Source: Kahani, M., Kalantary, F., Soudi, M. R., Pakdel, L., & Aghaalizadeh, S. (2020). Optimization of cost effective culture medium for Sporosarcina pasteurii as biocementing agent using response surface methodology: Up cycling dairy waste and seawater. *Journal of Cleaner Production, 253*, https://doi.org/10.1016/j.jclepro.2020.120022

Optimization of cost effective culture medium for *Sporosarcina pasteurii* as biocementing agent using response surface methodology: Up cycling dairy waste and seawater

Mostafa Kahani[1], Farzin Kalantary[1], Mohammad Reza Soudi[2], Lida Pakdel[2], Sepideh Aghaalizadeh[1]

1- Department of Civil Engineering, K.N. Toosi University of Technology, Tehran, Iran
2- Department of Microbiology, Faculty of Biological Sciences, Alzahra University, Tehran, Iran

Biological precipitation of calcium carbonate using *Sporosarcina pasteurii*, has been developed in the recent decades for the civil applications such as improvement of soil engineering parameters, crack repair in concrete and remediation of contaminated soil. In order to facilitate the application of this method, cost optimization and production simplification are the main challenges. In this study, optimization of culture media in order to reducing the cost of production of urease bacteria and achieving an ecofriendly process were investigated. Therefore, inexpensive nutrients and water resources were used in composition of the culture media and sanitized media were examined instead of sterilized ones. A central composite design was used to design required tests to investigate yeast extract, whey, heating temperature and the Caspian Sea water effects. The response surface method predicated that the maximum specific urease activity (16.50 mm urea.min-1.OD-1) could be achieved at 9.94 g.l-1 yeast extract, 23.43 g.l-1 whey, heating temperature of 128.6 °C and 0% seawater. When the medium contained 12.31 g.l-1 yeast extract, 23.43 g.l-1 whey and 0% seawater was sanitized by heating at 100.0 °C, 64% of optimum specific urease activity was reserved; and it could improve the unconfined compressive strength of a poorly graded sand up to 520 kPa. In case of using the Caspian Sea water as the solvent of culture media, the specific urease activity changes could be ignored. Application of whey as a nutrient source has shown promising results that could relieve some environmental and economic concerns. This approach is promising to achieve an ecofriendly biocementation technology for large scale applications.

Keyword: Biocementation, calcium carbonate, whey, the Caspian Sea, sanitization, urease.