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To Analyze the Effectiveness of Cattle Dung Ash as Adsorbent for Wastewater Treatment

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Abstract: *The most commonly method used in India for treatment of wastewater which are basically primary treatment by coagulants and flocculants as well as secondary treatment by inculcating micro-organisms and activated Carbon for color removal. However all the above methods described are bit expensive. So the current study is about the use of cattle dung ash as an adsorbent in the secondary treatment of wastewater for contaminants reduction. Several parameters viz. Total Dissolved Salts (TDS), Chemical Oxygen Demand (COD), pH, Total Organic Carbon (TOC), Total Suspended Salts (TSS) for tertiary wastewater will be analyzed prior and after the treatment with Cattle Dung Ash to identify the effect on effluents. This adsorbent is bit inexpensive, easily available and also ecofriendly.*

Keywords*: Cattle Dung Ash; pH; TDS; TOC; TSS; COD;*

I. Introduction

Rapid urbanization, Industrial Expansion, rapid growth of population, energy usage and wastes generation from industrial and residential sources have transformed many water bodies unwholesome, unhygienic and hazardous to human beings and their environment in many developing nations like India. Wastewater is distinguished in terms of its physical, chemical and biological composition. In developing nations like India, industries produce large amount of wastewater which includes dairy, paper and pulp, dye, chemical, paint, brewery, metal, textile and distillery. Effluent treatment can be performed using three methods: Primary, Secondary and Tertiary. In primary treatment method, greases and suspended solids are separated from wastewater; in secondary treatment method dissolved chemicals are removed by process called coagulation whilst in tertiary treatment method dissolved organic chemical wastes are extensively removed.

Dissolved chemical present in effluents can affect health and create environment hazard and therefore removal of such wastes cannot be done using primary technique. Therefore, secondary techniques such as adsorption and precipitation can be used for dissolved wastes removal. Although, chemical precipitation in effluent treatment demands chemical involvement to adapt the physical state of suspended salts and dissolved salts to intensify their removal by sedimentation process.

A chemical such as Alum when added to effluents reacts with the alkalinity and forms the precipitates of aluminium hydroxide which are gelatinous and heavy and gelatinous in nature. These precipitates entangle other suspended salts and convey them downwards at faster rate. The entire process of addition of alum and mixing thoroughly is called coagulation and entire process of flocs formation is known as flocculation. The chemical added in effluents to form precipitates is known as precipitant. But capacity of forming flocs is low. For various reasons, adsorption technique has acquired a wider application because of its implicit low cost, versatility, and simplicity. Adsorption process starts with the choice of an adsorbent. Various adsorbents can be used in wastewater treatment plant. A few adsorbent materials are silica gel, activated alumina, activated carbon zeolites. But, most of the above mentioned adsorbents and adsorption media are very expensive.

Thus, the low cost adsorbent usage is derived from cattle dung ash for effluent treatment has extreme gained attention in recent years. These waste materials are not very much utilized and therefore they are easily and

readily available. Hence, the use of this low cost adsorbent like cattle dung ash develops the main focus in this study.

II. Material And Methods

Materials: The low cost adsorbent used in this study was derived from cattle dung cake. This typical waste was selected due to their easy availability and prudent physical parameters. It is very eco-friendly and low adsorbent. It contains 0.9% magnesium oxide, 20% iron oxide, 12.48% calcium oxide, 20% aluminum oxide, 61% silica and 0.312% calcium sulphate which are bio-organic. The presence of silica percentage is maximum that makes it to manifests considerable affinity for metal ions. Main advantages of cattle dung utilization in replacement of activated carbon is not only its low price but it can also hinder other environmental problems of bad smell resulting from it. Cattle dung cakes are burned at 500°C in the muffle furnace and thus cattle dung ash is prepared.

Figure 1.1 Cattle Dung Ash

Methodology: Cattle dung ash was prepared by burning cattle dung ash at 500°C in muffle furnace and then after effluent treated by cattle dung ash having dosage of 10 gm to 100 gm as 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100gm and was rapidly agitated at the speed of 900-1000 rpm. Various parameters like TSS, TDS, COD and TOC were calculated before and after treatment. A graph of parameters (TSS, TDS, COD and TOC) versus dosage (10gm – 100gm) was plotted.

