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COLD PLASMA TREATMENT AS A NON-THERMAL STRATEGY TO ENHANCE CHICKPEA FLOUR FOR PLANT-BASED FOODS

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Plasma is a medium of free positive and negative particles that is overall electrically neutral. Non-thermal plasma has emerged as a sustainable technology in food processing, with potential to improve quality and microbial safety. As starch is a major food component, there is growing interest in using plasma to tailor its functionality through interactions with reactive species [1].

This study examined the effect of short cold plasma treatments (5 and 10 s), applied at a fixed distance of 4 cm from the plasma source using the *Blown Arc*™ system, on the thermal, structural, and pasting properties of chickpea flour. Differential Scanning Calorimetry (DSC) was used to assess starch gelatinization, Fourier Transform Infrared Spectroscopy (FTIR) to evaluate short-range structural changes, and rheology was performed with a controlled-strain under temperature sweep conditions. The aim was to explore cold plasma as a green, non-thermal modification method for chickpea flour in plant-based (Pb) applications.

During heating, both elastic (G′) and viscous (G″) moduli increased above ~95 °C, consistent with starch gelatinization (Figure 1). Plasma altered this response: the 5 s treatment reduced G′ and G″ relative to the control, while the 10 s treatment increased them, suggesting stronger gel formation [2]. ATR-FTIR spectra showed no visible differences among samples, and band-ratio analysis (1047/1022, 1022/995 cm^{-1}) indicated only minor variations, implying no significant changes in short-range molecular order. DSC revealed higher onset, peak, and endset gelatinization temperatures in plasma-treated flours, indicating greater thermal stability and delayed gelatinization [3].

In conclusion, cold plasma modified the thermo-rheological behavior of chickpea flour without major structural disruption, highlighting its potential as a sustainable tool to enhance functionality in Pb systems.

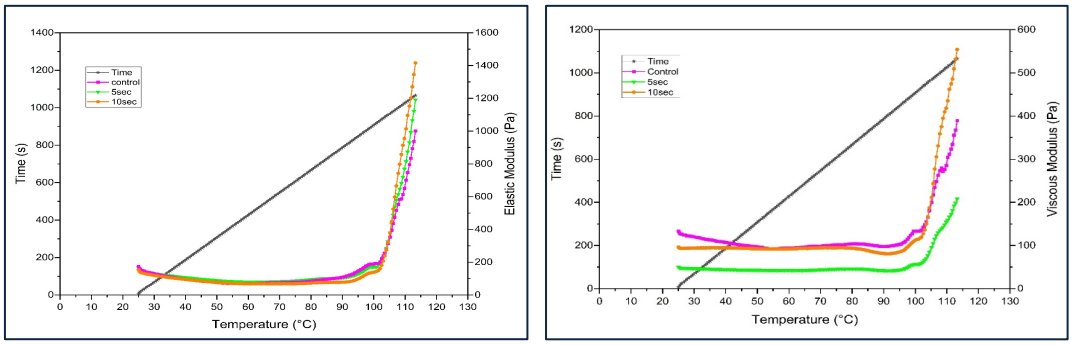

Figure 1 - Pasting properties of plasma-treated chickpea flours. Left: Elastic modulus (G′); Right: Viscous modulus (G″). Purple line: control; green line: 5 s treatment; orange line: 10 s treatment.

References

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