ABSTRACT OF PH. D. THESIS

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Title: Toxicological studies of chloropyrifos on various enzymes in albino rat and role of some plant extracts as antidotes

The research work entitled ‘Toxicological studies of chloropyrifos on various enzymes in albino rat and role of some plant extracts as antidotes’ was designed to ascertain the toxic effects of oral administration of chloropyrifos, an organophosphate pesticide, on liver and RBCs and to see the protective effects of *Commiphora mukul* (gugul), *Tinospora cordifolia* (gloe) and *Myristica fragans* (jayfal). Adult male rats of Wistar strain, weighing 120-180 g were randomly segregated into groups with each experimental group/subgroup having six animals. Corn oil was used as a vehicle for oral administration of Chloropyrifos. For plant materials (gum in case of *Commiphora mukul*, powdered stem in case of *Tinospora cordifolia* and powdered fruit in case of *Myristica fragans*), water was used as a vehicle. Control animals were administered corn oil only.

Chloropyrifos treated animals were further divided into 3 subgroups. subgroup I animals were administered with 10 mg chloropyrifos/kg b. wt., subgroup II animals were administered with 20 mg chloropyrifos /kg b. wt. and subgroup III animals 30 mg chloropyrifos /kg b. wt., with reference to the LD_{50} value of Chloropyrifos for 28 days. *Tinospora cordifolia* + Chloropyrifos treatment: Subgroup I, II and III animals were administered with 2.0 g/kg b. wt, 2.5 g/kg b.wt. and 3.0 g/kg b.wt. of *Tinospora cordifolia* along with 30 mg chloropyrifos /kg b. wt. respectively and subgroup IV ( 3.0 g/kg b.wt.) with *Tinospora cordifolia* only. *Commiphora mukul* + Chloropyrifos treatment: Subgroup I, II and III animals were administered with 150 mg/kg b.wt., 200 mg/kg b.wt and 250 mg/kg b. wt. of *Commiphora mukul* along with 30 mg chloropyrifos /kg b. wt. respectively and subgroup IV (250 mg/kg b.wt.) with *Commiphora mukul* only. *Myristica fragans* + Chloropyrifos treatment: Subgroup I, II and III animals were administered with 200 mg/kg b.wt., 300 mg/kg b.wt and 400 mg/kg b.wt. of *Myristica fragans* along with 30 mg
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chloropyrifos /kg b. wt. respectively and subgroup IV (400 mg/kg b.wt.) with Myristica fragans only.

A significant decrease in the activity of glutathione reductase, catalase, superoxide dismutase, acetylcholine esterase, lactate dehydrogenase, ATPase, acid phosphatase and increase in lipid peroxidation was observed with increase in concentration of chloropyrifos. On the basis of these results, 30 mg chloropyrifos /kg b. wt. was selected for the next set of experiments.

The increase in oxidative stress in terms of decrease in antioxidant enzymes such as glutathione reductase, catalase and superoxide dismutase by chloropyrifos dosing was then decreased to different levels by different concentration of Tinospora cordifolia, Comniphora mukul and Myristica fragans extracts. Chloropyrifos dosing significantly decreased the activity of acetylcholine esterase, lactate dehydrogenase, ATPase and acid phosphatase, which was increased to some extent by Tinospora cordifolia, Comniphora mukul and Myristica fragans dosing. There was an increase in lipid peroxidation due to chloropyrifos treatment and the extract of Tinospora cordifolia reduced the lipid peroxidation at doses of 2.5 g/kg b. wt. and 3.0 g/kg b.wt., but not in case of 2.0 g/kg b. wt., the extract of Comniphora mukul and Myristica fragans reduced it at all the concentrations. It can be suggested that Tinospora cordifolia and Comniphora mukul would be beneficial to chloropyrifos exposed individuals but Myristica fragans would be beneficial in lower dose concentration but not good when concentration is increased.

While comparing the performance of all the three antidotes at low, medium and high dose with respect to all the enzymes and LPO, taking the weighted cumulative performance indices into consideration, it was concluded that the antidote Comniphora mukul performed the best for all the three doses. Further analysis of the result showed that Tinospora cordifolia performed equally well, when antidote dose was high. However, for medium and low dose the performance of Comniphora mukul was far better than Tinospora cordifolia and Myristica fragans. Therefore, it can be concluded that Comniphora mukul is the best antidote against chloropyrifos poisoning.