Effect of inculation with Sulfur oxidizing bacteria and addition of mineral Sulfur and rock phosphate on availability of phosphorus and some nutrients and corn growth

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Summary

In order to study the effect of inoculation with oxidizing sulfur bacteria, levels of agricultural sulfur , rock phosphate and its interaction in the available phosphorus from rock phosphate and their effect on soil characteristics , growth of maize (*Zea mays L.*) varity Bohooth 106 , and content of NPK and S .The study was conducted in two stages .The first was isolation of oxidizing sulfur bacteria, and the second was the use of bacteria as inoculant in agricultural experiment.

It was obtained (20) bacterial isolates isolated from soil samples (0-30)cm from Abu-Alkhssid soil(Asbillat) region , North Rumaila(polluted with oil), the plant rhizospheres in fields at college of Agriculture, University of Basra and from Qurna district. It was diagnosed by studying the biochemical, cultivated and microscopical,characteristics.

The results showed that all the bacterial isolates belong to the genus Thiobacillus which oxidizing sulfur ,differed among themselves in reducing the pH and the production of sulphates in the sulfur and thiosulfate liquid, The isolate number (T2) isolated from soil Abu-Alkhssib treated with sulfur , rock phosphate and organic matter was excellent in reducing the pH degree of Starkey (sulfur) and Thiosulfate from 8.00 to 5.22 and 4.82, and production of 114.9 and 29.1 mg$SO_4^{=}$.L^{-1} respectively ,and used as inoculant in the experiment pots.

The experiment was Carried in the canopy wire of the Department of Soil Science and Water Resources, Faculty of Agriculture - University of Basra using clay loam soil takan from lsharsh districtin Qurna – Basrah,each pot contained 4 Kg of soil. and treatmed with four levels of

sulfur(0, 2, 4 and 6 ton S ha^{-1}) , rock phosphate (0, 400, 800 and 1600 kg rock. ha^{-1}) and inoculated with 10 ml .pot^{-1} of the bacterial isolate (T2) and add a nitrogen fertilizer quantity of 160 kg N .ha^{-1} as urea fertilizer, potassium amount of 160 Kg k.ha^{-1} as potassium sulfate and incubated for a month in the laboratory condition, the experiment was carried out by Completey Randomized Design (CRD) and planted with 6 seed.pot^{-1}.

The plants were cut after two month after germination , dried, estimated dry weight and digested with acid mixture to assess the content of nutrients (K, P, N and S) in the plant.

Samples of the soil pots were taken during plant growth and during periods of 2, 4, 6, 8 and 9 a week and determined the available phosphorus and sulfur element, pH soil and electrical conductivity were also estimated after 2 and 9 weeks as well as the estimated the number of oxidizing sulfur bacteria.

The results were summerizd as follow:

1-The inoculation with sulfur oxidizing isolate (T2), level of sulfur and rock phosphate and the addition were reduced the degree of soil reaction (pH) and increase the electrical conductivity (EC) after 9 weeks of germination, reaching the lowest of pH 7.67 and the highest rate of EC 5.00 $ds.m^{-1}$ after 9 weeks of germination.

2-The Inoculation with sulfur oxidizing isolate (T2) increased significantly the availability of phosphorus and sulfur in the soil , the highest rate of phosphorus after 2 weeks from germination, reaching 49.42 mg p. Kg^{-1} while the highest increase of sulfur was 473.5 mg $SO_4^{=}$. ha^{-1} after 9 weeks.

3-Bifurcation between Inoculation and sulfur , Inoculation and phosphate rock significantly increased phosphorus and sulfur uptake during the final periods of growth ,reaching the highest rate 34.92 and 38.87mg p Kg^{-1} ,734.4 and 538.6 mg SO_4 Kg^{-1} after 9 weeks.

4-The addition of phosphate rock significantly increased the dry weight of maize 20.03 gm $pots^{-1}$ and increased absorption N,P,K and S at the highest rate 244.5 ,115.1 ,179.2 and 507.3 mg $pots^{-1}$ at the 1600 Kg rock ha^{-1}

5- The inoculation sulfur oxidizing isolate (T2) and the addition of agricultural sulfur and rock phosphate levels significantly increased the number of bacteria oxidizing sulfur after cutting when it reached the highest rates of 10.33 , 13.68 and 9.65 $x10^3$ MPN. gm^{-1} dry soil Respectively.