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Natural Biomass Adsorbents from Seaweed and Coconut Fiber for Weaving Wastewater Treatment: A Study on TDS, TSS, and Color Reduction

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ABSCTRACT

The weaving industry generates wastewater containing high levels of suspended solids, dissolved solids, and synthetic dyes that can threaten aquatic ecosystems if discharged untreated. This study investigates the effectiveness of seaweed and coconut husk powder as combined adsorbents for improving weaving wastewater quality in Nusa Penida, Bali. Three treatment variations (V1, V2, and V3) were applied, while untreated wastewater served as the control. Key parameters measured included Total Suspended Solids (TSS), Total Dissolved Solids (TDS), and color, using standard water quality assessment methods. Results showed that treatment V3 provided the highest pollutant removal efficiency. TSS decreased significantly from 72.89 mg/L in the control to 14.78 mg/L after V3 treatment, while color values reduced drastically from 2202.6 TCU to 235.61 TCU. TDS also exhibited notable reductions, confirming the strong adsorption capacity of the combined materials. The superior performance of V3 suggests that the optimal ratio of seaweed and coconut husk powder enhances binding capacity and surface interaction with pollutants. Compared to conventional treatments, this method is cost-effective, environmentally friendly, and utilizes locally abundant resources, making it highly suitable for small-scale industries. Overall, the study demonstrates the potential application of natural adsorbents as a sustainable solution for weaving wastewater management, while further research is recommended to optimize large-scale application and evaluate reusability of the adsorbents.

Keywords: weaving wastewater treatment, TDS, TSS, color, adsorbent, seaweed, coconut fiber

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INTRODUCTION

The weaving industry is a vital part of Bali's cultural heritage and local economy, particularly in regions like Nusa Penida (Amir, 2017). Beyond its economic value, weaving also sustains local traditions and provides livelihoods for many households. However, this industry generates wastewater containing pollutants such as Total Dissolved Solids (TDS), Total Suspended Solids (TSS), and synthetic dyes (Abdel-fatah, 2023). These pollutants pose a risk to local water sources, potentially disrupting ecosystems and affecting the health of nearby communities (Sundari et al., 2024). Without proper treatment, weaving wastewater may reduce water quality, harm aquatic organisms, and limit the usability of natural water resources (Islam et al., 2025). As weaving activities increase, so does the demand for sustainable and affordable wastewater treatment solutions that can mitigate the impact of these pollutants (Biyada & Urbonavičius, 2025). Therefore, immediate action is required to prevent long-term ecological damage and safeguard community well-being.

Traditional wastewater treatment methods, while effective, are often costly and require extensive infrastructure, making them less accessible for small-scale weaving industries. Many small weaving enterprises operate with limited financial resources, meaning high-tech or chemical-based treatments are not feasible for long-term use. Consequently, interest in natural adsorbents has grown as a more feasible solution for such industries. Natural adsorbents are known for their abundance, low cost, and environmental compatibility (Liu et al., 2024). By exploring natural materials, researchers aim to identify alternative methods that can deliver effective results with minimal environmental impact, thus aligning with the goals of sustainable industry practices. This shift also responds to the urgent need for circular economy approaches, where waste products and natural resources are repurposed effectively.

Seaweed and coconut fiber are promising natural adsorbents due to their unique properties. Seaweed contains polysaccharides that offer excellent adsorption capabilities, particularly for organic dyes commonly found in textile wastewater (Sundari et al., 2024). Furthermore, seaweed

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is abundant in coastal areas like Nusa Penida, making it an easily accessible local material. Additionally, coconut fiber possesses a naturally porous structure (Yadav et al., 2024), making it effective in trapping suspended solids and reducing TSS levels. Since coconut husks are often discarded as agricultural waste, their use as adsorbents provides added value and reduces environmental disposal problems (Abdul Rahim et al., 2021). Using a combination of these two materials could potentially enhance the overall effectiveness of wastewater treatment by simultaneously reducing TDS, TSS, and color in weaving wastewater. This integrated approach offers not only technical benefits but also economic and environmental advantages for rural communities.

