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POTENTIAL OF *Moringa oleifera* SEED COAGULANT FOR ABATTOIR WATEWATER TREATMENT

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ABSTRACT

Abattoir is one of the factories that is becoming environmental threat in the urban cities due to the amount of wastewater generated. In the process of operation, huge volume of effluent is released directly to the environment. *Moringa oleifera* seeds serves as natural coagulant and reported to be use for treatment of wastewater. In the present study, discharged abattoir wastewater was collected from Potiskum main abattoir and treat with the natural coagulant. 2.5 g of *Moringa oleifera* seed powdered was dissolved into 50mL distilled water, then blend at high speed to extract the active coagulant agent. The seeds extract solution 25ml, 30ml and 35ml was transferred into 450ml of the wastewater for coagulation by jar test experiment. The results indicated that majority of the tested physicochemical parameters were high alarming to maximum effluent. Subsequent to the treatment, turbidity removal of 72.17, TSS 73.90, conductivity 56.45, TDS 21.97, while pH was adjusted between 7.0 - 7.5 was obtained. The results have shown that abattoir wastewater treated with *Moringa oleifera* seed coagulant is effective in reducing the determined physicochemical parameters. The result demostrate that *Moringa oleifera* seed has represents a powerful option for usage as natural plant material for abattoir wastewater treatment.

Keywords: Abattoir, Wastewater, M. *oleifera,* Potiskum

INTRODUCTION

Abattoirs are one of the most pronounced but yet ignored sources of highly recalcitrant wastewater that has significant impacts on the environment (Businge, Kagoya, Omara, & Angiro, 2021). The negative effect of abattoir wastewater on the quality of both surface and ground water is alarming in Nigeria and other part of the world. Abattoir operation generate huge amount of sewages and refuses which is released directly into the environment without undergoing any treatment. This has become one of the major environmental threat, therefore they is need to call for action to mitigate such danger (Okey-Onyesolu, Onukwuli, Ejimofor, & Okoye, 2020).

Abattoir/slaughterhouse industry is very vital as it yields meats as source of nutrition. Moreover, bones and leather are used for other industrial purposes yet the damages it caused to our environment is dismaying and if not treated before its final release can be detrimental to the lives of humans as it contains pathogens and eco-toxics pollutants. Adegbola, Adewoye, and Abosede (2012), reported on water related illness as a result of pollution from water bodies across the globe. This had called for proper treatment of abattoir effluent before disposal. It was estimated that about a quarter of the diseases facing mankind today occur due to prolonged exposure to water pollution (Vivien[1], Caleb, & Lekwot, 2012), viz. one of such water pollutants is abattoir effluent.

Moringa oleifera (*M. oleifera*) have different importance to humans and is effective in wastewater treatment. The coagulation attributes of *Moringa oleifera*

makes it potential toward reducing the effluent content of wastewater sample (Sulaiman et al., 2017). *M. oleifera* seed is effective in removing turbidity and treating other effluent such as total suspended solids, total dissolve solid, and adjusting water pH (Ali, Muyibi, Salleh, Salleh, & Alam, 2009; Okuda & Ali, 2019).

MATERIALS AND METHODS

Collection and Characterization Abattoir Wastewater

Final discharged abattoir wastewater from Potiskum main abattoir located between Rugan Fulani and Nahuta area along Gombe main road, at 11°43′N 11°04′E (Ibrahim, Nwaichi, & Abu, 2020) was aseptically collected for the analysis. Prior to the analysis, the sample was stored at 4 °C and the characterization analysis was conducted at Biological research laboratory of Yobe State University following the procedures provided under standard methods for the examination of water and wastewater. Physicochemical parameters of the wastewater determined include pH, temperature, turbidity, conductivity, total dissolve solid (TDS) and total suspended solid (TSS).

Preparation of *Moringa oleifera* Seed Coagulant

M. oleifera dried seeds was obtained and crushed thoroughly to a fine powder. 2.5g of the powdered seeds was dissolved into 50 ml distilled water, then blend at high speed to extract the active coagulant agent. Muslin cloth was used to filter the *M. oleifera* seeds stock solution prior to adding into the wastewater (Bhatia, Othman, & Ahmad, 2007).

