

Optimization and evaluation of plant growth using laser light source and air flow simulation in plant factory

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Abstract

Present agricultural products have numerous problems, such as the necessity to meet food safety standards under environmental pollution, and to increase food production efficiency under the increasing population. In order to solve these problems, a plant factory will be required in the future. However, plant factories have a significant problem, particularly their high-cost. This study was focused on cost reduction by taking consideration of the following four topics: (1) laser diode illumination: by examining the length of lighting time using a laser with a wavelength of 660 nm that had ultra-short pulse irradiation might improve lighting and cost efficiency in the plant factory; (2) air flow simulations: improving productivity focusing on the effect of airflow simulation; (3) sterilization method: using a sterilization machine with no maintenance would be cost-effective in the long run; (4) bacteria counting method: estimating the number of bacteria by use of small potentiostat.