The goal of this study is to evaluate the effectiveness of a combined seaweed and coconut fiber adsorbent in treating wastewater from weaving industries in Nusa Penida. Focusing on TDS, TSS, and color as key parameters, this research aims to assess whether these natural adsorbents can provide an affordable, environmentally friendly solution for small-scale weaving operations. The findings are expected to generate practical insights for developing low-cost wastewater management systems that can be easily applied at the community level. If proven effective, this method could be adopted more widely, offering local businesses an accessible way to improve wastewater management. Moreover, the study highlights the importance of utilizing locally available natural resources as part of sustainable development strategies.

Ultimately, this study seeks to contribute to sustainable industrial practices in Bali and beyond. By demonstrating the feasibility of natural adsorbents for wastewater treatment, it aligns with the broader goals of environmental conservation and responsible industry. Such innovations not only support ecological protection but also enhance the resilience of local economies that depend on small-scale industries. This research not only provides practical insights for the weaving industry but also highlights the potential of natural resources to play a critical role in addressing pollution from small-scale industries. In the long run, integrating environmentally friendly wastewater solutions can help balance industrial growth with the preservation of cultural and natural heritage.

METHOD

The research employed a True Experimental approach with a Posttest Only Control Group Design. This design aims to assess the treatment's impact on the experimental group by comparing results with those from a control group.

Preparation of Seaweed Powder (SWP) and Coconut Husk Powder (CHP)

Seaweed and coconut husk sourced from Nusa Penida were thoroughly cleaned to remove any impurities. The cleaned materials were then sun-dried for two days. After drying, the seaweed and coconut husk were cut into small pieces or blended, followed by sieving through a 300 µm mesh. The granulated materials were further dried in an oven at 105°C. Once fully dried, they were stored in a desiccator, ready for use as adsorbent media. Additional filtration media, including coconut shell charcoal, zeolite stones, and silica sand, were also prepared for the filtration process.

Cepuk Woven Waste Adsorption Filtration Model

Each filtering and adsorbent medium was arranged as illustrated in Figure 1, with specific placements tailored to the different media used.

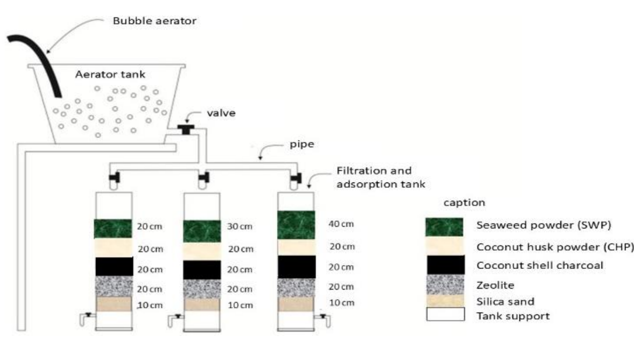

Figure 1. Filtration and adsorption tank model with combined SWP and CHP adsorbents (Sundari et al., 2024)

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Filtration and Adsorption Process

A 10-liter sample of wastewater is first added to the experimental tank. The sample is then aerated for 30 minutes to improve the treatment process. Following aeration, the wastewater flows through the adsorption and filtration pipes. After completing these processes, the treated wastewater is collected for quality assessment. Both untreated (control, Vo) and treated samples are sent to the Panureksa Laboratory in Denpasar for analysis. The final quality evaluation focuses on measuring TDS, TSS, and color parameters of the wastewater.

Statistical analysis

Data analysis was conducted using Microsoft Excel (2010) and the Statistical Package for the Social Sciences (SPSS; version 23). A one-way ANOVA was applied to evaluate the experimental results, with a significance threshold set at a p-value of < 0.05.

RESULTS

The effectiveness of combining seaweed powder and coconut fiber with different composition variations led to changes in TDS, TSS and color, as shown in Figure 2, Figure 3, Figure 4. The results of the One-Way ANOVA statistical test, which highlight significant differences between the treatments, are presented in Table 1.

