

学 位 論 文 要 旨	
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題 目	A Fundamental and Applied Study on the Antioxidant Property of Functional Water (機能水による抗酸化特性に関する基礎ならびに応用研究)
<p>Reactive oxygen radicals induce oxidative stress and increase the risk of lifestyle diseases (hypertension, diabetes, coronary heart disease, cancer, etc.). Antioxidants, which neutralize or destroy reactive oxygen radicals before they damage the DNA in cells, have become an essential part of life. Recently, a number of scholars have focused on exploring methods that can enhance the antioxidant activity. Moreover, some functional waters exhibit superoxide dismutase (SOD)-like activity. In the present research, a series of studies were conducted to investigate the antioxidant activity of functional water. Alkaline electrolytic water (AIEW) and its composition were verified from physicochemical measurements, and it was found that the pH and characteristic changes of the adjusted water produced some differences in the glass electrode pH meter (GpH meter) and colorimetric method. Therefore, the cause of the enhanced antioxidant activity of AIEW was evaluated by the WST-kit method depending on the generation conditions and constituent factors, and its antioxidant activity was compared with that of tourmaline treated water (TMW). The feasibility of functional water-enhanced antioxidant property was verified in food industry. By preparing the concentrated reconstituted juices, the antioxidant activity, processing and storage properties, and sensory evaluation of functional water-modified juices were investigated. Moreover, a novel functional silver ionized water (SIW) generated by microcurrent treatment (5 mA) was developed and its antioxidant properties were evaluated. The main conclusions of the present research are as follows. 1 Colorimetric pH (pH measured by colorimetric method) can be approximated by ionic pH (pH calculated from ionic concentration) while GpH has deviation from ionic pH. By comparing the glass electrode pH meter and the colorimetric method, it could be inferred that electrolysis promoted the dissociation of AIEW and increased the OH⁻ ion content. It was indicated that, as a solvent, the water itself was affected by the electrical treatment. 2 Physicochemical parameters of AIEW, pH (NaOH), EC (NaCl) and ORP (hydrogen bubbles) were not the main factors for AIEW to enhance the SOD activity of ascorbic acid (ASA). AIEW at electrolytic currents from 4 to 16 A and TMW at tourmaline stone treatment temperatures from 25 to 100 °C showed significant ascorbic acid antioxidant enhancement. The peak was reached at AIEW with an electrolytic current of 8A (89.67%) or TMW (94.25%) with a tourmaline stone treatment temperature of 75°C. 3 AIEW and TMW, two types of functional water, can enhance the antioxidant activity, increase sweetness, maintain sourness, and improve taste of juices. 4 AIEW-SIW and TMW-SIW generated by applying microcurrent to pure silver electrodes with AIEW and TMW as electrolytes can obviously enhance and maintain the stability of ASA antioxidant activity. In summary, functional water, especially those containing AIEW and TMW, can enhance the antioxidant activity of antioxidant substances and be used as a technique to extend the shelf life of products when used in beverages, which is beneficial to health as daily drinking water for long-term consumed.</p>	