

# Colour Removal from Dry Cleaning Unit Waste Water Using Low Cost Bio Absorbents

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**ABSTRACT:** The wastewater from industries varies so greatly in both flow and pollution strength. So, it is impossible to assign fixed values to their constituents. In general, industrial wastewaters may contain suspended, colloidal and dissolved (mineral and organic) solids. In this study a dry cleaning unit was selected to study the effectiveness of bio absorbents. The dry cleaning unit wastewater was collected from Lara laundry hub, Thrikkariyoor, Kothamangalam, Kerala. Four different types of bio absorbents were used to conduct the study that are Orange peel, Banana peel, Neem leaves and charcoal. The parameters tested on the samples are Turbidity, colour and pH and found out the effects of absorbents in the wastewater sample in different dosages and different contact times.

**KEYWORDS:** Dry cleaning unit waste water, Bio absorbents

## I. INTRODUCTION

The wealth of the nation depending on environmental factors such as clean air, water and land. But now a days all environmental factors are highly polluted due to dumping of wastes on environment from various places such as industries, factories, mills, hospitals, hotels, temples, domestic places, recreational centres etc. The main parameters identified in the laundry are colour, turbidity and pH. When compared to other parameters, the treatment colour removal can increase the risk. Therefore, treat the waste waters from the dyeing units before discharge to the environment. Currently, various physicochemical, coagulation, oxidation, precipitation, filtration, electrochemical treatment, ozonation, chemical precipitation, membrane filtration, hydrogen peroxide, reverse osmosis and biological techniques can be employed to remove the turbidity and colour from wastewater. Due to the high cost and disposal problems involved in the above said methods, further investigation of new techniques have been come up. The absorption process provides an attractive alternative to the above processes because of inexpensive and readily available to control the various pollutants from the water and wastewater. Exploration of good low cost and non-conventional absorbents may contribute to the sustainability of the environment and offer promising benefits for the commercial purpose infuture.

## II. RELATED WORK

The tests include various parameters of waste water to find the best absorbent while using neem leaves, banana peels, orange peel and charcoal as low cost absorbents. The parameters include, pH, turbidity and colour. After the collection of sample, the initial values were checked out and compared it with the final results. In the experiments, the obtained values of color concentration was changed to percentage removal. The color concentration were checked by using colorimeter test.

## III. METHODOLOGY

### 3.1 STUDY AREA

The dry cleaning unit waste water was collected from 'LARA laundry hub', Thrikaryoor, Kothamangalam, Kerala

### 3.2 MATERIALS USED AND ABSORBENT PREPARATION

Materials used for the test are low cost bio-absorbents such as orange peel powder, Neem powder, banana peel powder



& charcoal were kept in refrigerator at a temperature of 20<sup>0</sup> C. Beakers were also used. The low cost bio-absorbents like neem leaves, orange peels, banana peels and charcoal were collected from the local areas and washed repeatedly with distilled water to remove dust and soluble impurities. Initially all bio-absorbents were kept for drying at room temperature in a shade for 10 hr and then heating in an air oven at 150 degree Celsius for 24 h. Then they crushed and passed through 15-20 mm size mesh. Then, the prepared neem leaves, orange peels, banana peels and charcoal powders were kept in a refrigerator at a temperature of 20 degree celsius. This method used to avoid the decomposition, because neem leaves, orange peels, banana peels and charcoal powders are agro-based products.

PARAMETERS TESTED

- pH
- Turbidity
- Colour

STANDARD LIMITS

Table 1 :BIS Standard limits

PARAMETERS	DRY CLEANING INDUSTRY	INITIAL READING
COLOUR	25 hazen	0.2
TURBIDITY	10 NTU	32
pH	5.5-9	8.4

3.3 EQUIPMENTSUSED

1. pH meter – for testing pH of sample
2. Colouri meter – for testing colour
3. Nephelo meter – for turbidity measurement
4. Stirring Apparatus for mixing the absorbent

3.4 TEST PROCEDURE

Conducted the experiments in turbidimeter with five glass beakers containing 500 ml laundry waste water with different absorbent dosage (100, 200, 300 and 400 mg), different contact time (25, 50, 75 , 100 min and 24hr and 48hr). The beakers are placed in the turbidi meter .The mixing proceeded for 20 min. to establish equilibrium, after which the mixture was left to settle for 1 h.The absorbance was determined by means of the colorimeter, the wave length adopted for colour test is 495nm, and also check the Turbidity and pH of the samples.

## IV. EXPERIMENTAL RESULTS

The test results obtained were given in the tables and the following conclusions were made.

