

Thesis of the month

Faculty : Science

Department : Biochemistry, Biotechnology and Bioinformatics

Branch : Biotechnology

Sub Subject Heading : Environmental biotechnology

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Title of the Thesis : Biofertilizer mediated Remediation of Silk Dyeing
Industrial Effluent and its Effect on selected
Green Leafy Vegetables

Nomenclature of the Degree : Ph.D

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Name of the Supervisor : Dr. Sivagami Srinivasan

Designation of the Supervisor : Professor in Biochemistry

Centre/Department /School in
which Research is conducted : Biochemistry, Biotechnology and Bioinformatics

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Abstract

1) Major objectives

- a. To assess the biometric, the biochemical, the antioxidant and the pigment constituents of the selected green leafy vegetables (GLVs) grown in fresh water, 75% effluent and biotreated effluent.
- b. To characterize the physico-chemical parameters in the silk dyeing effluent.
- c. To decolorize the silk dyeing effluent with the selected biofertilizers.
- d. To identify the functional groups and the compounds, using spectroscopic and chromatographic techniques in the selected GLVs grown in different treatments.

2) Hypotheses

- a. The Null hypothesis (H_0) proposed is “*Pseudomonas fluorescens* do not decolorize the silk dyeing effluent”.

3) Methodology

Five green leafy vegetables such as mustard (*Brassica juncea*), fenugreek (*Trigonella foenum*), sirukeerai (*Amaranthus polygonoides*), araikeerai (*Amaranthus tristis*) and agati (*Sesbania grandiflora*) were selected and grown in fresh water, 75% of silk dyeing and biotreated effluent by *Pseudomonas fluorescens*. The plants were uprooted on the 45th day without any damage and analysed for various parameters like biometric, phytochemicals, proximate principles, minerals, antioxidant and pigments. The physicochemical analysis of untreated control soil, crude soil and biotreated soil was carried out. The histological study was performed on the stem, the leaf and the root sections of GLVs grown in fresh water, crude effluent and biotreated effluent. The physico-chemical analysis of the collected silk dyeing effluent was carried out. *In vitro* preliminary studies and decolorization studies were performed for the randomly selected three biofertilizers (*Rhizobium sp.*, *Pseudomonas fluorescens* and *Azospirillum sp.*). The best decolorizing biofertilizers (*Pseudomonas fluorescens* and *Azospirillum sp.*) were inoculated in silk dyeing industrial effluent for phytohormones analysis.

4) Findings

The percentage decolorization of silk dyeing effluent was high with *Pseudomonas fluorescens*. The physicochemical parameters and heavy metals of silk dyeing effluent was found to have maximum reduction with *Pseudomonas fluorescens*. The biometric parameters such as percentage seed germination was high in *A.polygonoides*, *T.foenum* and *B.juncea* grown in both control and biotreated soil. The root length and shoot length were drastically affected with increasing concentrations of the silk dyeing effluent in all GLVs. In phytochemical analysis, in effluent exposed GLVs, the carbohydrate and protein were found to be less in the stem and root of *B.juncea* and *T.foenum* and in the stem of *A.tristis*. All the GLVs were found to have good amount of proximate principles, mineral contents, enzymic, non-enzymic antioxidants and pigment levels grown in both control and biotreated soil. The macronutrients (N, P and K) and the micronutrients (Fe, Mn, Cu and Zn) were found to be high in biotreated soil compared to effluent soil. The histological sections of tissues in the leaf, the root, and the stem showed a fine structural integrity in all selected GLVs grown in both control and biotreated soil. In the functional group studies, the alcohol, alkane and amine groups were found in all the GLVs irrespective of the treatments. In Chromatographic studies, the compound carotene and fructose were found in *T.foenum* and chlorophyll C3 and alkaloid caffeine in *A.tristis* grown in biotreated soil.

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