World Academy of Science, Engineering and Technology
International Journal of Bioengineering and Life Sciences
Vol:10, No:07, 2016

Ethyl Methane Sulfonate-Induced Dunaliella salina KU11 Mutants Affected for Growth Rate, Cell Accumulation and Biomass

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Abstract : Dunaliella salina has great potential as a system for generating commercially valuable products, including beta-carotene, pharmaceuticals, and biofuels. Our goal is to improve this potential by enhancing growth rate and other properties of D. salina under optimal growth conditions. We used ethyl methane sulfonate (EMS) to generate random mutants in D. salina KU11, a strain classified in Thailand. In a preliminary experiment, we first treated D. salina cells with 0%, 0.8%, 1.0%, 1.2%, 1.44% and 1.66% EMS to generate a killing curve. After that, we randomly picked 30 candidates from approximately 300 isolated survivor colonies from the 1.44% EMS treatment (which permitted 30% survival) as an initial test of the mutant screen. Among the 30 survivor lines, we found that 2 strains (mutant #17 and #24) had significantly improved growth rates and cell number accumulation at stationary phase approximately up to 1.8 and 1.45 fold, respectively, 2 strains (mutant #6 and #23) had significantly decreased growth rates and cell number accumulation at stationary phase approximately down to 1.4 and 1.35 fold, respectively, while 26 of 30 lines had similar growth rates compared with the wild type control. We also analyzed cell size for each strain and found there was no significant difference comparing all mutants with the wild type. In addition, mutant #24 had shown an increase of biomass accumulation approximately 1.65 fold compared with the wild type strain on day 5 that was entering early stationary phase. From these preliminary results, it could be feasible to identify D. salina mutants with significant improved growth rate, cell accumulation and biomass production compared to the wild type for the further study; this makes it possible to improve this microorganism as a platform for biotechnology application.

Keywords : Dunaliella salina, ethyl methyl sulfonate, growth rate, biomass
Conference Title : ICLSBE 2016 : International Conference on Life Science and Biological Engineering
Conference Location : Prague, Czechia
Conference Dates : July 07-08, 2016