The aim of the present study is to investigate the potential of flue gases to be efficiently and economically applied in production of algal biomass in a photobioreactor (PBR). Various microalgae strains (*Chlorella sorokiniana 211-234, Bracteacoccus minor 61.80, Radiosphaera negevensis 87.80, Chlorosarcinopsis negevensis 67.80 and Chlorococcum novae-angliae 5.85*) had been tested for CO_2 mitigation, growth and tolerance to high CO_2 levels. The flue gas and CO_2 bubbling induced a significant algal mass growth compared to control (ambient air). Removal of CO_2 and NO by the studied microalgae strains was found to be 44% and 33% along daily intervals, respectively. A growth rate of ~0.4g L^{-1} d^{-1} was obtained for all algal species tested. Growth conditions for tested algae can be optimised through PBR technology in order to obtain highest biomass yield for production of valuable biochemicals (i.e., low-cost biofuel).