



VIII. Symposium of Young Researchers on Pharmaceutical Technology, Biotechnology and Regulatory Science

28–30 January, 2026 – Szeged, Hungary

OP-24

DOI: [10.14232/syrptbrs.2026.49](https://doi.org/10.14232/syrptbrs.2026.49)

Influence of guar gum on the stability and thermorheological properties of soy protein isolate-stabilized oil-in-water emulsions



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The increasing demand for naturally derived alternatives to synthetic excipients, driven by the principles of "green pharmacy" and the extensive application of emulsions in pharmaceutical and cosmetic formulations, has increased interest in proteins and polysaccharides as emulsion stabilizers. In this context, soy protein isolate (SPI) and guar gum (GG) have demonstrated considerable potential.

Fifteen oil-in-water (O/W) emulsions containing jojoba, linseed or silicone oil stabilized with 3% SPI and 0-0.15% GG were prepared using a rotor-stator homogenizer. Organoleptic properties, pH and physical stability (centrifugal stress testing, temperature cycling and creaming index) were assessed. Rheological and thermorheological properties were determined from flow curves and amplitude, frequency, and temperature sweep tests. Additionally, three zinc oxide-containing emulsions (5% ZnO, 3% SPI and 0.15% GG) were prepared and characterized.

All emulsions exhibited acceptable organoleptic properties and pH values suitable for topical application. Formulations containing 0.15% GG demonstrated superior physical stability, with a pronounced influence of the oil phase type. Rheological characterization revealed rheopectic behavior dependent on GG concentration and oil phase type. Emulsions containing 0.15% GG were predominantly viscous and thermoresponsive, exhibiting a sol-gel transition temperature. ZnO incorporation increased elasticity and altered thermoresponsive behavior.

The combination of 3% SPI and 0.15% GG represent a promising approach for developing physically stable and thermoresponsive O/W emulsions, particularly jojoba oil-containing systems, suitable for topical therapeutic and cosmetic applications.

Acknowledgement

This research was funded by the Provincial Secretariat for Higher Education and Science, Autonomous Province of Vojvodina, Republic of Serbia (project No. 003877177 2025 09418 003 000 000 001).

