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Effect Of Mat(Cyprus Rotundis) Industry Effluents On Biomolecules 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 biochemical constituents 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 .Biochemical constituents like total soluble sugars, free aminoacids, total soluble starch, total soluble proteins,free proline, total lipids were decreased with increasing effluent concentration.*
Key words:- *biochemical, constituents, diluent, effluent,physico-chemical.*

I. Introduction

Water is a vital source for all kinds of life on planet; on the other hand, it is also a resource that is adversly affected both quantitatively and qualitatively due to urbanization , industrialization and other human activities. Even the ground water, which is supposed to be pure, is affected due to contamination of effluent discharged from industries containing decomposing matter and industrial wastes. So it becomes necessary to find out the level of pollution in water sources and examine if they are hazardous to plant.The mat industry is more than 250 years old. The woven mats are then polished with smooth river stones and their edges bound. While the superfine quality mats are fit enough to grace palaces and become part of a bridal troussea, the coarser ones are used all over Tamilnadu for sitting and sleeping, fancy wall fitting in cottages and hotels. Dyes contain metals such as copper, nickel, chromium, mercury and cobalt. In some dyes, these metals are integral to the dye's molecule; in others, they present as impurities. Metals are difficult to remove from waste water and may escape the capacities of the effluent treatment system. If the system manages to remove them, they become part of the sludge rendering it toxic.

The coloured dye effluents are considered to be highly toxic to the aquatic biota and affect the symbiotic process by disturbing the natural equilibrium through reducing photosynthetic activity and primary productiondue to the colouration of water in streams. Also the persisting nature of colour, non-biodegradable, toxic and inhibitory nature of the spent dye bath has considerable deleterious effect on the total environmental matrix[1].

Lablab purpureus(L.) , previously classified as *Dolichos lablab(L.)* is one of the major leguminous forage and green manure crop in this area of the world[2]. Once the mature beans are harvested, they need only be cooked to provide nourishment for humans[3] and [4]. Studies regarding value added traits such as bio-functional and biologically active components of legumes have only recently begun because most speciality phytochemicals are extracted from other plant sources. Not only can biofunctional legumes provide healthy food constituents for use as nutraceuticals, pharmaceuticals and pesticides, but they can increase healthy food resources worldwide.

II. Materials And Methods

Mat industry effluent was collected from Musiri, Trichy District, Tamilnadu. *Lablab purpureus(L.)* seeds were collected from Agricultural seed farm, Trichy.ThePhysico-chemical characteristics of the effluent and ground water like colour, odour, pH, electrical conductivity, biological oxygen demand [5], total dissolved solids and total suspended solids[6], bicarbonate and carbonate [7], chloride[7], nitrate and sulphate(turbidometric method), phenols were determined.

The effluent was then subjected to elemental analysis . Ground water was collected from respective industry. Ground water treated plants were used as control and also used as a diluent.Biomolecules like total soluble sugars [8],free aminoacids[9], total soluble starch[10], total soluble proteins[11], free proline[12], total lipids of 15 and 30 day old plant leaves were analysed.

III. 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.

IV. 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.

Table 1 Physico-Chemical Analysis Of Ground Water And Mat (Cyprus Rotundis) Industry Effluent

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 Ground Water And Mat (Cyprus Rotundis) Industry Effluent

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(Cyprus Rotundis) Industry Effluents On Biomolecules In Leaves Of *Lablab Purpureus(L.)*

Sl.No.	Biomolecules(mg/gdw)	Plant (in Days)	Effluent Treatment (%)					ANOVA Source - F Value
			0%	5%	10%	15%	25%	
1	Total soluble sugar	15	87.33^{a}	65.62^{b}	58.43^{c}	45.416^{d}	36.19	A=523141** B=1324081**
		30	128.20^{a}	71.6^{b}	64.19^{c}	55.59^{d}	L	C=152177.9**
2	Total soluble starch	15	333.45^{a}	257.62^{b}	233.76^{c}	174.41^{d}	115.23	A=6.3E±07**
		30	365.61v	286.71^{b}	254.71^{c}	213.51^{d}	L	B=2.9E±08** C=968080.2**
3	Total lipids	15	10.66^{a}	9.08^{b}	8.01^{c}	7.66^{d}	4.33	A=6.445**
		30	14.86^{a}	13.66^{b}	10.25^{c}	8.73^{d}	L	B=10.342** C=0.084
4	Total soluble proteins	15	200^{a}	161^{b}	146^{c}	109^{d}	72	A=1045.333**
		30	222^{a}	164^{b}	147^{c}	111^{d}	L	B=37473.333** C=504.0000**
5	Free aminoacids	15	2.59^{a}	3.21^{b}	4.76^{c}	6.05^{d}	8.01	A=21218.778**
		30	2.70^{a}	3.52^{b}	4.81^{c}	6.67^{d}	L	B=769519.2** C=4622.630**
6	Free proline	15	0.02^{a}	0.27^{b}	0.37^{c}	0.65^{d}	0.80	A=856.655**
		30	0.03^{a}	0.35^{b}	0.40^{c}	0.75^{d}	L	B=20399.276** C=109.621**

Source of variation: A= age of the plant(df 1,24) ;B = effluent treatment(df 3,24); C = A * B (df 3, 24); *significance at 5% level; ** significance at 1% level; a,b,c means within a row with same letters are not significantly different from each other by Duncan Multiple Range Test, at 5% level; L= Lethal

Table 3 shows that the total soluble sugar, total soluble starch, total lipids , total soluble proteins, free amino acids, proline 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 soluble sugarof 15^{th} and 30^{th} day decreases at the rate of 2.659mg/g and 4.505mg/g dw of leaves respectively for each 5% of the effluent treatment.From the table 3, it is observed that total soluble starch of 15^{th} and 30^{th} day old plant decreases at the rate of 10.020mg/g and 9.766mg/g dw of leaves respectively for each 5% of the effluent treatment. Biomolecules like total soluble sugar, total soluble starch, total lipids, total soluble proteins were decreased with increased effluent concentration may be due to the presence of heavy metals and high BOD and COD.Similar observations were made by [13]. They reported that cement klin dust, on entering into leaf tissues, the chemically active solution caused partial denaturations of the chloroplasts and a decrease in pigment content in the cells of damaged leaves. Higher levels of cement klin dust pollution considerably decreased the growth and metabolic activities.

From the table 3, it is observed that total lipidsof 15^{th} and 30^{th} day old plant decreases at the rate of 0.201mg/g dw and 0.436mg/g dw of leaves respectively for each 5% of the effluent.It is observed that total soluble proteins of 15^{th} and 30^{th} day decreases at the rate of 5.760mg/g and 7.000mg/g dw of leaves respectively for each 5% of the effluent treatment.Present observation on the reduction in total protein content in effluent treated plants. Similar observations were made by [13]. They reported that reduction in protein content in dusted plants parallel to that of many workers[14] ,[15], [16] thus appears that the total protein content is also a suitable indicator of particulate pollution level.From the table 3, it is observed that free aminoacidsof 15^{th} and 30^{th} day old plant increases at the rate of0.239mg/g and 0.264mg/g dw of leaves respectively for each 5% of the effluent treatment.Increase in free proline was observed with increasing effluent concentration in both 15 and 30 day . Also irrigation of crops and trees species such as maize, sorghum, black gram, cotton, acacia nilotica, sesbaniarostrata affected further growth of seedlings/saplings at higher as well as moderate concentrations of effluent.Free proline was the one to be increased maximally in most of the treated plants. The significance of free proline is a moot point for discussion[17]. The accumulation of free proline is considered to be stress tolerant marker [18], [19], [20], [21].

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