

Effect of non-thermal plasma treatment on structural properties of vital gluten reflecting on its functionality for breadmaking

BARROS J. (2), STEEL C. (1)

1 University of Campinas (UNICAMP), Campinas, SP, Brazil

2 Federal Institute of Acre (IFAC), Rio Branco, AC, Brazil

Vital gluten (VG) is an ingredient from wheat that is used to improve the technological quality of low-gluten wheat flour. Due to its production process, VG is usually of lower quality than the gluten of the flour that originated it. Non-thermal plasma (NTP) is an emerging technology, which studies have shown that has active species that can affect protein conformation and modify its functionality. In this work, a NTP system operating at 50 W (milder) and 150 W (stronger) power was used, with a flow rate of 5 L/min of argon gas and 10 min of treatment. Analyses to determine the percentage of unextractable protein polymer (% UPP), chemical interactions by solubility in different solvents, free sulfhydryl groups and disulfide bonds, and secondary structure by Fourier transform infrared spectroscopy (FT-IR) were used to evaluate the changes induced in the molecular structure of VG, and how they affect VG when it is developed. Solubility in different solvents, as well as the content of sulfhydryl groups, were altered after NTP treatment. The VGs treated by NTP showed higher solubility in dithiothreitol (DTT) reducing solvent and lower solubility in sodium dodecyl sulfate (SDS) detergent. The FT-IR analysis confirmed the conformational modification of VG, demonstrating the formation of random structures that, when resulting from milder conditions (50 W), were able to recover into more ordered structures when the VG had its gluten network developed, which would result in more elastic and stronger doughs. The unfolding effect of gluten proteins and the formation of aggregates have been suggested. The results confirmed that the treatment of VG with NTP at 50 W with a flow rate of 5 L/min of argon gas and 10 min can change the conformation of gluten proteins and provide more elastic doughs, revealing its potential for improving VG for breadmaking.