

A Comparative Analytical Study of Greywater Treatment Results Using Moringa Aloe vera

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Abstract

This study evaluates the effectiveness of powdered Moringa Aloe vera leaves in improving greywater quality using a standard water treatment protocol. Greywater samples were tested before and after treatment to measure changes in turbidity, pH, salinity, and dissolved oxygen. Three greywater samples were treated with ground Moringa leaves, and measurements were conducted according to the GLOBE Water Protocol. The results showed a clear reduction in turbidity, an increase in dissolved oxygen, improvement in pH toward neutral, and a slight decrease in salinity. These findings indicate that Moringa Aloe vera leaf powder is an effective, environmentally friendly, and sustainable natural method for improving greywater quality and supporting water reuse.

Research questions

The research addresses the following questions:

1. Do Moringa Aloe vera leaves have a measurable impact on the physicochemical properties of greywater?
2. Can Moringa Aloe vera leaves be utilized as a sustainable natural water purification agent?

Research Methods

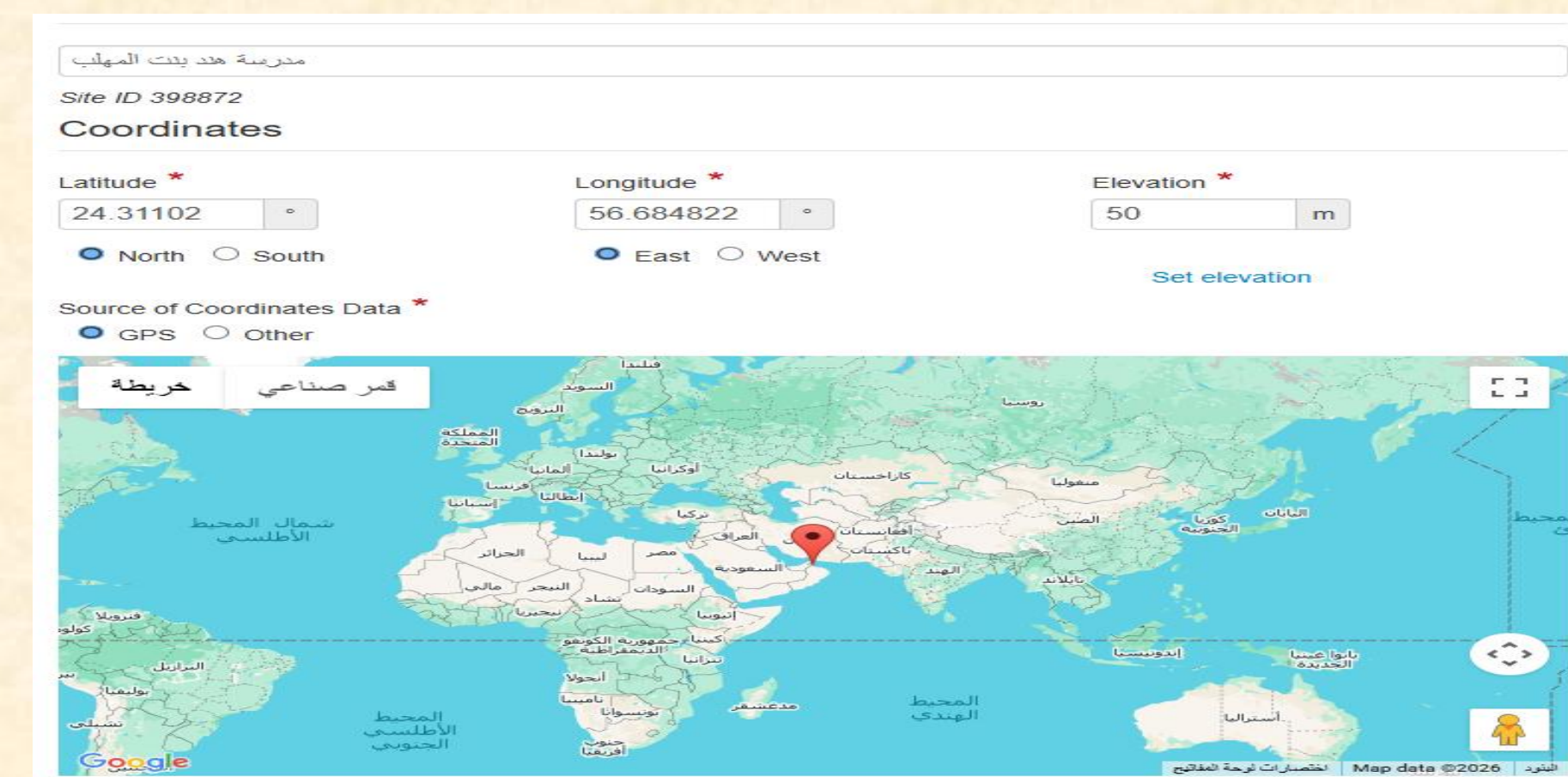
This study adopted an experimental research design to examine the effectiveness of powdered Moringa Aloe vera leaves in treating greywater. Greywater samples were collected from a single source to ensure uniformity of the samples. Key water quality parameters, including turbidity, pH, salinity, and dissolved oxygen, were measured before and after treatment. The treatment process involved adding ground Moringa leaves to the greywater samples and allowing sufficient time for interaction. All measurements were conducted using the GLOBE Water Protocol to ensure accuracy and consistency. Multiple readings were taken for each parameter, and the average values were calculated to evaluate the impact of Moringa treatment on greywater quality.

