

Kinetics and Toxicological Effects of Kickxia elatine Extract-Based Silver Nanoparticles on Rat Brain Acetylcholinesterase

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Abstract : Purpose: The green synthesis of AgNPs has been favored over chemical synthesis due to their distinctive properties such as high dispersion, surface-to-volume ratio, low toxicity, and easy preparation. In the present work, the biosynthesis of AgNPs (KE-AgNPs) was carried out in one step by using the traditionally used plant Kickxia elatine (KE) extract and then investigated its enzyme inhibiting activity against rat's brain acetylcholinesterase (AChE) in vitro. Methods: KE-AgNPs were synthesized from 1mM AgNO₃ using KE extract and characterized by UV-spectroscopy, SEM, EDX, XRD, and FTIR analysis. Rat's brain acetylcholinesterase (AChE) inhibition activity was evaluated by the standard protocol. Results: UV-spectrum at 416 nm confirmed the formation of KE-AgNPs. X-ray diffraction (XRD) pattern presented 2θ values corresponding to the crystalline nature of KE-AgNPs with an average size of 42.47nm. The scanning electron microscope (SEM) analysis confirmed the presence of spherical-shaped and huge density KE-AgNPs with a size of 50nm. Fourier transform infrared spectroscopy (FT-IR) suggested that the functional groups present in KE extract and on the surface of KE-AgNPs are responsible for the stability of biosynthesized NPs. Energy dispersive X-ray (EDX) displayed an intense sharp peak at 3.2 keV, presenting that Ag was the chief element with 61.67%. Both KE extract and KE-AgNPs showed good and potent anti-AChE activity, with higher inhibition potential at a concentration of 175 µg/ml. Statistical analysis showed that both KEE and AgNPs exhibited non-competitive type inhibition against AChE, i.e., V_{max} decreased (34.17-68.64% and 22.29- 62.10%) in the concentration-dependent mode for KEE and KE-AgNPs respectively and while K_m values remained constant. Conclusions: KEE and KE-AgNPs can be considered an inhibitor of rats' brain AChE, and the synthesis of KE-AgNPs-based drugs can be used as a cheaper and alternative option against diseases such as Alzheimer's disease.

Keywords : Kickxia elatine, AgNPs, brain homogenate, acetylcholinesterase, kinetics

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