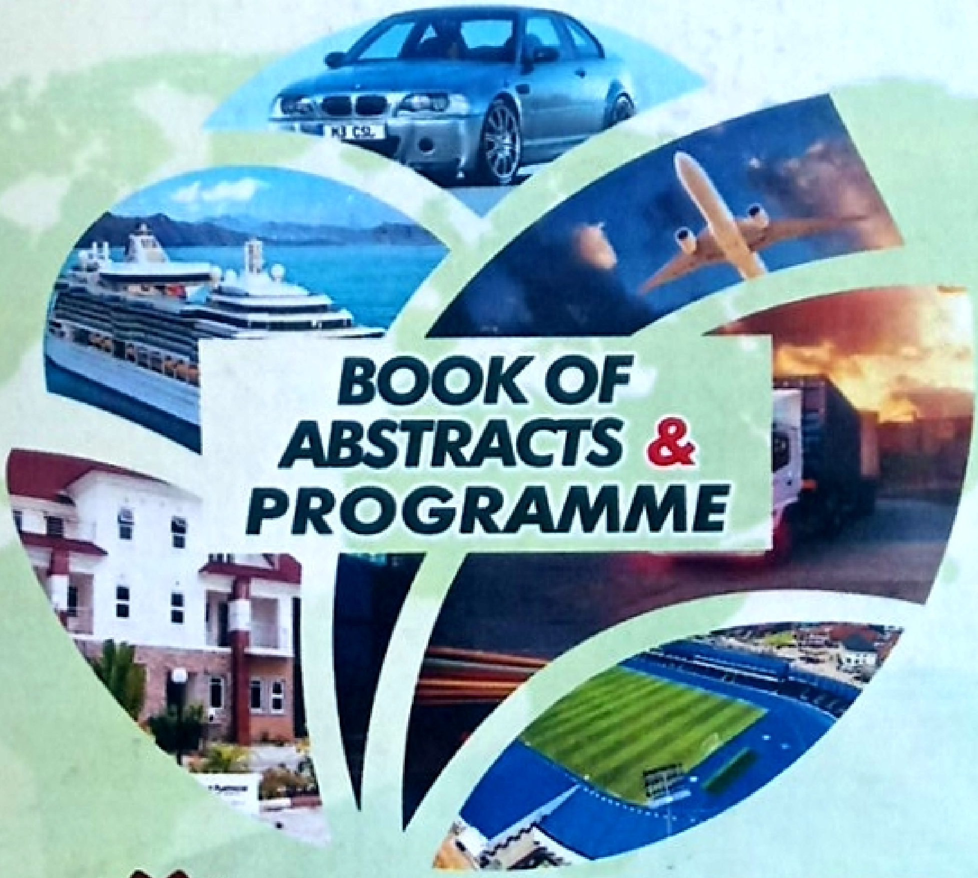
Conference on Environmental Health Sciences - (CEHS) Ibadan 2021

Organised by: Environmental Health Scientists Association, Nigeria

Hosted by: The Department of Environmental Health Sciences University of Ibadan



BOOK OF ABSTRACTS & PROGRAMME

9th ANNUAL CONFERENCE ON ENVIRONMENTAL HEALTH SCIENCES (CEHS) - IBADAN 2021

Conference Theme:

THE BUILT ENVIRONMENT AND OUR HEALTH

Date: 22nd - 24th November, 2021

Venue: Conference Centre, University of Ibadan, Ibadan, Nigeria.

Day 3

Wednesday, 24 November, 2020			
9:00 am - 9:30 am	**Plenary session V:** Built settings, recreation and psychosocial wellbeing	Dr. Mokolade Johnson Department of Architecture, Unilag	Arc. T.O. Odeyale Department of Architecture, UI
9:30 am - 10:00 am	**Plenary session VI:** Policy and regulatory issues in land use systems	ProfessorM.M. Alhassan Department, Geography and Environmental Management, UniAbuja	ProfessorB. Wahab Department of Urban and Regional Planning, UI
10:00 am - 10:30 am	**Plenary session VII:** COVID-19 Pandemic, impact on public activities, the economy and health	Dr. Y.O. Disu Nigeria Centre for Disease Control	Professor Olufunmilayo I. Fawole Department of Epidemiology & Medical Statistics, UI
10:30am - 11:00am	**Roundtable discussion:** Indoor air quality in the automobile industry	Professor G.R.E.E. Ana Department of Environmental Health Sciences, UI	
11:00am - 11:30 am	Tea Break		
11:30am - 1:00pm	***Syndicate Sessions*** **Specialised Workshop:** Indoor air quality management and respiratory health of in school and out school children Risks associated with building collapse		
1:00pm - 1:30pm	Closing remarks Distribution of certificates		
1:30pm - 2:30pm	Lunch		
2:30pm	Social/Technical Tours		

