

**Solubility Enhancement, Formulation Development, And Antibacterial Activity of Xanthan-Gum-Stabilized Colloidal Gold Nanogel Of Hesperidin Against Proteus Vulgaris**

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The objective of the study was to develop a transdermal nanoformulation of hesperidin (HSP) against *Proteus vulgaris* (*P. vulgaris*). Based on the low water solubility of HSP, we prepared HSP-enabled AuNPs stabilized with xanthan gum (XA), referred to as HSP@XA@AuNPs. The HSP@XA@AuNP formulation was evaluated for particle size (43.16 nm), PDI (0.565), zeta potential (-31.9 mV), and entrapment efficiency (56.7%). The HSP@XA@AuNPs gel was developed by incorporating selected formulation grades into a 1% Carbopol gel base and characterized by physical evaluation and rheological studies. The color of the HSP@XA@AuNP gel was light pink, and the texture was very smooth and non-greasy. The gel was shown to be odorless. A field emission scanning electron microscope (FESEM) was used to investigate the shape of HSP@XA@AuNPs further. The drug release was 73.08% for the HSP@XA@AuNPs and 86.26% for the HSP@XA@AuNPs gel in 500 min. The prepared gel showed antimicrobial activity against *P. vulgaris* with an MIC of 1.78 µg/mL. In conclusion, the HSP@XA@AuNPs gel could be an advanced modality for treating *P. vulgaris*.