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Optimizing ZIF-8 nanocomposite for Quercetin loading efficiency

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Abstract

Cancer is the second most common cause of mortality worldwide. Advanced drug delivery systems offer a targeted and efficient approach for improving cancer therapy outcomes while minimizing side effects. Zeolitic imidazolate frameworks (ZIFs) constitute a category of metal-organic frameworks (MOFs) distinguished by a zeolite-like architecture and the incorporation of imidazolate linkers. Zn^{2+}-based ZIF (ZIF-8) has garnered considerable attention within the biomedical domain owing to its minimal toxicity and favorable biocompatibility profile. Quercetin (Que) stands out as the most prevalent flavonoid, exhibiting potent antioxidant properties and a multitude of biological functions, including antimicrobial, antidiabetic, anticancer, and anti-inflammatory activities within the biomedical sphere. By conducting research, the Mechanochemical method was used for ZIF-8 nanocomposite at different times (8, 16, 24 h), while the amount of initial materials was the same in all three times. Proceeded the Que loading as a pharmacological agent at ratios of 1:1 and 2:1 (ZIF-8: Que). Based on the obtained results, the efficiency of ZIF-8 synthesis is directly dependent on the time of synthesis. Also, drug loading at lower ratios of quercetin, yielded superior outcomes.

Keywords: Antioxidant, Drug delivery, Optimization, Quercetin, Zeolitic imidazolate frameworks (ZIFs)