Table 2 :TEST RESULTS FOR NEEM POWDER

DOSAGE (mg)	TIME (min.)	pH	TURBIDITY IN NTU	ABSORBANCE	PERCENTAGE OF COLOUR REMOVAL
100	25	7.98	23.9	0.36	0
	50	8.03	22	0.32	0
	75	8	20.9	0.32	0
	100	8.05	18.5	0.32	0
	24 hr	8.2	10.2	0.05	75
	48 hr	8.2	10.3	0.05	75
200	25	7.78	25.9	0.49	0
	50	7.68	21.2	0.45	0
	75	7.75	20.4	0.43	0
	100	7.85	19.2	0.43	0
300	25	7.51	25.8	0.56	0
	50	7.47	20.8	0.53	0
	75	7.59	20.2	0.52	0
	100	7.65	18.9	0.52	0
400	25	7.38	25.7	0.63	0
	50	7.31	20.8	0.6	0
	75	7.33	19.3	0.59	0
	100	7.36	18.2	0.58	0

The table 2 shows that absorbance increases with increase in dosage of absorbent but when time of contact increases



the colour decreases. Here 100 mg dosage shows good result in colour removal when comparing to other dosages. The turbidity decreases with increase in dosage and contact time. The pH increases with increase in contact time and increase in absorbent dosage. When time of contact increases to 24 and 48 hrs in 100 mg dosage, the value of pH was within the standard limit, and turbidity and colour near by the standard.

Table 3: TEST RESULTS FOR ORANGE PEEL POWDER

DOSAGE(mg)	TIME(min.)	pH	TURBIDITY IN NTU	ABSORBANCE	PERCENTAGE OF COLOUR REMOVAL
100	25	7.7	26.2	0.14	30
	50	7.5	25.8	0.14	30
	75	7.67	23.3	0.13	35
	100	7.66	22	0.13	35
	24 hr	7.5	9.5	0.02	90
	48 hr	7.4	9.8	0.02	90
200	25	7.4	31.2	0.18	10
	50	7.4	24.5	0.16	20
	75	7.4	23	0.15	25
	100	7.4	22.6	0.14	30
300	25	7.4	29.6	0.19	5
	50	7.32	26.5	0.16	20
	75	7.29	24.2	0.16	20
	100	7.23	23.3	0.16	20
400	25	7.4	30	0.2	0
	50	7.22	28.8	0.19	5
	75	7.14	28.6	0.18	10
	100	7.1	21.3	0.18	10

From Table 3 it is clear that absorbance increases with increase in dosage but when time of contact increases the absorbance decreases. 100 mg dosage shows a good result in colour removal. The turbidity decrease with increase in dosage and contact time. Also pH decreases with increase in contact time. When time of contact increased to 24 and 48 hrs the obtained value of pH and turbidity were within the limit and colour concentration was near by the limit.



Table 4 : TEST RESULT FOR CHARCOAL

DOSAGE(mg)	TIME(min.)	pH	TURBIDITY IN NTU	ABSORBANCE.	PERCENTAGE OF COLOUR REMOVAL
100	25	8.21	25.2	0.28	20
	50	8.21	24.4	0.27	25
	75	8.01	23.7	0.25	25
	100	7.81	23	0.25	25
	24 hr	8.9	7.5	0.01	95
	48 hr	8.9	7.6	0.01	95
200	25	8.01	25.2	0.38	5
	50	8.01	24.9	0.38	5
	75	7.81	23.5	0.36	10
	100	7.71	22.9	0.34	10
300	25	7.85	23.4	0.43	0
	50	7.81	22.4	0.41	0
	75	7.71	21.9	0.41	20
	100	7.61	20.4	0.39	20
400	25	7.61	23.3	0.47	0
	50	7.41	22.4	0.45	0
	75	7.37	21.9	0.44	0
	100	7.35	20.4	0.44	0

Charcoal was a good absorbent for removing turbidity and colour when comparing with other absorbents. Table 4 shows that absorbance increases with increase in dosage but decreases when the contact time increases. 100 mg dosage shows a good result in colour removal. Turbidity decreases with increase in absorbent dosage and contact time. When the time of contact increases to 24 and 48 hrs in 100 mg dosage. The pH and turbidity were comes within the standard limit and .95% of colour concentration was removed.



Table 5 :TEST RESULTS FOR BANANA PEEL POWDER

DOSAGE(mg)	TIME(min.)	pH	TURBIDITY	ABSORBANCE	PERCENTAGE OF COLOUR REMOVAL
100	25	7.98	23.9	0.36	0
	50	8.03	22	0.32	0
	75	8	20.9	0.32	0
100	100	8.05	18.5	0.32	0
	24 hr	7.6	10.3	0.03	85
	48 hr	7.6	10.5	0.03	85
200	25	7.78	25.9	0.49	0
	50	7.68	21.2	0.45	0
	75	7.75	20.4	0.43	0
	100	7.85	19.2	0.43	0
300	25	7.51	25.8	0.56	0
	50	7.47	20.8	0.53	0
	75	7.59	20.2	0.52	0
	100	7.65	18.9	0.52	0
400	25	7.38	25.7	0.63	0
	50	7.31	20.8	0.6	0
	75	7.33	19.3	0.59	0
	100	7.36	18.2	0.58	0

From Table 5 we can see that absorbance increases with increase in absorbent dosage and decreases with contact time increases. 100 mg shows good result in removal of colour in the waste water. The turbidity decreases with increase in dosage and contact time. When contact time increases to 24 and 48 hrs in 100 mg dosage. The pH obtained was within the limit and turbidity was near by the standard limit and also 85% of colour removal take place

