EFFECT OF VARIOUS LIMITING SUBSTRATES ON PHBV PRODUCTION BY RALSTONIA EUTROPHA

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ABSTRACT

PHAS ARE THERMOPLASTIC AND BIODEGRADABLE POLYMERS THAT ARE SYNTHESIZED WITH HYDROXYALKA -NOATES (HA) MONOMERS, AND CAN BE PRODUCED BY VARIOUS BACTERIA IN SOME SPECIFIC CONDITIONS .WITHIN THESE PHAS, PHB (POLYHYDROXYBUTYRATE) IS MOST WIDELY STUDIED.IN THIS STUDY, THE IN -FLUENCE OF MEDIA WITH DIFFERENT LIMITING SUBSTRATES (NITROGEN OR PHOSPHORUS) ON THE MICRO -BIAL GROWTH OF RALSTONIA EUTROPHA ATCC 17699 AND THE PRODUCTION OF PHB IN A BATCH FERMEN -TER AT VARIOUS TEMPERATURES (26, 30 AND 35℃) IS EXPLORED.CARBON SOURCE AND LIMITING SUB -STRATE (NITROGEN OR PHOSPHORUS) CONSUMPTION RATES ARE ALSO EXAMINED.WHEN LIMITING SUBSTRA -TES DEPLETED, BACTERIA CAN GET INTO THE PATHWAY OF PHB SYNTHESIS.THE YIELDS OF PHB IN BAC -TERIA INTRACELLULAR FOR DIFFERENT LIMITING SUBSTRATES ARE COMPARED.THE CULTURE CONDITION HAVING A HIGHEST MAXIMUM SPECIFIC GROWTH RATE (MM) HAS BEEN SELECTED FOR LATER STUDY IN A SEMI- CONTINUOUS FERMENTATION. A FLOW RATE OF 50 ML/H OF MEDIUM WITH EXTRA SODIUM PROPIO -NATE WAS FED INTO THE FERMENTER IN ORDER TO PROLONG THE PHBV ACCUMULATING PERIOD. REGARDLESS OF LIMITING NITROGEN OR PHOSPHORUS MEDIUM, HIGHER TEMPERATURES HAVE SIGNIFICA -NTLY SHORTENED THE GENERATION TIME OF R. EUTROPHA. WHEN CULTIVATED AT 35℃, MM WAS 0.24 76 H-1, TD WAS 2.80 H. SIMILARLY,MM (0.2769 H-1) AND TD (2.50 H) WAS ALSO THE HIGHEST AT 35℃ WHEN CULTIVATED IN A LIMITING PHOSPHORUS MEDIUM.IN A LIMITING NITROGEN MEDIUM FOR A B -ATCH CULTURE AT 35℃,PHB HAS REACHED ITS HIGHEST ACCUMULATION,THE PHB/BIOMASS RATIO BEING 75.6%, AT 64 H. FOR A BATCH CULTURE IN A LIMITING PHOSPHORUS MEDIUM AT 35℃,PHB HAS REACHE -D ITS HIGHEST ACCUMULATION,THE PHB/BIOMASS RATIO BEING 43.1%,AT 26 H. THE YIELD OF PHB FOR THE LIMITING NITROGEN MEDIUM,AT 30℃ YP/GLUCOSE = 0.41 G PHB/G GLUC -OSE.FOR THE LIMITING PHOSPHORUS MEDIUM AT 35℃,YP/GLUCOSE = 0.19 G PHB/G GLUCOSE.USING A FLOW RATE OF 50 ML/H TO FEED THE MEDIUM WITH NO PHOSPHORUS INTO A SEMI-CONTINUOUS FERMENTE -R,BECAUSE OF LACKING PHOSPHORUS, THE MICROBIAL GROWTH RATE TENDS TO DECLINE.THE HV/PHBV R -ATIO WAS ABOUT 11.3% (W/W) AND THE HB/PHBV RATIO 88.7% (W/W) FOR THE ENTIRE PROCESS.IF PH -OSPHORUS WAS ADDED IN THE MEDIUM, MICROBIAL GROWTH CAN BE SIGNIFICANTLY PROLONGED.HOWEVER ,THE HV/PHBV RATIO WAS ONLY 6.4% (HB/PHBV RATIO BEING 93.6%),AND THESE RATIOS MAY BE AFFEC -TED BY THE CONCENTRATIONS OF GLUCOSE AND SODIUM PROPIONATE IN THE MEDIUM.

Keywords : RALSTONIA EUTROPHA, LIMITING SUBSTRATE, SEMI-CONTINUOUS CULTURE, PHB, PHBV

Table of Contents

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