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EFFECT OF MAT(CYPRUS ROTUNDIS) INDUSTRY EFFLUENTS ON PHOTOSYNTHETIC PIGMENTS IN LEAVES OF *LABLAB PURPUREUS(L.)*

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ABSTRACT

The effect of mat (Cyprus rotundis) industry effluent in different concentrations (viz. 5%, 10%, 15%, 25%, 30%, 35%, 40%, 45%, 50%) on the photosynthetic pigment contents in leaves of Lablab purpureus(L.) was studied . Ground water treated plants were used as control and as well as diluent. Physico-chemical, Elemental analysis of effluent and ground water were also studied . Photosynthetic pigments like total chlorophyll, chlorophyll a, chlorophyll b, carotenoids were decreased with increasing effluent concentration.

Keywords: *Effluent, growth, photosynthetic pigments, physico-chemical, elemental analysis*

INTRODUCTION

Environmental pollution continues to be a major problem all over the globe. In spite of stringent environmental rules and regulations in developing countries like India, due to fast expansion of industries, factories and mills which let out voluminous effluents and exhausts polluting the environment in and around the location sites. The mat industry is more than 250 years old. Korai grass(Cyprus rotundis) is plucked from river bed and the three thin reeds within each blade extracted. These are used for weaving either in natural colours or after dyeing. The chemical dyes are used. The colours used are green, orange, red, violet, blue and yellow. Dye production in India is estimated to be around 60,000 tonnes or about 6.6% of world population. Most of the dyes have not been evaluated for their impact on health and their environment, yet they are widely used by textile, leather, paper, paints, plastics, printing and even in the food industry. Dyes contain metals such as copper, nickel, chromium, mercury, cobalt. In some dyes, these metals are integral to the dyes molecule, in others they are present as impurities.

Lablab purpureus(L.) combines a great number of qualities that can be successfully under various conditions. It is drought resistant, as green manure it provides organic matter, minerals and fixes nitrogen into the soil, thereby improving crop yields in an economic and

environmentally friendly manner. Legumes produce primary and secondary metabolites and other phytochemicals such as nutraceuticals, pharmaceuticals, pesticides and industrial products. The potential breast cancer fighting chemicals known as kievitone is found in hyacinth bean but not in common bean or soya bean. Bio-functional legumes have been used in the past primarily for forage, pasture, minor food, green manuring and erosion control.

MATERIALS AND METHODS

Mat industry effluent was collected from Musiri, Trichy District, Tamilnadu. *Lablab purpureus(L.)* seeds were collected from Agricultural seed farm, Trichy. The Physico-chemical characteristics of the effluent and ground water like colour, odour, pH, electrical conductivity, biological oxygen demand (APHA, 1980), total dissolved solids and total suspended ±solids(Valentine Port 1996), bicarbonate and carbonate (Hesse, 1971), chloride(Hesse, 1971), nitrate and sulphate (turbidometric method), phenols were determined.

The elemental analysis was then applied in various concentrations (Viz. 5%, 10%, 15%, 25%, 30%, 35%, 40%, 45%, 50%) to the growth of *Lablab purpureus(L.)* . Ground water was collected from respective industry. Ground water treated plants were used as control and also used as a diluent.

Photosynthetic plants like total chlorophyll , chlorophyll a, chlorophyll b were estimated by the method of Arnon(1949). Total carotenoids were determined by the method of Goodwin(1954).

STATISTICAL ANALYSIS

The data recorded in the experiments were the mean values. The experiments were tested for significance using ANOVA and Duncan multiple range test.

RESULT AND DISCUSSION

Environmental problems in the present day world are myraid in number and pollution continues almost unabated in developing countries in view of fastness of expansion of industries, factories, distilleries etc.

Physico-chemical analysis of effluent (Table 1) shows effluent from the mat industries is dark reddish brown emanating an unpleasant odour. The pH is acidic with high values of EC(44.2 dsm^{-1}), BOD(59600 mg/l), total suspended solids(14.597mg/l), total dissolved solids (28290 mg/l), carbonate (0.00 mg/l), bicarbonate(3020 mg/l), chloride(13322 mg/l), sulphate (1612.8 mg/l), nitrate(85.6 mg/l), phenols (0.19 mg/l) which are higher than levels recommended by general standards for discharge of effluents on land for irrigation.

Elemental analysis (Table 2) such as zinc (12.48 mg/l), copper (5.25 mg/l), iron (18.45 mg/l), manganese (24.68 mg/l), lead(0.87 mg/l), mercury(0.15 mg/l), nickel(0.42 mg/l), chromium(1.26 mg/l), fluoride(0.50 mg/l), sodium(7252 mg/l), potassium(49 mg/l),calcium(2388 mg/l), magnesium(1580 mg/l), which are higher than general standards for discharge of effluents on land for irrigation. But cyanide which has 0.60 mg/l which is lower than general standards for discharge of effluents on land for irrigation.

