



Ameliorative Effect of *Mentha spicata* on Dichlorvos-Induced Oxidative Stress in the Rat Brain

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Abstract: The present study was carried out to evaluate the protective role of aqueous extract of *Mentha spicata* (MSE) leaf on dichlorvos (DDVP) induced oxidative stress in rat brain. Male rats were divided into 4 groups, the first group served as control (C). Group (E1) received 5.33mg/Kg BW of DDVP and group (E2) received 5.33mg/Kg BW of DDVP with MSE (100.0 mg/kg) and the group (E3) received MSE (100.0 mg/kg). Rats under all the groups were treated with their respective constituents for 30 days. The results suggested that rats under E1 suffered from significant ($p < 0.01$) decline in the activity of superoxide dismutase, catalase, glutathione peroxidase with a significant elevation in the levels of malondialdehyde of their brain. Histological changes were also found to be prominent in the brain of E1 group as compared to others. Rats under E2 showed recuperation tendencies which were evidenced by partial restoration of antioxidant enzyme activity and the lesser degree of damage in histological aspect as compared to E1. No significant changes were observed in either biochemical constituents or histological aspects of rats under E3. The current study suggests that DDVP can cause oxidative damage and brain injury in male rats and co-administration of MSE with the selected dose partially attenuates the toxic effect caused by DDVP.

Keywords: *Mentha spicata*, Brain, Dichlorvos, Oxidative stress and Xenobiotics.

INTRODUCTION

Chemical contamination as a result of pesticide exposure in agriculture sector has been postulated as one of the major factors for the deterioration of natural fauna [1, 2].

Organophosphate pesticides (OPs) are the neurotoxin they inhibit acetylcholinesterase and pseudocholinesterase leading to the accumulation of acetylcholine and subsequent activation of cholinergic muscarinic and nicotinic receptors [3, 4]. Interference of these OPs in the human physiological system through consumption of contaminated foods, breathing air near pesticide applications and drinking pesticide contaminated water would cause negative effects in many organs, including the liver [5], heart [6], neuron [7] and respiratory dysfunction [8]. Dichlorvos [O, O-dimethyl-2, 2-dichlorovinyl phosphate (DDVP)] is one among the organophosphates, is extensively used to kill agricultural and veterinary pests [11]. DDVP has shown potential antagonist on the acetylcholinesterase (AChE) and cholinesterase (ChE) the enzyme that degrades the neurotransmitter ACh in cholinergic synapses, and disrupts nerve function activities, thereby loss of efficient neuron function in the nervous system [7, 9, 10]. DDVP is poisonous if inhaled, swallowed or absorbed through skin and eyes [11]. Exposure to high doses of DDVP leads to severe health effect; it includes headache, blurred vision, muscle tremors, breathing problems, coma and even death [12]. According to the

literature studies brain is very sensitive to DDVP [13, 14], it causes excessive generation of reactive oxygen species (ROS) and subsequently increased oxidative stress as well as neural cell death [14-17].

Currently, there is an increased demand for neuroprotective medicinal to overcome the xenobiotics induced neurotoxicity [18]. Many plants have medicinal property, which are enriched by antioxidants, which can play an important role in neutralizing free radicals and protect the key biomolecules such as DNA, proteins, and lipids by scavenging ROS [19]. *Mentha spp.* are a rich source of polyphenols and essential oil like carvone, limonene, dihydrocarvone [20-22], vitamin C, vitamin E and carotenoids, these acts as a strong antioxidant by neutralizing free radicals [23, 24]. A previous report shows *Mentha spp.* are well known folk remedy for treatment of several disorders [25]. According to recent pharmacological studies, *Mentha spp.* shows various biological activities, such as antiallergenic, antimicrobial, anti-inflammatory, antioxidant, antiviral, gastrointestinal protective, hepatoprotective, chemopreventive, anticancer and radioprotective activities [26, 61].