Acetylcholinesterase from Puntius javanicus for the detection of carbamate and organophosphate

Abstract

A new alternative local source of acetylcholinesterase (AChE) has been found to be sensitive towards several insecticides. AChE was purified from the brain tissue of Puntius javanicus using affinity chromatography (procainamide hydrochloride coupled with sephacryl 6B) with the total recovery of 40% at 8.48 purification fold. All carbamate (CB) insecticides tested at the concentration of 1 mg/L were capable of lowering AChE activity to less than 30%; Bendiocarp (18.80%), carbaryl (5.96%), carbofuran (6.12%), methomyl (13.91%) and propoxur (15.851%). The P. javanicus AChE was found to be unaffected by several activated organophosphates (OP) such as acephate and dimethoate, while trichlorfon slightly inhibited the enzyme activity (p < 0.05). Chlorpyrifos, diazinon, malathion and parathion lowered AChE activity to 43.02, 40.97, 37.11 and 46.72%, respectively. Pesticides that inhibit AChE activities more than 50% were further tested in different concentrations to determine the half maximal inhibitory concentration (IC50). Carbofuran and carbaryl showed the lowest IC50 value at 0.035 and 0.031 mg/L, respectively, as both showed no significant differences (p < 0.05), followed by bendiocarp, propoxur, methomyl, malathion, diazinon, parathion and chlorpyrifos at 0.045, 0.076, 0.090, 0.063, 0.103, 0.151 and 0.202 mg/L, respectively. Based on these results, the sensitivity of AChE from brain P. javanicus brain tissue shows promise as an alternative biosensor for the detection of insecticides contamination.