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TO ANALYZE THE EFFECTIVENESS OF COW DUNG ASH AS NATURAL ADSORBENT FOR TERTIARY WASTEWATER TREATMENT

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ABSTRACT
The prevailing most widely used and convenient method in India for Wastewater treatment such as primary and secondary treatment by flocculants and coagulants as well as secondary treatment by using micro organisms and color removal by using activated Carbon. However this method is quite expensive. So the present study is about the use of cow dung ash as an adsorbent in the secondary treatment of wastewater to reduce the contaminants. Various different parameters viz. pH, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Chemical Oxygen Demand (COD) and Total Organic Carbon (TOC) for tertiary wastewater will be analyzed before and after the treatment with Cow dung ash to find out the effect on effluent. This natural adsorbent is cheap, easily available and ecofriendly.

KEYWORDS: Adsorbent, cow dung ash, pH, COD, TDS, TSS, TOC

INTRODUCTION
Industrial expansion, rapid urbanization, fast population growth, use of energy and generation of wastes from domestic and industrial sources have converted many water sources unwholesome and hazardous to man and the environment in developing countries like India. Wastewater is characterized in terms of its physical, chemical and biological composition. In India, industries which produce significant volumes of wastewater include textile, dairy, metal, dye, chemical, paper and pulp, sugar cane, paint, distillery and brewery. Wastewater treatment can be done using three methods: primary, secondary and tertiary processes. Primary treatment separates suspended solids and greases from water; secondary treatment called coagulation process is used to remove dissolved chemicals whilst tertiary treatment methods are largely used to remove dissolved organic chemical wastes.

Dissolved chemicals pose a serious health and environmental hazard and removal of these wastes cannot be attained using primary methods. Hence, secondary wastewater treatment methods such as precipitation and adsorption can be used to remove these dissolved wastes. However, chemical precipitation in wastewater treatment involves the inclusion of chemicals to alter the physical state of dissolved solids and suspended solids to enhance their removal by sedimentation.

A chemical like alum when added in wastewater reacts with the alkalinity and forms the precipitates of aluminium hydroxide which are gelatinous and heavy. These precipitates entrap other suspended solids and carry them downwards at faster rate. The process of addition of alum and mixing thoroughly is coagulation and process of formation of flocs is called flocculation. The chemical added in wastewater to form precipitates is called precipitant. But flocs formation capacity is low. For these reasons, adsorption technology has procured a wider application due to its inherent low cost, simplicity, and versatility. The success of a process of adsorption starts with the choice of an adsorbent. Several adsorbents can be used to treat industrial wastewater. A few of such adsorbent materials are commercial activated carbon zeolites, silica gel and activated alumina. Unfortunately, most of these adsorption media are very costly.

Thus, the use of low cost adsorbent derived from cattle dung wastes for wastewater treatment has attracted a vast amount of attention in recent decades. These waste materials are underutilized and hence they are readily available. Consequently, the use of this low cost adsorbent such as cow dung ash forms the main focus of this study.

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MATERIALS AND METHODS

Cow dung ash

The low cost adsorbent used in this study was derived from cow dung cake. This waste was selected because of their availability and desirable physical characteristics. Cow dung ash is an eco-friendly and low cost adsorbent. It is a bio-organic waste that contains 12.48% calcium oxide, 0.9% magnesium oxide, 0.312% calcium sulphate, 20% aluminum oxide, 20% iron oxide and 61% silica. The presence of maximum percentage of silica makes it to exhibits considerable affinity for metal ions. Advantage of utilizing cow dung as activated carbon is not only revolving around its low economic value, but also can stop other environmental problems of foul odor resulting from it. Cow dung cakes are burned in the muffle furnace at 500°C and hence cow dung ash is prepared.

Figure:

Cow dung ash

Methodology

Cow dung ash was prepared by burning cow dung cake in muffle furnace at 500°C and then tertiary wastewater was treated by cow dung ash at the dosage of 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100gm and was agitated at the speed of 1000rpm. After those parameters such as COD, TSS, TDS, and TOC were measured. A graph of parameters (COD, TDS, TSS, & TOC) against dosage (10gm – 100gm) was plotted.

