

DEMOCRATIA

DEMOCRATIA - AQUA - TECHNICA

TURNING AGRICULTURAL BY-PRODUCTS INTO CLEAN WATER: ACTIVATED CARBON FOR POLLUTANT REMOVAL IN GHANA

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Access to safe and clean water remains a major challenge in many regions of Ghana. Agricultural by-products represent a low-cost and sustainable resource for producing activated carbon, which can effectively remove key water contaminants. This study evaluates the performance of activated carbon derived from locally available agricultural by-products for improving water quality, providing a practical solution to enhance access to safe drinking water.

1. BACKGROUND

Why water matters

Safe water is essential for health, ecosystems, and economic well-being [1]. Improving water quality directly supports community resilience and sustainable development.

Challenges in Ghana

Surface and groundwater face multiple stressors: mining-related pollution, agricultural runoff, and industrial discharge [2]. These complex pollutant mixtures strain conventional treatment systems and threaten public health.

Treatment gap & opportunity

Many urban and rural systems struggle to remove mixed contaminants with standard filtration and disinfection alone [3]. There is a pressing need for low-cost, effective, locally adoptable treatment options.

Why activated carbon from agricultural by-products?

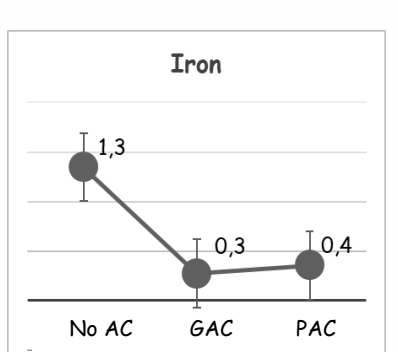
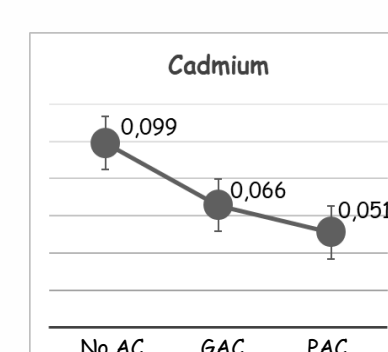
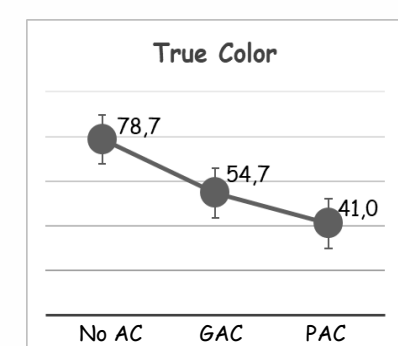
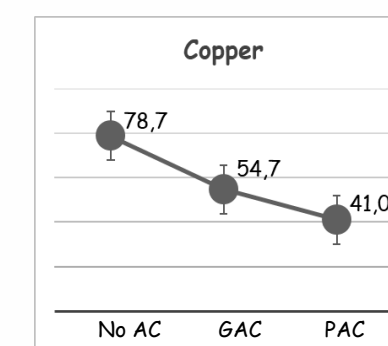
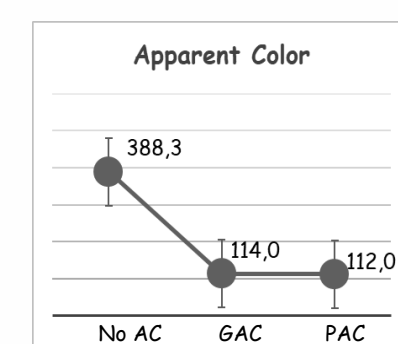
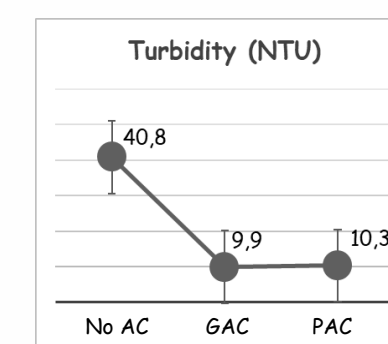
Activated carbon (AC) is highly porous and effective at adsorbing diverse pollutants [4]. Converting locally available by-products into AC offers a sustainable, context-appropriate feedstock and reduces supply barriers.

Previous Project:



4. FINDINGS

Parameter	%removal	
	GAC	PAC
pH	Increased	Increased
Turbidity	75,8%	74,8%
Salinity	4,7%	7,1%
Total Dissolved Solids	1,8%	4,1%
Conductivity	6,0%	8,3%
Apparent Color	70,6%	71,2%
True Color	30,5%	47,9%
Copper	76,3%	82,1%
Cadmium	33,7%	48,5%
Iron	79,7%	73,5%
Phosphates	3,8%	4,4%
Nitrates	1,1%	0,9%
Sulfates	5,2%	2,6%



Yield (amount of product obtained relative to the starting material)

Four trials yielded an average of **31.53%** activated carbon

✓ About one-third of the raw biomass transforms into high-quality activated carbon.

2. OBJECTIVES

1

To assess the current state of water quality in Ghana, including key pollutants, pollution sources, current efforts, and public perception.

2

To analyze the availability and suitability of agricultural by-products as raw materials for activated carbon production for water treatment.

3

To assess the effectiveness of activated carbon through lab analysis and comparison of powdered vs. granular forms.

