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Organic Low-Cost Anti-Algal Powder for Brickwork in Construction Projects

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Abstract –

In construction projects, brickwork often remains exposed to rain and humidity before plastering, leading to moisture absorption and the growth of algae and fungi on wall surfaces. This biological growth affects the appearance of buildings and reduces the bond strength between brick and plaster, causing peeling, dampness, and surface deterioration. Conventional cleaning methods such as manual scrubbing and chemical treatments are time-consuming, expensive, and harmful to both workers and the environment.

This study proposes the development of an organic low-cost anti-algal powder composed of hydrated lime, borax, neem powder, and fly ash. These materials were selected due to their antimicrobial properties, availability, and environmental safety. The powder is designed to be mixed with water to form a brushable solution that can be applied directly on algae-affected brick surfaces.

Experimental testing was conducted on algae-grown brick samples to evaluate the cleaning efficiency of the developed formulation. The results showed that the unfiltered mixture achieved approximately 99% algae removal, while the filtered solution removed around 80% of algae. The treatment effectively cleaned the brick surface without causing structural damage and improved surface roughness beneficial for plaster adhesion.

The study demonstrates that the developed organic powder can serve as a safe, eco-friendly, and economical alternative to chemical cleaning methods used in construction sites.

Keywords: Brickwork, Algae Removal, Organic Construction Materials, Sustainable Construction, Lime-Based Cleaning.

1. INTRODUCTION

Brick masonry is one of the most widely used construction techniques due to its affordability, durability, and structural reliability. However, bricks are porous in nature and tend to absorb moisture when exposed to environmental conditions such as rainfall and humidity. When brick walls remain unplastered for extended periods, especially during the monsoon season, they absorb water and become susceptible to biological growth such as algae and fungi.

Algal growth forms a thin biofilm layer on the brick surface that acts as a barrier between the brick and plaster.

This reduces plaster adhesion and may lead to peeling, cracking, and dampness in building walls. In many construction sites, algae removal is carried out using manual scrubbing or chemical agents such as hydrochloric acid and bleaching powder. Although these methods provide temporary cleaning, they are labor-intensive, hazardous to workers, and environmentally harmful.

To address this problem, the present research focuses on the development of an organic low-cost anti-algal powder that can be applied to brick surfaces before plastering. The proposed formulation uses natural and easily available materials such as hydrated lime, borax, neem powder, and fly ash. These materials possess antimicrobial and alkaline properties that help eliminate algae and prevent regrowth.

The aim of this study is to develop an eco-friendly surface treatment that improves plaster bonding, reduces construction delays, and promotes sustainable construction practices.

2. KEY OBJECTIVE

- To develop an eco-friendly organic anti-algal powder using materials such as hydrated lime, borax, neem powder, and fly ash.
- To evaluate the effectiveness of the developed

formulation in removing algae from brick surfaces.
- To study the effect of the treatment on improving plaster adhesion on brick masonry.
- To compare the cost and performance of the organic powder with conventional chemical cleaning methods.
- To promote sustainable and environmentally

safe practices in construction

3. LITERATURE REVIEW

Several studies have investigated biological growth on masonry surfaces and its impact on building durability. Research shows that moisture retention in porous materials like bricks creates favorable conditions for algae and fungal growth.

Studies on lime-based coatings indicate that alkaline materials can effectively inhibit microbial growth on construction surfaces. Mineral additives and protective coatings have also been tested to reduce moisture absorption and biological contamination.

Some researchers explored advanced technologies such as nano-additives and photocatalytic coatings that prevent microbial growth under sunlight. Although these materials are effective, their high cost limits their practical use in common construction projects.

Recent studies have highlighted the potential of herbal and organic materials such as neem and plant-based extracts as natural antimicrobial agents. These materials provide safer alternatives to chemical cleaners and support environmentally sustainable construction methods.

However, existing literature shows limited research on **simple, low-cost organic anti-algal powders that can be prepared directly at construction sites**. This research aims to address that gap by developing an economical and environmentally safe formulation suitable for field applications.

4. METHODOLOGY

4.1 Materials Used

The materials used in this research were selected based on their antimicrobial properties, availability, and cost effectiveness.

Material	Purpose
Hydrated Lime	Provides alkalinity and disinfects surface
Borax	Acts as antiseptic and cleaning enhancer
Neem Powder	Natural antibacterial and antifungal agent
Fly Ash	Improves adhesion and consistency

These materials are non-toxic and widely available in local markets.

4.2 Composition of Anti-Algal Powder

The powder formulation was prepared in the following proportion:

Ingredient	Percentage
Hydrated Lime	90%
Borax	1–2%
Neem Powder	2–5%
Fly Ash	5%

The mixture was prepared by thoroughly blending the powdered materials to obtain a homogeneous composition.

4.3 Preparation Procedure

1. All materials were sieved through a fine mesh to remove lumps.
2. The powders were mixed manually in a clean tray.
3. The mixture was blended for 10–15 minutes to ensure uniform distribution.
4. The prepared powder was stored in

airtight containers to prevent moisture absorption.

For application, the powder was mixed with water in a 1:4 ratio to form a brushable suspension.

4.4 Experimental Procedure

Brick samples were prepared to evaluate the performance of the anti-algal formulation.

1. Bricks were exposed to river water and nutrient solution to encourage algal growth.
2. Once algae developed on the brick surfaces, the prepared solution was applied.
3. Two types of solutions were tested:
   - Filtered mixture
   - Unfiltered mixture
4. After application, the surface was left for approximately two hours.
5. The bricks were then washed with clean water to evaluate algae removal efficiency.

5. RESULT

Sample	Type of Solution	Algae Removed
Sample 1	Filtered mixture	80%
Sample 2	Unfiltered mixture	99%

The experimental results showed significant algae removal from treated brick surfaces.

Fig. 1 – Sample:1 Brick with filtered mixture

Fig. 2 – Sample:2 Brick with unfiltered mixture

The unfiltered mixture showed better performance because the presence of lime particles provided mild abrasive action and increased surface contact with the algae layer.

The alkaline nature of hydrated lime created an unfavourable environment for algal survival. Neem powder contributed natural antimicrobial activity, while borax enhanced cleaning efficiency.

After treatment, the brick surface became cleaner and slightly rougher, which is beneficial for improving plaster adhesion. No structural damage or discoloration was observed.

Compared with chemical cleaning methods, the developed organic powder offers several advantages:

- Lower cost
- Reduced labor requirement
- No harmful fumes
- Environmentally safe formulation

6. CONCLUSIONS

This study successfully developed an organic low-cost anti-algal powder for removing algae from brick surfaces before plastering. The formulation consists of hydrated lime, borax, neem powder, and fly ash, which are environmentally friendly and readily available materials.

Experimental results demonstrated that the developed solution effectively removes algae from brick surfaces, with the unfiltered mixture achieving up to **99%**

removal efficiency. The treatment improved surface cleanliness and enhanced plaster bonding without causing damage to the brick material.

The developed powder provides a sustainable and economical alternative to conventional chemical cleaning methods used in construction sites. Its ease of preparation and application makes it suitable for large-scale construction projects.

The study contributes to the development of eco-friendly construction practices and highlights the potential of natural materials in building maintenance and protection.

7. FUTURE SCOPE

Further research can focus on:

- Large-scale field testing on construction sites
- Long-term observation of algae regrowth
- Optimization of material proportions
- Integration with plaster or cement coatings
- Commercial development of ready-to-use anti- algal products

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