TABLE1 PHYSICO-CHEMICAL ANALYSIS OF MAT (Cyprus rotundis) INDUSTRY EFFLUENT AND GROUND WATER

S1.N0.	Physico-chemical characteristics	Ground Water	Effluent
1	Colour	Colourless	Dark-reddish brown
2	Odour	Agreeable	Unpleasant
3	PH	7.66	3.84
4	Electrical conductivity(dsm^{-1})	1.75	44.2
5	Total suspended solids(mg/l)	192	14597
6	Total dissolved solids(mg/l)	1120	28290
7	BOD(mg/l)	75	59600
8	Carbonate(mg/l)	Nil	Nil
9	Bicarbonate(mg/l)	647	3020
10	Chloride(mg/l)	216	13322
11	Sulphate(mg/l)	79	1612.8
12	Nitrate(mg/l)	3.4	85.6
13	Phenols(mg/l)	Nil	0.19

TABLE 2 ELEMENTAL ANALYSIS OF MAT (Cyprus rotundis) INDUSTRY EFFLUENT AND GROUND WATER

S1.No	Elements	Ground Water(mg/l)	Effluent(mg/l)
1.	Calcium	192	2388
2.	Magnesium	122	1580
3.	Sodium	163	7252
4.	Potassium	20	49
5.	Zinc	0.80	12.48

6.	Copper	0.54	5.26
7.	Iron	1.26	18.45
8.	Manganese	0.68	24.68
9.	Lead	Nil	0.87
10.	Nickel	Nil	0.42
11.	Chromium	Nil	1.26
12	Fluoride	Nil	0.5
13.	Cyanide	Nil	0.06

TABLE 3 EFFECT OF MAT INDUSTRY EFFLUENTS ON PHOTOSYNTHETIC PIGMENTS IN LEAVES OF *Lablab purpureus(L.)*

Sl.No.	Photosynthetic Pigments(µg/gfw)	Plant (in Days)	Effluent Treatment (%)					ANOVA Source - F Value
			0%	5%	10%	15%	25%	
1	Total Chlorophyll	15	1.323	0.243	0.186	0.159	0.118	A=6.1E ± 07** B=9.8E±07** C=6070724**
		30	1.563	0.894	0.811	0.301	L	
2	Chlorophyll a	15	0.894	0.161	0.123	0.104	0.089	A=2.5E±07** B=5.1±07** C=3463929**
		30	0.9983	0.5741	0.5106	0.1708	L	
3	Chlorophyll b	15	1.02	0.21	0.16	0.14	0.13	A=2.0E±08** B=2.1E±08** C=2.0E±07**
		30	1.98	0.77	0.75	0.25	L	
4	Carotenoids	15	0.47	0.09	0.04	0.03	0.027	A=298137.8** B=18158.204** C=149104.4**
		30	0.69	0.28	0.25	0.06	L	

Table 3 shows that the total chlorophyll, chlorophyll a, chlorophyll b , carotenoids differ significantly due to effluent treatment (0%, 5%, 10%, 15%) between age of the plant (15^{th} and 30^{th} day). There is significant interaction between age of the plant and treatment.

It is observed that total chlorophyll of 15^{th} and 30^{th} day decreases at the rate of 7.10E±02 microgram and 7.74E±02 microgram respectively for each 5% of the effluent treatment.

From the table 3, it is observed that chlorophyll a of 15^{th} and 30^{th} day old plant decreases at the rate of 4.82E±02 microgram and 5.04E±02 microgram respectively for each 5% of the effluent treatment.

From the table 3, it is observed that chlorophyll b of 15^{th} and 30^{th} day old plant decreases at the rate of 5.33E±02 microgram and 0.106E±02 microgram respectively for each 5% of the effluent treatment.

From the table 3, it is observed that Carotenoids of 15^{th} and 30^{th} day old plant decreases at the rate of 2.74E±02 microgram and 3.81EV02 microgram respectively for each 5% of the effluent treatment.

The decrease in photosynthetic pigments may be due to the presence of heavy metals present in the effluent.

Chlorophyll a and b were found to be reduced in treated plants with increase in concentration of cadmium oxalate, nickel sulphate, copper sulphate, silver nitrate, lead nitrate.

Chlorophyll a was more adversely affected than Chlorophyll b. The loss in Chlorophyll a is indicative of the profound damage to the photosynthetic apparatus.

Chlorophyll b serves mainly as antenna molecule, more consciously engaged in harvesting photons and are less prone to adverse situation. The loss in Chlorophyll b corresponds to the pollutant heavy metals level(Dubey,1991).

Manuchehr Tahavi and Vora (1994) observed that higher concentration of the effluent from a chemical factory was detrimental to the Chlorophyll content of *Cyamopis tetragonoloba*. Total Chlorophyll content of the seedlings of *Cyamopis tetragonoloba* was higher at control,10%, 20%, and 40% effluent treatment as compared with that of high concentration of the effluent.

Heavy metals inhibit the synthesis of chlorophyll and alter the activities of catalase and peroxidase (Agarwala *et al* .,1977). The metal treatment enhanced activity of phenylalanine ammonialyase (PAA) while the activity of polyphenol oxidase (PPO) showed a decline. Heavy metal stress also decrease the chlorophyll content of the leaves among with the significant reduction in hill activity(Nagoor ,1999).

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