Conference on Environmental Health Sciences 2021
SCHEDULE OF PRESENTATION

Number of Plenary: 8

Number of Abstracts to be presented: 57

First day: Two keynote addresses

Second day: Four plenary sessions, syndicate sessions (onsite and virtual) and in-conference workshop

Third day: Four plenary sessions, syndicate sessions (onsite and virtual), in-conference workshop

TIME SCHEDULES

Keynote Address:

Time allotted: 30 minutes

Plenary sessions:

Time allotted: 30 minutes

Parallel sessions:

Main presentation: 10 minutes

Floor Discussion: 5 minutes

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Assessment of the removal of Nickel and Chromium in Grey Water using *Gliricidia Sepium* as an Adsorbent

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Background: Greywater contains variety of inorganic compounds, which is characterized as toxic, carcinogenic and mutagenic, which when persistent in the environment has the potential to cause adverse effect on man and the environment. Little has been documented on the use of*gliricidia sepium* as an adsorbent in the removal of some heavy metals present in greywater. The study investigated the adsorption of nickel and chromium by modified *gliricidia sepium* stem from some bathroom greywater. **Methods:** The *gliricidia sepium* stem was modified by mixing with 0.1 M NaOH. The effects of varying adsorbent loading, contact time and pH of adsorption were studied. Similar experiments were carried out using unmodified *gliricidia sepium* stem, in order to compare the results obtained from the modification experiments.**Results:** The results obtained show that the dosage of 5g was able to adsorb 0.38; 0.15 mg/L at the 4[th] and 28[th] hour for nickel and chromium respectively for the modified *gliricidia sepium*. For the non-modified *gliricidia sepium* the dosage of 5g was able to adsorb 0.0.09; 0.128 mg/L at the 28[th] and 24[th] hour for nickel and chromium respectively. **Conclusion:** The NOAH modified adsorbent gave the best result for removal of nickel and chromium from bathroom greywater.

Key Words: *gliricidia sepium*, greywater, adsorption.

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Evaluating WASH Conditions in Tertiary Institutions in parts of Lagos, Metropolis

[1]**I.S. Akoteyon*and O. Otusanya**[2]

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Background: The study evaluated WASH conditions in tertiary institutions in parts of Lagos Metropolis. **Method:** A total of 220 structured questionnaires were administered to students and staff across three tertiary institutions using a random sampling technique. Frequency and percentages were employed to analyze the data while the map of the study area and WaSH attributes were mapped using ArcMap and Excel software. **Results:** The result shows that 57.1% of the respondents interviewed hold a master's degree certificate. Approximately 54.3% of the respondents are acquainted with WaSH program in the area. Borehole is the dominant water supply in the area and is unfit for drinking. Only 13.4% of the respondents have access to a piped water supply. Similarly, access to hand washing material was relatively low, with the lowest recorded at YABATECH. The rating on the adequacy and quality of WaSH facilities is poor, with the poorest rating from YABATECH. **Conclusion:** The study concluded that safe water supply and access to hand washing facility is generally low. The study offers policymakers the opportunity for investment in WaSH services in tertiary institutions. Safe water supply and hand washing materials were recommended with greater priority at YABATECH, considering its poor rating on WaSH amenities.

Keywords: Sanitation and hygiene, Tertiary institution, Water.

ASSESSMENT OF THE REMOVAL OF NICKEL AND CHROMIUM IN GREYWATER USING *GLIRICIDIA SEPIUM* AS AN ADSORBENT

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Background
Greywater contains a variety of inorganic compounds, which are characterized as toxic, carcinogenic, and mutagenic, which when persistent in the environment have the potential to cause an adverse effect on man and the environment. Little has been documented on the use of *gliricidia sepium* as an adsorbent in the removal of some heavy metals present in greywater. The study investigated the adsorption of nickel and chromium by modified *gliricidia sepium* stem from some bathroom greywater.

Methods
The *gliricidia sepium* stem was modified by mixing with 0.1 M NaOH. The effects of varying adsorbent loading, contact time, and pH of adsorption were studied. Similar experiments were carried out using unmodified *gliricidia sepium* stem, in order to compare the results obtained from the modification experiments.

Results
The results obtained show that the dosage of 5g was able to adsorb 0.38; 0.15 mg/L at the 4th and 28th hour for nickel and chromium respectively for the modified *gliricidia sepium*. For the non-modified *gliricidia sepium* the dosage of 5g was able to adsorb 0.0.09; 0.128 mg/L at the 28th and 24th hour for nickel and chromium respectively.

