ECP 2024 Conference

The 3rd International Electronic Conference on Processes

29–31 May 2024 | Online

Direct Comparison of Powdered Activated Carbon (PAC) and Natural Powder in Urban Waste Water Treatment.

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INTRODUCTION & AIM

Water, a finite and indispensable natural resource crucial for survival and well-being (Leder, Sinclair, and McNeil 2002), faces a global challenge intensified by insufficient access to clean water and sanitation, a prominent issue affecting populations worldwide.

The presence of organic matter in wastewater is a well-established concern, giving rise to several issues, such as membrane fouling, compromised treatment efficacy, and the potential generation of harmful by-products (Shon, Vigneswaran, and Snyder 2006). The chemical constituents of wastewater, known for their toxic effects, pose significant threats to aquatic and terrestrial organisms and human health, amplifying the magnitude of the challenges faced in managing water resources (Shon, Vigneswaran, and Snyder 2006).

The research systematically examined various parameters such as pH, humidity, infrared (IR) analysis, concentration, mass, and particle size to assess their impact on the adsorption process.

This study aimed to compare the adsorption capabilities of the AC and natural powder materials. The research sought to determine if one material outperformed the other by assessing their adsorption capacities under standardized conditions.

METHOD

1. Synthesis of the adsorbent material

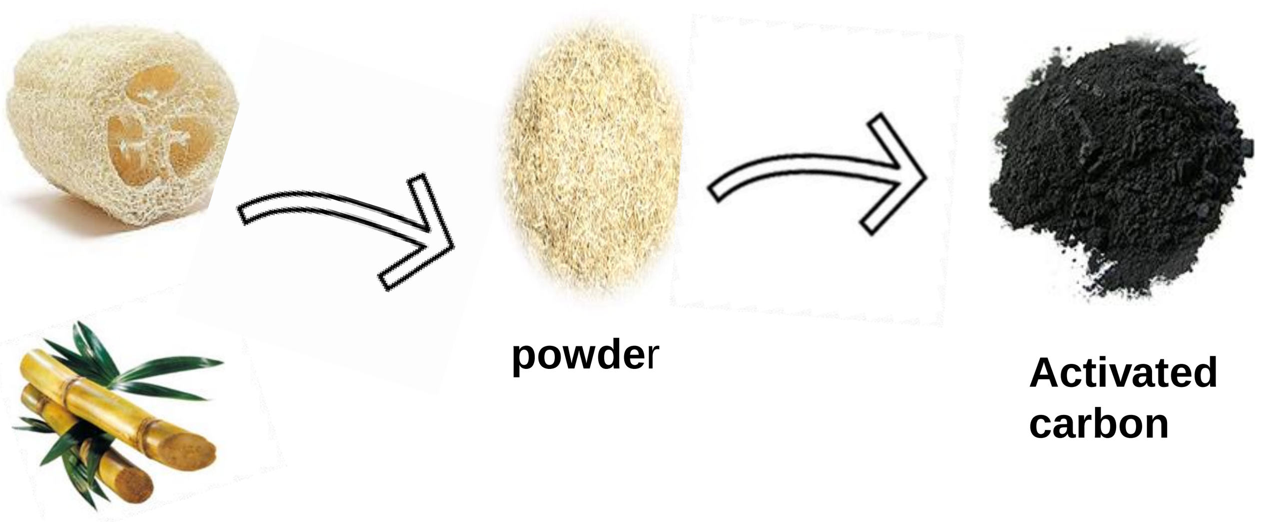

Figure 1: synthesis of the adsorbant materials

2. Pore characterization and physio-chemical properties

Table 1: Physiochemical properties and pore characterization

	Sugar cane	Squash	Activated carbon
Yield (%)			52.83 %
Burn-off (%)			29,58%
pH de contact	4,10	7,54	5.32
Ash rate (%)			2,604%
Humidity rate (%)			2.39%
Diode index (mg/g)	1485.9	1460.5	1498.6
Phenol index (ppm)	9.42	6.847	20.11

