6. Summary

Eight different samples of clay rice soil were collected from Egyptian rice soils located in different Governorates, i.e., Damietta, Kafr EL- Sheikh, EL-Dakahlia and EL-Sharkia. The samples were collected from the upper surface layer of the soil (0-15 cm) to sort and isolate some of the most common cyanobacteria (blue-green algae) strains inhabited these rice soils. The isolated cyanobacteria strains were exposed for identification, purification and laboratory propagation. The propagated cyanobacteria isolates were also tested for their growth and biomass accumulation, their natural products content, i.e., carbohydrates, polysaccharides, lipids, fatty acids differentiation and pigments.

The obtained results can be summarized as in the following:

5.1. Soils:

The chemical properties of the collected rice soil samples from different Governorates can encourage cyanobacteria to inhabit, dominate and prevail in these rice soils. Thus, rice soils can save the environmental conditions required for the growth and proliferation of cyanobacteria.

5.2. Identification of the cyanobacteria isolates:

Eight cyanobacteria (blue-green algae) isolates were isolated from the aforementioned rice soil locations and identified as *Anabaena flos aquae* (Damietta) *Nostoc muscorum* (Kafr EL-Sheikh), *Nostoc maculiforme*, (Kafr EL-Sheikh), *Microchate tenra* (EL-Sharkia), *Nostoc calcicola* (EL-Sharkia) *Anabaena laxa* (Damietta), *Nostoc humifusum* (EL- Dakahlia) and *Wollea* sp. (Damietta).

5.3. Biomass production by the isolated cyanobacteria strains:

All the isolated cyanobacteria isolated cyanobacteria strains succeeded to grow under the continuous illuminated laboratory condition when they

cultured for different periods of 7, 14, 21 and 28 days under light intensity of 3000 lux and ambient temperature of 28-32 ^{o}C on BG11 medium. Results indicated that all the cyanobacteria (blue-green algae) strains were able to accumulate their maximum biomass after 28 days of incubation with priority for the first six strains *viz. A. flos aquae, N. muscorum, N maculiforme, M. tenra, N. calcicola* and *A. laxa*.

5.4. Natural products content of the selected isolated cyanobacteria strains:

- **Total carbohydrate content:**

Culturing all the tested isolated cyanobacteria strains on BG 11 medium at periods of 7 to 28 days led to increase the total carbohydrate contents along with increasing the time of incubation. *N. muscorum* recorded the highest content of carbohydrate (5.80%), followed by 5.70 and 5.3% for both *N. cacicola* and *N. maculiforme*, respectively.

- **Polysaccharides content:**

Results confirmed the presence of fructose, glucose, ribose and xylose as mono saccharides, sucrose and maltose as disaccharides, rafinose as trisaccarides in the six selected cyanobacteria strains.

- **Total lipids content:**

All the tested cyanobacteria strains had recorded their maximum lipids content at 28th day of incubation. The highest total lipids content was 3.75% (*N. cacicola*) followed by 3.20% (*A. laxa*) and 2.98 % for *M. tenra*.

- **Fatty acids differentiation:**

Results indicate the presence and variation of the fatty acids extracted and differentiated from lipids extracted from the isolated cyanobaeria strains. Lauric, myristic, palmetic, palmetoleic and stearic represent the highest contents of fatty acids in all examined strains compared to those of oleic,

linoleic, lenolenic, arachidic and arachidonic, which recorded less contents of fatty acids.

- **Pigments contents:**

Results proved the presence of chrophyll a and carotene in all tested cyanobacteria strains when all examined after 28 days of incubation. Chlorophyll a values was higher than those of carotene and phycopillin pigments. However, *M. tenra* gave the highest value of chlorophyll a (63.00 mg 100 ml^{-1} medium) followed by 54.00 and 51.00 mg 100 ml^{-1} medium for both *A. laxa* and *N. maculiforme*, respectively. While, for carotene the highest recorded value was 25.14 mg 100 ml^{-1} medium (*A. laxa*) followed by 22.46, 21.26 and 20.32 mg L^{-1} medium for *M. tenra*, *N. calcicola* and *N. maculiforme*, respectively. Due to phycobilin pigments, *N. cacicola* recorded the high C-phycocyanin value (38.00 mg 100 ml^{-1}medium). The highest Allophycocyanin value of 62 mg 100 ml^{-1} medium was recorded by *A. laxa*, while the highest C-phycoerthrin value of 7 mg 100 ml^{-1} medium was recorded by both *N. calcicola* and *N. maculiforme.*