3. METHODOLOGY

Qualitative Methodology (Objective 1 and 2)

Data type: Categorical

Descriptive (related to words)

Collected through observation, surveys and interviews

Analyzed using triangulation

Quantitative Methodology (Objective 3)

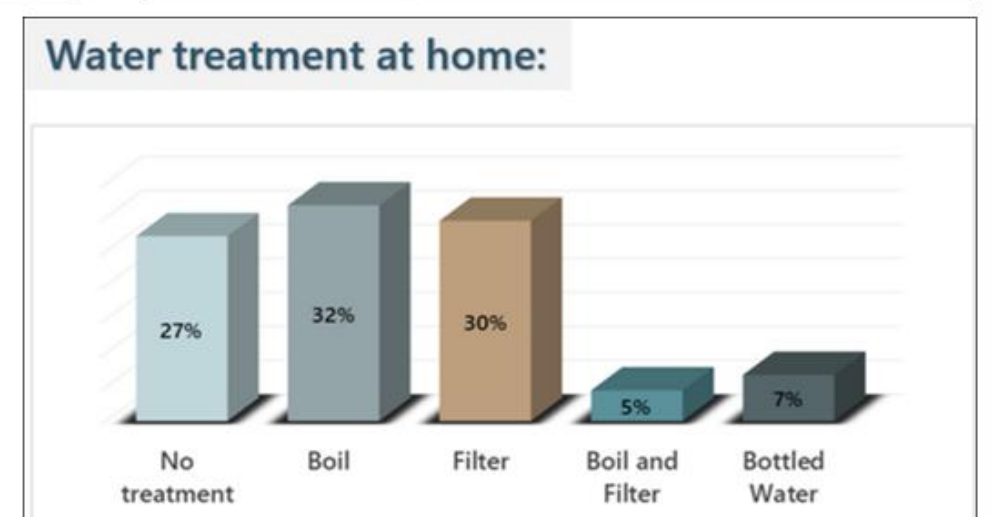
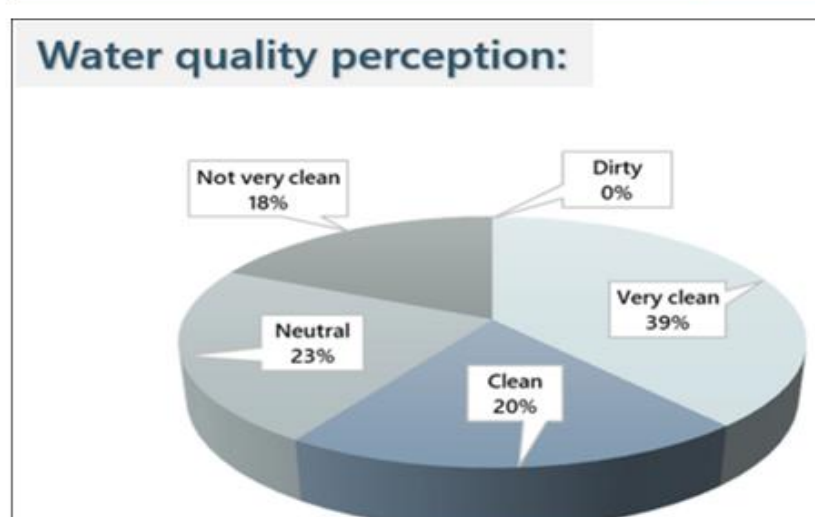
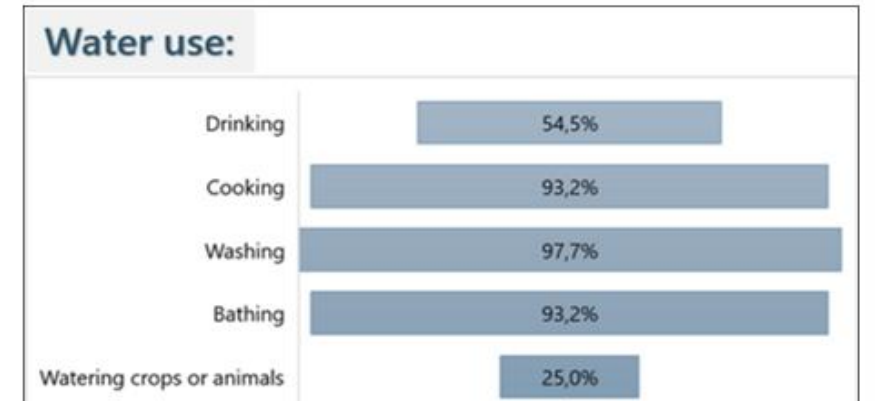
Data type: Numerical

Measurable (related to numbers)

Collected by measuring and calculating variables

Analyzed using statistical analysis

FROM SURVEYS...



5. CONCLUSIONS

- Water Current State:** Ghana's water is polluted by municipal, industrial, agricultural and mining sources. Inadequate sanitation, outdated treatment.
- Availability agricultural by-products:** Ghana's abundant agricultural waste, especially coconut by-products in the coastal area, offers a sustainable way to improve water quality and manage waste.
- AC Performance:** AC performed well under lab conditions: powdered form was better. Both forms removed color, turbidity, cadmium, copper, and iron effectively. Nutrient removal was low, suggesting the need for additional treatments.

USES OF COCONUT BASED ACTIVATED CARBON FOR WATER TREATMENT IN GHANA

- Household Water Purification
- Point-of-Use filtration in Rural Areas
- Emergency or Seasonal Water Treatment
- Community Water Systems
- Fourth Stage in Existing Water Treatment Plants

Note: Activated carbon is not a complete disinfection solution, but when combined with other methods, it significantly improves water quality.

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