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Transglutaminase effects on the rheological characteristics of peanut flour dispersions

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Introduction: Peanuts (*Arachis hypogaea L.*) are a stable food commodity around the world. In the last few decades, peanut flour has been used as a food ingredient. Previously, microbial transglutaminase (TGase), an enzyme that catalyzes protein cross-linking via acyl-transfer reactions (1) was shown to modify functional properties of food systems including viscosity, solubility, and water holding capacity.

Objective: Characterization of rheological properties of roasted peanut flour-12% fat (PF) dispersions containing amidated pectin (AP) crosslinked with TGase.

Methods: Dispersions (20% w/w) were heated from 40° to 90ºC at 1°C/min and subsequently cooled to 40ºC while continuously monitoring rheological changes. Small strain rheological measurements were conducted under a stress of 1.5 Pa, frequency = 0.1 Hz, a value identified to be within the linear viscoelastic region. PF fractions (+/-) TGase and (AP) were analyzed with SDS-PAGE electrophoresis and the *O*-Phthaldialdehye assay (OPA).

Results: Figure 1 indicates TGase treated PF dispersions had increased gelling temperature (~78°C) after 7 hrs incubation compared to untreated samples (~68°C). Others have noted increased gelling temperature for whey and soy upon treatment with TGase (2, 3). Figure 2 showed PF (+) AP treated with TGase under incubation (24 hrs) resulted in formation of a high molecular weight polymers on the SDS-PAGE gel. OPA assay (Figure 3) showed ~10% coupling of PF after treatment with TGase PF dispersions prepared with AP after incubation for 6 hrs. AP was added to the dispersions to increase gel strength and water holding capacity.

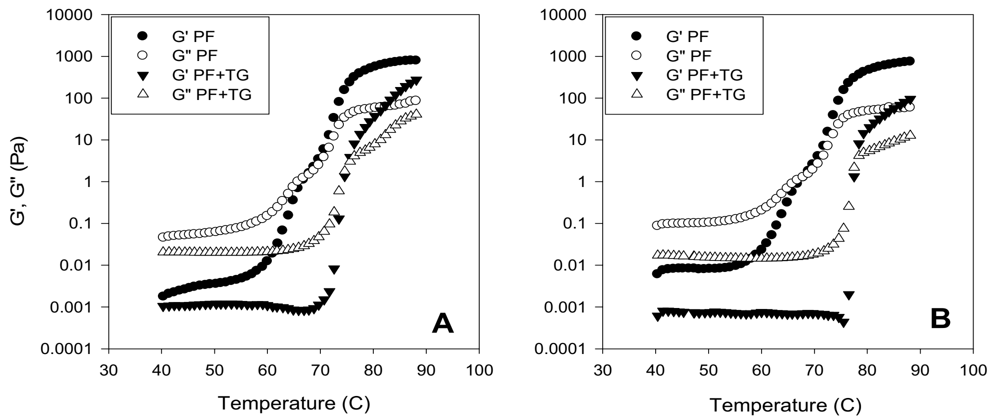

Figure 1: Small Strain Rheological Data (+/-) TGase with PF, pH 8.00. A = PF (+/-) TGase 0 hr incubation. B = PF (+/-) TGase 7 hr incubation.

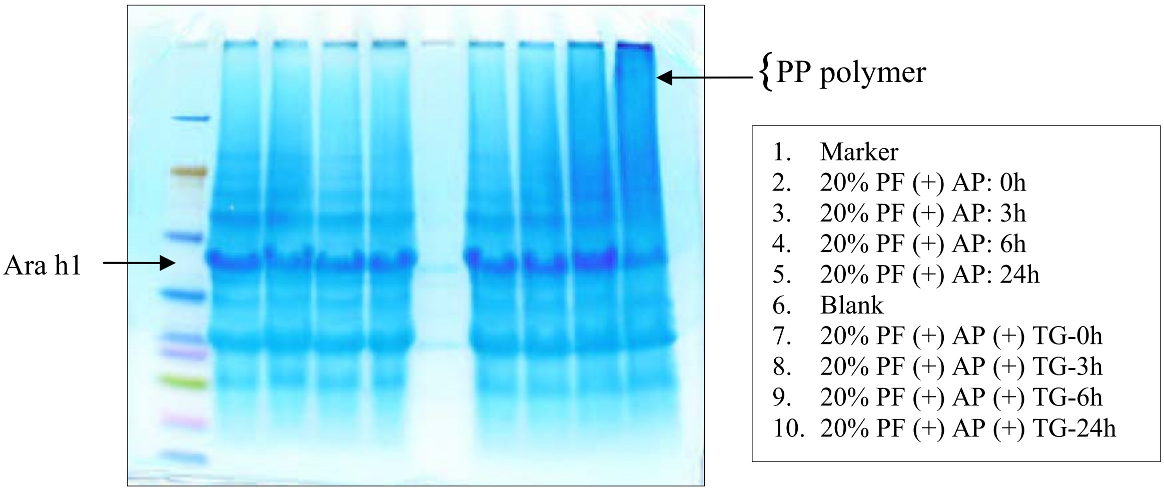

Figure 2: TGase Polymerization of PF (+/-) AP, pH 8.00

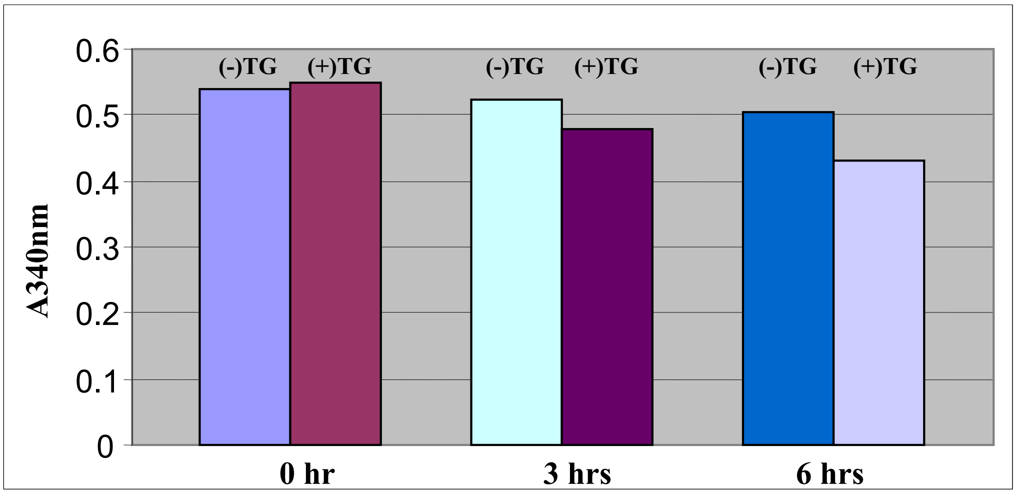

Figure 3: OPA analysis of PF containing AP (+/-) TGase after incubation at 37°C for 0-6 hrs.

Conclusion: In reporting the first effects of TGase on the rheological properties of PF dispersions: TGase treated PF dispersions had increased gelling temperature, PF (+) AP treated with TGase under incubation (24 hrs) resulted in formation of a high molecular weight polymers, and OPA assay showed ~10% coupling of PF after treatment with TGase PF dispersions.

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