III. Result

When the adsorbent i.e. cattle dung ash was rapidly mixed with the effluent at 1000rpm, the removal percentage in TSS of the adsorbent obtained is as below:

Table no 1. Percentage removal in TSS

SR NO	DOSAGE	INITIAL READINGS	FINAL READINGS	% REDUCTION
1	10	2900	2480	14.48275862
2	20	2900	2065	28.79310345
3	30	2900	1530	47.24137931
4	40	2900	1450	50
5	50	2900	1237	57.34482759
6	60	2900	1127	61.13793103
7	70	2900	1005	65.34482759
8	80	2900	1126	61.17241379
9	90	2900	1265	56.37931034
10	100	2900	1386	52.20689655

Graph no 1. Percentage removal in TSS

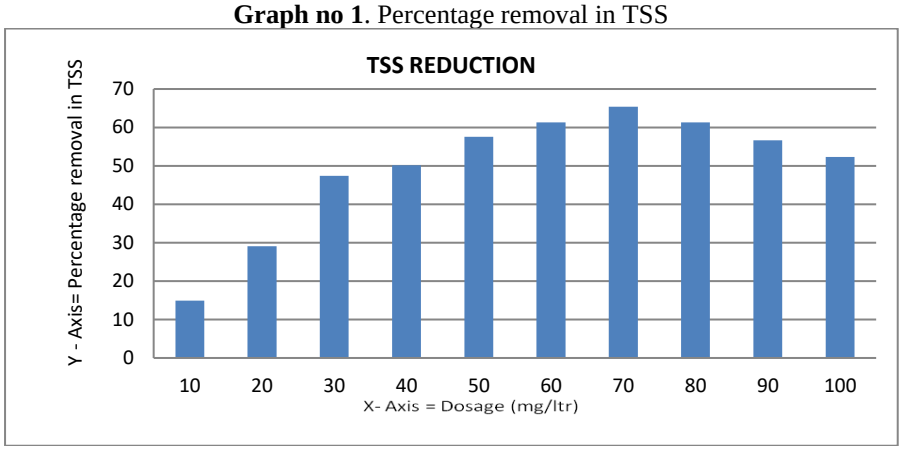


Table no 2. Percentage removal in TDS

SR NO	DOSAGE	INITIAL READINGS	FINAL READINGS	% REDUCTION
1	10	17240	16660	3.364269142
2	20	17240	15685	9.019721578
3	30	17240	15495	10.12180974
4	40	17240	15380	10.78886311
5	50	17240	15260	11.48491879
6	60	17240	15055	12.67401392
7	70	17240	13165	23.63689095
8	80	17240	14290	17.11136891
9	90	17240	15690	8.990719258
10	100	17240	16850	2.262180974

Graph no 2. Percentage removal in TSS

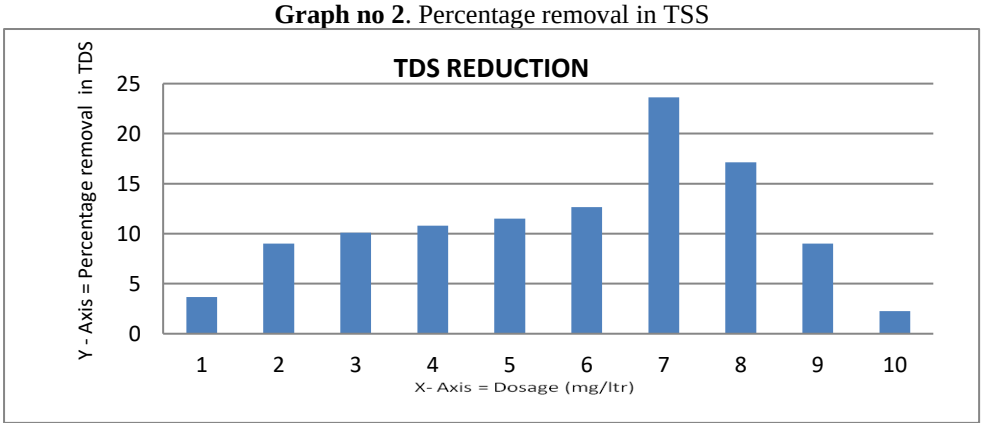


Table no 3. Percentage removal in COD

SR NO	DOSAGE	INITIAL READINGS	FINAL READINGS	% REDUCTION
1	10	2090	1822	12.82296651
2	20	2090	1630	22.00956938
3	30	2090	1631	21.96172249
4	40	2090	1565	25.11961722
5	50	2090	1545	26.07655502
6	60	2090	1466	29.85645933
7	70	2090	1445	30.86124402
8	80	2090	1485	28.94736842
9	90	2090	1530	26.79425837
10	100	2090	1610	22.96650718

