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 _fibs aquae, Nostoc muscorum, Anabaena law 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 NaC1, 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 a newly reclaimed sandy 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 $C2H_4$ g^{-1} dry weight cyanobacteria h^{-1}.

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

2.1. Salinty:

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

- Increasing salt concentration up to 8000 mgU^{i} NaCl enhanced the N-ase activity whereas the cyanobacterial culture exposed to 12000 mgL^{-1} NaCI 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 did not significantly affect both stover yield and plant height.

- Cyanobacterial inoculation to maize seeds seemed not to affect significantly yield of cups, stover yield, ear length, ear diameter and plant height compared with the control treatment.

- The inoculation with cyanobacteria at a rate of 100% of the recommended dose led to increase significantly both maize grain yield and 100-grain weight compared with the control treatment and for the other inoculated cyanobacterial levels (25 and 50 %).

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

3.2. NPK uptake by grains and stover:

-Fertilization with different levels of nitrogen significantly affected NPK- uptake by grains, nevertheless, they affected significantly only K-uptake by stover.

- All applied cyanobacterial levels increased significantly NPK-uptake by grains but only P-uptake by stover over the control treatment.

-The use of 100% cyanobacterial inoculation induced the highest significant NPK-uptake amounts by grains, whereas the highest P uptake was attained with 100% cyanobacterial inoculation.

-The combination among different levels of cyanobacteria and nitrogen did not significantly affect K and N uptake by grains or P uptake by stover. Whereas, they significantly affected P-uptake by grains and K-uptake by stover.

-Cyanobacterial inoculation alone did not enhance 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 post harvest of maize:**

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

-Only slight increases in available P and K were observed along with increasing level of applied N up to 100 % of its recommended dose and by the way, the highest available P and K contents were attained due to 100 % N level treatment.

-Cyanobacterial inoculation with 100% of its recommended dose caused available -N to be significantly higher than the other

treatments. On the other hand, cyanobacterial inoculation did not significantly affect both available P and K contents.

-The combination of cyanobacteria and nitrogen significantly affected the available nitrogen but, at the same time, did not show the same effect on both available P and K in the soil remained after maize harvesting.

- Cyanobacterial inoculation decreased slightly the soil pH to be towards slight acidity. Soil inoculation with cyanobacteria at the level of 100% without nitrogen led to decrease pH to the least value (6.03).

-Soil pH decreased to 6.12 due to both the treatments (50 %N+ 100% cyanobacteria) and (100%N +100% cyanobacteria).

- 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 (0.059 $dSni^{-1}$) was attained due to 100% cyanobacteria without nitrogen.

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

-Inoculation with 100% cyanobacteria either alone or combined with nitrogen although recorded the least bulk density values, yet it resulted in the highest hydraulic conductivity and CEC values.

-Cyanobacterial inoculation increased the percentages of the aggregates having the diameters (1-0.5mm) and (0.5-0.25mm) to values higher than the corresponding ones of the un-inoculated treatments.

-The treatments received nitrogen possessed only higher percentage of the aggregates having diameters (1- 0.5mm) and (0.5- 0.25mm). 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, this, in turn increased the crop production.