Conclusion
The NaOH modified adsorbent gave the best result for removal of nickel and chromium from bathroom greywater.

Key Words: *gliricidia sepium*, greywater, adsorption

Introduction

Water is a vital component of the economic prosperity of any country (Mage *et al.*, 2016). In the coming years, the economic importance of water is expected to grow with global economic growth, industrial development, and urbanization (Jordao *et al.*, 2017). As pressures on freshwater resources grow around the world and as new sources of supply become increasingly scarce, expensive, or politically controversial, the challenge of ensuring a sustainable water supply has led to dedicated research on a variety of water conservation efforts (Mora *et al.*, 2015). Efforts are underway to identify new ways for meeting water needs by increasing the efficiency of water use and expanding the use of alternative sources of water previously considered unusable. Among these potential new sources of supply is ‘‘GREYWATER’’. The potential for reducing household water demand and therefore protecting the freshwater supply by reusing greywater is rapidly becoming more widely accepted (Gurrieri, 2018). By the strictest definition, greywater is any wastewater not generated from toilet flushing, otherwise referred to as black water. Greywater includes used water from bathtubs, showers, bathrooms, washbasins, and water from clothes washing machines, and laundry tubs (Yao, 2013). It commonly contains soap, shampoo, toothpaste, food scraps, cooking oils, detergents, and hair (Odum, 2000). Not all greywater is equally "grey". Kitchen sink water laden with food solids and laundry water that has been used to wash diapers are more heavily contaminated than greywater from showers and bathroom sinks (Peng *et al.*, 2018). Therefore, different greywater flows may require different treatment methods that would render the water suitable for reuse. The most frequent use of greywater is for landscape drip and sub-surface irrigation. Toilet flushing is another application for greywater reuse seen more commonly around the world (Shaffer *et al.*, 2011)

Greywater makes up the largest proportion of the total wastewater flow from households in terms of volume (Stern *et al*., 2017). Typically, 50-80% of the household wastewater is greywater. If a composting toilet is also used, then 100% of the household wastewater is greywater. Greywater contains a variety of inorganic compounds, which are characterized as toxic, carcinogenic, and mutagenic which when persistent in the environment have the potential to cause adverse effects on man and vegetation (Sobha et al., 2017). The heavy metals present in greywaters such as Nickel and chromium are toxic. Hence, there is a burning need for the removal of these heavy metals from the wastewater. Various technologies that are currently used for the removal of heavy metals are evaporation, Ion exchange, precipitation, membrane filtration, and adsorption (Fenglian *et.al*,. 2011). Among all these technologies, the adsorption process appears to be the more favorable technology as it is low cost, economical, requires low maintenance, and is energy efficient (Lalor, 2008). A lot of work has been carried out on the use of various materials as adsorbents, but little has been documented on the use of *gliricidia sepium*. This study, therefore, investigated the removal of heavy metals such as Chromium and Nickel using *gliricidia sepium* as an adsorbent.

Materials and Methods

Collection and preparation of gliricidia sepium

The *gliricidia sepium* was obtained from Omu-aran, Kwara state. The *Gliricidia sepium* stalks were harvested at 30 cm above the ground level, chipped to 0.5 – 1 cm, screened to remove dust, sand, dirt, and contaminations and dried at ambient temperature, and milled to obtain 0.25 mm particle size. The milled samples were stored in a polythene bag prior to analysis.

Activation of adsorbent

The milled *gliricidia sepium* was divided into two equal parts, with one part chemically activated with sodium hydroxide while the other part was left as it was. 40g of the sodium hydroxide pellets were placed in a 1000ml beaker with distilled water and stirred thoroughly until the pellets dissolved in the water and were left for 24hrs. Then the sample was washed thoroughly with the solution until it no longer had any effect on a litmus paper**.** The gliricidia sepium sample was then dried in the oven at a temperature of 300^{o}C for a period of 48hrs

Collection of Greywater sample

A greywater sample was obtained from the bathrooms in Isaac Hall, which is one of the male hostels at Landmark University. The sample was collected in a 10 litres gallon and stored in one of the refrigerators kept in the Environmental Engineering Laboratory at Landmark University.

Experimental setup

200ml of greywater was poured into six plastic containers and it was then diluted with 800ml of distilled water after which 0g, 5g, 10g, 15g, 20g, and 25g the adsorbent was added into the grey water in each container respectively. The sample with 0g was designated as the control. The samples were then left for a period of2hrs without any tampering before the first reading was taken. Subsequent readings were taken at 2 hours intervals four times a day for 2 days. Plate 1 shows the experimental set up

Plate 1 Prepared samples.

