Quercetin (QT) is a plant polyphenol with various pharmacological properties. However, the low water solubility limits its therapeutic efficacy. In the present study, QT-loaded sodium taurocholate-Pluronic P123 (QT-loaded ST/P123) mixed micelles were developed and characterized, and the effect of the formulation on improving the water solubility of QT was investigated. QT-loaded ST/P123 mixed micelles were prepared by thin film hydration-direct dissolution and optimized by uniform design. The optimal formulation possessed high drug loading (12.6%) and entrapment efficiency (95.9%) in small (16.20 nm) spherically-shaped micelles. A low critical micelle concentration indicated that the micelles were stable, and they showed a sustained release pattern, as determined *in vitro* in simulated gastric fluid and intestinal fluid. Pharmacokinetic evaluation showed the C_{max} and AUC_{0-24} were 1.8-fold and 1.6-fold higher than the QT suspension. The present results indicate that QT-loaded ST/P123 micelles are potential candidates to improve the solubility and oral bioavailability of QT.