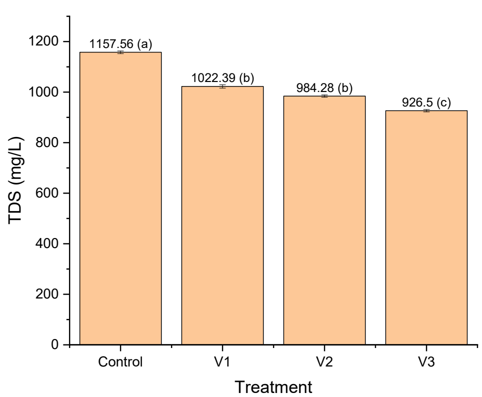

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Figure 2. TDS in Cepuk Weaving Liquid Waste Using Various Treatment Methods with Combined Seaweed and Coconut Husk Powder Adsorbents

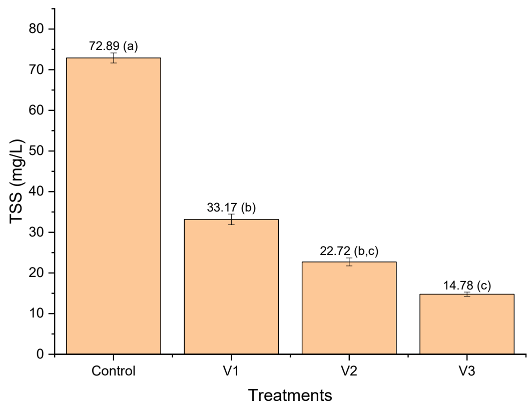

Figure 3. TSS in Cepuk Weaving Liquid Waste Using Various Treatment Methods with Combined Seaweed and Coconut Husk Powder Adsorbents

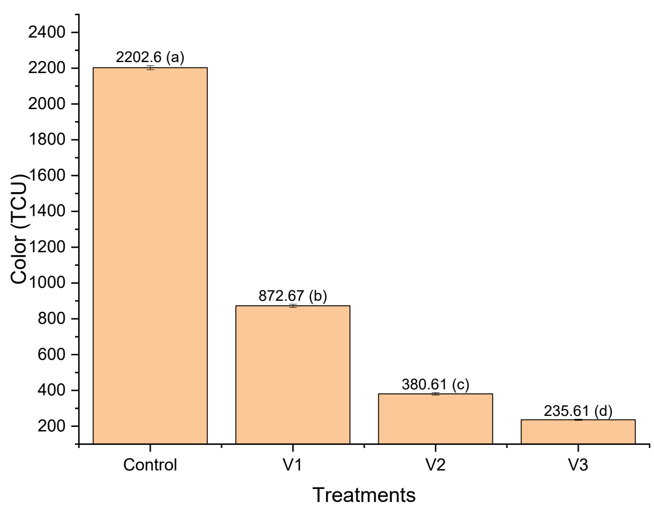

Figure 4. Color in Cepuk Weaving Liquid Waste Using Various Treatment Methods with Combined Seaweed and Coconut Husk Powder Adsorbents

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Table 1 Results of the One Way ANOVA statistical test for each treatment

Treatments	Sig value (95% confidence interval, α = 0.05)		
	TDS	**TSS**	**Color**
Vo - V1	0.001	0.000	0.000
Vo - V2	0.000	0.000	0.000
Vo - V3	0.000	0.000	0.000
V1 - V2	0.330	0.217	0.058
V1 - V3	0.016	0.032	0.150
V2 - V3	0.142	0.347	0.573

DISCUSSION

The results of this study demonstrate that the combination of seaweed powder (SWP) and coconut fiber powder (CFP) significantly improved the quality of weaving wastewater, particularly in reducing TDS, TSS, and color. The adsorption-filtration tank model (Figure 1) provided an effective configuration for maximizing the contact surface between wastewater and natural adsorbents. By arranging the two materials in layers, the model enabled both physical filtration and chemical adsorption to occur simultaneously, creating a synergistic effect. This design mirrors conventional multi-stage treatment processes but utilizes low-cost, locally available resources.

Effect on Total Dissolved Solids (TDS)

As shown in Figure 2, TDS levels in weaving wastewater were significantly reduced across all treatments, with V3 achieving the highest reduction compared to the control. This finding confirms the strong adsorption potential of the seaweed–coconut fiber combination. TDS represents dissolved inorganic salts, small organic molecules, and soluble dye residues in wastewater, which can increase water salinity, reduce light penetration, and impair aquatic ecosystems if not properly treated (Pushpalatha et al., 2022). High TDS levels are also problematic for human use, as they affect taste, scaling in pipes, and overall water quality standards (Akcaalan et al., 2022). Seaweed contributed substantially to TDS reduction due to its content of

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polysaccharides such as alginate, carrageenan, and agar, which carry negatively charged groups (carboxyl and sulfate) (Mamede et al., 2023). These functional groups act as ion-exchange sites, allowing seaweed to bind positively charged ions like calcium, magnesium, or dye cations (Sharma et al., 2025). Polysaccharide-based adsorbents are particularly effective for binding dissolved salts and dye molecules (Ortiz-Martínez et al., 2024), which explains the sharp reduction in TDS observed in this study.

