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A STUDY ON THE POTENTIAL OF MORINGA SEEDS IN ADSORPTION OF ORGANIC CONTENT FROM WATER COLLECTED FROM OILFIELD REFINERY

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ABSTRACT:
The purpose of this education is to explore uses of moringa seeds (*M. oleifera)* in the adsorption of organic contents from wastewater of oilfield refinery, Iraq. Adsorption treatment conditions were optimized to assess the relations between working condition, such by means of moringa amount, contact time and pH, to classify the best working circumstances. Organic removal rates were 89.65% under the optimum conditions comprise a contact time of 1.5 h, 1.5 g moringa dose and pH 3. The aptitude of moringa seeds to eliminate organic contents was augmented subsequently addition of different dosage at regular mixing time between 0.5 and 1 h. The equilibrium data of adsorption were investigated by Freundlich and Langmuir isotherm replicas. We noted that supreme adsorption capacity of organic intended from Langmuir isotherm stood about 23.97 mg/g. The devised adsorption can be explored as a well-organized green treatment for removal of organic matter from refinery waste water in acidic conditions pH < 7.

Keywords: Environmental, Refinery waste water, organic treatment and adsorption.

INTRODUCTION

The ecological influence of oil petroleum industries is frequently negative, meanwhile they consume huge quantities of water and produce a important quantity of oily wastewater. As organic request is predictable to increase in the subsequent two decades, there is an cumulative consciousness of the essential to circumvent the contamination produced by petroleum manufacturing waste streams (Nogueira et al., 2016**,** Ali 2018). Waste water produced from oil-refining trades vary from plant to another owing to difference in shrub configuration and kind of crude oil treated, Wastewater from oil trades is actual multifaceted, and comprises numerous organic and inorganic materials, for instance dissolved oil, ammonia and heavy metal byproducts (Aziz and Daud 2012 **,** Parvaneh et al., 2014) .Thus, the removal of these substances from oily wastewater is currently unique of the greatest significant features of contamination regulator in oilfield refinery (Palaniandy, et al., 2015). The old style handling of the petroleum wastewater wastes in the deliberate refinery is based on the physical and chemical approaches such as oil/water separation and coagulation (Stepnowski et al., 2002, Almarouf et al., 2015). Numerous approaches are applied to organic compound from petroleum waste water reduction in aqueous wastes, such as coagulant mixtures (Hosny et al., 2016, (Khalid 2017) electrocoagulation (Fouad 2014), flocculation/ membrane (Zhong, 2003), flotation (da Silva et al., 2015), biological treatment (Souza et al., 2011, Sukriming et al. 2018, Li, et al., 2005) and advanced oxidation processes (Khan et al., 2015, Haider et al., 2018).Amongst these approaches, adsorption method is unique of the active systems extensively rummage-sale in petroleum wastewater schemes (Fathy et al. 2017). Furthermore, the working procedures of these approaches are difficult and time-consuming. With the intention of decrease the operational period and treatment costs, numerous studies have been led by using plentifully available natural wilds to seek substitute cheap methods. Lately, insufficient common adsorbents have been established to remove organic content from petroleum waste water aqueous solution (Tiburtius, et al., 2005). Adsorption conducts are humble with no cross creation by way of the contaminants are adsorbed on the adsorbent surface and in numerous cases, can be renewed and recycled (Dahri, et al., 2015). adsorption is careful a significant technique that is usually used for elimination of organic content in the petroleum industrial process (Mohammed and Baytak 2016). More than a few absorbents must remained practical to organic removal, such as activated carbon (Okiel, et al., 2011, Kusworo, et al., 2018), human hair (Jadhav et al., 2011), multi wall carbon nanotubes (MWCNT), (Naghizadeh et al., 2013), banana peels (El-Din et al., 2017), organobentonite (Shen 2002), and rubber from scrap tyre (Aisien, et al., 2013). Although moringa seeds exhibitions great potential aimed at adsorption of organic from waste water (Vieira et al., 2010). In the present research, the moringa seeds wood as environment friendly, available locally and cost-effective. Moringa seeds wood as an adsorbent for the elimination of organic content from refinery waste water solutions, which is extensively used

in petroluem industries. Different parameters effectses such the adsorption dose, contact time, and pH were led in this study.

2. MATERIALS AND METHODS

2.1. Preparation of sorbent: The moringa seeds were obtained from Iraqi local trees. The moringa seeds wereas washed to eliminate slightly adhering dirt and formerly were dried, crumpled and sieved. They were air dried at constant temperature for 20 hours. After drying, the moringa seeds was approved through a 1.18 mm sieve.

