

From Agricultural Waste to Ocean Rescue? CocoQuill Oil Sorbent: An Effective and Eco-Friendly Synergistic Coconut Fiber–Chicken Feather Sorbent for Oil Spill Cleanup

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Marine oil spills are a severe form of pollution, causing lasting ecological and economic damage. Polypropylene sorbents are non-biodegradable and pose environmental concerns. Thus, our aim is to develop a sustainable sorbent using agricultural waste for efficient oil spill cleanup. We propose a novel oil sorbent, CocoQuill Oil Sorbent, synergizing coconut fiber (*Cocos nucifera*) and chicken feathers (*Gallus gallus domesticus*) with hydrophobic and oleophilic properties for oil removal from water. Different ratios were evaluated for oil absorption capacity, oil-water selectivity, and reusability and degradation performance. The 1:9 coconut fiber to chicken feather ratio showed the highest absorption capacity under static (16.69 g/g) and dynamic (20.74 g/g) conditions. One-Way ANOVA indicated significant differences among seven sorbent compositions ($p < .001$), while Tukey HSD showed no significant difference between the 1:9 ratio and 100% chicken feathers (static $p = 0.903$; dynamic $p = 0.666$). The 1:9 ratio also achieved the highest oil selectivity (96.56%). One-Way ANOVA indicated significant differences among sorbent compositions ($p < .001$), while Tukey HSD showed no significant difference between the 1:9 ratio and 100% chicken feathers ($p = 1.000$). In reusability and degradation tests, the 1:9 ratio retained 74.40% performance over five cycles. One-Way ANOVA showed significant differences in reusability ($p < .001$), while Tukey HSD showed no significant differences between the 1:9 ratio and other ratios ($p > 0.05$). Therefore, CocoQuill Oil Sorbent at a 1:9 ratio is a feasible, effective, and eco-friendly oil sorbent to protect aquatic environments, reduce water pollution, and support Sustainable Development Goals through agricultural waste recycling and sustainable water management.

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