

# Combined aqueous ozone and ultrasound application inhibits microbial spoilage, reduces pesticide residues and maintains storage quality of strawberry fruits

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## Abstract

Inappropriate use of pesticides and unhygienic supply chains contaminate fresh fruit and vegetables with health-hazardous micro-organisms and chemical residues. Here, combined efficacy of aqueous ozone and ultrasound to disinfect and decontaminate strawberry fruits from food-borne microbial pathogen and pesticide residues was evaluated. Strawberry fruits were exposed to either ozone (flow rate  $\geq 3.3 \text{ mg min}^{-1}$  for 125 g strawberry  $\text{L}^{-1}$  water) or ultrasound (40 kHz at 100 W) for 3, 6 and 9 min. Treatment of strawberry fruits with either ozone or ultrasound for 3 min effectively reduced bacterial survival by 44-fold and 17-fold, respectively, compared to control. Then, strawberry fruits were simultaneously treated with both ozone and ultrasound for 1, 2 or 3 min and stored at  $2 \pm 0.5 \text{ }^\circ\text{C}$  and 95% relative humidity for 12 days. Ozone and ultrasound treatment for 3 min was most effective in reducing bacterial survival (98%) and residues of various pesticides (98–99%) compared to control. Strawberry fruits treated with ozone and ultrasound for 3 min exhibited delay in fungal decay by 4 days and 4% reduction in weight loss during cold storage for 12 days. Also, gradual decline in total soluble solids, titratable acidity, pH, ascorbic acid and anthocyanins in cold-stored strawberry fruits was also hindered. Ozone and ultrasound treatment for 3 min also restrained 62% higher catalase, 52% higher peroxidase, and 70% higher superoxide dismutase in strawberry tissues compared to control after 12 days in cold storage. Thus, combined treatment of ozone and ultrasound for 3 min increased marketable life of strawberry fruits for 6 more days under cold storage conditions. Overall, results revealed a positive effect of ozone and ultrasound on disinfecting and decontaminating strawberry fruits along with extending their marketable life under cold storage conditions.