Determination of Concentrations using Colorimetric Method

Colorimetric method was used to work on the greywater samples with the *gliricidia sepium* absorbent in it to determine the concentration level of Chromium and Nickel in the samples. This was done by taking 2ml of the sample in a colorimetric test tube and diluting it with 8ml of distilled water and then inserting it in the Palintest photometer to obtain the readings. The readings were taken thrice and the mean values was recorded.

Effects of Adsorbent Dose

The adsorbent dose is an important parameter as it affects the removal efficiency (%). In this study 5 samples of greywater were treated with milled *gliricidia sepium* stem both activated with sodium hydroxide NaOH and non-activated at different levels of concentration ranging from 5g, 10g, 15g, 20g, and 25g to know at which concentration the treatment is most effective.

Effect of pH

Effect of pH on the absorption process was ascertained by adjusting the pH of the working solutions to 2, 4, 6, and 8 using 10g of sodium hydroxide to balance the PH to 6 & 8, while drops of H_2SO_4 was added to the solution until it dropped to 2 & 4. Batch adsorption was carried out in 250 mL beaker by mixing 250mL of 15 mg/L grey water sample with 3.75g of *Gliricidia sepium* biomass for the activated sample while 250mL of 10 mg/L grey water sample with 2.5g of *Gliricidia sepium* biomass was used for the non-activated sample.

Data Analysis

The Data obtained was analyzed using descriptive analysis while the removal efficiency at each interval was calculated by

$$q = \frac{C_{o-}C_e}{M}\ x\ V$$

Where C_o is the control and C_e is the final concentration of cyanide after analysis. M is the mass of adsorbent used and V is the volume of the greywater.

Results

Results for Chromium and Nickel adsorption using activated *gliricidia sepium* as an adsorbent.

Figure 1 and 2 shows the results obtained after the inoculation of activated *gliricidia sepium* into the greywater for two days and the concentration level of chromium and nickel was checked using colorimetric analysis. For nickel, the results obtained shows that 5g of the adsorbent was the most effective course of treatment having its most absorbance by absorbing 0.38mg/l on the 4^{th} hour and it also experienced a decline in adsorption capabilities up to -0.09mg/l on the 30^{th} hour. While for chromium, the results obtained shows that the 5g dosage of the absorbent was the most effective course of treatment having its most absorbance by absorbing 0.15mg/l on the 28^{th} hour.

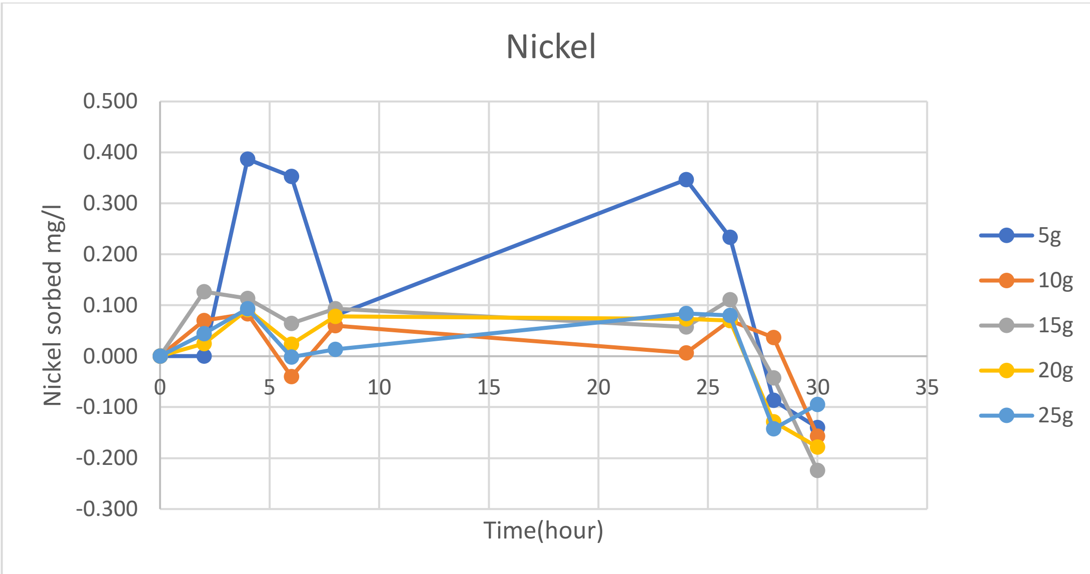

Figure 1 shows Results for nickel adsorption using activated *gliricidia sepium* as an Adsorbent.