Meanwhile, coconut fiber, with its lignocellulosic structure composed of cellulose, hemicellulose, and lignin, offers hydroxyl groups that interact with dissolved organic compounds and ions (Abolore et al., 2024). Its porous structure also increases surface area, providing more adsorption sites (Chukwu et al., 2022). The complementary action of seaweed's chemical binding and coconut fiber's physical-chemical adsorption results in the superior TDS reduction found in V3. The statistical analysis (Table 1) further validates these results. Significant differences ($p < 0.05$) were observed between the control and all treatments, demonstrating the consistent ability of the adsorbents to reduce dissolved solids. The difference between V1 and V3 ($p = 0.016$) highlights that increasing the proportion of adsorbents, especially seaweed, enhances TDS removal efficiency. This supports the Langmuir adsorption model, which states that adsorption capacity increases with greater availability of active binding sites until equilibrium is reached(Amaechi et al., 2024).

These results are consistent with earlier studies. Alginate-based composites achieved notable TDS reductions in textile effluents(Zdiri et al., 2022), while Sahu et al. (2019) observed that lignocellulosic fibers effectively captured dissolved organics(Hasan et al., 2022). Compared to chemical treatments like coagulation–flocculation, the seaweed–coconut fiber adsorbent system offers a more eco-friendly alternative, as it does not require added chemicals or produce large amounts of sludge. Overall, the results highlight that the seaweed–coconut fiber combination is not only effective but also sustainable for reducing TDS in weaving wastewater. By lowering dissolved pollutant concentrations, this approach improves water quality and supports safe reuse or discharge, which is essential for small-scale weaving industries in Bali that lack advanced treatment infrastructure.

Effect on Total Suspended Solids (TSS)

The findings in Figure 3 show that TSS levels in weaving wastewater decreased significantly after treatment with seaweed and coconut fiber, with the most notable result in V3 (14.78 mg/L from 72.89 mg/L in the control). High TSS in wastewater is problematic because it increases turbidity, reduces light penetration, and may carry pathogens or toxic substances(Adjovu et al., 2023). Thus, reducing TSS is essential for both ecological balance and wastewater quality improvement. Coconut fiber was particularly effective due to its fibrous and porous structure, which physically trapped suspended particles. Its lignocellulosic composition provides a rough surface area for adsorption and attachment of solids(Jakka et al., 2023). Seaweed, meanwhile, complemented this role by promoting the aggregation of colloidal particles through its negatively charged sulfate and carboxyl groups, enhancing overall TSS removal.

The statistical results in Table 1 confirm significant differences between control and treated samples ($p = 0.000$). However, differences between V2 and V3 were not statistically significant ($p = 0.347$), suggesting that TSS removal approaches a plateau at higher adsorbent doses. This observation aligns with adsorption isotherm principles, where efficiency declines as available binding sites become saturated. These findings are consistent with studies that natural fibers and agricultural biomass effectively reduce suspended solids in textile effluents(Dungani et al., 2016)(Chaurasia et al., 2023). Compared with chemical coagulants, the seaweed–coconut fiber combination is cheaper, biodegradable, and environmentally friendly, making it a practical solution for small-scale weaving industries in Nusa Penida.

Effect on Color

The results in Figure 4 reveal that color intensity in weaving wastewater was drastically reduced after treatment, with V3 showing the most significant improvement (from 2202.6 TCU in the control to 235.61 TCU). High color levels in textile effluents are mainly caused by synthetic dyes, which are often resistant to biodegradation and may persist in aquatic environments, reducing

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light penetration and harming aquatic ecosystems(Azanaw et al., 2022). Effective color removal is therefore a crucial indicator of successful wastewater treatment. Seaweed played a major role in dye removal due to the presence of polysaccharides such as alginate and carrageenan, which contain negatively charged carboxyl and sulfate groups. These groups can bind cationic dye molecules through electrostatic attraction, enhancing adsorption efficiency(Elgarahy et al., 2021). At the same time, coconut fiber contributed by physically entrapping insoluble dye particles within its porous structure(Mishra & Basu, 2020). This dual mechanism explains the much higher performance of the combined adsorbent, particularly in V3.

