

UGC- Major Research Project

UTILIZATION AND RECYCLING OF SCP ENRICHED INDUSTRIAL EFFLUENTS FOR THE CULTIVATION OF BRINJAL – cv PLR 1 (*Solanum melongena* L.)

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INTRODUCTION

Spirulina are multicellular and filamentous blue green algae that has gained considerable popularity in the health food industry and increasingly as a protein and vitamin supplement to aquacultures diets. It grows in water, can be harvested and processed easily and has very high macro and micro nutrient contents. It has long been used as a dietary supplement by people living close to the alkaline lakes where it is naturally found for instance those living adjacent to lake chad in the kanem region have very low levels of malnutrition despite living on a Spartan millet base diet. This traditional food, known as dihe, was rediscovered in chad by a European scientific mission and is now widely cultured throughout the world. In many countries of Africa, it is still used as human food as a major source of protein and is collected from natural water, dried and eaten. It has gained considerable popularity in the human health food industry and in a many countries of Asia, it is used as protein supplement and as health food.

Spirulina has been used as a complementary dietary ingredient of feed for fish, shrimp and poultry and increasingly as a protein and vitamin supplement to aqua feeds. China is using this micro alga as a partial substitute of imported forage to promote the growth, immunity and viability of shrimp. There has also been comprehensive research on the use of *Spirulina* as aquaculture feed additives in Japan.

OBJECTIVES OF THE PROJECT

In order to recycle and minimize the industrial effluents and maximize the growth and biochemical components *Spirulina platensis* for the benefit of humans and vegetable crops, the present investigation has been planned with the following objectives.

- 1) Collection of industrial effluents (sugar mill effluent, distillery effluent, tannery effluent, rice mill effluent and molasses) and analysis of its physico-chemical characteristics.

- 2) To cultivate the *Spirulina platensis* on Zarrouk's medium and Paoletti medium with Industrial effluents supplementation.
- 3) To compare the growth, dry weight, proximal composition, total phenol content, chlorophyll content, carotene content and phycoyanin content of *Spirulina platensis* cultivated on Zarrouk's and Paoletti medium with industrial wastes and lignite fly ash supplementation.
- 4) To study the antagonistic activity and Minimum inhibitory concentration (MIC) of *Spirulina platensis* against human pathogens and pathogens of Brinjal – cv PLR 1 (*Solanum melongena* L.).
- 5) To utilize the *Spirulina platensis* cultivated water for the irrigation of Brinjal – cv PLR 1 (*Solanum melongena* L.) and analysis of the growth and yield parameters.

SUMMARY OF THE FINDINGS

The present work has been planned to recycle the Industrial wastes *viz.*, Sugar mill effluent, Distillery effluent, Tannery effluent, Rice mill effluent and Molasses for the mass cultivation of *Spirulina platensis*. The analysis of beneficial effect of the Blue green algae *Spirulina platensis* in human beings and vegetable crops Brinjal – cv PLR 1 (*Solanum melongena* L.) was also planned in this present research. Effective recycling of Industrial wastes for mass cultivation of *Spirulina platensis* will minimize the industrial pollution and maximize the growth and biochemical components of the Blue Green Algae *Spirulina platensis*. With this in view, an attempt has been planned. From the present research, it was concluded that,

- ❖ The present research showed that the effective recycling of various industrial effluents *viz.*, sugar mill effluent, distillery effluent, tannery effluent, molasses, etc., for mass cultivation of *Spirulina platensis* will minimize the industrial pollution and maximize the growth and biochemical constituents of the *Spirulina platensis*.
- ❖ The *Spirulina platensis* cultivated in Zarrouk's medium showed more growth and biochemical parameters when compared to the *Spirulina platensis* cultivated in Paoletti's medium.
- ❖ Among the four different concentrations of wastes, maximum *Spirulina platensis* growth and biochemical parameters were recorded in the flasks containing 100 ml waste.
- ❖ Among the five different wastes tested, maximum *Spirulina platensis* growth and biochemical parameters were recorded in the flasks containing rice mill effluent.

- ❖ The Zarrouk's medium supplemented with wastes was considered as the best for the improvement of growth and biochemical parameters in *Spirulina platensis* when compared to Paoletti's medium supplemented with wastes.
- ❖ The methanol extract of *Spirulina platensis* was sensitive against test bacterial and fungal pathogens. So, in future there would be a special place for *Spirulina platensis* in antimicrobial therapy. This present research also encourages *Spirulina platensis* cultivation in a large scale to increase the economic status of peoples and country.
- ❖ The antagonistic activity of *Spirulina platensis* was determined against the pathogens of vegetable crop Brinjal – cv PLR 1 (*Solanum melongena* L.). The *Spirulina platensis* exhibited maximum zone of inhibition against *Pythium aphanidermatum*, *Rhizoctonia solani*, *Alternaria solani*, *Phomopsis vexans*, *Pythium indicum*, *Sclerotium rolfsii* and *Alternaria melongenae*. Least antagonistic activity on pathogens of vegetable crop Brinjal – cv PLR 1 (*Solanum melongena* L.) was recorded in *Cercospora solani*.
- ❖ The effect of *Spirulina platensis* cultivated waste water on growth and yield of Brinjal PLR – 1 (*Solanum melongena* L.) was studied in this present research under field condition. Among the six treatments, maximum Germination percentage, Plant height, Plant dry weight, Number of fruits per plant, Fruit yield and Fruit weight was recorded in the treatment T₆ (100 % of *Spirulina platensis* cultivated waste water + RDF) followed by T₅ (75 % of *Spirulina platensis* cultivated waste water + RDF), T₄ (50 % of *Spirulina platensis* cultivated waste water + RDF), T₃ (25 % of *Spirulina platensis* cultivated waste water + RDF) and T₂ (Farmer's Practice). Lowest growth and yield parameters were observed in the treatment T₁ (Control).

SIGNIFICANCE OF THE STUDY

- *Spirulina platensis* appears to have considerable potential for development, especially as a small – scale crop for nutritional enhancement, livelihood development and environmental mitigation.
- It provides an easy digestible, high protein (60% protein) product with high levels of β – carotene, vitamin B₁₂, iron and trace minerals and the rare essential fatty acids. In addition, it has no obvious negative cultural or religious issues associated with its consumption.

- *Spirulina* production occupies only a small environmental footprint, with considerable efficiencies in terms of water use, land occupation and energy consumption when compared to terrestrial crops.
- *Spirulina* production is especially suitable to alkaline conditions that are often unfavourable to traditional crops and are frequently occupied by disadvantaged people suffering from vulnerable to natural disasters.
- *Spirulina* production can be conducted at number of different scales, from household “pot culture” to intensive commercial development over large areas.
- *Spirulina* cultivation has a potential for integration with rural organic waste treatment processes to improve both environmental conditions and improve energy transfer efficiencies.