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Isolation and Molecular Characterization of Lipase-Producing and Phosphate-Solubilizing Bacteria from Activated Sludge for Environmental Wastewater Management

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ABSTRACT

The disposal of lipid-containing organic waste and of excess nutrients into water bodies is becoming a serious problem in wastewater disposal and in environmental public health. The goal of the present study was the isolation, characterization and identification of lipase-producing bacteria (LPB) and phosphate-solubilizing bacteria (PSB) from municipal wastewater by classical microbiological techniques and by 16S rRNA gene sequences determination, and their possible applications for the environment. The physicochemical characteristics of wastewater were monitored over six months. Temperature (22.9 ± 1.8°C), pH (6.49–7.60), and dissolved oxygen (6.93 ± 0.20 mg/L) indicated suitable aerobic conditions. However, biochemical oxygen demand, BOD_5 (4.96 ± 0.12 mg/L), fats, oils, and grease, FOG (8.67 ± 4.18 mg/L), and sludge volume index, SVI (147.5 ± 75.5 mL/g) occasionally exceeded optimal ranges. Eight LPB isolates demonstrated lipolytic activity on tributyrin agar, whereas five PSB

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Nautiyal, C.S. (1999). An efficient microbiological growth medium for screening phosphate solubilizing microorganisms. *FEMS Microbiology Letters, 170*(1), 265–270. https://doi.org/10.1111/j.1574-6968.1999.tb13383.x

Nimkande, V.D., & Bafana, A. (2022). A review on the utility of microbial lipases in wastewater treatment. *Journal of Water Process Engineering*, 46, 102591. https://doi.org/10.1016/j.jwpe.2022.102591

Norman, M., Advinda, L., Chatri, M., & Handayani, D. (2025). Test of the Ability of Fluorescent Pseudomonas to Dissolve Phosphate. *Jurnal Biologi Tropis*, 25(4b), 681–687. https://doi.org/10.29303/jbt.v25i4b.11143

Okino-Delgado, C. H., Prado, D. Z. D., Facanali, R., Marques, M. M. O., Nascimento, A. S., Fernandes, C. J. D. C., Zambuzzi, W. F., & Fleuri, L. F. (2017). Bioremediation of cooking oil waste using lipases from wastes. *PLOS ONE*, *12*(10), e0186246. https://doi.org/10.1371/journal.pone.0186246

Pagu, M.V., Narayanan, A.S., Ponmurugan, K., & Jeya, K.R. (2013). Screening selection identification production and optimization of bacterial lipase from oil spilled soil. *Asian Journal of Pharmaceutical and Clinical Research*, 6(3), 62–67. http://www.ajpcr.com/Vol6Suppl3/155.pdf

Pan, L., & Cai, B. (2023). Phosphate-Solubilizing Bacteria: Advances in Their Physiology, Molecular Mechanisms and Microbial Community Effects. *Microorganisms*, *11*(12), 2904. https://doi.org/10.3390/microorganisms11122904

Pollution Control Department (PCD) (2005). *Notification of the Ministry of Natural Resources and Environment: Effluent standards for certain types and sizes of buildings*. Royal Thai Government Gazette. Vol. 122, Special Part 125 pp. 47-53. https://www.pcd.go.th

Pollution Control Department (PCD) (2024). *Notification of the Ministry of Natural Resources and Environment: Prescribing effluent standards for certain types and sizes of buildings B.E. 2567*. Royal Thai Government Gazette. Vol. 141, Special Part 238 pp. 26-33. https://www.pcd.go.th

Premono, M.E., Moawad, A.M., & Vlek, P.L.G. (1996). Effect of phosphate-solubilizing *Pseudomonas putida* on the growth of maize and its survival in the rhizosphere. *Indonesian Journal of Crop Science*, 11(1), 38–48.

Rich, S.L., & Helbling, D.E. (2024). Broad Microbial Community Functions in a

with potential bioremediation applicability. *Nepal Journal of Biotechnology*, *13*(1), 26–34. https://doi.org/10.54796/njb.v13i1.376

Singh, A., & Jain, R. (2024). Treatment of Domestic Wastewater Using Bio-Enzymes: A Review. *Archives of Current Research International*, 24(12), 147–154. https://doi.org/10.9734/acri/2024/v24i121004

Smibert, R.M., & Krieg, N.R. (1994). Phenotypic characterization. In P. Gerhardt et al. (Eds.), *Methods for General and Molecular Bacteriology*. pp. 607–654. American Society for Microbiology.

Sukplang, G., Narasettiti, C., Chunhachart, O., Srithaworn, M., Lorliam, W., Krajangsang, S., & Panyachanakul, T. (2024). Isolation and identification of lipase-producing bacteria from wastewater treatment pond for the removal of oil and grease in wastewater treatment. *Chiang Mai Journal of Science*, *51*(6), e2024096. https://doi.org/10.12982/CMJS.2024.096

Swarupa, V., Varghese, R., Gaonkar, B., Roopashree, R., & Subbulakshmi, G. (2024). Biocatalysts in remediation of wastewater. In A. R. Abraham, L. Sepúlveda Torre, T. Tatrishvili, & A. K. Haghi (Eds.), *Application of engineering principles and practices in biotechnology* (pp. 27–40). Apple Academic Press. https://doi.org/10.1201/9781003439929-3

Thongpoo, P. (2021). Isolation and screening of lipase-producing bacteria from oil-contaminated soil. *ASEAN Journal of Scientific and Technological Report*, 24(2), 1421–1430. https://doi.org/10.55164/ajstr.v24i2.242336

Umar, K., Umar, S., Parveen, T., Wei, O.C., & Rahat, R. (2024). Bioremediation of cooking oil waste by lipases. In *Enzymes in Oil Processing: Recent Developments and Applications*. pp. 83–101. Elsevier. https://doi.org/10.1016/b978-0-323-91154-2.00012-2

Verhoeven, M.D., Nielsen, P.H., & Dueholm, M.K.D. (2023). Amplicon-guided isolation and cultivation of previously uncultured microbial species from activated sludge. *Applied and Environmental Microbiology*, 89(12), e01151-23. https://doi.org/10.1128/aem.01151-23

Wang, C., Pan, G., Lu, X., & Qi, W. (2023). Phosphorus solubilizing microorganisms: potential promoters of agricultural and environmental engineering. *Frontiers in Bioengineering and Biotechnology*, 11, 1181078. https://doi.org/10.60692/pbmkf-d6842

Winkler, U.K., & Stuckmann, M. (1979). Glycogen, hyaluronate, and some other polysaccharides greatly enhance the formation of exolipase by *Serratia marcescens*. *Journal of Bacteriology*, 138(3), 663–670. https://doi.org/10.1128/jb.138.3.663-670.1979

Ye, M., & Li, Y.Y. (2023). Methanogenic treatment of dairy wastewater: A