The statistical analysis presented in Table 1 confirms that differences between the control and all treatments were highly significant ($p = 0.000$). Interestingly, the differences between V1, V2, and V3 were less pronounced ($p > 0.05$ in some comparisons), suggesting that even small additions of adsorbents can substantially reduce color. However, the lowest levels achieved in V3 indicate that an optimal adsorbent composition provides the most consistent and effective results. These findings are in line with previous research. Seaweed biomass achieved dye removal in synthetic wastewater(Soares Dias et al., 2025) and the role of lignocellulosic materials such as coconut fiber in reducing chromatic pollutants (Etale et al., 2023). Compared with conventional methods like chemical coagulation or activated carbon, natural adsorbents provide a more sustainable option, particularly for small-scale weaving industries in Bali. By reducing color efficiently, this method supports both environmental protection and sustainable cultural industries.

The combination of coconut husk powder and seaweed powder is effective in improving TDS, TSS, and color in Cepuk weaving wastewater due to the unique adsorption properties of each component. Coconut husk powder contains lignocellulosic fibers(Vieira et al., 2024), which have a high surface area and functional groups that bind with contaminants, particularly organic and inorganic particles(Vasić et al., 2023). This structure allows coconut husk powder to trap suspended solids and reduce TSS levels significantly(Sabara et al., 2022). The natural porosity of coconut fibers enhances this adsorption, making it a suitable material for capturing fine particles in wastewater(Jang, 2023).

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Seaweed powder complements coconut husk by introducing specific bioactive compounds, such as polysaccharides (e.g., alginates), which are known to interact with various metal ions and organic pollutants(Trica et al., 2019). These compounds form complexes with contaminants, effectively reducing the levels of dissolved solids and helping to lower TDS in the wastewater. Additionally, seaweed has natural gelling properties that improve the coagulation and flocculation processes(Hentati et al., 2020), binding smaller particles into larger aggregates that can be more easily removed from the liquid phase(Tsoutsa et al., 2024).

Color removal in the weaving wastewater is also aided by the presence of phenolic compounds in seaweed, which are known for their ability to bind with dyes and pigments(Arumugam et al., 2018). The natural coloration in weaving wastewater, often due to dye residues, can be effectively reduced as the phenolic groups in seaweed interact with dye molecules, breaking down or trapping the colorants. Meanwhile, the lignin content in coconut husk further enhances this color removal by providing additional adsorption sites, creating a synergistic effect with the seaweed components(Thamer et al., 2023).

Together, the combination of seaweed and coconut husk powder forms an efficient, eco-friendly adsorbent system that improves the quality of Cepuk weaving wastewater. This combination not only reduces TDS and TSS but also significantly lowers color, contributing to a cleaner effluent. By using locally available and sustainable materials, this approach presents an effective solution for industrial wastewater treatment, reducing the environmental impact and enhancing wastewater management practices in the textile industry. Overall, this study demonstrates that the combination of seaweed and coconut fiber as adsorbents effectively reduces TDS, TSS, and color intensity in wastewater from the weaving industry. The 40 cm adsorbent thickness proved to be the most effective among the variations tested, highlighting the potential of seaweed and coconut fiber as an environmentally friendly and economical solution for wastewater treatment, particularly for small industries in areas like Nusa Penida, which have easy access to these natural resources. Thus, these findings support the implementation of sustainable, locally sourced natural-resource-based wastewater treatment technologies that also reduce pollution from

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the weaving industry. The adoption of this method is expected to offer a more affordable and practical alternative compared to conventional wastewater treatment methods.

CONCLUSIONS

The findings of this study confirm that the combination of seaweed powder and coconut fiber powder is an effective natural adsorbent for treating weaving wastewater in Nusa Penida, Bali. Significant improvements were observed across all parameters, with treatment V3 consistently providing the highest removal efficiency. Total Dissolved Solids (TDS) decreased substantially, demonstrating the strong ion-binding capacity of seaweed polysaccharides and the complementary adsorption properties of coconut fiber. Total Suspended Solids (TSS) were also markedly reduced, highlighting the ability of coconut fiber to entrap particulate matter while seaweed enhanced colloidal removal.

