ABSTRACT

Across the world, industrialization and the consequent emergence of economies reliant on fossil fuels have inevitably resulted in the adverse condition of atmospheric warming known as the greenhouse effect. Anthropogenic CO_2 has been identified as one of the major causes. This research focuses on investigating the possibility of exploiting the natural photosynthetic process in fresh-water South African microalgae in order to reduce CO_2 emissions, and in this way to create a more benign environment. In order to investigate the conditions that would make the large-scale cultivation of these microalgae possible, we first considered the factors that limit their growth. The research was carried out using batch cultures to study the effects on the microalgae of varying amounts of light intensity, photoperiod, and of concentrations of nitrogen and phosphate ions and CO_2. The results showed that growth was best at a light intensity of 10 000lux for 12 hours a day, or a photoperiod of at least 16 hours per day at 6 000lux. A maximum growth rate of 0.67 per day was obtained with an optimal ammonium nitrate concentration of 300mg/l. The species under investigation showed no tendency to discriminate between different types of nitrogen ions. The most favourable phosphate ion concentration was found to be 500mg/l, with a maximum growth rate of 0.84 per day. Feeding microalgae with CO_2 resulted in substantial growth, while a gas flow rate of 50ml/min of 100% CO_2 yielded a rate of 1.27 per day. However, the maximum growth rate of 2.0 per day was achieved with 5 while in10% CO_2 at 50ml/min.