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Analysis and optimization of polyhydroxyalkanoates production by environmental bacteria

Adhikari, Sandesh; Bhattarai, Saman; Shrestha, Roja; Shah, Shikha Shree; Kunwar, Usha
Bmc Microbiology

The versatile non-biodegradable material plastic has significantly enhanced innovation, but its production relies on fossil fuels and non-renewable resources, which causes severe pollution and ecosystem disruption.

Cited publication:

The Integration of Textile Wastewater Treatment with Polyhydroxyalkanoate Production by *Enterobacter* Strain TS3

Synthesis and Properties of Degradable Poly(3-hydroxybutyrate-co-3-hydroxyvalerate) [P(3HB-co-3HV)] from Waste Fish Oil

Volova, Tatiana G.; Kiselev, Evgeniy G.; Sukovatyi, Alexey G.; Zhila, Natalia O.; Sapozhnikova, Katerina
Polymers

The article presents the results of the first successful synthesis of degradable microbial copolymer of 3-hydroxybutyrate and 3-hydroxyvalerate [P(3HB-co-3HV)] by the wild-type strain *C. necator* B-10646 using waste fish oil.

Cited publication:

Utilisation of tuna condensate waste from the canning industry as a novel substrate for *Enterobacter* production

The genus *Halomonas*: A promising haloalkaliphilic bacterium for dye biodegradation in dye wastewater

Bogale, Fekadu Mazengiaw; Aragaw, Tadele Assefa
Journal Of Hazardous Materials Advances

The treatment of textile dye wastewater (WW) presents significant challenges, owing to its high salinity and presence of persistent synthetic dyes. Biological methods are considered the preferred ecofriendly approach.

Cited publication:

Enhanced immobilization efficiency of *Enterobacter* sp. TS3 on sugarcane bagasse and removal of dyes

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Analysis and optimization of polyhydroxyalkanoates production by environmental bacterial isolates from Nepal

By Adhikari, S (Adhikari, Sandesh) ; Bhattarai, S (Bhattarai, Saman) ; Shrestha, R (Shrestha, Roja) ; Shah, SS (Shah, Shikha Shree) ; Kunwar, U (Kunwar, Usha)

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Abstract The versatile non-biodegradable material plastic has significantly enhanced innovation, but its production heavily relies on fossil fuels and non-renewable resources, which causes severe pollution and ecosystem disruption, highlighting the urgent need for eco-friendly alternatives. Polyhydroxyalkanoates (PHA) are a class of bioplastics that offer a promising solution as biodegradable, environmentally compatible, and versatile biopolymer synthesized by microorganisms using various substrates, aiding in organic waste management. This study was

aimed to isolate and profile PHA producing bacteria from diverse sources such as soil, compost, landfill site, and sewage in Nepal. The initial screening of bacteria was performed by Sudan Black B dye, followed by secondary screening with the more specific Nile Blue A dye to detect PHA accumulation. Out of 343 isolates, 81 were confirmed positive for PHA production which were further processed for PHA extraction. The isolates Ht3d (12.76 +/- 1.854%), Nk3e (22.748 +/- 3.608%), Mn7d (14.24 +/- 2.223%), and Dg5c (14.952 +/- 3.401%) from soil, compost, landfill, and sewage respectively, showed the highest PHA accumulation and were biochemically identified as *Bacillus circulans*, *Bacillus subtilis*, *Staphylococcus aureus*, *Staphylococcus spp.*, respectively. The yield ratio for isolate Ht3d significantly increased by 2.74 fold under the optimal conditions (pH 7, 35 degrees C, and 48 h with glucose as carbon source) which was 34.99 +/- 5.61% having titer value of 0.82 g/L and production rate of 0.034 g/L/h with respect to 2.4 g/L of cell biomass. The production rate and dry cell weight of other isolates were also enhanced under different optimal conditions. The characterization of the produced biopolymer through UV-Visible spectrophotometry provided maximum absorbance at 232 nm and the FT-IR spectroscopy indicated the presence of O-H and C-H vibrations along with C = O, C-O-C stretching which collectively confirmed the presence of PHA.

Keywords

Author Keywords: Polyhydroxyalkanoates; Nile blue a; Sudan black b; Bioplastic; Plastic pollution

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