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Research Article

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Biodegradation of domestic effluent using different solvent extracts of *Murraya koenigii*

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ABSTRACT

Many water bodies are polluted by the harmful chemicals present in industrial and domestic effluents which is untreated and released in to them. In this work, the fresh leaf powder extracts of Murraya koenigii was treated with domestic effluents at acidic pH for three days and their effects were studied. Four different solvents were used for extracting the plant constituents such as benzene, ethanol, acetone and propane-2-ol. Among two different volumes (5ml and 10ml) of extract, waste water treated with 10ml extract showed higher reduction of hardness, TDS, sulphate and nitrate. Hardness of the water was highly reduced by ethanolic extract (21mg/l). The extract of acetone reduced more TDS (15mg/l). Both benzene, acetone and ethanolic extracts showed more reduction in nitrate levels (6.1mg/l). An enormous reduction in sulphur was found in benzene extract (3mg/l).

Keywords: *Murraya koenigii*, TDS, sulphate, hardness, nitrate.

INTRODUCTION

Worldwide civilization had originated on the banks of large water bodies as water is the most essential commodity for survival. Of late water is polluted by lots of factors among which industrial and domestic effluent play vital role, as they are discharged in the untreated form to the water bodies, canals, and drainage ditches, land and water resources. This method of waste disposal has greatly reduced the amount of potable water. The main constituent in domestic wastewater is human excreta with smaller contributions from food preparations, washings, laundry and surface drainage [1]. A large number of enteric bacterial and viral pathogens may be excreted by infected individuals and may therefore be present in untreated domestic wastewater [2]. Precipitation technique is the first stage of treatment which usually involves the removal of solids, which are separated as sludge [3]. Untreated or allegedly treated effluents have increase the level of surface water pollution up to 20 times the safe level in 22 critically polluted areas of the country. It is found that almost all rivers are polluted in most of the stretches by some industry or the other [4, 5, 6].

Murraya koenigii commonly known as curry leaves, is an aromatic shrub or a small tree that grows up to 6 m in height. It is found throughout India up to an altitude of 1500 m and are cultivated for ite aromatic leaves. It is used as an antiemetic, antidiarrhoeal, dysentery, febrifuge, blood purifier, tonic, stomachic, flavoring agent in curries and chetneys. The oil is used externally for bruises, eruption, in soap and perfume industry [7]. The leaves have a slightly pungent, bitter taste, and they retain their flavour and other qualities even after drying. Curry leaf is also used in many of the Indian ayurvedic and unani prescriptions. The crop is usually propagated by seeds or suckers.

As populations in towns and cities grew, the rivers could not absorb the pollution. They began to smell and became unable to support life So safe treatment of wastewater and its return to the natural environment (rivers or the sea) is a key part of the water cycle. It protects the life of rivers and ensures that all water sources are clean and may be easily used for the public supply. Many methods are used for treating the effluent includes activated sludge process, microbial degradation, enzymatic treatment [8, 9]. *Prosopis julifora* carbon was used as ad adsorbent for the removal of COD from waste water [10]. In this study, the fresh leaf powder extract of *Murraya koenigii* was investigated for analyzing the reduction of important chemicals present in domestic effluent.

EXPERIMENTAL SECTION

Collection of sample

The domestic waste water was collected from the canal from Thiruvanchery village, Chennai, Tamil Nadu, India. *M.koenigii* leaves were collected from the area of effluent collection. Then the leaves of *M.koenigii* were separated manually and dried under sun light for three days. After complete drying, it was made as a fine powder and was stored.

Preparation of plant extract

The powdered samples were soaked in solvents such as ethanol, benzene, acetone and propane-2-ol to get the plant extract.

Treatment of effluent

Domestic effluents were treated with 5ml and 10ml of four extracts for three days at acidic pH. The details of the experimental samples are mentioned in Table.1

Table.1 Extract

S.No	Solvent used	Volume of extract treated with effluent (ml)	Extract
1	Ethanol	5	EE1
2	Ethanol	10	EE2
3	Benzene	5	BE1
4	Benzene	10	BE2
5	Propane-2-ol	5	PE1
6	Propane-2-ol	10	PE2
7	Acetone	5	AE1
8	Acetone	10	AE2

Estimation of TDS

The sample was filtered and the sediment leftover on the filter was scrapped off and dried in oven. Then the dry weight of the sediment was measured.

Determination of Hardness

An aliquot containing 25ml of extract was dissolved in 50ml of distilled water and 1 or 2 drops of EBT indicator was added to it. The solution was titrated with EDTA solution till the color changes from reddish to blue tinge.

