

**Title** Effects of TiO<sub>2</sub>/UV photocatalytic reaction on microbial safety and enzymatic activity of iceberg lettuce during storage

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### Abstract

**Introduction:** Improving quality and microbial safety of perishable food is currently a major preoccupation in the food industry. Proper disinfection methods without carcinogenic by-products need to be developed in order to improve the quality and increase the shelf-life of fresh product. Titanium dioxide (TiO<sub>2</sub>) photocatalytic reaction under ultraviolet (UV) irradiation offers useful bactericidal effects. TiO<sub>2</sub> is used widely due to its non-toxicity, chemical stability, and capability for repeated use with loss of catalytic activity. Hydroxyl radicals generated by the TiO<sub>2</sub>/UV reactions have strong oxidizing power, which can be applied to the disinfection of fresh produces. Therefore, we attempted to use a TiO<sub>2</sub>/UV photocatalytic reactor for the disinfection of iceberg lettuce and observed its quality changes during storage. **Materials and Methods:** The counts of microflora (total aerobic bacteria, coliforms, psychrotrophic bacteria, yeasts and molds) and food-borne bacteria (*E. coli*, *L. monocytogenes*, *S. aureus* or *S. typhimurium*) in inoculated iceberg lettuce were determined after TiO<sub>2</sub>/UV treatment, UV irradiation, sodium hypochlorite (NaOCl) solution, or tap water washing process for 20 min. The counts of microflora and browning enzyme activity of iceberg lettuce during storage at 4°C and 25°C were analyzed for 9 days. **Results and Discussion:** TiO<sub>2</sub>/UV treatments reduced the microorganisms in iceberg lettuce about 2.5-2.8 log CFU/g, compared to about 0.8-1.4 log CFU/g reductions by UV alone or NaOCl treatment. Treatment with tap water as a control showed no reduction. TiO<sub>2</sub>/UV treatment of iceberg lettuce showed a slower microbial growth rate during storage than UV irradiation, NaOCl, or tap water treatments. TiO<sub>2</sub>/UV treated samples showed significantly lower enzymatic activity than NaOCl-treated samples during storage. The TiO<sub>2</sub>/UV photocatalyst reaction showed significant bactericidal effects, indication that TiO<sub>2</sub>/UV photocatalytic treatment can be used as an alternative method to conventional disinfection process for controlling microorganisms in fresh produces.