^{-3}	390.28	63.88



Graph: Normal Stress Vs shear stress

Plastic limit test:

An international laboratory test known as the plastic limit test of soil is used to assist identify or categorized soils into different groups. It is typical to begin the plastic limit and liquid limit tests concurrently. In most instances, the tests are conducted concurrently on purpose. The "plastic limits," according to Swedish scientist A. Atterber, are the limitations between soils' plastic and solid states.

RESULTS;

Because peat is a dark fibrous substance produced when decomposition is unable to keep up with the synthesis of organic material, peat soil will not produce threads

7. SUMMARY AND CONCLUSION

CONCLUSION:

•We can ascertain the soil's shearing strength with the aid of a direct shear test.

•Banana leaf and cow dung ash are added to the soil to improve its qualities.

•The proctor test measures soil compaction to identify the point at which soils can be compacted with construction m achinery most effectively.

FUTURE SCOPE:

Farmer use cow dung ash and banana leaf ash to the oil to enrich the soil with vital nutrients. Ignore the other fertilizers, and use cow dung ash has more nutrients like phosphorous and nitrogen that are very essential in enabling the growth of fresh crops.

REFERENCE:

1. Alexander, M. & Mindless, S., 2005.. Aggregates in Concrete New York: Taylor &Francis Group.

2. Akeke, G. A., Ephraim, M. E. Akobo, .I. & Ukpata, J. O., 2013. Structural properties of rice husk ash concrete.

International Journal of Engineering and Applied Sciences,Volume 3, pp. pp 57-62.3.

3. J. Hu, G. Chen, I.M.C. Lo, Removal and recovery of Cr (VI) from wastewater by maghemite nano particles, Water Res. 39 (2005) 4528–4536.doi: 10.1016/j.watres.2005.05.051.

4. C “European Cooperation in the Field of Scientific and Technical Research,” Brussels, 14 December 200

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