



Supplementary Figure 1. Time-dependent particle size analysis of hydrogel formulations over 36 hours. The graph compares the particle size of BG (Betaine-Gelatin), AG (Aloe vera-Gelatin), and BAG (Betaine-Aloe vera-Gelatin) formulations at various time points (0 hr to 36 hr). A gradual reduction in particle size is observed across all formulations, indicating progressive structural stabilization and crosslinking over time. BAG formulation exhibited the highest initial particle size, which significantly reduced by 24 hours, suggesting successful integration of all components.