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Aqueous solubility and degradation kinetics of the phytochemical anticancer thymoquinone; probing the effects of solvents, pH and light

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Thymoquinone (TQ) is a potent anticancer phytochemical with confirmed *in vitro* efficacy. Its clinical use has not yet established, and very few reports have documented its formulation. There also are no reports about the aqueous solubility andstability of this valuable drug, despite their direct correlation with the in vivo efficacy. In the current research, it was established and validated a stability-indicating HPLC methodfor the detection of TQ and its degradation products under different conditions. It was then investigated the solubility and stability profiles of TQ in aqueous solutions. The stability study was aimed to determine the effect of pH, solvent type and light on the degradation process of TQ, along with the investigation of the kinetics of this degradation. The solubility of TQ varied in different aqueous solvents, and might be compromised due to stability issues. However, these findings confirm that the aqueous solubility is not the major obstacle for the drug formulations mainly due to the considerable water solubility (>500 μg/mL) that may be enough to exert pharmacologic effects if administered via parenteral route. Stability study results showed a very low stability profile of TQ in all the aqueous solutions with rapid degradation that varied with solvent type. The study of the degradation kinetics showed a significant effect of pH on the degradation process. The process followed first order kinetics at more acidic and alkaline pH values, and second order kinetics at pH 5-7.4, regardless of the solvent type. The results also expressed that light has a greater impact on the stability of TQ as a shorter period of exposure led tosevere degradation, independent of the solution pH and solvent type. Obtained results also addressed some discrepancies in previously published researches regarding the formulation and quantification of TQ with suggested solutions. Overall, the current study concludes that TQ is unstable in aqueous solutions, particularly at an alkaline pH, in addition to presenting severe light sensitivity. This data indicates the inappropriateness of aqueous solutions as pharmaceutical vehicles for TQ preparations. To the best of knowledge, this is the first study describing TQ aqueous solubility and stability that may lead to thedevelopment of a stable and effective TQ formulation.

Biography

Jumah Masoud Mohammad Salmani graduated with a Bachelor of pharmaceutical sciences at Baghdad University, Iraq 1998 and obtained his Masters and PhD degrees (Pharmaceutics) from China Pharmaceutical University in 2010 and 2014, respectively. He worked at Sammara Drug Industry (SDI) and at Al-Mustansiriya University, Baghdad Iraq. He has more than 7 publications and 2 patents on pharmaceutical sciences.

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