

Evaluation of the protective effects of some Iranian medicinal plants against neurotoxin-induced apoptosis in neuronal cells

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Background and Aims: Oxidative stress plays an important role in neurodegenerative disorders such as Parkinson and Alzheimer's diseases. The induction of apoptosis in PC12 cells by hydrogen peroxide mimics the pathology induced by reactive oxygen species (ROS) in central nervous system and is a well-established cellular model of neurodegeneration. The aim of this study was to evaluate the protective activity of some Iranian plants in a neurodegenerative disease cellular model.

Methods: A total of 21 plants such as *Salvia* and *Stachys* species, which have shown significant biological effects in several studies, were selected. Two different extracts, methanolic 80% and dichloromethane extracts were prepared from plants. PC12 cells were used as neural cell models and apoptosis was induced by neurotoxin hydrogen peroxide (H₂O₂) in these cells. The ability of plant extracts in preventing cell damage was investigated by MTT method. Inhibitory effect of plants on the production of intracellular ROS was evaluated using 2', 7'-dichlorofluorescein-diacetate (DCFH-DA) method and also the effect on apoptosis caused by H₂O₂ in cells was evaluated using Annexin V-FITC/propidium iodide (PI) by flow cytometer.

Results: Methanolic extracts of *Carthamus oxyacantha*, *Salvia santolinifolia* and *Salvia sclarea* and also dichloromethane extracts of *Carthamus oxyacantha* and *Stachys pilifera* showed the greatest protective effect in the range of 10-100 µg/ml concentration in the methods of MTT and DCFH-DA. Also methanolic extracts of *Carthamus oxyacantha*, *Salvia santolinifolia* could inhibit apoptosis in these cells measured by flow cytometry. Extract of other investigated plants did not show significant effects.

Conclusions: These findings showed that the existing plants in Iran are rich source of useful compounds for prevention of cell damage induced by oxidative stress in neurodegenerative diseases.

Keywords: Plants; Medicinal; PC12; Neuroprotective; H₂O₂