3. Granulometer

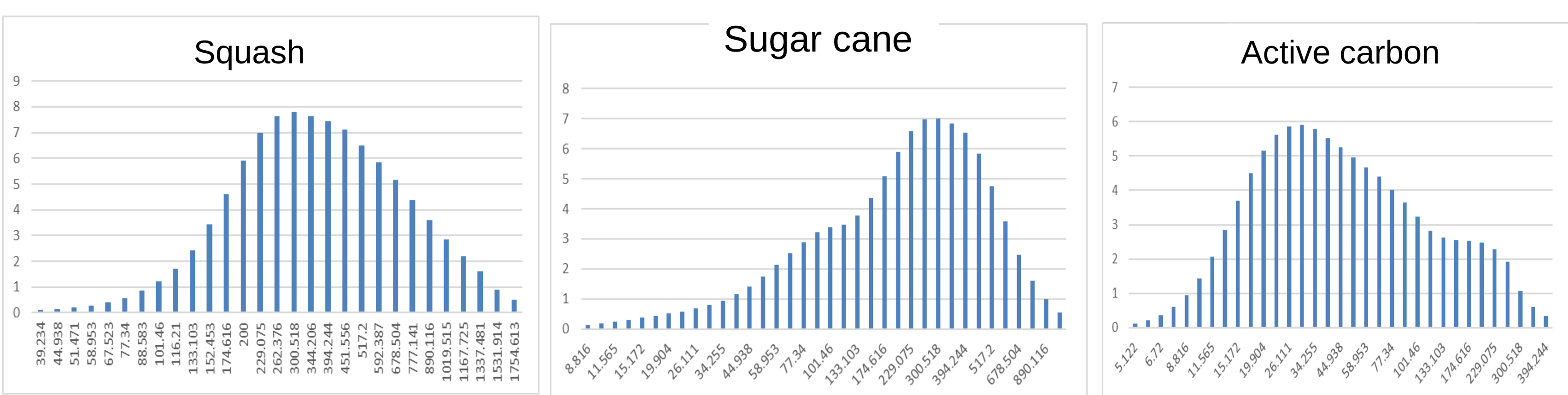

Figure 2:Results of particle size analyzes

RESULTS & DISCUSSION

Atomic adsorption experiments were done to determine the effect pollutant concentration, additive concentration, water pH, temperature, and contact time on the adsorption of Ca2+, Mg2+, and methylene blue

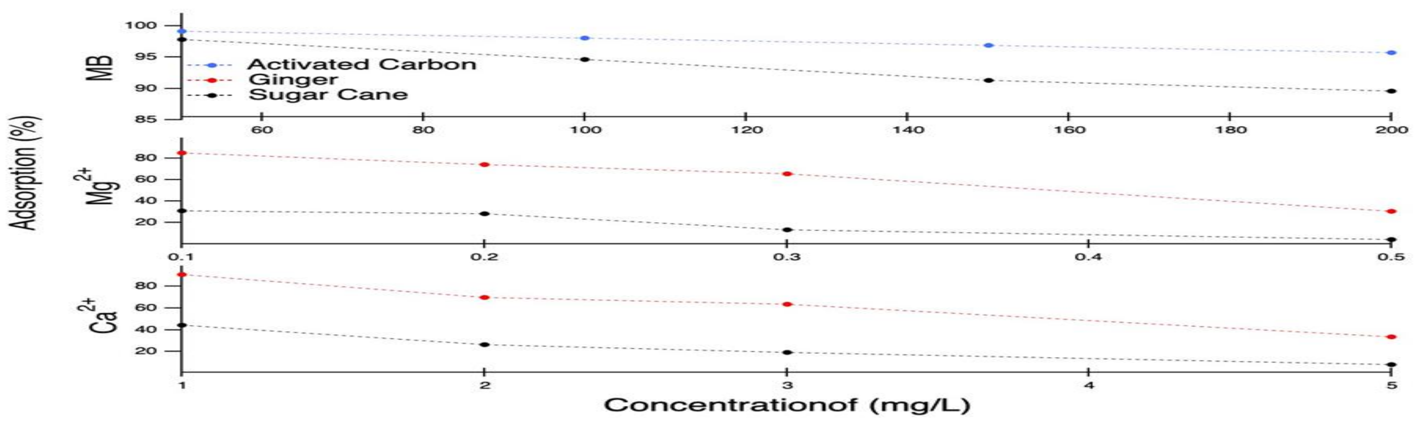

Figure 3: Percentage of calcium, magnesium and methylene blue (MB) absorption as a function of pollutant concentration.