Graph no 3. Percentage removal in COD

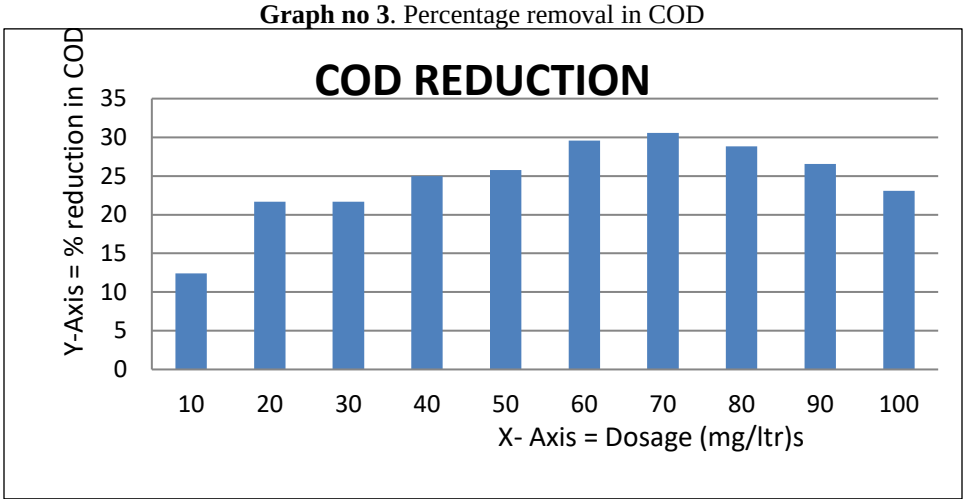
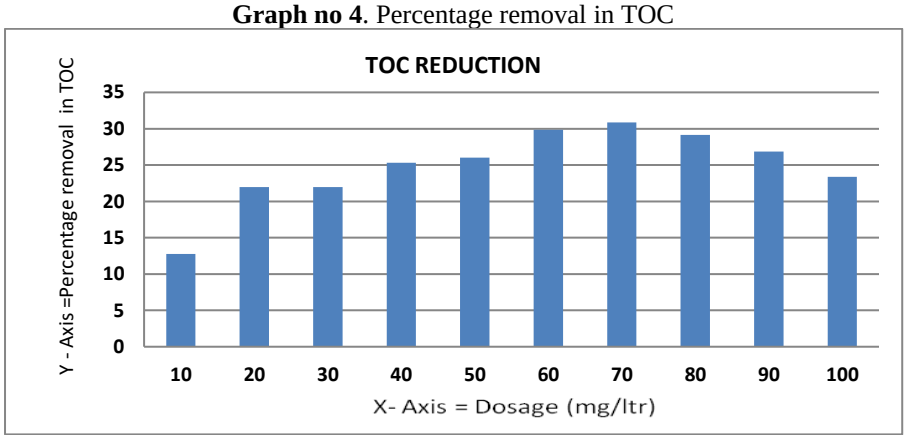


Table no 4. Percentage removal in TOC

SR NO	DOSAGE	INITIAL READINGS	FINAL READINGS	% REDUCTION
1	10	790	688	12.91139241
2	20	790	615	22.15189873
3	30	790	616	22.02531646
4	40	790	590	25.3164557
5	50	790	585	25.94936709
6	60	790	555	29.74683544
7	70	790	545	31.01265823
8	80	790	560	29.11392405
9	90	790	577	26.96202532
10	100	790	604	23.5443038

Graph no 4. Percentage removal in TOC



IV. Conclusion

On the basis of above readings obtained from practical and the observation tables, it can be concluded that as dosage of cattle dung ash increases, parameters reduction also increases. Maximum reduction observed in parameters like TSS, TDS, COD and TOC is at a dosage of 65gm/liter. With the further increase in dosage, parameters (TSS, TDS, COD and TOC) reduction is also decreased which can be seen from graph also.

Therefore it is concluded that optimum dosage value for various parameters reduction is 65gm/liter.

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