# Characterization of mozzarella cheese analogue with reduced saturated fats using soybean oil and beeswax oleogels

*Zoha ali**

## Abstract

The excessive consumption of saturated fats has been linked to an increased risk of non-communicable diseases such as cardiovascular disease and type II diabetes. As a result, consumers increasingly seek healthier food options, prompting the food industry to explore innovative ingredients that enhance nutrition and functionality. Oleogels, structured gels made from plant-based oils, are emerging as promising alternatives to traditional solid fats in dairy products due to their ability to improve fat profiles by increasing unsaturated fatty acids and reducing saturated fats. Soybean oil was structured into oleogels with varying yellow beeswax concentrations and evaluated as a solid fat alternative for low-saturated-fat mozzarella cheese analogues. Oleogels showed reduced sensitivity to temperature changes compared to shortening. Replacing shortening with oleogels resulted in cheese samples with harder and more cohesive textures. Moisture content significantly varied across treatments ($p<0.05$), increasing with oleogel concentration: the control sample (T0) had 53.00% ± 0.007, while T3 had 57.32% ± 0.004. Microscopic analysis reveals that oleogel-based cheese displayed a dense droplet aggregation similar to the control, with increased beeswax content enhancing droplet density and crystal network formation. Textural analysis demonstrated that no significant differences were observed in adhesiveness, springiness, or cohesiveness. However, hardness values were significantly different ($p<0.05$), increasing from 7.09 ± 0.16 in T0 to 9.97 ± 0.11 in T3. Fracturability also showed a significant difference ($p<0.05$), with T0 at 6.89 ± 0.11 and T3 at 9.50 ± 0.40. The SFA/USFA ratio significantly decreased across all treatments ($p<0.05$), with T1 at 0.0122 ± 0.004 and T3 at 0.0289 ± 0.002, compared to 0.79 ± 0.02 in the control. Saturated fatty acid concentration dropped significantly with oleogels. Meltability slightly decreased from 83.75 mm in the control (T0) to 81.23 mm in the 4% oleogel sample (T1). L* values increased significantly ($p<0.05$) with oleogel, indicating a lighter appearance, while a* values remained consistent. b* values increased with oleogel concentration. This research provides insight into the possible uses of oleogels, a milk fat substitute with useful characteristics, in the production of mozzarella cheese.