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Short Communication

Soil Treatment Using Biopolymers

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In the present day sustainability has become the latest trend and environment-friendly and economic feasible solution to any problem is gaining popularity in all realms. Soil is a major component responsible for the functioning of the ecosystem as it houses abundant organic components, nutrients and even acts as a habitat for many living organisms. It is also the medium of plant growth. From the engineering point of view, soil acts as a base for load dissipation either through the foundation or as a subgrade under the pavement. But in some areas, the soil doesn't satisfy the strength or stability criteria required for use as an engineering material. It might be too weak having a low bearing capacity and shear strength, it might be prone to wind or water erosion, it might have too low or too high permeability and compressibility or it might even be prone to liquefaction under dynamic loads. Such a situation demands and calls for soil stabilization and ground improvement.

The traditional soil stabilization practices involved the use of materials and practices that are 'not so sustainable' in terms of environmental perspective. They include dynamic compaction, use of stone columns, deep mixing, vibro-compaction etc. The commonly used materials for soil treatment consisted of cement, lime and other chemical admixtures. But form the past decade the harmful and toxic nature of these conventional methods are realized and the need for reduction of the carbon footprint and environmental protection is felt. Consequently, they are now being replaced by environment-friendly methods like use of biopolymers, microbial induced calcite precipitation and use of natural fibres for soil reinforcement. These methods mostly do not destroy the natural ecosystem of the soil. In particular, the uses of biopolymers are now gaining popularity in the field of geotechnical engineering.

Biopolymers are bio-based polymers produced from cells of living organisms. They are derived mostly from plants and certain microbes. The application of biopolymers like xanthan, starch, agar, guar, casein, beta-glucan are being extensively studied for use as a soil stabilizer and they have been found to improve the shear strength, compressibility and permeability properties of both sandy and clayey soil. Being of biological origin they do not harm the soil or groundwater in any manner. Research by Tran., *et al*. [1] and Chang., *et al*. [2] proved the fact that biopolymers improve vegetation and enhance the water retention capacity of the soil. Furthermore, researches have been conducted to use them for anti-desertification purpose since they impart cohesion to the non-cohesive type soil thus preventing soil erosion to a great extent. Thus, biopolymers are found to be an effective alternative material for soil treatment.

Correspondingly, in the agricultural domain biopolymers are explored for use as a soil conditioner and also as plant growth and yield enhancer [3]. Other applications in agriculture consist of their use as seed coating that provides protection against pathogens in early stages of plant growth and thus reduces the usage of fungicide. Though biopolymer offers to be a promising additive for soil improvement, scrupulous research is required before it is put to use in actual practice. Since it could restrict the use of cement and other such toxic soil additives, thereby reducing the carbon footprint, exhaustive research on the same is expected in the near future. Besides, through the manufacture of biopolymers exclusively for soil stabilization purpose, the current high market price could positively be reduced to a great extent.

Bibliography

1. TP Tran., *et al.* "Soil water retention and vegetation survivability improvement using microbial biopolymers in drylands". *The Geomechanics and Engineering* 17.5 (2019): 475-483.

2. Chang AK Prasidhi., *et al.* "Soil treatment using microbial biopolymers for anti-desertification purposes". *Geoderma* 253.254 (2015): 39-47.

3. S Niranjan Raj., *et al.* "Applications of Biopolymers in Agriculture with Special Reference to Role of Plant Derived Biopolymers in Crop Protection" (2011).