Multiple Insecticide Resistance in Culex quinquefasciatus Say, from Siliguri, West Bengal, India

Authors : Minu Bharati, Priyanka Rai, Satarupa Dutta, Dhiraj Saha

Abstract : Culex guinguefasciatus Say, is a mosquito of immense public health concern due to its role in transmission of filariasis, which is an endemic disease in 20 states and union territories of India, putting about 600 million people at the risk of infection. The main strategies to control filaria in India include anti-larval measures in urban areas, Indoor Residual Spray (IRS) in rural areas and mass diethylcarbamazine citrate (DEC) administration. Larval destruction measures and IRS are done with the use of insecticides. In this study, Susceptibility/ Resistance to insecticides were assessed in Culex quinquefasciatus mosquitoes collected from eight densely populated areas of Siliguri subdivision, which has a high rate of filarial infection. To unveil the insecticide susceptibility status of Culex quinquefasciatus, bioassays were performed on field-caught mosquitoes against two major groups of insecticides, i.e. Synthetic Pyrethroids (SPs): 0.05% deltamethrin and 0.05% lambda-cyhalothrin and Organophosphates (OPs): 5% malathion and temephos using World Health Organisation (WHO) discriminating doses. The knockdown rates and knockdown times (KDT50) were also noted against deltamethrin, lambda-cyhalothrin and malathion. Also, activities of major detoxifying enzymes, i.e. α -carboxylesterases, β -carboxylesterases and cytochrome P450 (CYP450) monooxygenases were determined to find the involvement of biochemical mechanisms in resistance phenomenon (if any). The results obtained showed that, majority of the mosquito populations were moderately to severely resistant against both the SPs and one OP, i.e. temephos. Whereas, most of the populations showed 100% susceptibility to malathion. The knockdown rates and KDT50 in response to above-mentioned insecticides showed significant variation among different populations. Variability in activities of carboxylesterases and CYP450 monooxygenases were also observed with hints of their involvement in contribution towards insecticide resistance in some of the tested populations. It may be concluded that, Culex quinquefasciatus has started developing resistance against deltamethrin, lambda-cyhalothrin and temephos in Siliguri subdivision. Malathion seems to hold the greatest potentiality for control of these mosquitoes in this area as revealed through this study. Adoption of Integrated mosquito management (IMM) strategy should be the prime objective of the concerned authorities to delimit the insecticide resistance phenomenon and filariasis infections.

Keywords : Culex quinquefasciatus, detoxifying enzymes, insecticide resistance, knockdown rate

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