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CHALLENGES IN CONTROLLING INSECT PESTS OF STORED GRAIN PRODUCTS IN SRI LANKA: INSIGHTS INTO INSECTICIDE METABOLIZING ENZYMES AND TARGET-SITE ALTERATIONS

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Sitophilus oryzae (rice weevil) and *Callosobruchus maculatus* (cowpea weevil) are major pests that cause severe post-harvest losses in stored grains in Sri Lanka. Awareness of the pesticide-resistant status is necessary since chemical control is the main pest management strategy practised in the country. This research aimed to determine the activity profiles of insecticide-detoxifying enzymes, carboxylesterases, monooxygenases, and glutathione S-transferases (GSTs), and alteration in the target-site, Acetylcholinesterase (AChE) in *Si. oryzae* and *Ca. maculatus.* Two hundred individuals from each species were subjected to bio chemical assays using standard procedures. Both species had higher amounts of carboxylesterases where the mean specific activity value for *Si. oryzae* (0.490 ± 0.06 μmol/mg/min) was higher than that of *Ca. maculatus* (0.104 ± 0.03 μmol/mg/min). Respectively, 86% and 92% of *Si. Oryzae* and *Ca. maculatus* had insensitive AChE target-sites. The development of resistance in both pests for the most commonly used organophosphates, malathion and pyrimiphose methyl might be due to these elevated levels of esterases and insensitive target-sites. Both populations had slightly higher GST levels [Mean specific activities for *Ca. maculatus* = 0.193 ± 0.001 mol/mg/min, *Si. Oryzae* = 1.425 ± 0.007 μmol/mg/min], which favours developing resistance against pyrethroids to a considerable level. The excessive use of organophosphates and deltamethrin as the main pesticides in controlling these pests is also evident by the presence of significantly elevated levels of monooxygenases (mean specific activity value for *Si. oryzae* = 0.784±0.021 μmol/mg/min for *Ca. maculatusc*= 0.350 ± 0.0032 μmol/mg/min). Results conclude that both *Si. oryzae* and *Ca. maculatus* populations have developed resistance mechanisms to thrive successfully against synthetic insecticides that belong to any group, making it extremely difficult to control their attack on rice and other stored grains. Therefore, the continuous effort towards novel and eco-friendly alternatives is essential to replace the currently used pesticides.

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