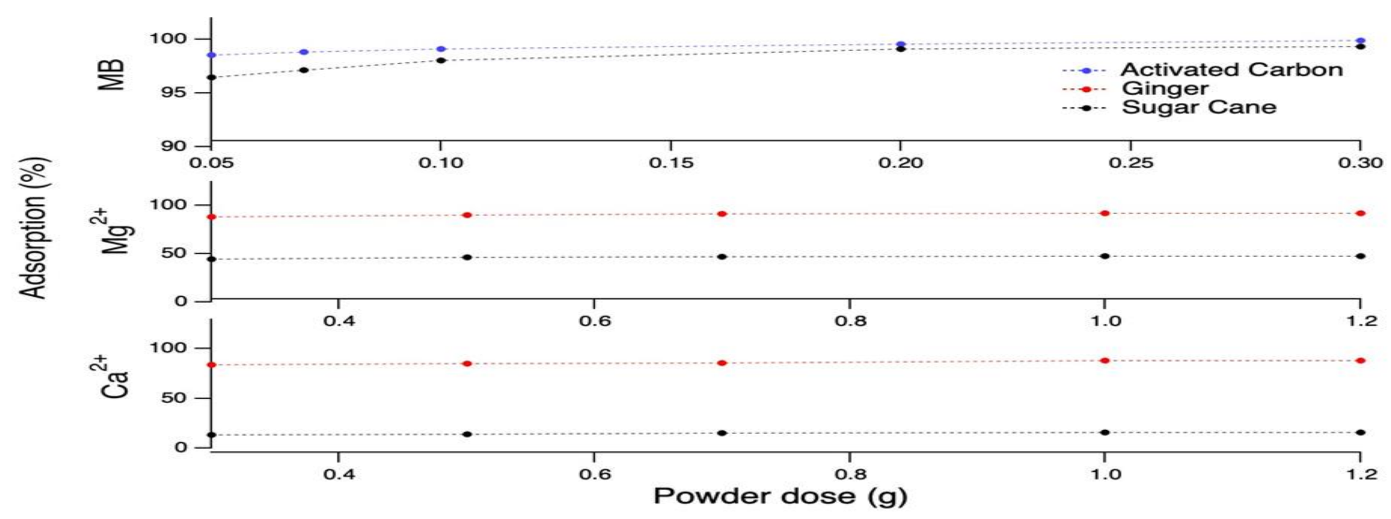

Figure 4: Percentage of calcium, magnesium, and methylene blue (MB) adsorption as a function of additive concentration.

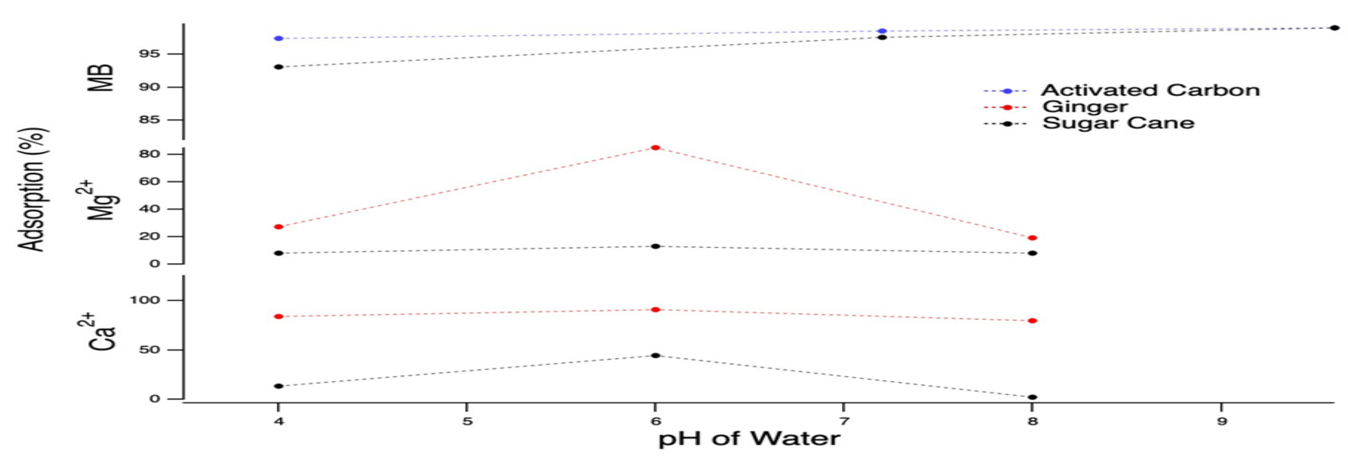

Figure 5: Percentage of calcium, magnesium, and methylene blue absorption as a function of water pH.

