AUCTORES
Globalize your Research

Biotechnology and Bioprocessing
Nida tabassum khan*

Open Access

Review Article

Bioemulsifiers

Nida tabassum khan

Department of Biotechnology, Faculty of Life Sciences & Informatics, Balochistan University of Information Technology, Engineering and Management Sciences.

Corresponding Author: Nida tabassum khan, Department of Biotechnology, Faculty of Life Sciences & Informatics, Balochistan University of Information Technology, Engineering and Management Sciences.

Received Date: September 13 2021; **Accepted Date:** October 23, 2021; **Published Date:** November 25, 2021

Citation: Nida tabassum khan (2021) Bioemulsifiers *J, Biotechnology and Bioprocessing*. 2(10); DOI: 10.31579/2766-2314/058

Abstract

Bioemulsifier is a poly-anionic and amphiphilic compound which can balance out the hydrocarbon emulsion in water by making an extremely thin layer between the hydrocarbon beads and water. Most extreme focus is acquired when culture media containing 12 carbon-based unsaturated fats are utilized as the carbon source. Bioemulsifier with proficient emulsifying action and low-production cost, meets various prerequisites of emulsification in the most practical manner in numerous industrial sectors such as in food and dairy.

Key words: biocompatibility; frothing; fermentation; polysaccharides; saccharomyces cerevisiae

Introduction

Bioemulsifiers are alluded to as surface biomolecule materials, because of their exceptional components over synthetic surfactants, as non-harmfulness, biodegradability, frothing, biocompatibility, productivity at low fixations, high selectivity in various pH, temperatures etc [1, 2]. Bioemulsifiers are high in atomic weight and composed of polysaccharides, lipoproteins and lipopolysaccharides [3]. Bioemulsifiers are additionally known as bioemulsans and presently they are considered as the green atoms [4].

Bioemulsifiers derived from microbes

The following are some Bioemulsifiers derived from different microbes:

1. **Liposan:** Liposan bioemulsifier are water-dissolvable emulsifier acquired from extricating natural solvents by Candida lipolytica yeast [5]. Liposan is produced inside the extracellular layer of the yeast and comprises of 83% carbohydrate and 17% protein [6]. The presence of protein divisions inside the bioemulsifier polymer atom is significant for its emulsifying properties [7]. It causes the consistent quality of differed kinds of emulsions in oil, similar to hydrocarbons, vegetable oils including cottonseed, soybean, sunflower, corn, ground, safflower and vegetable oil [8, 9].
2. **Rhodotorula yeast:** This bioemulsifier extra cellularly produced by the yeast Rhodotorula glutinis [10]. It is produced during fed-batch fermentation process under limited supply of nitrogen content at 30 °C and at low pH of 4 [11].
3. **Candida tropicalis yeast:** During fed batch fermentation, Candida yeast produces an extracellular bioemulsifier which is extremely effective in fixing emulsions of hydrocarbons, and aromatic compounds. The measure of emulsifier delivered and its movement increments during fermentation by restricting nitrogen (N) source [12]. Separating this bioemulsifier from Candida tropicalis cells utilizing quandary shows better prompts terms of speeding up emulsion strength [13].
4. **Mannoprotein:** Mannoprotein bioemulsifier is a glycoprotein with a relative atomic mass of around 14,000 to 15,800 Dalton [14]. Mannoprotein particles are available in glucan, networks, and delivered from the cell layer of yeast utilizing pressed thermal treatment [15]. This bioemulsifier is capable to settle oil-in-water emulsions and is frequently utilized for making mayonnaise along cellulose side chains, instead of utilizing costly fixings like ginseng for mayonnaise synthesis [16]. Baker's yeast Saccharomyces cerevisiae on the other hand is a reasonable, modest and non-harmful source utilized for creating this bioemulsifier at a steady pH range of 3-11 [17, 18].
5. **Phaffia Yeast:** Phaffia rhodozyma is a basidiomycetous yeast which is an enriched source of astaxanthin and different vital supplements [19]. Additionally, it's as of now utilized in feeds as well [20]. This yeast grows on starch, hydrocarbons, glycoproteins and lipid polymers and carries fermentation at a temperature of 22 °C to produce the specific bioemulsifier [21].
6. **Cyanobacteria:** Cyanobacteria is a well-known producer of polymeric bioemulsifiers with a relative molecular mass of approximately 200,000 Dalton [22]. It contains sugars, fatty acids, and a protein fraction and is employed for producing various sorts of oil-in-water emulsions [23].
7. **Baccilus strearothermophilus:** This bacterium produces an extracellular bioemulsifier on a medium containing 4% crude oil at a temperature of 50 °C and is employed for eliminating petroleum from reservoirs and petroleum oil tanks [24].
8. **Sphingomonas Bacteria:** This bacterium grows on aromatic hydrocarbon-based liquid medium to produce the specific bioemulsifier [25].
9. **Laurl Fructose:** This bioemulsifiers is assembled by lipase enzyme isolated from Pseudomonas spp. in a culture media