Research Procedures

1. The study was conducted according to the following structured steps:
2. 1. Reviewing relevant literature from available books at the Learning Resource Center and reliable online scientific sources.
3. 2. Developing a detailed research plan and establishing a timeline for its implementation.
4. 3. Employing an experimental research design to evaluate the effect of Moringa leaf powder on greywater quality.
5. 4. Collecting, organizing, and recording experimental data and observations in tabulated form.
6. 5. Entering the collected data into the program's designated online platform.
7. 6. Analyzing and discussing the results, including graphical representation of the data.
8. 7. Drawing conclusions and formulating recommendations based on the findings.
9. .

Study Location

The research was conducted in the North Al Batinah region, characterized by a hot and humid climate, specifically within Hind bint Al-Muhalib School.



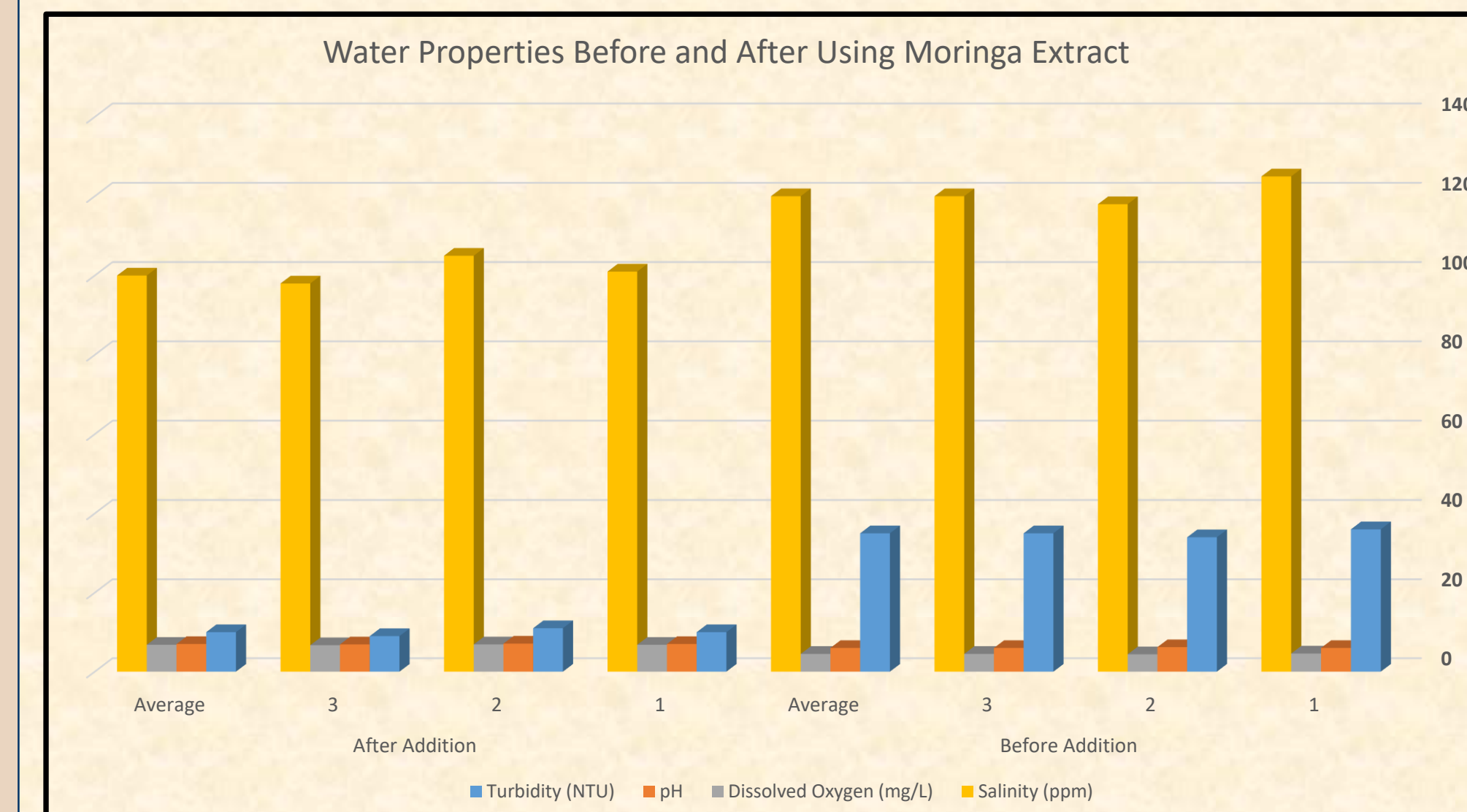
Identification of Protocols Used in the Study

