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PTFOS

OLEOGELS BASED ON CELLULOSE MICROFIBRILS FROM COCOA BEAN SHELL

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INTRODUCTION

Widespread use of fats rich in trans and saturated fatty acids leads to cardiovascular diseases and obesity. Structuring oils into oleogels is a promising strategy for replacing unhealthy fatty acids with unsaturated ones. This study investigated oleogel production based on cellulose microfibrils isolated from the food industry by-product cocoa bean shell

MATERIALS AND METHODS

Ground cocoa bean shell was subjected to alkaline and bleaching treatments to remove lignin and hemicellulose. After isolation, the washed cellulose was treated with an ultrasonicator and then lyophilised. The resulting microfibrils were used as oleogelators. Oleogels were produced at a fixed oil-to-water ratio of 20:80 (v/v) by an emulsion-templated method. Emulsions composed of sunflower oil with 1%, 2%, and 4% lecithin and a water suspension of microfibrils (1% w/v), were dried and then sheared to form the oleogel structure. Thermal sensitivity of the oleogel structure was determined by incubation for 30 minutes in a water bath at 25, 50, and 70 °C, followed by decanting the supernatant after centrifugation. The linear viscoelastic region (LVR) was identified through amplitude sweep tests at a fixed frequency of 1 Hz, with strain amplitudes from 0.1 % to 100 %. The rupture strength of oleogels was determined at room temperature with a texture analyzer equipped with a cylindrical probe (SMS/20), which was penetrated 20 mm into the samples at a speed of 2 mm/s.