2.2. Refinery waste water: Refiner waste water polluted with organic droplets taster was kindhearted provided by the local Iraqi refinery, Muthanna, Samawa. The petroleum waste water rummage-sale in these experimentations are existence transported from refinery unprotected to the atmosphere and formerly reserved in a setting comparable to their innate home that comprises oxygen pending the conduct procedure is useful. The description of petroleum waste water is assumed in Table 1.

Table 1: Refinerv waste water.

Parameter	value
Organic content	120 (mg/l)
Turbidity	55.4 NTU
pH	7.33
Solution oxygen content	0.058 (mg/l)
Specific gravity	0.995
conductivity	100451 µs/cm
TDS	64346.24 (mg/l)
viscosity	1.304 m Pa/S
iron	0.33 (mg/l)
sulphate	59.7 (mg/l)

2.3. Adsorbate and analytical measurements: All substances used in this study are a logical grade, H_2SO_4 (98% purity) and NaOH (98% purity) were bought from India. The concentration of organic content in the petroleum waste water was determined at maximum absorption wavelength (312 nm) using a UV–spectra meter (UV-1800 Shimadzu, Japan) connected to a PC. The pH capacities were made by means of pH meter (Model 2906, Jenway Ltd, UK).

2.4. Batch adsorption procedure: Batch adsorption tests be situated approved available in a usual of 250 cm^3 backer flasks comprising 0.50 gm. moringa seeds dose and 100 mL petroleum waste water solution with initial concentration of 120 ppm. The backer was nervous in wastewater-bath shaker at room temperature and trembling rapidity of 200 rpm designed for 150 min h. The organic content in the supernatant stood studied with a binary beam UV–vis spectrophotometer. The waste water was clean finished filter papers previous to examination to diminish meddling of carbon penalties with the examination. Wastewater tasters were reserved at dissimilar time intermissions and the concentration of organic in petroleum waste water was slow. The quantity of adsorption on time t, qt (mg/g), was intended by Foo and Hameed (2012)

$$q_e = \frac{V(C_o - C_e)}{M} \qquad (1)$$

where: qe (mg/g) is the quantity of petroleum waste water each mass unit of watermelon adsorbents at convinced time t, $C_\circ$ and C_e (mg/L) be situated the first and at time t concentration of petroleum waste water correspondingly, V is the volume of the waste water (mL), and M is the weight of watermelon adsorbent (mg). The percentage organic elimination by moringa seeds wood (Adsorption %) was intended for each equilibration by the appearance obtainable as:

$$\text{Adsorption \%} = (C_o - C)/C \times 100 \qquad (2)$$

2.5. Determination of organic content in petroleum waste water: 0.25 gm of NaCl was supplementary to 50 mL petroleum waste water in the separating funnel with the aim of break the emulsion of organic. 5 ml of CCL_4 was extra and shadowed by vigorous shaking for 2 min. Subsequently 25 min, once the solution separated into two distinct coatings, the lower (organic) layer was occupied for the absorbance measurement, and from the calibration curve, organic was obtained.

3. RESULTS AND DISCUSSION

3.1. **Effect of dose solution**: Figure 1 demonstrations the consequence of moringa dose on the % removal of organic content in petroleum waste water. It was experiential that the % removal augmented with upsurge in adsorbent dose. At equilibrium time, the % removal enlarged from 48.51 % to 76.53% intended for a rise in moringa dose from 0.5 to 1.5hrs. Cumulative the adsorption places and empty site consumed slight result on proportion organic elimination at great adsorbent amount because of the founding of symmetry at a very little adsorbate concentration in the wastewater beforehand attainment fullness. Consequently, rendering to this experiment the best adsorbent amount worth of 1.5 gm and this dose nominated aimed at organic adsorbents to transmit available the adsorption experimentation (Agarwal et al., 2016),(Haider et al., 2018).

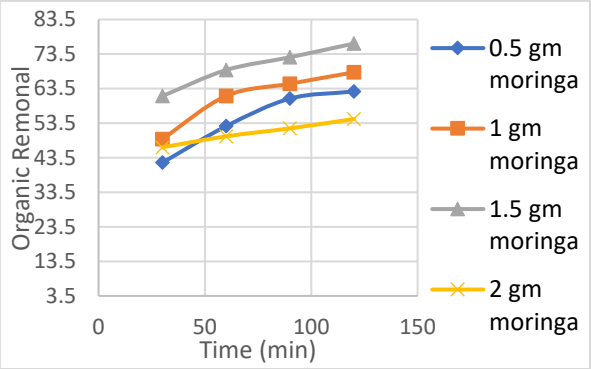

Fig. 1: Effect of dosage on organic removal in 1.18 mm moringa seeds size, pH=7.42, room temperature