containing dry pyridine [26]. This bioemulsifier has emulsification properties for hydrocarbons, edible oils, and oil-based oils like margarine etc [27]

10. **Pseudomonas Cepacia:** This bioemulsifier is produced in the presence of nitrogen content in the media and is employed as a natural source of disintegrating agents used for decomposing and neutralizing polychlorinated biphenyls [28].

Conclusion

Thus, bioemulsifiers derived from microbial sources are beneficial and is employed efficiently within the food and drug industry in acceptable and recommended quantities.

References

1. Zajic, J. E., Panchal, C. J., & Westlake, D. (1976). Bio-emulsifiers. *CRC critical reviews in microbiology*, 5(1), 39-66.
2. Satpute, S. K., Banpurkar, A. G., Dhakephalkar, P. K., Banat, I. M., & Chopade, B. A. (2010). Methods for investigating biosurfactants and bioemulsifiers: a review. *Critical reviews in biotechnology*, 30(2), 127-144.
3. Sałek, K., & Euston, S. R. (2019). Sustainable microbial biosurfactants and bioemulsifiers for commercial exploitation. *Process Biochemistry*, 85, 143-155.
4. Alizadeh-Sani, M., Hamishehkar, H., Khezerlou, A., Azizi-Lalabadi, M., Azadi, Y., Nattagh-Eshtivani, E. & Ehsani, A. (2018). Bioemulsifiers derived from microorganisms: Applications in the drug and food industry. *Advanced pharmaceutical bulletin*, 8(2), 191.
5. Cirigliano, M. C., & Carman, G. M. (1985). Purification and characterization of liposan, a bioemulsifier from Candida lipolytica. *Applied and environmental microbiology*, 50(4), 846-850.
6. Cirigliano, M. C., & Carman, G. M. (1984). Isolation of a bioemulsifier from Candida lipolytica. *Applied and environmental microbiology*, 48(4), 747-750.
7. Shepherd, R., Rockey, J., Sutherland, I. W., & Roller, S. (1995). Novel bioemulsifiers from microorganisms for use in foods. *Journal of Biotechnology*, 40(3), 207-217.
8. Cameron, D. R., Cooper, D. G., & Neufeld, R. J. (1988). The mannoprotein of Saccharomyces cerevisiae is an effective bioemulsifier. *Applied and Environmental Microbiology*, 54(6), 1420-1425.
9. Bhardwaj, G., Cameotra, S. S., & Chopra, H. K. (2013). Biosurfactants from fungi: a review. *J Pet Environ Biotechnol*, 4(6), 1-6.
10. Johnson, V., Singh, M., Saini, V. S., Adhikari, D. K., Sista, V., & Yadav, N. K. (1992). Bioemulsifier production by an oleaginous yeast Rhodotorula glutinis IIP-30. *Biotechnology letters*, 14(6), 487-490.
11. Johnson, V. W., Singh, M., Saini, V. S., Adhikari, D. K., Sista, V., & Yadav, N. K. (1995). Utilization of molasses for the production of fat by an oleaginous yeast, Rhodotorula glutinis IIP-30. *Journal of industrial microbiology and biotechnology*, 14(1), 1-4.
12. Singh, M., Saini, V. S., Adhikari, D. K., Desai, J. D., & Sista, V. R. (1990). Production of bioemulsifier by a SCP-producing strain of Candida tropicalis during hydrocarbon fermentation. *Biotechnology letters*, 12(10), 743-746.