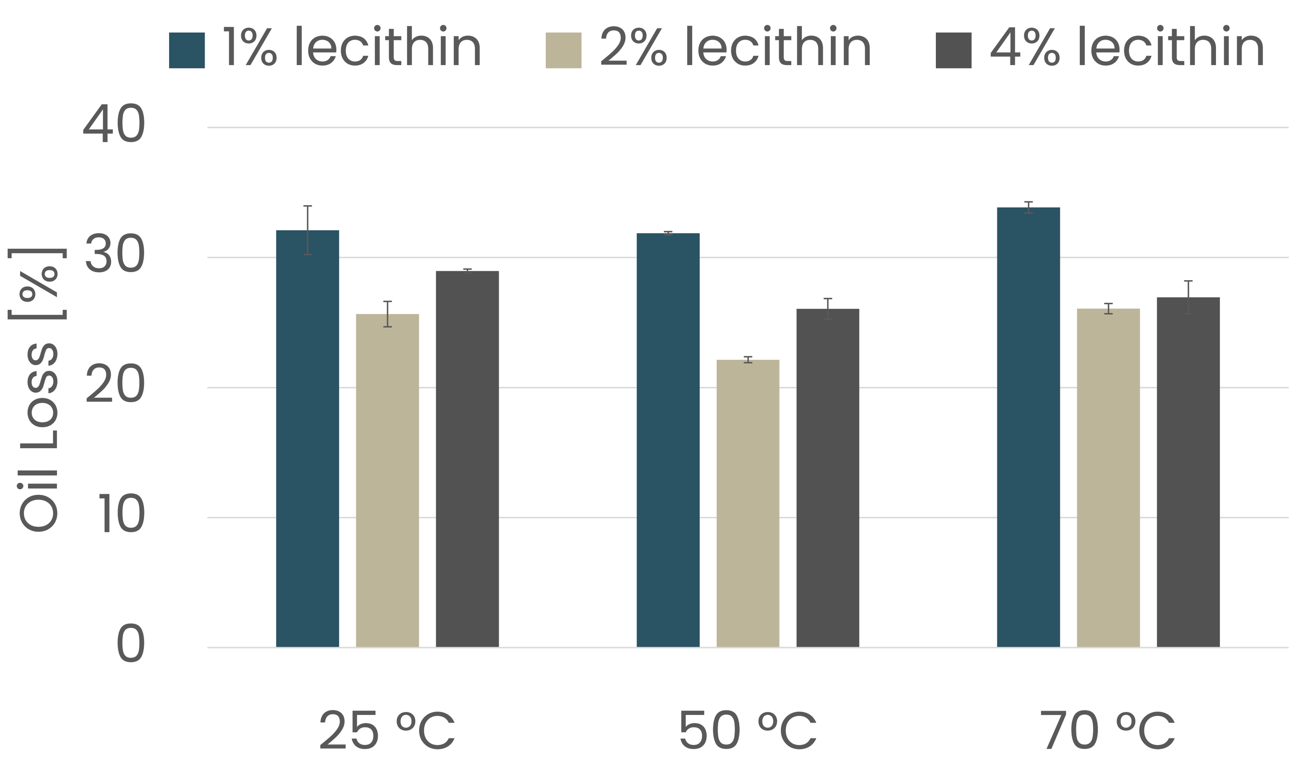

Figure 1. Oil loss from oleogels after incubation at different temperatures

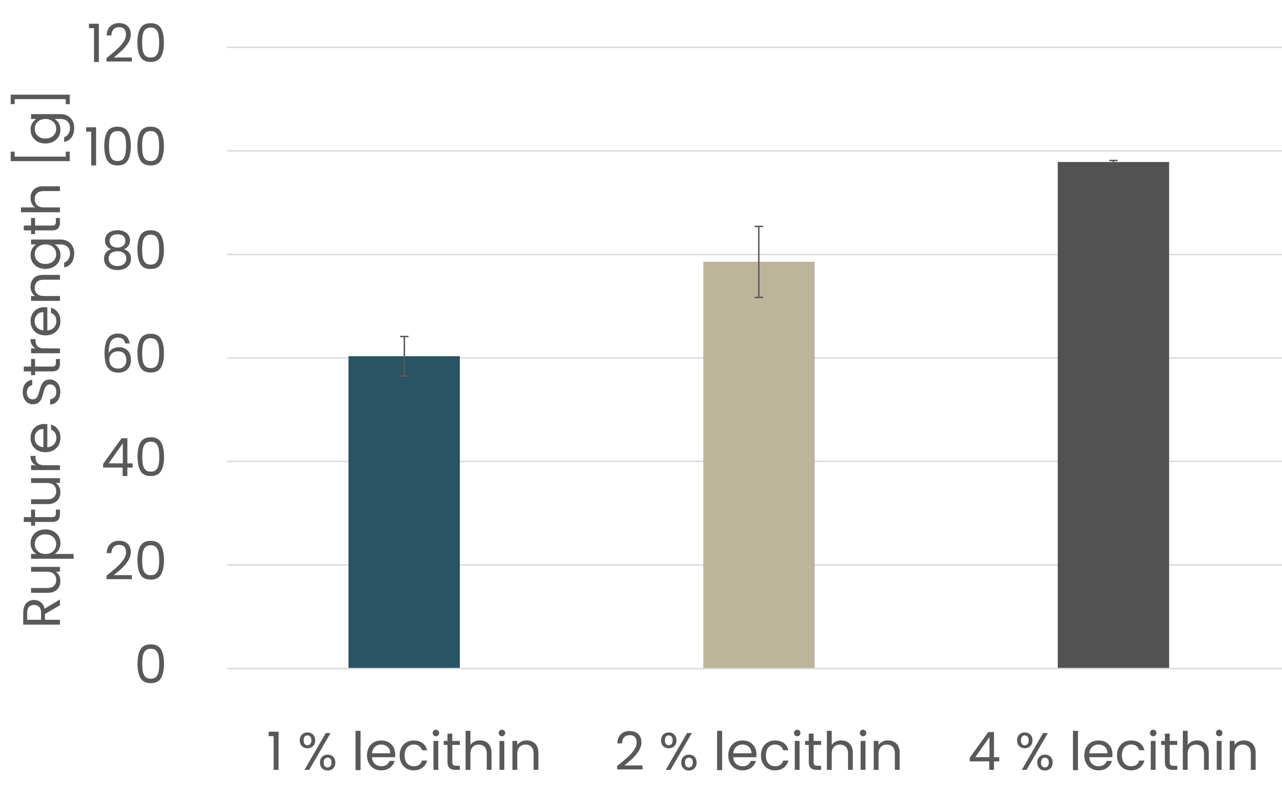

Figure 2. Rupture strength of analyzed samples

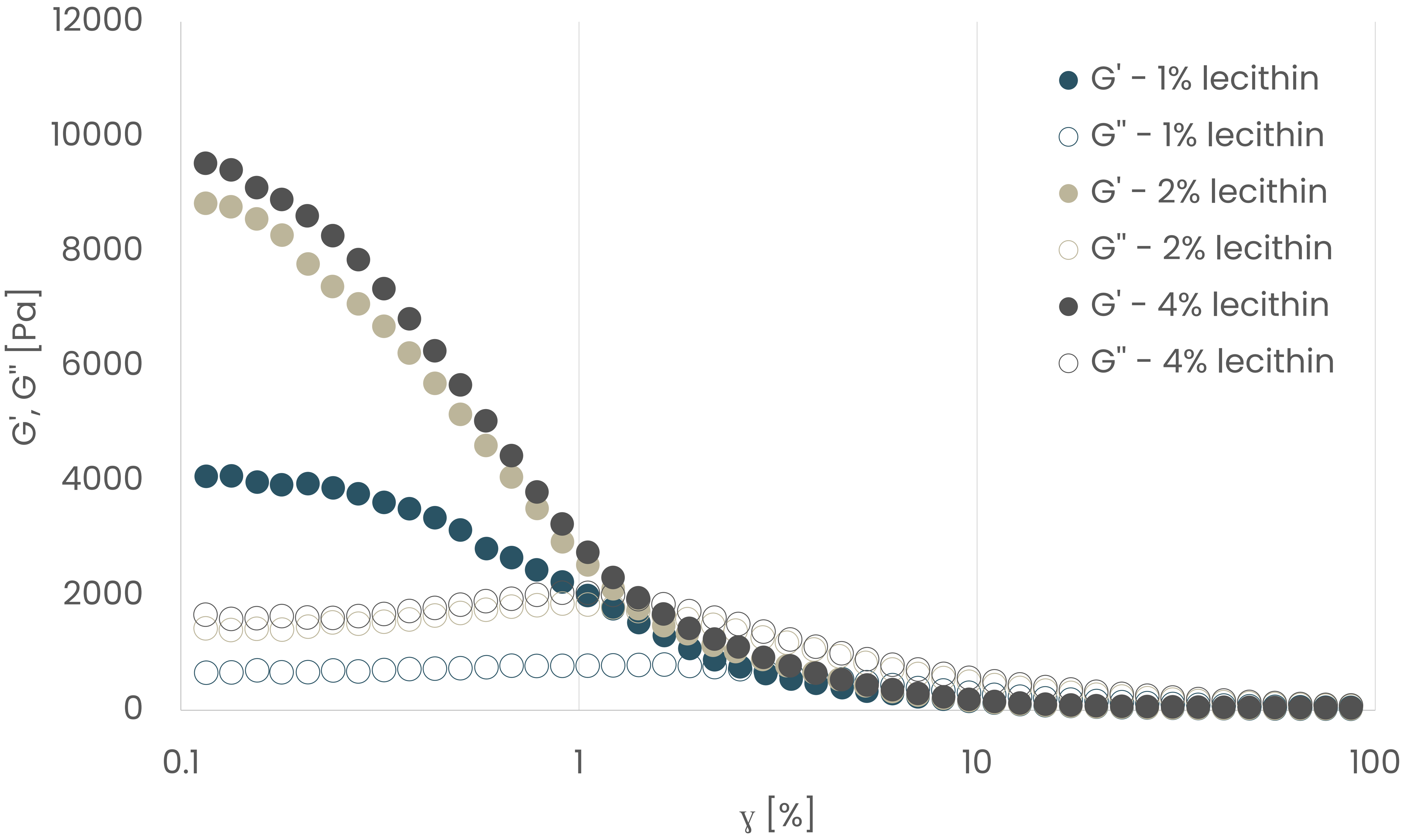

Figure 3. Amplitude sweep curves of oleogel samples with different lecithin concentrations

CONCLUSION

All oleogels remained thermally stable up to 70 °C, as oil loss did not change significantly with increasing temperature, indicating that the structure did not collapse at higher temperatures. In addition, the linear viscoelastic region (LVR) was not determined within the tested strain range (0.1–100%) (f = 1 Hz), indicating that the limit of the LVR was below 0.1% strain, which suggests that structural changes occur at small strains. Among all samples, the oleogel with the highest lecithin concentration had the highest rupture strength value (97.84 ± 0.31 g), showing that lecithin can improve mechanical properties of oleogels. This study demonstrated the potential of cellulose microfibrils as oleogelators, with lecithin acting as a synergist in strengthening the gel network.

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