3.2. Effect of adsorption time**:** The adsorption treatment augmented gradually by the contact time beforehand attainment value subsequently the contact time of 120 min, then formerly continued constant. Therefore, equilibration time be situated careful as 150 min, which was careful as adequate aimed at the elimination of organic content by this absorbent. So, the adsorption time remained usual to 120 min in the next experiments to safeguard adsorption symmetry. The contact time arcs in Fig. 2 stand flat and incessant, important to fullness signifying the option of monolayer attention of organic content on the surface of adsorbent. The quantity of adsorbed organic compound through moringa seeds (qe) from a first concentration subsequently a 120 min equilibration time was 21.44mg/g. Clearly, the early great adsorption rate is as a result of the profusion of free binding places (Wang, et al., 2010). Additional upsurge in contact time consumes no result on splicing harvest by way of the obtainable lively places have saturated and the equilibrium has remained recognized after 2 h..A similar observation was previously reported with (Ali, et al., 2016).

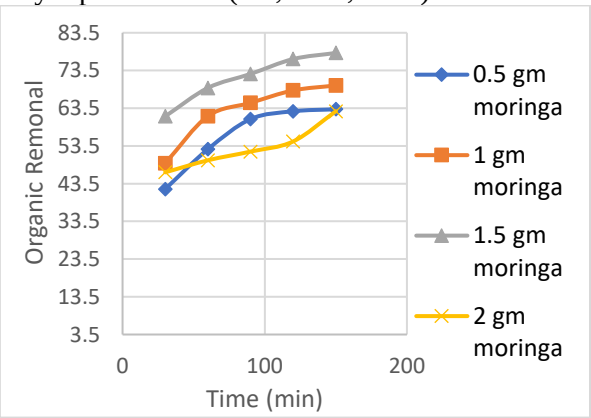

Fig. 2: Effect of contact time on organic removal in 1.18 mm moringa seeds size, pH=7.42, room temperature.

3.3. Effect of solution pH: pH is unique of the greatest significant issues swaying adsorption performance in petroleum waste water. pH touches the shallow charge of the absorbent and the grade of ionization of the absorbate throughout adsorption. Temporarily, H+ can powerfully contest by optimistic organic content meant for adsorption places scheduled the absorbent. So, the result of solution pH on the adsorption of organic content for petroleum waste water was deliberate. With the intention of choice the best pH and to evade the precipitation of organic content, experimentations were led on an early pH in the variety of 3–10 (Liu et al., 2018).In the Fig. 3 show the organic efficiency was 89.65% when the solution pH was 3, and it reduced drastically to 66.5% when pH was 10. Alike observations were also made by Kun Tonga et al., (2014) Tong et al., (2014), Tutuk Djoko et al., (2018) and Kusworo, et al., (2018) for the adsorption of organic content from petroleum waste water correspondingly .

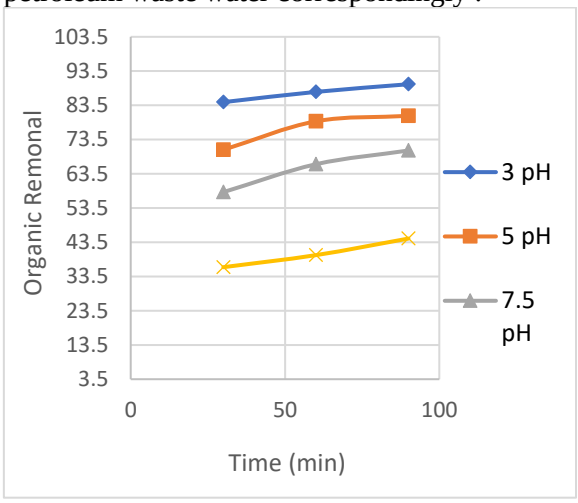

Fig. 3: Effect of pH on organic removal in 1.18 mm moringa seeds size, 1.5 gm moringa seeds, room temperature, and 120 min contact time.