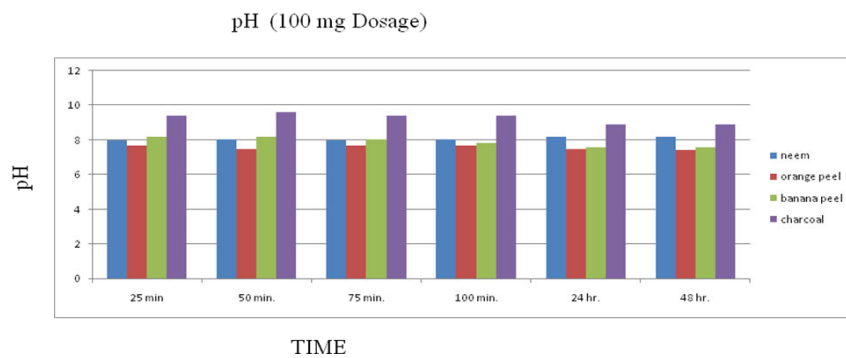


fig 1. Variation of pH in 100 mg Dosage

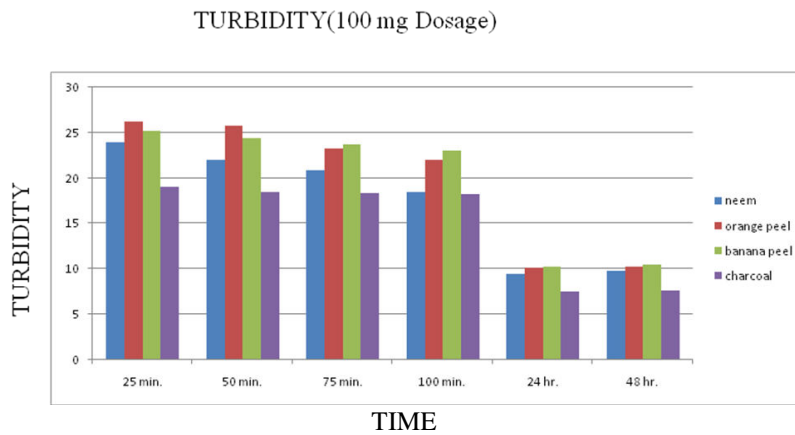


Fig 2: Variation of Turbidity in 100 mg Dosage

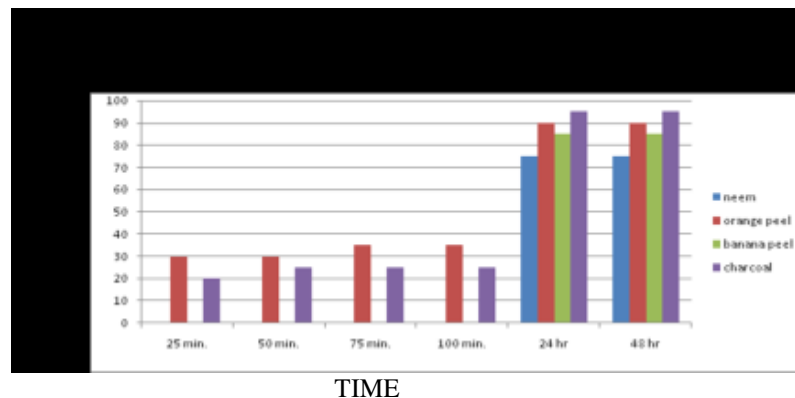


Fig 3: Variation of Percentage removal in 100 mg Dosage

## V. CONCLUSION

When the low cost absorbents such as Orange peel powder, Neem powder, Charcoal, and Banana peel powder were used in industrial coloured waste water, some of them are very effective. By comparing the results obtained it was observed that orange peel powder and charcoal are good absorbents. The main factors influenced are the dosage and time of contact. There was no significant difference in the value of pH and colour for the selected time period and dosage. It was required to increase time of contact to achieve the standard limit of turbidity. The 100 mg dosage was best suited to bring the pH, turbidity & colour to a convenient value when time of contact increases to 24 and 48 hrs the values had come within the BIS std. limit of waste disposal in dry cleaning waste water, charcoal was the best absorbent.

## REFERENCES

- [1] Sivakumar Durairaj., and Shankar Durairaj., "Colour Removal from Textile Industry Wastewater Using Low Cost Absorbents", Vol.3, pp. 52-57, 2012
- [2] Srinivasan a, and Viraraghvan T., "Decolorization of dye wastewaters by biosorbents" A review, Journal of Environmental Management", Vol 1, 2010;91:1915-1929.
- [3] R.S Mane., and V.N Bhusari., "Removal of Colour (dyes) from textile effluent by adsorption using Orange and Banana Peel", Vol 2, Issue 3, pp. 1997-2004, may -jun 2012
- [4] Jeya Jyoti.k., "Removal of dyes from textile wastewater using Orange peel as absorbent", Vol.5, pp. 161-165, 2014