Furthermore, color intensity dropped drastically, indicating the synergistic effect of electrostatic dye binding by seaweed and physical trapping by coconut fiber. These outcomes underscore the potential of integrating locally available biomass into sustainable wastewater treatment practices. Compared to conventional methods, this approach is low-cost, environmentally friendly, and highly relevant for small-scale weaving industries with limited resources. Taken together, the results provide strong evidence that seaweed and coconut fiber can serve as practical and eco-friendly alternatives for industrial effluent treatment, while further studies on adsorption kinetics, regeneration potential, and large-scale applications are recommended to enhance future implementation.

CONFLICT OF INTEREST

The author(s) declare no conflict of interest.

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REFERENCES

Abdel-fatah, M. A. (2023). Integrated Management of Industrial Wastewater in the Food Sector. *Sustainability*, *15*(23).

Abdul Rahim, A. R., Johari, K., Saman, N., & Mat, H. (2021). Sustainable Conversion of Coconut Wastes into Useful Adsorbents BT - Handbook of Nanomaterials and Nanocomposites for Energy and Environmental Applications. In O. V. Kharissova, L. M. Torres-Martínez, & B. I. Kharisov (Eds.), *Handbook of Nanomaterials and Nanocomposites for Energy and Environmental Applications. Springer, Cham.* (pp. 631–667). Springer International Publishing. https://doi.org/10.1007/978-3-030-36268-3_121

Abolore, R. S., Jaiswal, S., & Jaiswal, A. K. (2024). Green and sustainable pretreatment methods for cellulose extraction from lignocellulosic biomass and its applications: A review. *Carbohydrate Polymer Technologies and Applications*, *7*(November 2023), 1–28. https://doi.org/10.1016/j.carpta.2023.100396

Adjovu, G. E., Stephen, H., James, D., & Ahmad, S. (2023). Measurement of Total Dissolved Solids and Total Suspended Solids in Water Systems: A Review of the Issues, Conventional, and Remote Sensing Techniques. *Remote Sensing*, *15*(14), 1–43. https://doi.org/10.3390/rs15143534

Akcaalan, R., Devesa-Garriga, R., Dietrich, A., Steinhaus, M., Dunkel, A., Mall, V., Manganelli, M., Scardala, S., Testai, E., Codd, G. A., Kozisek, F., Antonopoulou, M., Ribeiro, A. R. L., Sampaio, M. J., Hiskia, A., Triantis, T. M., Dionysiou, D. D., Puma, G. L., Lawton, L., … Kaloudis, T. (2022). Water taste and odor (T&O): Challenges, gaps and solutions from a perspective of the WaterTOP network. *Chemical Engineering Journal Advances*, *12*, 1–9. https://doi.org/10.1016/j.ceja.2022.100409

Amaechi, P. ., Elenwo, C. ., & Dimkpa, S. O. N. (2024). Langmuir and Freundlich Isotherm Models' Description of P. Adsorption Capacity of Wetland and Upland Soil in Rivers State. *Global Journal of Agricultural Research*, *12*(3), 14–29. https://doi.org/10.37745/gjar.2013/vol12n31429

Amir, F. L. (2017). Pengembangan Kain Tenun Cepuk Sebagai Bagian Pariwisata Budaya Berkelanjutan Di Nusa Penida. *Jurnal Ilmiah Hospitality Management*, *8*(1), 29–38.

Arumugam, N., Chelliapan, S., Kamyab, H., Thirugnana, S., Othman, N., & Nasri, N. S. (2018). Treatment of wastewater using seaweed: A review. *International Journal of Environmental Research and Public Health*, *15*(12), 1–17. https://doi.org/10.3390/ijerph15122851

Azanaw, A., Birlie, B., Teshome, B., & Jemberie, M. (2022). Textile effluent treatment methods and eco-friendly resolution of textile wastewater. *Case Studies in Chemical and Environmental Engineering*, *6*(July), 100230. https://doi.org/10.1016/j.cscee.2022.100230

Biyada, S., & Urbonavičius, J. (2025). Circularity in textile waste: Challenges and pathways to sustainability. *Cleaner Engineering and Technology*, *24*, 1–11. https://doi.org/10.1016/j.clet.2025.100905

