

Effect of conventional heat and thermosonication treatments on broccoli (*Brassica oleracea* L.) total phenolic content

E.M.Gonçalves*¹, C. Alegria¹, M. Abreu¹, T.R.S. Brandão², C.L.M. Silva²
Departamento de Tecnologia das Indústrias Alimentares, INETI, Portugal¹
Escola Superior de Biotecnologia, UCP, Portugal²
[*elsa.goncalves@mail2.ineti.pt*](mailto:elsa.goncalves@mail2.ineti.pt)

Phenolic compounds constitute one of the most important groups of natural antioxidants, owing to their diversity and extensive distribution. Antioxidants can delay or inhibit lipids oxidation or other molecules by reducing the initiation or propagation of oxidative chain reactions. In human health, phenolic substances are associated to protection against coronary heart disease, cancer and neurodegenerative diseases. Fruit and vegetables are good sources of natural antioxidants, such as vitamins, carotenoids, flavonoids and other phenolic substances. Broccoli inflorescence is a particular important source of health promoting compounds.

Phenolic content of vegetables is influenced by technological treatments, thus affecting their stability, biosynthesis and degradation. Heat treatments are the most used methods for stabilising vegetables. However, they may degrade sensory attributes and nutritional properties. For such reason, a growing interest in non-thermal preservation methods, that promotes less quality losses, has been occurring.

In this work, the effect of conventional heat treatment and thermosonication (combined heat/ultrasound treatments) on total phenolic content in broccoli was studied in the temperature range of 70 to 90°C and 60 to 90°C, respectively. The thermosonication was conducted in an ultrasound equipment (Branson 3510) at 42 kHz and input power of 355 W.

Total phenolic content of fresh vegetable was 5.8 ± 0.2 mg/100g (as gallic acid equivalent). Both treatments affected significantly ($p < 0.05$) the total phenolic content as temperature increased. In both treatments, total phenolic degradation followed a zero-order reaction kinetics. The activation energies and the reaction rates at a reference temperature (80°C) were 20.5×10^3 and 70.3×10^3 Jmol⁻¹ and 0.2 and 0.4 min⁻¹, respectively for conventional heating and thermosonication.

The analysis of phenolic compounds degradation will hopefully be used in further studies aiming at optimizing conventional heat and thermosonication treatments.

Keywords: Broccoli, thermosonication, phenolic content, kinetics