

## STATUS KERENTANAN DAN MEKANISME RESISTENSI *Aedes aegypti* TERHADAP INSEKTISIDA DI PELABUHAN DUMAI

### INTISARI

**Latar belakang :** *Aedes aegypti* adalah vektor penyakit arbovirus secara global. Pengendalian vektor bertujuan untuk mengurangi populasi vektor melalui intervensi pada tempat perkembangbiakan. Kepadatan vektor dan status kerentanan terhadap insektisida di Pelabuhan Dumai belum diketahui. Informasi ini akan mendukung pelaksanaan pengendalian vektor berbasis bukti.

**Tujuan :** Penelitian ini bertujuan untuk menilai kepadatan dan status kerentanan *Ae. aegypti* terhadap insektisida. Mekanisme resistensi juga dianalisis menggunakan uji biokimia dan molekuler.

**Metode :** Nyamuk dikumpulkan melalui survei larva dan ovitrap. Nyamuk dipelihara hingga dewasa dan diuji menggunakan uji kerentanan standar WHO. Uji biokimia dilakukan untuk lebih memahami mekanisme metabolik resistensi insektisida. Amplifikasi dengan PCR dilakukan untuk mendeteksi mutasi asam amino pada gen *voltage-gated sodium channel* (VGSC) dan gen *Acetylcholinesterase-1* (AChE) dari nyamuk *Ae. aegypti*.

**Hasil :** Indeks entomologi berada di atas standar yang ditetapkan untuk pelabuhan oleh International Health Regulations tahun 2005. Resistensi terhadap temefos ditemukan dengan nilai RR 9,75 hingga 11,75. Kematian *Ae. aegypti* kurang dari 90% diamati pada deltametrin 0,05% dan permetrin 0,75%. Hasil uji biokimia menunjukkan bahwa aktivitas  $\alpha$ -esterase mengalami peningkatan. Mutasi V1016G/S989P (alel ganda) dan F1534C/V1016G/S989P (alel tiga) ditemukan pada *Ae. aegypti*. Sebaliknya, alel tipe liar G119 dari gen AChE ditemukan pada semua *Ae. aegypti*.

**Kesimpulan :** Tingkat infestasi *Aedes spp* yang tinggi menunjukkan risiko signifikan terhadap penularan penyakit arbovirus. *Ae. aegypti* sangat resisten terhadap temefos dan juga menunjukkan resistensi terhadap piretroid. Mutasi pada gen AChE tidak ditemukan namun ditemukan mutasi pada gen VGSC.

Kata Kunci : *Ae. aegypti*, Pengendalian Vektor, Insektisida, Resistensi

## SUSCEPTIBILITY AND INSECTICIDE RESISTANCE MECHANISMS of *Aedes aegypti* FROM DUMAI SEAPORT

### ABSTRACT

**Background :** *Aedes aegypti* is the main vector of the arbovirus disease globally. Vector control is mainly based on reducing the vectors population through intervention, which target potential breeding sites. However, in Dumai International Seaport, little is known about this vector's density and insecticide susceptibility status to support evidence-based implementation of control measures.

**Objective :** The present study aimed at assessing the density and susceptibility status of *Ae. aegypti* to various insecticides, and use biochemical and molecular assays to characterise resistance mechanism.

**Method:** Mosquito were collected in larval habitat surveys and through ovitraps. Mosquito reared to adult and tested using standar WHO susceptibility bioassays. Biochemical assays were conducted to further understand the metabolic mechanisms of insecticide resistance. Polymerase chain reaction (PCR) amplification conducted to detect amino acid mutations in paratype voltage gated sodium channel (VGSC) gene and Achetylcoline esterase-1 (AChE) gene of *Ae. aegypti* mosquitoes.

**Result :** All the entomological indices were above the critical level, prescribed for seaport by international health regulations Act, 2005. Resistance to temephos was observed, with RR values ranging from 9.75 to 11.75. Mortalities of *Ae. aegypti* were less than 90% observed against deltamethrin 0,05% and permethrin 0,75%. The results of biochemical assays showed the presence of  $\alpha$ -esterase elevated activity. V1016G/S989P (double allele) and F1534C/V1016G/S989P (triple allele) mutations were found in *Ae. aegypti*. In contrast, G119 wild type allele of AChE gene was found from all *Ae. Aegypti*.

**Conclusion :** High infestations level observed indicate significant risk of Arboviruses disease. *Ae. aegypti* is highly temephos resistant and also show of resistance againt pyrethroid. AChE gene mutation was not found. significant mutations were observed in the VGSC gene.

*Key Words : Ae. aegypti, Vector Control, Insecticide, Resistance*