In this study, the Water Protocol will be employed to measure the pH, salinity, turbidity, and dissolved oxygen content of the water samples.

Data Collection and Analysis

Data were collected using an experimental approach in accordance with the GLOBE Water Protocol. Three greywater samples were collected from the same source to ensure consistency of the results. Water quality parameters—including turbidity, pH, salinity, and dissolved oxygen—were measured before and after treatment with powdered Moringa Aloe vera leaves. Each parameter was measured several times, and average values were calculated to increase measurement accuracy. The collected data were organized into tables and represented graphically to allow clear comparison between untreated and treated greywater. Data analysis focused on identifying trends and changes in water quality indicators after treatment, in order to assess the effectiveness of Moringa as an environmentally friendly and sustainable method for improving greywater quality and supporting safe water reuse.

	Before Addition				After Addition			
	1	2	3	Average	1	2	3	Average
Turbidity (NTU)	36	34	35	35	10	11	9	10
pH	6	6.2	6	6	7	7.1	6.9	7
Dissolved Oxygen (mg/L)	4.6	4.4	4.5	4.5	6.8	6.9	6.7	6.8
Salinity (ppm)	125	118	120	120	101	105	98	100



Discussion of Results

Based on the practical experiments and the readings in Table 1 and Figures 1 and 2, it can be concluded that adding Moringa leaf extract to greywater improves its quality and properties as follows:

- **Improved water transparency:** Turbidity decreased significantly from an average of 35.0 NTU to 10.0 NTU, indicating the ability of Moringa to settle suspended particles.
- **pH adjustment:** The pH increased closer to neutral, enhancing water stability and reducing its acidic effect.
- **Reduced water salinity:** A slight decrease in salinity was observed, from an average of 121.0 ppm to 101.0 ppm, which may contribute to improved water quality for various uses.
- **Increased dissolved oxygen:** Dissolved oxygen concentration increased, improving water quality for irrigation or environmental reuse.

Conclusion

We praise Allah for the successful completion of this study, in which we employed practical experimentation following the protocols of the GLOBE program. The study demonstrated that powdered Moringa leaves are an effective and environmentally friendly method for treating greywater, helping to reduce turbidity, improve pH, decrease salinity, and increase dissolved oxygen. Further studies are recommended on a larger scale to determine the optimal doses and reaction times to achieve maximum benefits.

References

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