STUDIES ON SOME SOIL ENHANCERS USED IN ARID REGIONS

By

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B.Sc. Agric. Sc. (Soil Science), Ain Shams Univ., 2001

M.Sc. Agric. Sc. (Soil Science), Ain Shams Univ., 2011

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ABSTRACT

Manal Hassan Mohamed Ibrahim Elmahdy: Studies on some soil enhancers used in arid regions. Unpublished Ph.D. Thesis, Department of soil science, Faculty of Agriculture, Ain Shams University, 2019.

One of the ways to improve sandy soils is the addition of natural organic or inorganic amendment. The purpose of this investigation is study the nature amendment behavior and effect of some amendment most commonly used in arid regions , K- feldspar, rock phosphate, bentonite and biochar are choose and their effect either –alone or in combination**.**

In a laboratory work, a greenhouse experiment and a field experiment, biochar at 3 tons fed^{-1} accompanied with any of feldspar, rock phosphate and bentonite all applied as soil amendments at 3 tons fed^{-1} along with P & K solubilizing bacterial inoculation were exposed for a subsequent experiments to study their effect in maize plants growth either in a greenhouse or a field one. In the laboratory, the soil amendments were initially evaluated for X-Ray diffraction. The amendments exposed for treating with P & K solubilizing bacteria and/or their co-culture mixture as bioleaching agents to obtain highlight view on their ability to release both P & K from these natural soil amendments.

Results revealed that any of the tested solubilizing bacteria was able to bioleach both insoluble P & K forms changing them into a soluble available for form with a priority to their co-culture mixture. In the greenhouse experiment, the combination between biochar (3 tons fed^{-1}) and any of the tested natural soil amendment (3 tons fed^{-1}) resulted in higher maize dry weight, plant height, P & K plant uptake and soil available P & K compared with those without biochar. In field experiment, using biochar alone at 3 tons fed^{-1} combined with bacterial inoculation gave the highest significant mean value for maize plant dry

weight, plant height, P & K plant uptake, soil available P & K, maize ear yield, and maize seed yield compared to those recorded by same treatment without bacterial inoculation. Rock phosphate recorded the highest mean values of maize plant dry weight, plant height, plant P uptake; soil available P, maize ear yield and maize seed yield. Feldspar with bacteria inoculation recorded the highest mean value of maize plant K uptake, bentonite with bacteria inoculation recorded the highest mean value of soil available K. All results of these soil amendments were in a comparison with those obtained by the treatments without bacterial inoculation. The interaction between any of rock phosphate along with bacterial inoculation and biochar each applied at a rate of 3 tons fed^{-1} and that between any of feldspar along with bacterial inoculation and biochar each applied at a rate of 3 tons fed^{-1} gave the highest values of highest maize dry weight, plant height, plant P uptake, soil available P, maize ear yield and maize seed yield for the former interaction and the highest maize plant K uptake and soil available K the second one.

Keywords: K-feldspar, rock phosphate, bentonite, biochar, P & K solubilizing bacterial and maize

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Most of Agriculture land in Egypt is found in arid or semi-arid regions where is becoming rare water and cost and low resources in water in those area, drought is of the most dangerous abiotic stresses limiting the growth and productivity of plants around the world (**Darwish *et al* ., 2013)**. The problem of these soils is not only the existence of poor nutrients but also lacking high water holding capacity associated with a reduction in soil organic matter **(Noble *et al*., 2000).**

The crop production in Egypt relies completely on the ever-price growing of mineral fertilizers. The using of natural amendments to reduce the high cost of these mineral fertilizers and also to reduce their environmental hazards (**Alori *et al*., 2017).**

The amendment has been considered a long-term strategy to improve productivity and sustainability of agricultural cropping systems on sandy soils **(Bell and Seng, 2007).** A soil amendment is added to improve soil properties. These amendments are available in organic such as biochar or inorganic forms such as feldspar, rock phosphate and bentonite. **(Davis and Whiting, 2013)**.

The purpose of this investigation is studying behavior of some natural mineral deposits; K- feldspar , rock phosphate, bentonite was also studied because it is the most common mineral used for reclamation of sandy soil as well as biochar which is used as soil enhancers in arid region. These amendments are more friendly environmental with respect to the environmental concerns and impacts

Feldspars are the essential constituents of rocks that are weathered into secondary minerals, that main source of clay minerals **(Balic-Zunic *et al*., 2013).** The importance of the use feldspars as they are slow release potassium. The use of feldspar is beneficial cheap sources of K fertilization for sustainable agriculture in sandy soils. **(Seddik *et al*., 2015).**