13. Singh, M. A. N. J. E. E. T., & Desai, J. D. (1989). Hydrocarbon emulsification by Candida tropicalis and Debaryomyces polymorphus. *Indian journal of experimental biology*, 27(3), 224-226.
14. Cameron, D. R., Cooper, D. G., & Neufeld, R. J. (1988). The mannoprotein of Saccharomyces cerevisiae is an effective bioemulsifier. *Applied and Environmental Microbiology*, 54(6), 1420-1425.
15. Barriga, J. A., Cooper, D. G., Idziak, E. S., & Cameron, D. R. (1999). Components of the bioemulsifier from S. cerevisiae. *Enzyme and Microbial Technology*, 25(1-2), 96-102.
16. Caridi, A. (2006). Enological functions of parietal yeast mannoproteins. *Antonie Van Leeuwenhoek*, 89(3), 417-422.
17. Alcantara, V. A., Pajares, I. G., Simbahan, J. F., & Edding, S. N. (2014). Downstream recovery and purification of a bioemulsifier from Sacchromyces cerevisiae 2031. Phil. Agric. Sci, 96, 349-359.
18. CAMERON, D. COOPER, D. g.; NEUFELD, R. J. (1988) The mannoprotein of Saccharomyces cerevisiae is effective bioemulsifier. *Applied and Environmental Microbiology*, 1420-1425.
19. Meyer, P. S., & Du Preez, J. C. (1994). Astaxanthin production by a Phaffia rhodozyma mutant on grape juice. *World Journal of Microbiology and Biotechnology*, 10(2), 178-183.
20. Shekhar, S., Sundaramanickam, A., & Balasubramanian, T. (2015). Biosurfactant producing microbes and their potential applications: a review. *Critical Reviews in Environmental Science and Technology*, 45(14), 1522-1554.
21. Spencer, J., de Spencer, A. R., & Laluce, C. (2002). Non-conventional yeasts. *Applied Microbiology and Biotechnology*, 58(2), 147-156.
22. Satpute, S. K., Banat, I. M., Dhakephalkar, P. K., Banpurkar, A. G., & Chopade, B. A. (2010). Biosurfactants, bioemulsifiers and exopolysaccharides from marine microorganisms. *Biotechnology advances*, 28(4), 436-450.
23. Gutnick, D. L., & Shabtai, Y. (2017). Exopolysaccharide bioemulsifiers. In Biosurfactants and biotechnology (pp. 211-246). Routledge.
24. Gurjar, M., Khire, J. M., & Khan, M. I. (1995). Bioemulsifier production by bacillus stearothermophilus vr-8 isolate. *Letters in applied microbiology*, 21(2), 83-86.
25. Perfumo, A., Smyth, T., Marchant, R., & Banat, I. (2010). Production and roles of biosurfactants and bioemulsifiers in accessing hydrophobic substrates. In Handbook of hydrocarbon and lipid microbiology (pp. 1501-1512). Springer.
26. Natolino, A. (2016). Application of Supercritical Fluids technology on winery by-products. PhD of Food Science, University of Udine, Italy.
27. Oso, S. O. (2021). Surfactants produced by epiphytic bacteria and their role in diesel degradation.
28. Goswami, P., Hazarika, A. K., & Singh, H. D. (1994). Hydrocarbon pseudosolubilizing and emulsifying proteins produced by Pseudomonas cepacia N1. *Journal of fermentation and bioengineering*, 77(1), 28-31.