
Application of pulsed electric fields as an alternative peeling method for tomatoes and kiwifruits

GIANCATERINO M. (1,2), JER H. (1)

1 Universität für Bodenkultur Wien (BOKU), Wien, Austria

2 FFoQSI - Austrian Competence Centre for Feed and Food Quality, Safety & Innovation, Tulln, Austria

The industrial transformation of fruits and vegetables typically require a peeling step. However, the current peeling methods (i.e., lye peeling and steam peeling) are not environmentally and energetically sustainable. The two main disadvantages are the disposal of caustic wastewater and the high energy and water consumption. This requires the development of peeling processes that minimize these adverse issues. In the present study, pulsed electric fields (PEF) were applied on tomatoes and kiwifruits in order to investigate an alternative peeling technique. In particular, monopolar exponential shape pulses with an electric field strength of 1.0 kV/cm, frequency of 2 Hz and pulse width of 101 μ s were applied. The resulting total energy input was in the range of 0.6 - 5.0 kJ/kg for tomatoes and 1.3 - 12.6 kJ/kg for kiwifruits. The performances of the PEF treatments were compared with two traditional peeling methods: blanching (98 °C, 60 s) and lye peeling (2 % NaOH, 98 °C, 45 s). The peeling ability performances were assessed by manual peeling, mechanical peeling, skin resistance to mechanical stress and weight losses. The quality of the peeled products was evaluated by mechanical properties of the pericarp, colour, ascorbic acid content, total carotenoids and polyphenols content and antioxidant activity. The PEF treatment on whole red tomatoes (1.0 kV/cm, 5.0 kJ/kg) and whole kiwifruits (1.0 kV/cm, 12.6 kJ/kg) led up to 43 % and 83 % decrease of force needed for mechanical peel removal, respectively. Compared to blanching and lye peeling, the performance of the PEF treatment resulted in comparable or better peeling ability and in the reduction of pericarp softening and product losses. However, the softening and the weight losses tend to increase by increasing the number of pulses for both the investigated matrices. Additionally, the samples pre-treated with PEF showed a better retention of the polyphenols content and the antioxidant activity compared with blanched and lye peeled samples. This study proved that PEF can be a promising non-thermal and eco-friendly technology to achieve a better peeling of fully ripe tomatoes and kiwifruits, without negatively affecting their final quality.