RESULTS AND DISCUSSION

When the adsorbent i.e. cow dung ash was agitated with the effluent at 1000rpm, the percentage removal in COD of the adsorbent obtained is as below:

Table 1. Percentage removal in COD

SR NO	DOSAGE	INITIAL READINGS	FINAL READINGS	% REDUCTION
1	10	2080	1821.6	12.42307692
2	20	2080	1629.056	21.68
3	30	2080	1629	21.68269231
4	40	2080	1560	25
5	50	2080	1544.4	25.75
6	60	2080	1465.2	29.55769231
7	70	2080	1443.936	30.58
8	80	2080	1480	28.84615385
9	90	2080	1527.6	26.55769231
10	100	2080	1600	23.07692308

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Graph 1. Percentage removal in COD

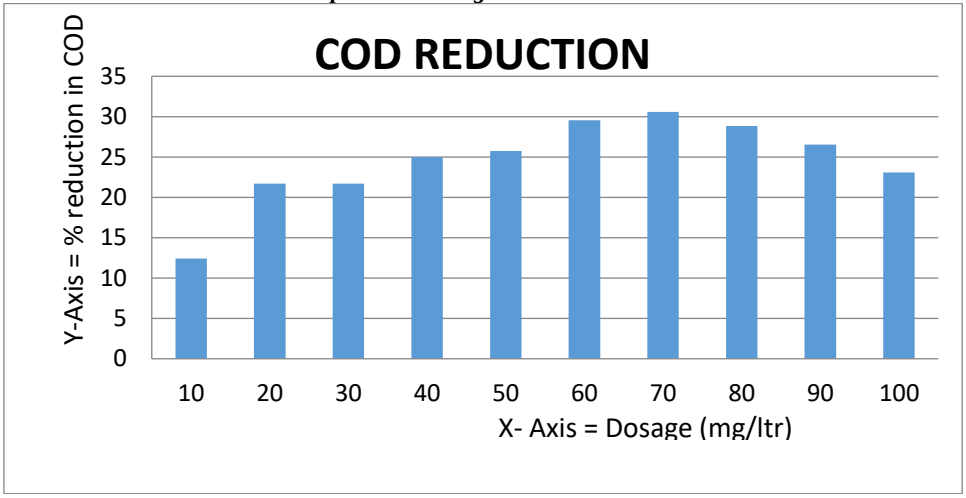

Table2. Percentage removal in TDS

SR NO	DOSAGE	INITIAL READINGS	FINAL READINGS	% REDUCTION
1	10	17230	16600	3.656413233
2	20	17230	15680	8.995937319
3	30	17230	15490	10.09866512
4	40	17230	15370	10.79512478
5	50	17230	15250	11.49158445
6	60	17230	15050	12.65235055
7	70	17230	13160	23.62159025
8	80	17230	14280	17.12130006
9	90	17230	15680	8.995937319
10	100	17230	16840	2.263493906

Graph 2. Percentage removal in TDS

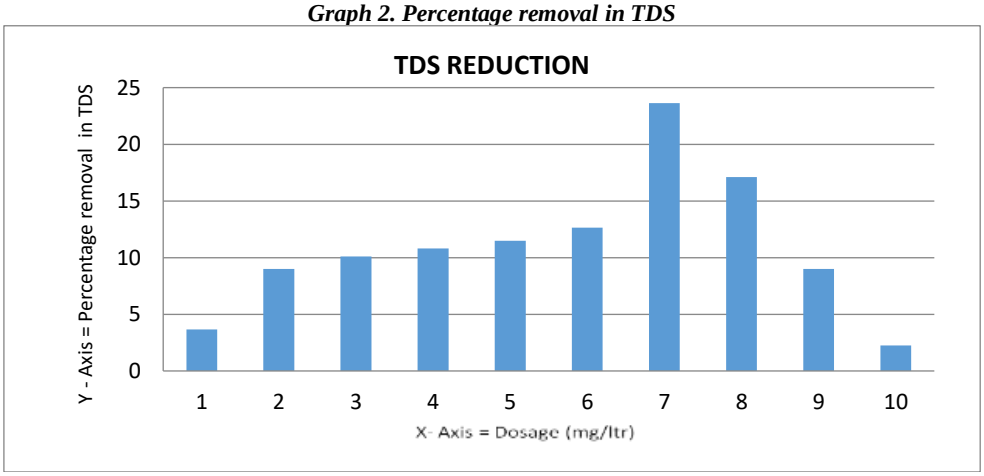

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Table3. Percentage removal in TSS

