Contents

5. SUMMARRY

The concept "environment select" for diazotrophic cyanobacteria was monitored in a series of short-term laboratory and a field experiments. The laboratory experiments were first started by the isolation and identification of different cyanobacterial isolates (*Nostoc maculiforme,Nostoc humifusum* and *Wollea* sp.) from rice soils. Besides the isolated cyanobacterial strains i.e. *Nostoc calcicola, Anabaena flos aquae, Nostoc muscorum, Anabaena laxa and Microchate tenra*, five local cyanobacterial strains were all being initially evaluated for growth and atmospheric N_2-fixation through determination of the nitrogenase activity (N-ase) after which the most six efficient nitrogen fixing cyanobacterial strains were examined when being exposed to various environmental stimulators or constraints. Cyanobacterial strains were cultivated in synthetic culture medium supplemented with increased concentrations of NaCl, phosphorus and glucose. Biomass and nitrogenase activity (N-ase) of the chosen cyanobacterial strains were estimated at 1, 2, and 3 week incubation intervals. The soil based cyanobacterial inoculum was prepared including these chosen cyanobacteria strains. As well as, the cyanobacterial soil based inoculum was evaluated for its effect on maize yield and yield components of maize plant cultivated in sandy clay loam soil and on some physical and chemical properties of the soil remained after maize harvesting. The obtained results could be summarized in the following:

1. **Biomass production and nitrogen fixation of local and isolated cyanobacterial strains:**

- Both biomass and N-ase activity increased with increasing the incubation period. The highest biomass which was 0.097/ g100mL medium was recorded with *Anabaena flos aquae* after 4 weeks while *Nostoc*

calcicola gave the highest N-ase activity which was 515.00 mmole C_2H_4 g^{-1} dry weight cyanobacteria h^{-1}.

2. Factors affecting the growth and nitrogen fixation capacity of cyanobacteria:

2.1. Salinty:

-The inclusion of NaCl into cyanobacterial culture media up to 8000 mgl^{-1} supported higher biomass yields for cyanobacterial strains over the control whereas increasing NaCl level up to 12000 mgL^{-1} in the growth medium decreased the threshold of cyanobacterial growth of all the tested strains.

- Increasing salt concentration up to 8000 mgL^{-1} NaCl enhanced the N-ase activity whereas the cyanobacterial culture exposed to 12000 mgL^{-1} NaCl exhibited considerable decreases in N-ase activity.

2.2. Phosphorus:

- Cyanobacteria cultures supplemented with P up to 60 mg PL^{-1} were characterized by high biomass yield and fixed more N_2 compared with the others which were supplemented with limited level of phosphrus, raising phosphorus level in growth medium suppressed, to some extent, the cyanobacterial development of all cyanobacterial strains at all incubation periods.

2.3. Glucose:

Increasing both glucose concentration and incubation period up to 3 weeks elevated linearly both cyanobacterial biomass and N-ase activity.

3. Effect of cyanobacterial inoculation on maize production:

3.1. Yield and yield components:

- The application of different nitrogen levels affected significantly yield with cups, grain yield and stover yield compared with the control treatment

Nitrogen levels did not affect significantly 100-rain weight, ear length, ear diameter and plant height compared with the control treatment.

- Cyanobacterial inoculation to maize seeds did not affect significantly 100-rain weight, ear length, ear diameter and plant height compared with the control treatment.

Cyanobacterial inoculation affected significantly yield with cups, grain yield and stover yield compared with the control treatment

-The different combinations among the different levels of cyanobacteria and different rates of nitrogen did not significantly affect 100-rain weight, ear length,ear diameter and plant height, Whereas they affected significantly maize yield with cubs, grain yield and **stover yield.**

3.2. NPK uptake by grains and stover:

-Fertilization with different levels of nitrogen significantly affected NPK- uptake by both grains and stover.

- All applied cyanobacterial levels increased significantly NPK-uptake by both grains and stover.

- The use of 100% cyanobacterial inoculation induced the highest significant NPK-uptake amounts by both grains and stover.,

- The combination among different levels of cyanobacteria and nitrogen significantly affected NPK uptake by grains and stover.

- Cyanobacterial inoculation alone enhanced NPK uptake by either grains or stover compared with the control treatment.

4. Effect of cyanobacterial inoculation and applied nitrogen on some chemical and physical properties of soil after maize harvesting:

- Increasing applied nitrogen level from zero up to 100% of the recommended dose increased significantly the available-N and P contents n soil and the increase was most pronounced upon application of the N fertilizer at a rate of 100% of its recommended dose.

- Only slight increases in available K were observed along with increasing level of applied N up to 100 % of its recommended dose.

- Cyanobacterial inoculation with 100% of its recommended dose caused soil vailable –N and P to be significantly higher than the other treatments. On the other hand, cyanobacterial inoculation did not significantly affect the available K content.

- The combination of cyanobacteria and nitrogen significantly affected the available N and P at the same time, they did not show same effect on available K in the soil.

- Cyanobacterial inoculation decreased slightly the soil pH.

Soil inoculation with cyanobacteria at the level of 100% plus 100% nitrogen led to decrease pH to the least value (8.17).

- Cyanobacterial inoculation only, decreased the soil EC compared to the control treatment and the treatments received both cyanobacteria and different

nitrogen levels. However, the least EC (0.42 dSm^{-1}) was attained due to 100% cyanobacteria + 50% nitrogen.

- Inoculation with cyanobacteria slightly decreased the bulk density but increased both hydraulic conductivity and CEC.

- Cyanobacterial inoculation caused the percentages of aggregates having diameters (1-0.5mm) and (0.5-0.25mm) to be more than the corresponding ones in un-inoculated treatments.

- Cyanobacterial inoculation, in general showed no definite effect on the soil aggregate stability.

- soil inoculation with cyanobacteria, led to increase soil micro-organisms community through the organic matter increase, Which improve the soil fertility.

Generally, the inoculation with cyanobacteria may be a future promise for avoiding the environmental pollution occurred due to the extensive application of chemical fertilizers in crop production. As well as, to ensure the improvement of the soil stability structure, which, in turn increased the crop production?