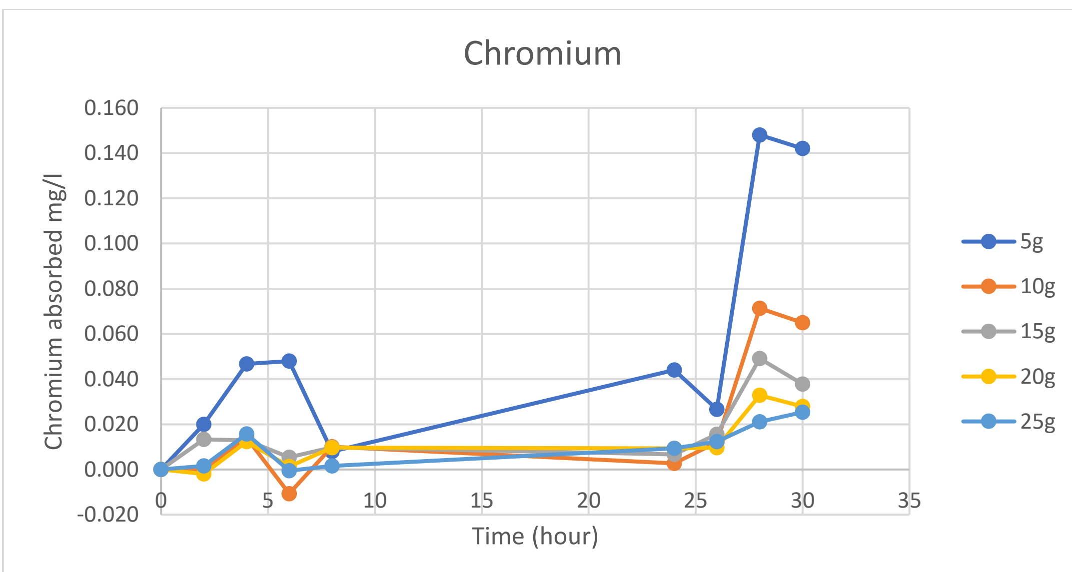

Figure 2 shows Results for chromium adsorption using activated *gliricidia sepium* as an Adsorbent

Results for Chromium and Nickel adsorption using non-activated *gliricidia sepium* as an adsorbent.

Figure 3 and 4 shows the results obtained after the inoculation of non-activated *gliricidia sepium* into the greywater for two days and the concentration level of chromium and nickel was checked using colorimetric analysis. For nickel, the results obtained shows that 5g of the adsorbent was the most effective course of treatment having its most absorbance by absorbing 0.09mg/l on the 24th hour. While for chromium, the results obtained shows that the 5g dosage of the absorbent was the most effective course of treatment having its most absorbance by absorbing 0.128mg/l on the 24th hour.

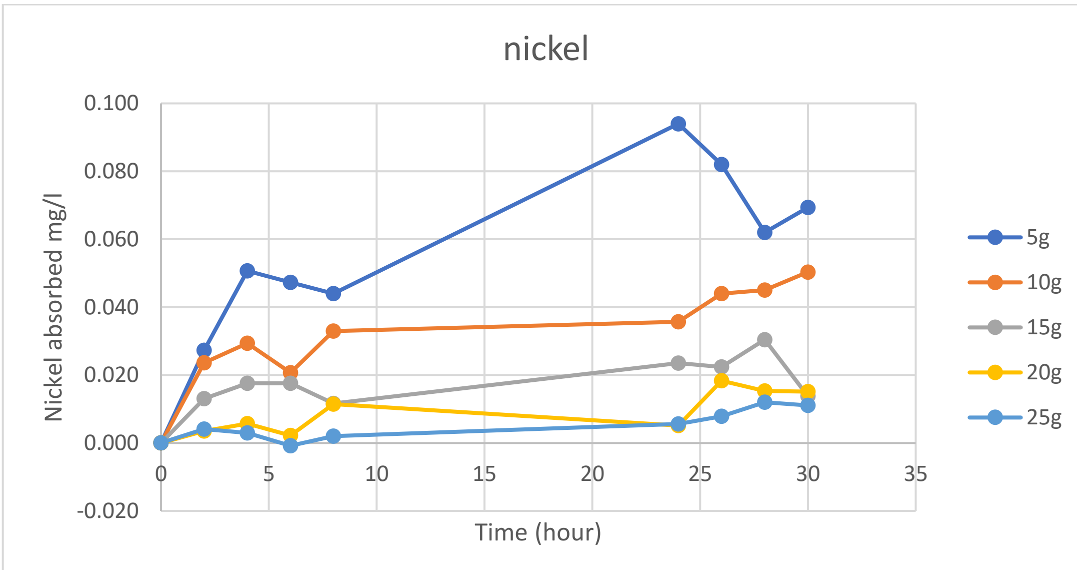

Figure 3 shows Results for nickel adsorption using non-activated *gliricidia sepium* as an Adsorbent

