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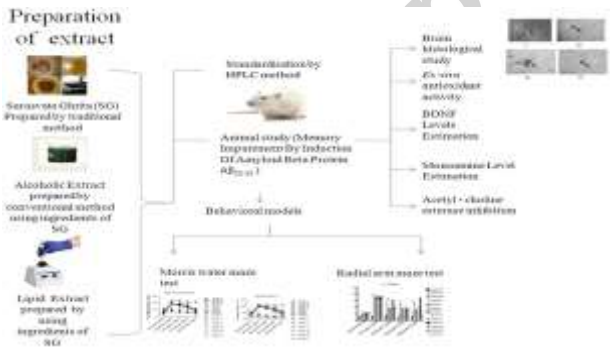
Abstract

Ethnopharmacological relevance Sarasvata ghrita (SG), a polyherbal formulation from ayurveda, an ancient medicinal system of India, has been used to improve intelligence and memory, treat speech delay, speaking difficulties and low digestion power in children. Aim of the study Study aimed to validate the ethno use of SG in memory enhancement through systematic scientific protocol. The effect of SG and modern extracts of ingredients of SG was compared on cognitive function and neuroprotection in amyloid-β peptide 25-35(Aβ25-35) induced memory impairment in wistar rats. Further the underlying mechanism for neuroprotective activity was investigated. Materials and methods SG was prepared as per traditional method, ethanolic extract (EE) was prepared by conventional method and lipid based extract was prepared by modern extraction method. All extracts were standardised by newly developed HPLC method with respect to marker compounds. SG, EE and LE were administered orally to male Wistar rats at doses of 100,200 and 400 mg/kg Body Weight by feeding needle for a period of 21 days after the intracerebroventricular administration of Aβ25-35 bilaterally. Spatial memory of rats was tested using Morris water maze (MWM) and Radial arm maze (RAM) test. The possible underlying mechanisms for the cognitive improvement exhibited by SG, EE and LE was investigated through ex-vivo brain antioxidant effect, monoamine level estimation, acetylcholine esterase (AchE) inhibitory effect and Brain-derived neurotropic factor (BDNF) levels estimation. Results SG, EE and LE were analysed by HPLC method, results showed that EE extract has high percent of selected phytoconstituents as compared with SG and LE. SG and LE decrease escape latency and searching distance in a dose dependant manner during MWM test.In case of RAM significant decrease in number of errors and increase in number of correct choices indicate an elevation in retention and recall aspects of learning and memory after administration of SG an LE. SG and LE extract can efficiently prevent accumulation of β-amyloid plaque in hippocampus region. There was increase in SOD, GSH, CAT and NO level and decrease in MDA levels in SG and LE administered animals. SG and LE have found to exhibit AchE inhibitiory activity and significant dose-dependent increase in BDNF level in the plasma. SG and LE significantly increased the levels of noradrenaline, dopamine and 5-hydroxytryptamine in the brain. Conclusion The study validated the neuroprotective activity of SG. The study concludes the extraction efficiency of SG for selected phytoconstituents is less than modern methods. However the neuroprotective activity of SG and LE was found to be greater than EE.

graphical abstract



Abbreviations

AD, Alzheimer's Disease; $A\beta_{25-35}$, Beta amyloid 25-35 protein; HPLC, high performance liquid chromatography; SG, Sarasvata ghrita; EE, Ethanolic extract; LE, Lipid based extract; MWM, Morris water maze; RAM, Radial arm maze; BDNF, Brain derived neurotrophic factor; ELISA, sandwich enzyme-linked ImmunoSorbent assay; AchE, Acetylcholinesterase, ICV, Intracerebroventricular route; SOD, Superoxide dismutase; GSH, Reduced Glutathione; NO, Nitric