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A STUDY ON THE EFFECT OF ROCKPHOSPHATE IN CL CLAYS

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Abstract As the development progresses the need for agricultural products are also increasing day by day. For increasing the productivity more fertilizers have been used. As days passes population also increasing thus the accommodation is becoming problem, thus the uncultivated lands which were earlier cultivating used for construction. Chemicals in fertilizers may change the properties of soils and can affect the constructed structures. One of the most used fertilizer is the Rock phosphate, which is used as remineralising agent in cultivation. This study focuses on the detailed study of Rock phosphate and its effect on CL Clays.

Keywords: Rock phosphate, remineralising agent

I. INTRODUCTION

Chemical fertilizers or inorganic fertilizers are manmade soil enhancers used to raise the level of nutrients found in soil. The natural nutrients found in the soil essential to plant growth, such as nitrogen, phosphorus and potassium, are manufactured synthetically from inorganic material and applied to soil in the form of chemical fertilizers. Although chemical fertilizers improve the growth of plants and increase the yields of fruits and vegetables in a relatively short period of time, there are certain disadvantages of using chemical fertilizers as opposed to organic fertilizers derived from natural sources. The persistent use of chemical fertilizers causes the pollution of ground water sources, or leaching. Chemical fertilizers that are highly soluble get absorbed by the ground more rapidly than they are absorbed by the intended plants. Plants have the capacity to absorb only a given level of nutrition at a time leaving the rest of the fertilizer to leach. Leaching is not only hazardous to groundwater sources but also to the health of subsoil where these chemicals react with clay to create hard layers of soil known as hardpan. As a result of chemical fertilizer use the health of soil and water is jeopardized, not to mention the waste of money and nutrient deficient plants. The presence of a number of acids in the soil, such as hydrochloric and sulfuric acids, creates a damaging effect on soil referred to as soil friability. The different acids in the soil dissolve the soil crumbs which help to hold together the rock particles. Soil crumbs result from the combination of humus, or decomposed natural material such as dead leaves, with clay. These mineral rich soil crumbs are essential to soil drainage and greatly improve air circulation in the soil. As the chemicals in the chemical fertilizers destroy soil crumbs, the result is a highly compacted soil with reduced drainage and air circulation.

Of all the major fertilizer nutrients, nitrogen is the main nutrient affecting soil pH, and soils can become more acidic or more alkaline depending on the type of nitrogen fertilizer used. Phosphoric acid is the most acidifying phosphorus fertilizer. -Potassium fertilizers have little or no effect on soil ph.

Rock phosphate or phosphorite, is mined from clay deposits that contain phosphorus and is used to make organic phosphate fertilizers that many gardeners utilize. In the past, rock phosphate was used alone as a fertilizer, but due to a lack in supply, as well as low concentration, most applied fertilizer is processed. There are a number of types of rock phosphate fertilizer available on the market, some are liquid, and some are dry. Many gardeners swear by using rock-based fertilizers such as rock phosphate, bone meal and Azomite. These nutrient-rich fertilizers work with the soil rather than against it as chemical fertilizers do. The nutrients are then made available to plants at a steady and even rate throughout the growing season.These fertilizers are commonly called “rock dust” and provide just the right amount of nutrients to make plants strong and healthy.

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1. MATERIALS AND METHODOLOGY

Materials

Materials used in this study are Kaolinite and Rock phosphate

Kaolinite. Kaolinite for the present study was collected from English India Clay Limited Company, Trivandrum. Various tests were conducted for determining the index properties of Kaolinite.

Fig. 1. Kaolinite

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Table 1. Properties of Kaolinite

Properties	**Values**
Specific gravity	2.67
Liquid limit (%) (IS 2720 PART 51985)	34
Plastic limit (%) (IS 2720 PART 51985)	23
Plastic index (%) (IS 2720 PART 51985)	11
Shrinkage limit (%) (IS 2720 PART 51985)	21
IS Classification	CL
Natural moisture content (%)	40
Optimum moisture content (%) (IS 2720 PART 7)	24.5
Maximum dry density (g/cc) (IS 2720 PART 7)	1.424
Percentage of clay (IS 2720 PART 4)	66
Percentage of silt (IS 2720 PART 4)	23
Percentage of sand (IS 2720 PART 4)	11
UCC strength (KN/cm^2) (IS 2720 PART 10)	46.8

2.1.2 Rock phosphate.Rock phosphate, or phosphorite, is mined from clay deposits that contain phosphorus and is used to make organic phosphate fertilizers that many gardeners utilize. It was collected from Krishimithra, Trivandrum. In the past, rock phosphate was used alone as a fertilizer, but due to a lack in supply, as well as low concentration, most applied fertilizer is processed. Some phosphate rock is used to make calcium phosphate nutritional supplements for animals. Pure phosphorus is used to make chemicals for use in industry. The most important use of phosphate rock, though, is in the production of phosphate fertilizers for agriculture. Environmental Impact: Rainfall can cause varying amounts of phosphates to wash from farm soils into nearby waterways. Phosphate will stimulate the growth of plankton and aquatic plants which provide food for fish. This process in turn causes the death of aquatic life because of the lowering of dissolved oxygen levels. Another major disadvantage of phosphate fertilizers is the high probability of water pollution. Phosphorus that makes its way into soil via phosphate fertilizers and binds tightly to soil particles is unlikely to move out of the soil. But if too much phosphate fertilizer is applied to soil, excess phosphorus can easily find its way into water systems via storm drains and plumbing. Grass clippings and leaves from plants that have been grown in soils with an overabundance of phosphorus will release their phosphorus into water, leading to algae and bacteria outbreaks and water contamination issues.