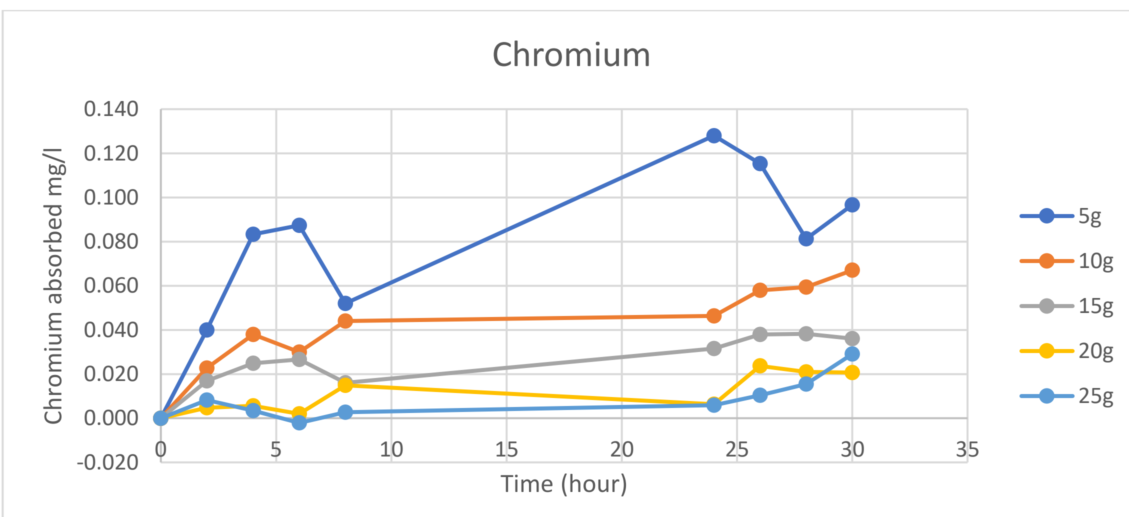

Figure 4 shows Results for chromium adsorption using activated *gliricidia sepium* as an Adsorbent

Results for chromium and nickel adsorption using treated *gliricidia sepium* and adjusting the pH level to various ranges (2,4,6,8).

Figure 5 and 6 shows the results obtained for the concentration of chromium and nickel after adjusting the pH level to 2,4,6 and 8 by addition of H_2SO_4 and NaOH to increase and reduce the pH to the desired range, while still using the treated/activated 5g sample as an adsorbent. The result obtained shows us that pH4 was the most effective as it show the highest adsorption capability by absorbing 0.099mg/L on the 30th hour. While for chromium, the result obtained showed that pH4 was the most effective by absorbing 0.084mg/l at the 30th hour.

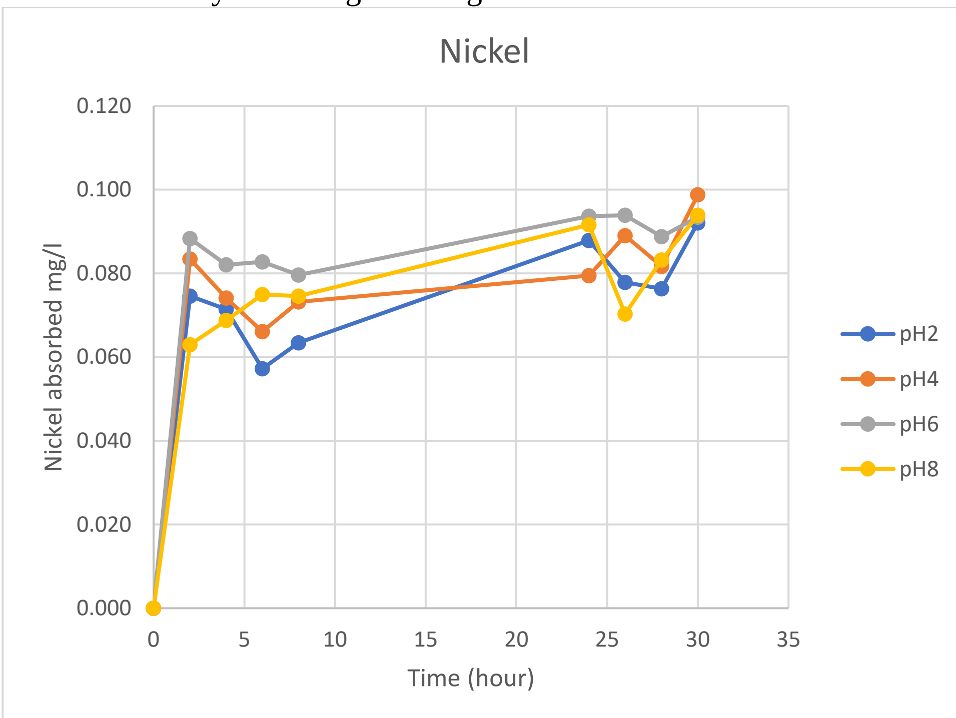

Figure 5 shows results for nickel adsorption for activated *gliricidia sepium* under pH values of 2,4,6 and 8