Chaurasia, P., Jasuja, N. D., & Kumar, S. (2023). Textile Effluent Treatment Methods and Limitations: a Sustainable and Ecological Aspect. *Suranaree Journal of Science and Technology*, *30*(6). https://doi.org/10.55766/sujst-2023-06-e01655

Chukwu, M. M., Ononogbo, C., Nwakuba, N. R., Obijiaku, R. E., Obijiaku, J. C., Chukwuezie, O. C., & Nwosu, O. U. (2022). Adsorptive Capacity of Coconut Fibre Carbon Activated by Potassium Hydroxide for Wastewater Treatment. *International Journal of Advanced Science and Engineering*, *9*(2), 2669–2677. https://doi.org/10.29294/IJASE.9.2.2022.2669-2677

Dungani, R., Karina, M., Subyakto, Sulaeman, A., Hermawan, D., & Hadiyane, A. (2016). Agricultural waste fibers towards sustainability and advanced utilization: A review. *Asian Journal of Plant Sciences*, *15*(1), 1–14. https://doi.org/10.3923/ajps.2016.42.55

Elgarahy, A. M., Elwakeel, K. Z., Mohammad, S. H., & Elshoubaky, G. A. (2021). A critical review of biosorption of dyes, heavy metals and metalloids from wastewater as an efficient and green process. *Cleaner Engineering and Technology*, *4*, 1–15. https://doi.org/10.1016/j.clet.2021.100209

Etale, A., Onyianta, A. J., Turner, S. R., & Eichhorn, S. J. (2023). Cellulose: A Review of Water Interactions, Applications in Composites, and Water Treatment. *Chemical Reviews*, *123*(5), 2016–2048. https://doi.org/10.1021/acs.chemrev.2c00477

Hasan, A., Rabbi, M. S., & Maruf Billah, M. (2022). Making the lignocellulosic fibers chemically compatible for composite: A comprehensive review. *Cleaner Materials*, *4*(April), 100078. https://doi.org/10.1016/j.clema.2022.100078

Hentati, F., Tounsi, L., Djomdi, D., & , Guillaume Pierre 1 , Cédric Delattre 1, 4 Alina Violeta Ursu 1, Imen Fendri 5, S. A. 2 and P. M. 1. (2020). Bioactive Polysaccharides from Seaweeds. *Molecules*, *25*(14), 1–29.

Islam, M. M., Aidid, A. R., Mohshin, J. N., Mondal, H., Ganguli, S., & Chakraborty, A. K. (2025). A critical review on textile dye-containing wastewater: Ecotoxicity, health risks, and remediation strategies for environmental safety. *Cleaner Chemical Engineering*, *11*, 1–19. https://doi.org/10.1016/j.clce.2025.100165

Jakka, V., Goswami, A., Nallajarla, A. K., Roy, U., Srikanth, K., & Sengupta, S. (2023). Coconut coir–derived nanocellulose as an efficient adsorbent for removal of cationic dye safranin-O: a detailed mechanistic adsorption study. *Environmental Science and Pollution Research*, *August*, 1–23. https://doi.org/10.1007/s11356-023-29075-7

Jang, E. S. (2023). Sound Absorbing Properties of Selected Green Material—A Review. *Forests*, *14*(7). https://doi.org/10.3390/f14071366

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MULTIDISCIPLINARY APPROACHES IN HEALTH SCIENCE
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https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs

Liu, Y., Biswas, B., & Hassan, M. (2024). Green Adsorbents for Environmental Remediation : Synthesis. *Proceses*, *12*(06), 1–24.

Mamede, M., Cotas, J., Bahcevandziev, K., & Pereira, L. (2023). Seaweed Polysaccharides in Agriculture: A Next Step towards Sustainability. *Applied Sciences*, *13*(11), 1–15. https://doi.org/10.3390/app13116594

Mishra, L., & Basu, G. (2020). Coconut fibre: its structure, properties and applications. In *Handbook of Natural Fibres* (Issue 1, pp. 1–27).