Analysis of Sulphate

Sulphate concentration was checked by nephlometry method. About 100ml of sample was treated with 20ml of buffer solution (30 g of $MgCl_2$ was dissolved in 5g of sodium acetate, 1g of KNO_3 and 20ml of CH_3COOH in 500ml distilled water). A spoonful of $BaCl_2$ was added to it. The turbidity was measured. Using standard graph, the concentration of sulphate was measured.

Determination of Nitrate

Aliquot containing 50ml of sample was added to 1ml of HCl and OD was measured using calorimeter. The nitrate concentration was measured for the given sample using standard graph.

RESULTS AND DISCUSSION

The domestic waste water was treated with different solvent extracts of leaves of *M.koenigii* to study its effect on TDS, hardness, nitrate and sulphate content present in the waste water.

Table.2 Analysis of wastewater treated with ethanolic extract of *Murraya konigii*

S.No	Parameters (mg/l)	Untreated sample	Extract	Treated sample		
				Day1	Day2	Day3
1	TDS	80	EE1	76	72	65
			EE2	75	55	60
2	Hardness	500	EE1	232	204	74
			EE2	192	92	21
3	Nitrate	25.5	EE1	22.1	15.5	9.1
			EE2	20.6	12.3	6.1
4	Sulphate	28	EE1	19	13	7
			EE2	20	10	5

Table.3 Analysis of wastewater treated with acetone extract of *Murraya konigii*

S.No	Parameters (mg/l)	Untreated sample	Extract	Treated sample		
				Day1	Day2	Day3
1	TDS	80	AE1	80	70	25
			AE2	75	71	15
2	Hardness	500	AE1	171	152	125
			AE2	201	102	85
3	Nitrate	25.5	AE1	23.1	18	12.5
			AE2	20.7	10.3	6.1
4	Sulphate	28	AE1	15	12	10
			AE2	25	10	5

Table.4 Analysis of wastewater treated with benzene extract of *Murraya konigii*

S.No	Parameters (mg/l)	Untreated sample	Extract	Treated sample		
				Day1	Day2	Day3
1	TDS	80	BE1	69	62	25
			BE2	65	55	20
2	Hardness	500	BE1	171	142	43
			BE2	91	72	23
3	Nitrate	25.5	BE1	21.4	13.4	9.2
			BE2	20	10.3	6.1
4	Sulphate	28	BE1	22	15	10
			BE2	15	9	3

Table.5 Analysis of wastewater treated with Propane-2-ol extract of *Murraya konigii*

S.No	Parameters (mg/l)	Untreated sample	Extract	Treated sample		
				Day1	Day2	Day3
1	TDS	80	PE1	74	50	46
			PE2	65	50	32
2	Hardness	500	PE1	332	295	225
			PE2	251	192	115
3	Nitrate	25.5	PE1	21.9	14.5	9.8
			PE2	18.2	11.5	6.5
4	Sulphate	28	PE1	25	20	17
			PE2	17	12	8

Total Dissolved solids

The main constituents in total dissolved solids are usually calcium, magnesium, sodium, and potassium cations and carbonate, hydrogencarbonate, chloride, sulfate, and nitrate anions. The maximum TDS content was removed by sample treated with AE2 (20mg/l) and EE1 has very less effect on reduction of TDS (65mg/l) (Table.1,2,3,4,5).

Hardness

The U.S. Environmental Protection Agency (EPA) has classified hardness into four categories namely, soft (0-50mg/l), moderately hard (50-150), Hard (150-300), Very hard (>300). It is because of presence of calcium and magnesium ions in the water.

Sample treated with EE2 showed less hardness (21mg/l) than other extracts on third day of treatment. Hence the treated water becomes soft water (Table.1,2,3,4,5).

Nitrate

The maximum allowable limit of nitrate concentration in drinking water by Indian standard is 45 mg/l. Sample treated with all PE2 (6.5mg/l) showed good reduction in nitrate concentration (6.1mg/l) (Table.1,2,3,4,5).

Sulphate

The desirable limit of sulphate concentration is set as 150mg/l by IS 10500. But in the waste water sample, the sulphate concentration was 28mg/l. A drastic reduction in sulphate concentration was found in waste water treated with BE2 (3mg/l) and less sulphate was reduced by PE1 (17mg/l) (Table.1, 2, 3, 4, 5).

CONCLUSION

In conclusion, this study has revealed that the phytochemical constituents of *Murraya koenigii* have highly favorable effect on reducing the harmful compounds present in the waste water. Though *Murraya koenigii* has medicinal value, it may be used for effluent treatment also, since it's availability is more in India. Further studies may be carried out to analyze the reactivity of phytochemical constituents with the toxic chemicals present in the effluent.

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