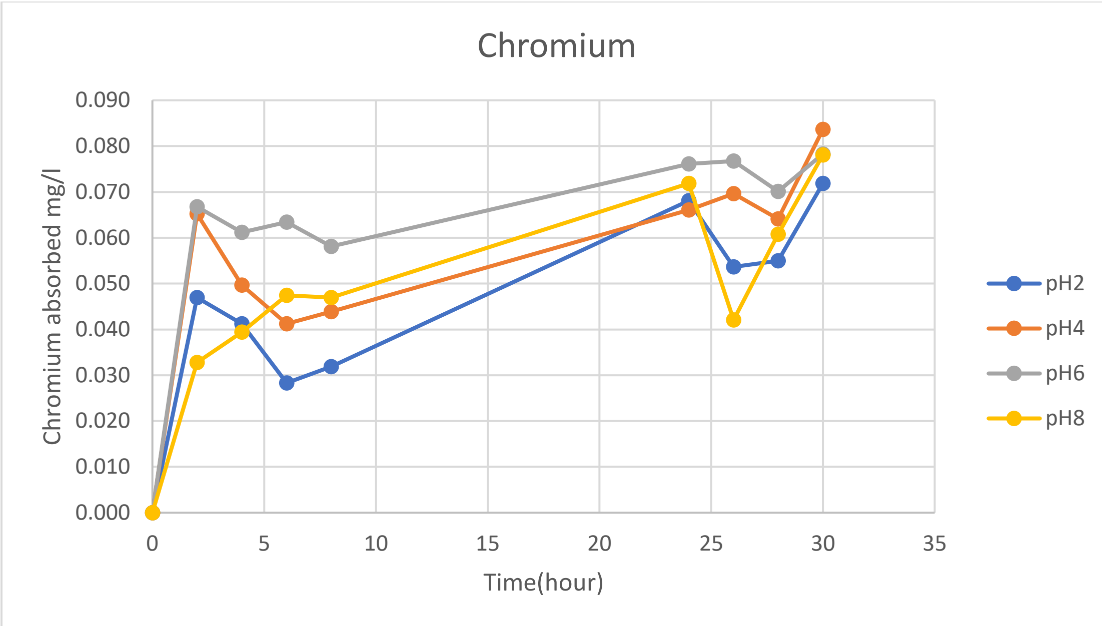

Figure 6 shows results for chromium adsorption for activated *gliricidia sepium* under pH values of 2,4,6 and 8

Results for chromium and nickel adsorption using non-treated *gliricidia sepium* and adjusting the pH level to various ranges (2,4,6,8).

Figure 7 and 8 shows the results obtained for the concentration of chromium and nickel after adjusting the pH level to 2,4,6 and 8 by addition of H_2SO_4 and NaOH to increase and reduce the pH to the desired range, while using the non-treated/non-activated 5g sample as an adsorbent. The result obtained shows us that pH4 was the most effective as it show the highest adsorption capability by absorbing 0.157mg/L on the 26^{th} hour. While for chromium, the result obtained showed that pH4 was the most effective by absorbing 0.14mg/l at the 26^{th} hour.

Conclusion and Recommendation

Findings from the study revealed the effect of adsorbent dose and pH on the removal of chromium and nickel from the greywater. The study showed that Very little absorption took place in both the activated and non-activated adsorbents for both chromium and nickel. In addition, 5g of the adsorbent appeared to be the most effective in the reduction of both Nickel and Chromium for both the activated and un-activated adsorbent.4. Adjusting the pH level to pH of 2, 4, 6, and 8 it was ascertained that pH4 was most effective for treatment in both the activated and non-activated adsorbents for both chromium and nickel. Based on the findings it is therefore recommended that further research be carried on the adsorption potential of *Gliricidia sepium.*

