Crocin decreased acrylamide – induced neurotoxicity in wistar rat through oxidative stress and apoptosis pathway


1Department of Pharmacodynamics and Toxicology, School of Pharmacy, Mashhad University of Medical Sciences, Mashhad, Iran
2Pharmaceutical Research Center, Department of Pharmacodynamics and Toxicology, School of Pharmacy, Mashhad University of Medical Sciences, Mashhad, Iran
3Pharmaceutical Research Center, Department of Medicinal chemistry and Department of Biotechnology, School of Pharmacy, Mashhad University of Medical Sciences, Mashhad, Iran
4Department of Pathology, Imam Reza Hospital, Mashhad University of Medical Sciences, Mashhad, Iran

Background and Aims: Acrylamide (ACR) is a water-soluble monomer that is used in different industries. ACR has been found in carbohydrate – rich food cooked at high temperatures. ACR monomer is a potent neurotoxic and damages the central and the peripheral nervous system in humans and animals. Crocin is an active and important compound of Crocus sativus L. (saffron). In different in vitro and in vivo models crocin has shown high antioxidant activity. Crocin can decrease ACR induced cytotoxicity in PC 12 cells via reduction of ROS production and decreased apoptosis. Therefore in this study neuroprotective effect of crocin in ACR induced neurotoxicity in wistar rats was investigated through evaluation of stress oxidative and apoptosis pathway.

Methods: Male wistar rats were treated with ACR (50 mg/kg ip) alone or with crocin (12.5, 25 and 50 mg/kg ip) for 11 days. Then molondialdehyde as a marker of lipid peroxidation and total glutathione were determined in cerebral cortex tissue. Caspase – 3, 8, 9, bax and bcl-2 protein expression was evaluated using Western blotting. Real time PCR was used for determination of bax and bcl-2 gene expressions.

Results: ACR increased level of MDA while reduced GSH level. Crocin in a dose-dependent manner prevented ACR induced lipid peroxidation (P< 0.001). In apoptosis pathway, ACR increased bax, caspase 3, 9 protein expression. There were not significant changes in bcl-2 and caspase 8 protein expression. RT- PCR results showed no changes in bax and bcl-2 gene expression. Crocin decreased apoptosis protein expression in a dose-dependent manner.

Conclusions: Oxidative stress and apoptosis played important role in ACR- induced neurotoxicity in rats. Treatment with crocin significantly reduced ACR neurotoxicity via suppression of lipid peroxidation and elevation of GSH content. Crocin decreased ACR- induced apoptosis especially through intrinsic apoptosis pathway.

Keywords: Crocin; Acrylamide; Stress oxidative; Apoptosis