Discussion on the Effects of Plasma-Activated Water on the Disinfection and Storage Quality of Meat

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Abstract

In recent years, nonthermal processing techniques have shown significant microbial inactivation effects while maintaining product quality. Plasma-activated water (PAW) has been proven to be an effective and eco-friendly disinfectant. The reactive oxygen and nitrogen species (RONS) it generates, combined with its low pH, can inactivate food spoilage microorganisms .This study initially investigated the microbial changes and physicochemical properties of sea bream fillets treated with PAW. At a solid-liquid ratio of 1:5 and an immersion time of 20 minutes, the microbial groups, including total aerobic bacteria (TAB), yeast/molds, H_2S-producing microorganism, lactic acid bacteria (LAB), *Pseudomonas* spp., *Brochothrix thermosphacta*, and *Enterobacteriaceae* were reduced by 1.58, 3.95, 1.96, 2.25, 1.48, and 2.14 log CFU/g, respectively. In storage tests, the PAW-treated group demonstrated reduced microbial growth rates and lower total volatile basic nitrogen (TVBN) values, while preserving good color and hardness. The shelf life was extended by 60%, yielding superior results compared to treatments with deionized water and artificially prepared solutions. Next, we investigated the microbial changes and physicochemical properties of beef treated with PAW. There was no significant reduction in nutrients in the PAW-treated group. The PAW treatment enhanced the tenderness of the beef and reduced the degree of lipid oxidation. Effective inactivation was achieved with a 5.9 log reduction in the population of *Salmonella Typhimurium* and a 4 log reduction in the population of *E. coli* after exposure to PAW for up to 240 seconds and 300 seconds, respectively. In summary, the experiments described above demonstrate that PAW has a significant ability to inactivate pathogenic bacteria while preserving the quality and color of meat products, making it highly promising for food applications.