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Protective effect of *Moringa oleifera* on cypermethrin-induced neurotoxicity in albino rats

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Summary

Mitochondria are described as "powerhouse of the cell" because they produce most of the adenosine triphosphate (ATP) cellular supply. Mitochondria play a pivotal role in other metabolic activities, for example: Apoptosis, calcium signaling, regulation of the potential membrane and cell metabolism, , certain heme synthesis reactions and steroid synthesis.

Pesticides are heterogeneous chemicals group that have a significant impact on public health. CYP is a commonly used pyrethroid insecticide, that was investigated for mitochondrial dysfunction.

The present study was conducted to evaluate:

a) The possible sub-acute effects of CYP on mitochondrial dysfunction, apoptotic marker, genotoxicity, neurotoxicity and histopathological changes in brain rats.
b) Possibility of oxidative stress induced by CYP.
c) Possibility of protective role of *Moringa oleifera* as neuroprotectant agent to combination with CYP to minimize the adverse effect of CYP.

Experimental study, done on 60 male albino rats that were caged and fed under standard conditions, and divided into 6 groups according to the planned protocol of treatment.

Results obtained from this study indicated that:

1- Mitochondrial NADH dehydrogenase and ATPase activity in rats' brain in CYP exposed groups G2 and G3 were significantly reduced as compared with control group.
2- Apoptotic markers in brain tissue showed the brain caspase-3 activity and DNA fragmentation in CYP exposed groups G2 and G3 were significantly increased when compared with control group.

3- Oxidant/antioxidant status in brain tissue revealed significant increase in malondialdehyde and protein carbonyl levels but enzymatic antioxidants activities (superoxide dismutase and catalase) and glutathione related enzymes (glutathione, glutathione-s-transferase and glutathione peroxidase) in CYP exposed groups G2 and G3 were significantly decreased when compared with control group.

4- Result exhibited a significant decrease in AchE brain activity CYP exposed groups G2 and G3 when compared with control group.

5- Histopathological examination of the brain tissue observed changes (necrosis of neurons, neuronophagia of necrotic neurons, cellular oedema, focal cerebral hemorrhage and focal gliosis) in CYP exposed group G2 and (hemorrhage in the meninges, congestion of cerebral blood vessel, necrosis of neurons, neuronophagia of necrotic neurons and focal gliosis) in CYP exposed group G3 in comparison with tissues of organs of control group.

6- Co-treatment with *Moringa oleifera* leaves extract ameliorated the mitochondrial dysfunction, apoptotic markers, oxidative stress, neurotoxicity and histopathological changes induced by CYP in brain tissue.

7- Native gel electrophoresis of the SOD isozymes from rat brain, revealed reduction in the bands' density of SOD1 and SOD2 in CYP exposed groups G2 and G3 when compared with the control groups. Whereas, moringa extract treated groups G5 and G6 have an improvement in the bands' density of SOD1 and SOD2 as compared to G2 and G3 groups respectively. On the other hand, the band's density of SOD3 disappeared in CYP exposed groups G2 and G3 in comparison with the control group. After treatment with moringa leaves extract, the band's density of SOD3 appeared in G5 group but it still disappeared in G6 group when compared with the control group.