Ortiz-Martínez, M., Restori-Corona, B., Hernández-García, L., & Alonso-Segura, D. (2024). Polysaccharides and Composite Adsorbents in the Spotlight for Effective Agrochemical Residue Removal from Water. *Macromol*, *4*(4), 785–804. https://doi.org/10.3390/macromol4040047

Pushpalatha, N., Sreeja, V., Karthik, R., & Saravanan, G. (2022). Total Dissolved Solids and Their Removal Techniques. *International Journal of Environmental Sustainability and Protection*, *2*(2), 13–20. https://doi.org/10.35745/ijesp2022v02.02.0002

Sabara, Z., Anwar, A., Yani, S., Prianto, K., Junaidi, R., Umam, R., & Prastowo, R. (2022). Activated Carbon and Coconut Coir with the Incorporation of ABR System as Greywater Filter: The Implications for Wastewater Treatment. *Sustainability (Switzerland)*, *14*(2). https://doi.org/10.3390/su14021026

Sharma, A., Dubey, S., Singh, K., Mittal, R., Quille, P., & Rajauria, G. (2025). Innovative Processing and Industrial Applications of Seaweed. *Phycology*, *5*(1), 1–27. https://doi.org/10.3390/phycology5010010

Soares Dias, A. P., Santos, F. A., Rijo, B., Simes, D. C., Pereira, L., & Pereira, M. F. C. (2025). Seaweed-Derived Biochar for Effective Treatment of Dye-Contaminated Wastewater. *Water (Switzerland)*, *17*(8), 1–22. https://doi.org/10.3390/w17081215

Sundari, C. D., Arjani, I. A., Wilan Krisna, L. A., Karta, I. W., Jirna, I. N., Suriani, N. L., & Mariani3, M. (2024). The Efficacy of Seaweed Powder Application for Enhancing Wastewater Quality in the Cepuk Textile Industry of Nusa Penida. *Tropical Plantation Journal*, *3*(1), 11–19. https://doi.org/10.56125/tpj.v3i1.35

Sundari, C. D. W. H., Arjani, I. A. M. S., Karta, I. W., & Bryan, S. N. (2024). The Effectiveness of Seaweed and Coconut Fiber Combination as Adsorbents for Wastewater Treatment in Weaving Home Industries in Nusa Penida , Klungkung , Bali : A Study on BOD , COD , and DO Quality. *Internasional Conference On Multidisciplinary Approaches In Health Science*, *2*, 285–295.

Thamer, B. M., Al-aizari, F. A., & Abdo, H. S. (2023). Enhanced Adsorption of Textile Dyes by a Novel Sulfonated Activated Carbon Derived from Pomegranate Peel Waste: Isotherm, Kinetic and Thermodynamic Study. *Molecules*, *28*(23).

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https://ejournal.poltekkes-denpasar.ac.id/index.php/icmahs

Trica, B., Delattre, C., Gros, F., Ursu, A. V., Dobre, T., Djelveh, G., Michaud, P., & Oancea, F. (2019). Extraction and Characterization of Alginate from an Edible Brown Seaweed (Cystoseira barbata) Harvested in the Romanian Black Sea. *Marine Drugs*, *17*(7). https://doi.org/10.3390/md17070405

Tsoutsa, E. K., Tolkou, A. K., & Kyzas, G. Z. (2024). New Trends in Composite Coagulants for Water and Wastewater Treatment. *Macromol*, *40*(30), 509–532.

Vasić, V., Kukić, D., Šćiban, M., Đurišić-Mladenović, N., Velić, N., Pajin, B., Crespo, J., Farre, M., & Šereš, Z. (2023). Lignocellulose-Based Biosorbents for the Removal of Contaminants of Emerging Concern (CECs) from Water: A Review. *Water (Switzerland)*, *15*(10). https://doi.org/10.3390/w15101853

Vieira, F., Santana, H. E. P., Jesus, M., Mata, F., Pires, P., Vaz-Velho, M., Silva, D. P., & Ruzene, D. S. (2024). Comparative Study of Pretreatments on Coconut Fiber for Efficient Isolation of Lignocellulosic Fractions. *Sustainability (Switzerland)* , *16*(11), 1–21. https://doi.org/10.3390/su16114784

Yadav, M., Singh, N., Annu, Khan, S. A., Raorane, C. J., & Shin, D. K. (2024). Recent Advances in Utilizing Lignocellulosic Biomass Materials as Adsorbents for Textile Dye Removal: A Comprehensive Review. *Polymers*, *16*(17). https://doi.org/10.3390/polym16172417

Zdiri, K., Elamri, A., Erard, A., & Salaun, F. (2022). Alginate-Based Bio-Composites and Their Potential Applications. *Journal of Funtional Biomaterials*, *13*(03), 1–31.

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