Title: New water-resistant soil material

Abstract : The use of earth materials in construction poses a major challenge due to their high vulnerability to water. This innovation opens up a promising avenue by transforming a potential disadvantage into a solution that makes raw earth construction more sustainable, challenging the conventional view of mold as a threat to indoor air quality and suggesting instead that inactivated mold mycelium represents an opportunity.
Adding mycelium to earth materials could help them compete with conventional concrete blocks and reduce CO_2 emissions in the construction industry.

Description : Earth concrete is an environmentally friendly alternative to cement. To make the material easier to shape and improve its durability, biostabilization using biopolymers can be carried out. The bold idea behind this innovation is to exploit, in a controlled manner, the vulnerability of biopolymers to mold growth. The aim is to use mold mycelium, a network of filaments, to protect biostabilized earth materials from deterioration caused by water.

Usually, we try to combat ubiquitous mold and microfungi because they are harmful to indoor air quality. In other areas, however, such as packaging and insulation, fungi are specifically cultivated for their mycelium (the vegetative part of fungi) because of their low density, good insulating properties, and hydrophobicity, which makes them highly durable when exposed to water. The researchers behind the innovation then wondered whether mold mycelium, once inactivated, could also improve the water resistance of earthen materials. They therefore prepared various formulations based on soil and biopolymers, which were then placed in conditions designed to promote mold growth. The mycelium that developed was then inactivated by heat treatment.

As it develops, the mycelium forms a network of microscopic filaments, which are intrinsically hydrophobic, in the pores of the soil matrix. This hydrophobic mesh prevents water from easily penetrating the material. Once the mycelium is inactivated, the network continues to act as a waterproofing agent.

The materials formulated in this way demonstrated significantly higher water resistance. Water absorption through capillary action was reduced by an average of 20%. More importantly, mass loss after direct spraying decreased by an average of 64% across all mixtures tested. This new formulation achieved a reduction of nearly two-thirds in material loss to water

Benefits: Increased water resistance, reduced material loss

Keywords : raw soil, mycelium, eco-materials, biostabilization

Applications : eco-construction

Seeked collaboration : Collaboration/Patent License or License Option with an R&D Validation Program

TRL : 5

Development stage: The proof of concept has been validated by the research team, who are now offering a licensing option to an industrial partner with a view to jointly accelerating the technology's maturation. A patent application has been filed for this invention in France (FR2409418) and has been extended by an international filing (PCT/EP2025/075224).