Fig. 2. Rock Phosphate

Table 2. Properties of Rock phosphate

PROPERTIES	**VALUES**
Specific gravity	2.7
Clay (%)	25
Silt (%)	15
Sand (%)	60

3. METHODOLOGY

Physical properties of Kaolinite and Rock phosphate are determined. After that variations in Liquid limits and Unconfined Compressive Strength Values are studied due to the addition of Rock phosphate.

3.1 Liquid limit and Plastic limit (IS: 2720(Part 5 and Part 6))

Liquid limit and Plastic limit were determined as per IS:2720(Part 5 and Part 6) on Kaolinite using Rock phosphate for different concentrations of 5%,7.5%,10%, 15%. Liquid limit is generally defined as the minimum water content at which soil flows under its own weight. Plastic limit is defined as the water content at which soil begins to crumble when rolled into threads of diameter 3mm.

3.2Particle size distribution (IS: 2720 (Part 4))

Particle Size were determined using Hydrometer as per IS: (2720(Part 4)) on Kaolinite using Rock phosphate for different concentrations of 5%, 7.5%, 10%, 15%.

3.3 Unconfined Compressive Strength (IS: 2720(Part (10))

TheUnconfined Compressive Strength test was determined as per IS:2720(Part (10)- 1991)). It is the maximum compressive stress which a cylindrical soil sample is able to carry when it is not confined. The test was conducted for varying percentages of Rock phosphate.

4. RESULTS

4.1 Variation in Clay, Sand, Silt Content due to the Rockphosphate

Particle size distribution studies of Kaolinite clay for various proportions of Rockphosphate were studied and results are obtained as below

Table 3. Variations in Clay, Sand, Silt Content

Rockphosphate (%)	0	5	7.5	10	15
Clay (%)	66	82	80	78	76

Sand (%)	23	8	13	15	16
Silt (%)	11	10	7	7	8

4.2Variation in Liquid limit limit, Plastic limit due to addition of Rock phosphate

Atterberg's limit of different proportions of the Rockphosphate and Kaolinite mixtures was tested and results were obtained are shown below

Table 4. Variations in Liquid limit and Plastic limit

Rock phosphate (%)	0	5	7.5	10	15
Liquid limit (%)	34	33.5	32	31	30
Plastic limit (%)	25	21	20	19	15

The results obtained shows that increase in the percentage of Rockphosphate to the Kaolinite increases to a certain value and decreases after optimum value.

4.3. UNCONFINED COMPRESSIVE STRENGTH FOR VARIOUS PERCENTAGE OF ROCKPHOSPHATE

Unconfined compressive strength of Kaolinite and Rockphosphate mixture was tested and results were obtained are shown below

Table 5. Unconfined compressive strength for Kaolinite RP mixture

Rock Phosphate (%)	0	5	7.5	10	15
UCC (Kg/cm²)	0.468	0.72	0.74	0.70	0.67

The results obtained shows that, UCC value increases with increasing percentage of RP and decreased after optimum value.

5. CONCLUSION

Rockphosphate is a porous material. As it is mixed with the soil the soil properties changes.

- Fine content of Kaolinite decreased as the dosage increases.

- As the Particle sizes decrease the surface area increases, thus need of water content decreases.
- Liquid limit and Plastic limit shows a decreasing trend as the fine content decreases.
- Rockpowder with lesser Specific surface than clay gives better result.
- With increase in Coarser particles the liquid limit and Plastic limit decreases due to intermolecular force of attraction thus Unconfined compressive strength is increased.

6. REFERENCES

1. Arpita, V.P.,(2014), " A study on effect of fertilizer (urea) on geotechnical properties of silty clay", International Journal Of Innovative Research In Engineering And Multidisciplinary Physical Sciences (IJIRMPS) Vol 2, Issue 3, December 2014 2.
2. Dorothy, C and Harry, C.S., (1971), "Reactivity Of Clay Minerals With Acids And Alkalies", Journal of Geological Survey U.S. Vol 19, pp 321-333
3. Musa Alhassan., (2012) "Effect of Municipal solid waste on Geotechnical properties of soils", International Journal of Environmental Science Management And Engineering Research Vol.1 (5), pp 204-210
4. V.Giridhar et.al.,(2015), "Experimental studies on clay, bentonite and leachate mixer as liner material" International Journal of Innovative Research in Advanced Engineering (IJIRAE) ISSN: 2349-2163 issue 1, Volume 2.
5. Oluwapelumi& O. Ojuri.,(2015), "Geotechnical characterization of some clayey Soils for use as landfill liner" J. Appl. Sci. Environ. Manage.Vol. 19 (2) 211 – 217.