3.4. Adsorption Isotherms: The adsorption model is the association amid the quantity of organic adsorbed and its wastewaters in the symmetry solution. This test allows the all-out adsorption volume of an assumed absorbent toward remain intended, contingent on the exact model practical. We verified two dissimilar replicas, with the intention of discovery the most suitable one: Langmuir and Freundlich (Postai et al., 2016).The untried isotherms were rummage-sale as the Langmuir Equation 3, lawful for monolayer adsorption (Omri and Benzina 2012). This model comprises an incomplete quantity of places and delivers a same delivery of adsorption dynamisms.

$$q_e = \frac{q_m K_L C_e}{1 + K_L C_e} \qquad (3)$$

Where qe stays the quantity of organic adsorbed at evenness (mg/g), C_e the organic content at symmetry (ppm), KL the constant of Langmuir adsorption (L/g), connected to adsorption energy, and qm is the capacity of extreme adsorption (mg/g). The Freundlich Equation 4 can be practical to label multilayer adsorption (varied scheme) (Saleh, et al., 2016, Reddy, et al., 2017).

$$q_e = K_F C_e^{1/n} \qquad (4)$$

Where K_F is the constant of Freundlich adsorption (L/g) connected to capacity of adsorption, and n is the heterogeneity parameter that specifies whether the caring of model.

The adsorption information for moringa seeds was fitted into Freundlich and Langmuir and isotherm equations. The Langmuir supreme adsorption capacity for moringa seeds were originated to be 23.97 mg/g. Association coefficients optional that the Langmuir model appropriate the facts improved than the other model ($R^2 > 0.96$ for Langmuir model vs 0.91 for Freudlich model). and this result is alike to Xincai et al., (2011), Chen et al., (2011), Smitha et al., (2017) Smitha et al., (2017) and Sadia et al., (2016) and Shakoor and Nasar (2016). Figure 4 exposed the Langmuir model for moringa seeds wood.

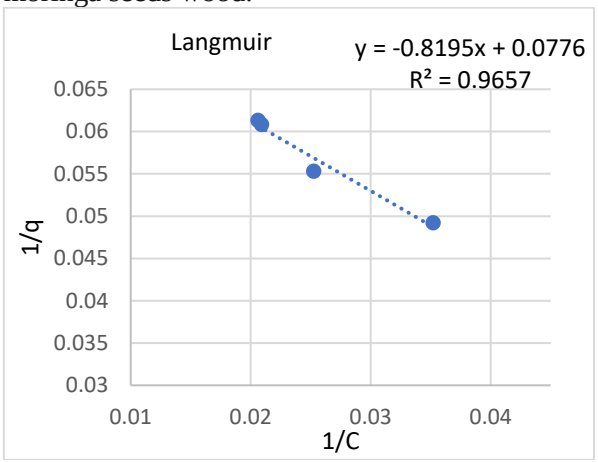

Fig. 4: Langmuir model of organic content on petroleum waste water.

The values of qm and a linear correlation R^2 are assumed in Table 2.

Table 2: Langmuir model for organic content adsorbed on moringa seeds.

Sample	qm	R^2
petroleum waste water	0.7065	0.9314

The plot of log$C$e versus log q in Fig.5 for moringa seeds is working to assess the intercept K_F and the slope $1/n$. The finest fit showed R^2 = 0.98 for moringa seeds. The greatness of n was 2.57 for the moringa seeds taster.

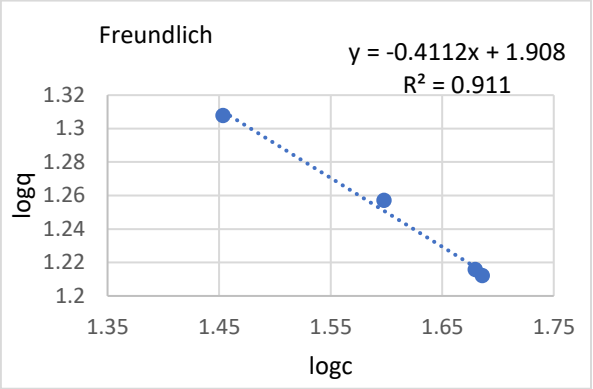

Fig. 5. Freundlich model of organic content on refinery waste water.

4. Conclusions: The consequences got demonstration that the moringa seeds can stand rummage-sale as a low-cost absorbent for elimination of organic content from petroleum waste water. An appropriate operating condition was selected as: 1.5 gm moringa seeds, 1.18 mm particle size, 2hour contact time and pH =3 at. In the assumed conditions, more than 84.5 % of squalor efficiency was attained within 30 min of contact time. And when the initial pH was reduced from 10 to 3, the degradation efficiency of organic elimination within 30 min augmented meaningfully from 36.2% to 84.5%. The adsorption process shadows Langmuir isotherm model for all adsorbents. The consequences were examined by the modeling equations which specified that the outside transport is preferred with time. The use of moringa seeds in the action of petroleum wastewater aimed at the elimination of organic content might stand a low-cost skill.

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