Coagulation Process and Optimization

M. oleifera seed extract solution 25 ml was transferred into 450 ml of the wastewater sample for coagulation analysis, while raw abattoir wastewater without the *Moringa* seeds extract was considered as control. The Samples was shaked vigorously in jar test experiment. The treatment was allowed to settle, then clear supernatant was collected (Chaudhuri & Khairuldin, 2009; Feria-Díaz, Polo-Corrales, & Hernandez-Ramos, 2016). Optimization of the plant extract was carried out to achieving high reduction of effluent using 30 ml and 35 ml dosage. The coagulation efficiency was investigated by analyzing the physicochemical parameters (as above) of the treated wastewater sample before and after the treatment.

RESULTS AND DISCUSSION

Characteristics of Abattoir Wastewater

Characteristics of the abattoir discharged wastewater, Potiskum sampling site prior to coagulation treatment with *M. oleifera* seeds are presented in Table 1. The results indicated that majority of the tested parameters were high alarming to maximum pollution rate (Feria-Díaz *et al*., 2016).

Table 1: Characterization of Potiskum main abattoir wastewater

Parameters	Average value
Turbidity (NTU)	212
pH	6.5
Conductivity (s/m)	310
Temperature (°C)	38
TSS (mg/mL)	889
TDS	783

After characterization of the wastewater and first treatment (before optimization), values of the various parameters (pH, TDS, TSS, conductivity, temperature and turbidity) tested were compared. The comparison is shown in Table 2.

Effectiveness of *M. oleifera* Seed Dosages as Coagulant

Effect of *M. oleifera* seeds coagulant at different dosage for turbidity reduction and pH buffering was carried out. The coagulant agent concentrations at 25 ml have drastically reduced the turbidity level from 212 NTU to 59 NTU at 450 ml wastewater. The result indicated that the most efficient dosage for turbidity removal was 25ml as

shown in table 3. This indicated that the coagulant dosage has significant effect in the treatment process. Saputra, *et al*., (2019), reported similar on the effect of *M. oleifera* toward reducing turbidity level in wastewater. Further, the treatment process revealed the influence of the coagulant agent toward pH balancing (Vieira *et al.,* 2010). It could be observed that the pH of the raw wastewater was is slightly acidic.

Table 2: Characteristics of the untreated and treated abattoir wastewater

S/N	parameters	Untreated sample	Treated sample	Removal Percentage
1	Turbidity	212	59	72.17
2	pH	6.5	7.5	-
3	Conductivity	310	135	56.45
4	TDS	783	611	21.97
5	TSS	889	232	73.90

The *M. oleifera* seed coagulant revealed fair effect on conductivity as it changes from 310 to 135. Similar was reported by Vieira *et al*., (2010). Whereas, for TDS and TSS the high removal efficiency was from 25 ml as shown in table 3. This correspond with the finding of (Al-Wasify, et al 2019).

Table 3: Effects of *M. oleifera* seed coagulant' different dosages on turbidity reduction, pH adjustment, conductivity, TDS and TSS removal from Potiskum abattoir wastewater

Dosage	Parameters				
	Turbidity	pH	Conductivity	TDS	TSS
25ml	59	7.5	189	611	232
30ml	137	7.0	188	616	249
35ml	143	6.5	135	612	258

CONCLUSION

This study concluded that the treatment of abattoir effluent before disposal is important to ensure the safety of our environment. The initial characteristics of the abattoir wastewater indicated high effluent. After the treatment with three different coagulant dosage, the pH adjust to 7.0, TSS 282, TDS 115mg/mL, and turbidity 59NTU with the exception of conductivity which is adjusted to 135 at the dose of 35ml . The result demostrate that *Moringa oleifera* seed coagulant used in this study has represents a powerful option for usage as natural plant material for wastewater treatment. As well, the seed powder is eco-friendly and cheaper.

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