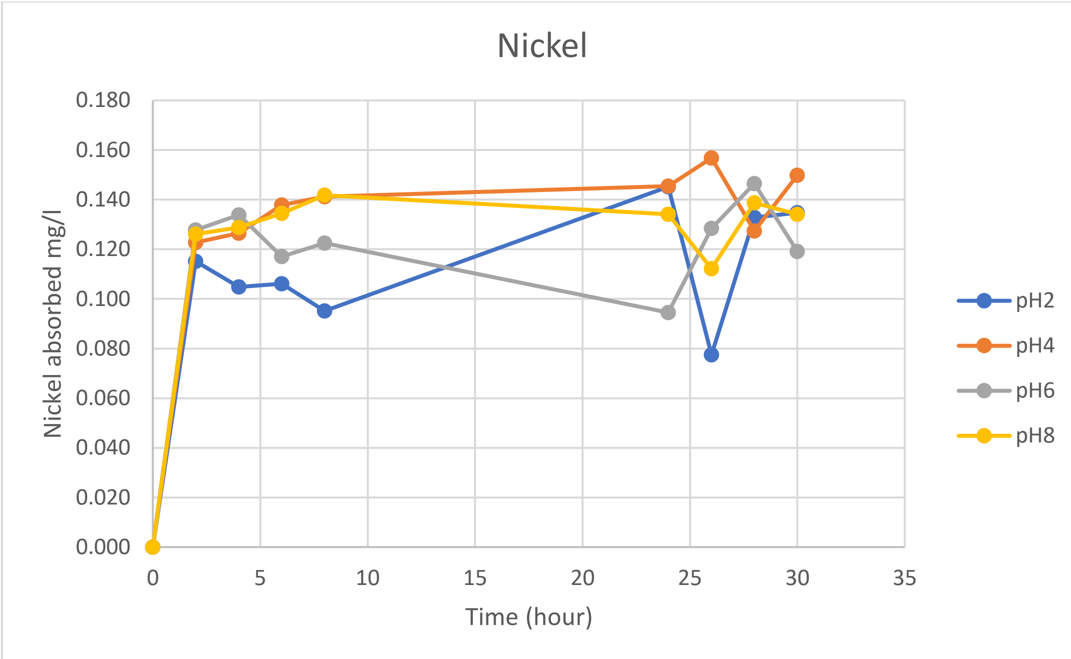

Figure 7 shows results for nickel adsorption for non-activated *gliricidia sepium* under pH values of 2,4,6 and 8

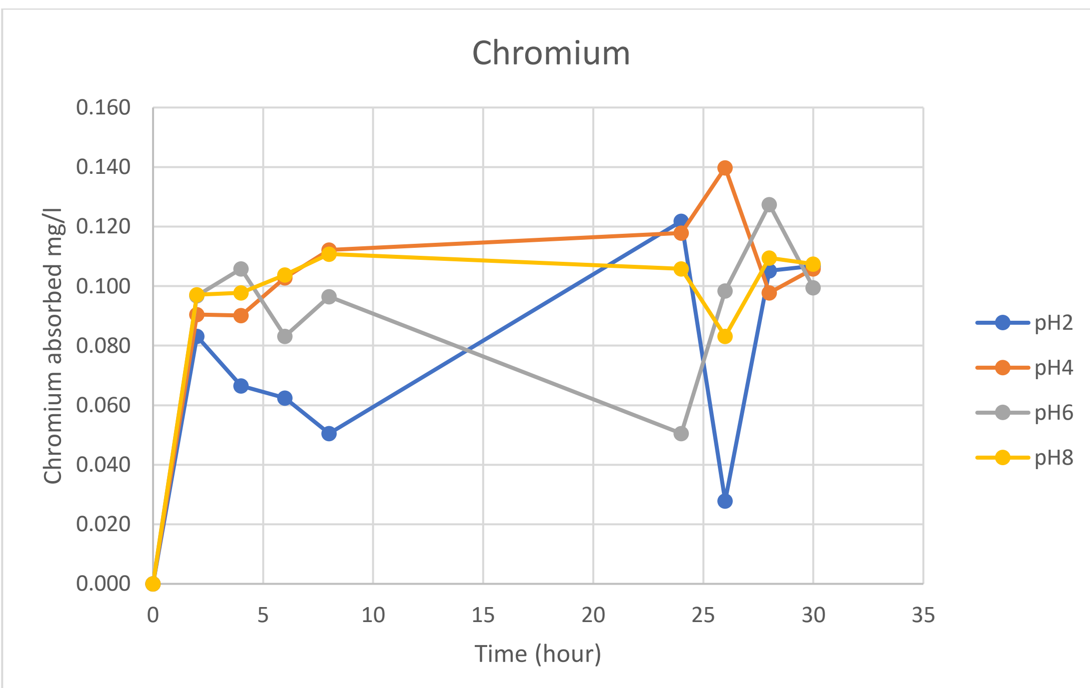

Figure 8 shows results for chromium adsorption for non-activated *gliricidia sepium* under pH values of 2,4,6 and 8

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