SR NO	DOSAGE	INITIAL READINGS	FINAL READINGS	% REDUCTION
1	10	2904	2470	14.94490358
2	20	2904	2060	29.06336088
3	30	2904	1528	47.38292011
4	40	2904	1448	50.13774105
5	50	2904	1232	57.57575758
6	60	2904	1124	61.29476584
7	70	2904	1004	65.42699725
8	80	2904	1124	61.29476584
9	90	2904	1260	56.61157025
10	100	2904	1384	52.3415978

Graph3. Percentage removal in TSS

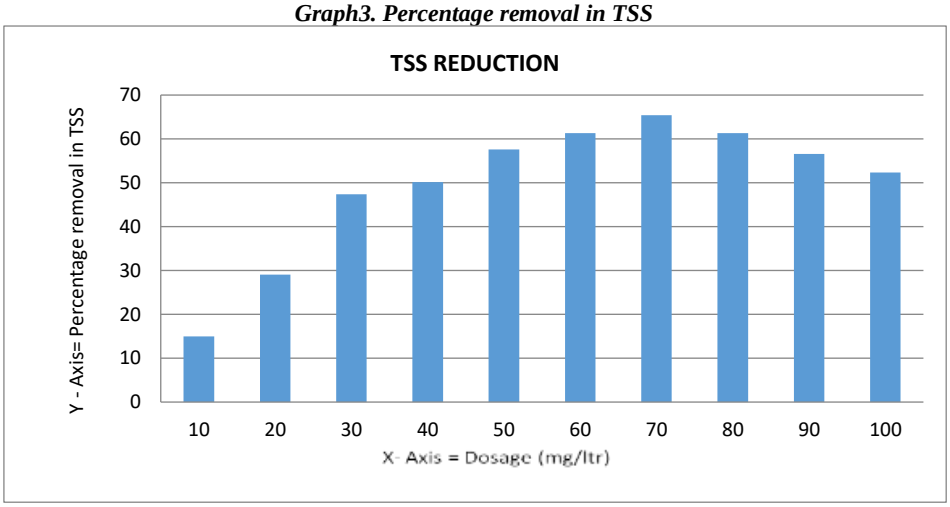

Table4. Percentage removal in TOC

SR NO	DOSAGE	INITIAL READINGS	FINAL READINGS	% REDUCTION
1	10	788	687.3962	12.7669797
2	20	788	614.7381	21.98755076
3	30	788	614.717	21.99022843
4	40	788	588.6792	25.29451777
5	50	788	582.7925	26.04156091
6	60	788	552.9057	29.83430203
7	70	788	544.8815	30.85260152
8	80	788	558.4906	29.12555838
9	90	788	576.4528	26.84609137
10	100	788	603.7736	23.37898477

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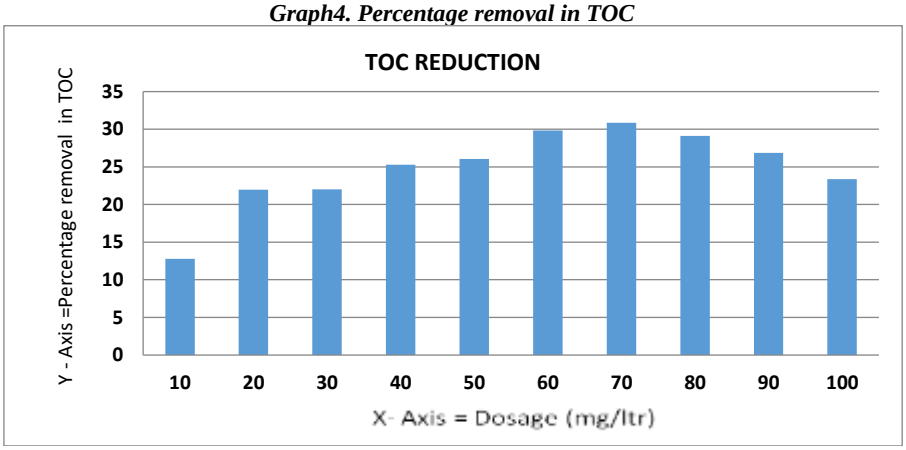
Graph4. Percentage removal in TOC



CONCLUSION

Based on the readings obtained during the practical and the observation tables prepared on its basis, it can be concluded that with the increase in the dosage the COD, TDS, TSS, TOC reduction increases and the maximum reduction of COD, TDS, TSS and TOC is obtained at a dosage value of 70gm/liter. With the further increase in dosage, COD, TDS, TSS and TOC reduction decreases which can be easily visualized from the graph also.
The optimum value of dosage for maximum reduction of COD, TDS, TSS and TOC is 70gm/liter.

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