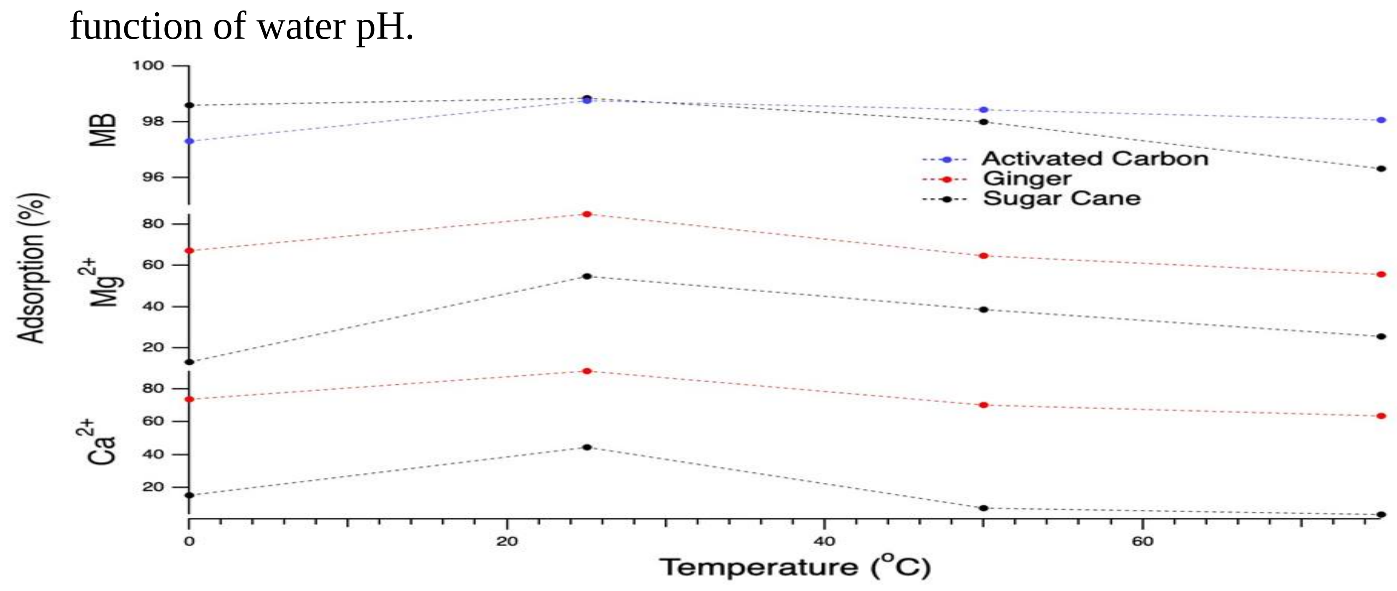

Figure 6: Percentage of calcium, magnesium, and methylene blue absorption as function of temperature.

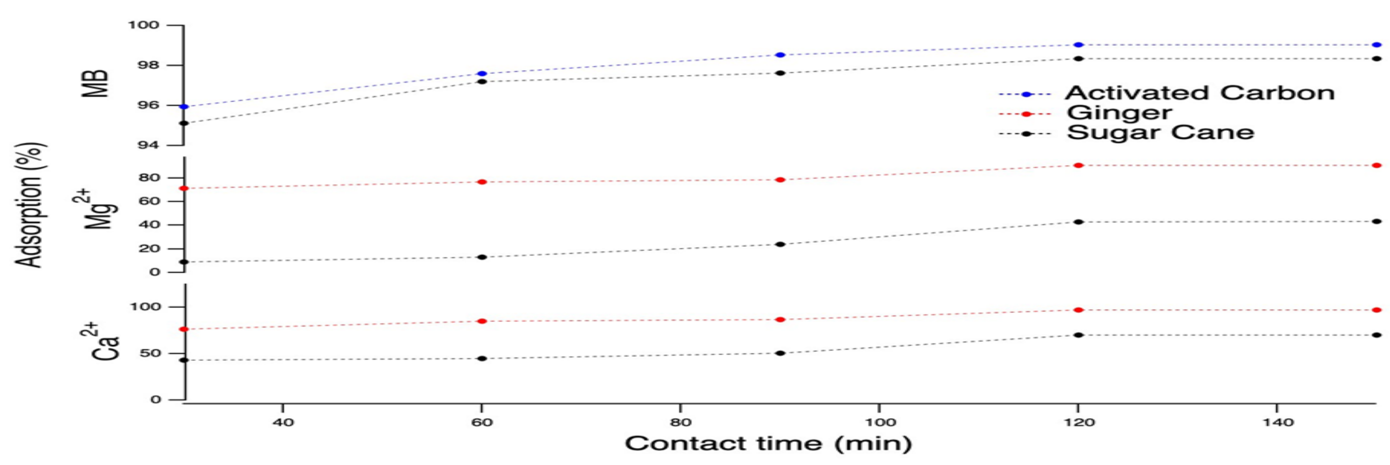

Figure 7: Percentage of calcium,magnesium and methylene blue adsorption as function of contact time(min)

In these observations, it becomes evident that both powders exhibit a stronger affinity for Ca2+ compared to Mg2+, as the quantity of Ca2+ adsorbed exceeds that of Mg2+. Furthermore, ginger demonstrates superior adsorption properties when compared to sugarcane, as indicated by its higher percentage of adsorption for both metal ions.

FUTURE WORK / REFERENCES

This research findings hold promising prospects for broader investigations into the removal of various pollutants from water sources. The potential application of these natural residues, such as ginger and sugarcane, as industrial-scale filters for pollutant removal represents an environmentally friendly and economically viable solution..

CONCLUSION

The findings revealed that, based on atomic absorption spectroscopy (AAS) results, calcium exhibited more significant adsorption results than magnesium for both ginger and sugar cane powders. Additionally, ginger emerged as the preferred adsorbent over sugarcane for ion adsorption suppression.