

Studies on Knockdown Resistance Mutations in *Aedes aegypti* and *Aedes albopictus* in India

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Abstract : Background: Knockdown Resistance (KDR) is one of the mechanisms of insecticide resistance in insects caused by the reduced target site sensitivity i.e. voltage gated sodium channel (VGSC) rendering it less sensitive to the toxic effects of DDT and pyrethroids. In this study, we evaluated insecticide susceptibility and its underlying KDR mechanism in eight *Ae. aegypti* and five *Ae. albopictus* field populations. Methodology: Field population was collected from four different geographical regions of India covering 18 districts of ten states. For genotyping of twelve KDR alleles in *Ae. aegypti* field populations, three PCR based assays were used; with DNA sequencing; ASPCR; PCR-RFLP. Genomic DNA was isolated, and three partial domains (II, III, and IV) of VGSC were amplified and sequenced. Results: Molecular screening for common KDR mutations, revealed the presence of five mutations viz. S989P, V1016G, T1520I, F1534C/L. Two novel mutations were observed, first at T1520 (ACC) residue where a C > T substitution at the second position of codon results in amino acid change to Isoleucine (ATC). Second mutation was an alternative point mutation at F1534 (TTC) residue where a substitution of T > C at the first position of codon results in an amino acid change to Leucine (CTC). ASPCRs were not accurate, so three PCR-RFLP assays were developed for genotyping of five KDR alleles in *Ae. aegypti*; viz. T1520I, F1534C/L. Representative samples of all genotypes (n=200) were sequenced to validate the newly developed PCR based assays for *Ae. aegypti*. Genotyping results showed that 989P is linked to 1016G and novel mutation 1520I was always found with 1534C allele. Conclusion: Present study confirmed the presence of DDT and pyrethroid resistance among *Ae. aegypti* populations in India and for the first time reported KDR mutations in this species from India including two novel mutations. Results of present study lead us to infer that, at least five KDR mutations (S989P, V1016G, T1530I, F1534C, and F1534L) can be seen as a potential marker for DDT/pyrethroid resistance.

Keywords : F1534C, F1534L, S989P, T1530I, V1016G

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