

## DETEKSI MUTASI V1016G PADA GEN VGSC PADA POPULASI *Aedes aegypti* YANG RESISTEN TERHADAP INSEKTISIDA SIPERMETRIN DI KEDUNGmundu, SEMARANG

### INTISARI

**Latar Belakang:** Resistensi terhadap insektisida golongan piretroid terutama sipermetrin sudah banyak ditemukan pada populasi *Aedes aegypti*, secara genetik umumnya ditandai dengan adanya mutasi titik pada gen penyandi VGSC.

**Tujuan:** Mengetahui status entomologi, status resistensi dan mendeteksi mutasi V1016G pada nyamuk *Aedes aegypti* yang resisten terhadap sipermetrin di Kelurahan Kedungmundu, Semarang.

**Metode:** Penelitian deskriptif dengan rancangan *cross sectional*. Nyamuk *Ae. aegypti* diperoleh dengan pemasangan *ovitrap* dan *single larva* yang dikolonisasi dari RW 1, 2, 3, dan 4 di Kelurahan Kedungmundu (6°50'- 0°10' LS dan 109°35'- 110°50' BT) pada bulan Maret-Mei 2022. Indikator entomologi dianalisis menggunakan data survei entomologi (*Ovitrap index*, *Larva index*, dan *Maya index*). Status resistensi diuji menggunakan metode CDC *bottle bioassay* dan deteksi mutasi V1016G menggunakan metode AS-PCR dan *sequencing*, lalu divisualisasi menggunakan elektroforesis.

**Hasil:** Nilai OI 50-89,29%, nilai LI (HI 0-14,29%; CI 0-4,32%; BI 0-14,29%; dan ABJ 85,71-100%), nilai MI (rendah 35,71-100%, sedang 0-55,38%, dan tinggi 0-11,9%). Status resistensi nyamuk *Ae. aegypti* terhadap sipermetrin adalah resisten dengan nilai mortalitas 0-2,6%. Mutasi V1016G heterozigot terdeteksi pada 39 sampel dari 40 sampel menggunakan metode AS-PCR, lalu dilakukan validasi menggunakan *sequencing* dan hasilnya berbeda.

**Kesimpulan:** Hasil analisis status entomologi, berdasarkan nilai OI, LI, dan MI berturut-turut menunjukkan: kepadatan nyamuk dalam kategori tinggi di seluruh lokasi penelitian; kepadatan jentik dalam kategori sedang di RW 2, 3, dan 4, sedangkan RW 1 bebas jentik; dan lokasi penelitian memiliki tingkat resiko yang rendah sebagai tempat berkembang biak nyamuk *Aedes* sp. serta memiliki tingkat kebersihan yang baik. Status resistensi nyamuk *Ae. aegypti* terhadap sipermetrin adalah resisten. Mutasi V1016G ditemukan di seluruh lokasi penelitian. Terdapat perbedaan hasil antara menggunakan metode AS-PCR dengan metode *sequencing*.

**Kata kunci:** *Aedes aegypti*, AS-PCR, indikator entomologi, mutasi V1016G, resistensi, sipermetrin.

## DETECTION OF THE V1016G MUTATION IN THE VOLTAGE-GATED SODIUM CHANNEL (VGSC) GENE IN *Aedes aegypti* RESISTANT TO CYPERMETHRIN INSECTICIDES IN KEDUNGmundu, SEMARANG

### ABSTRACT

**Background:** the resistance to cypermethrin insecticide commonly found in the population of *Aedes aegypti*, was genetically characterized by the mutation of points in gene-coding VGSC.

**Objective:** to figure out both entomological and resistance status as well as to detect the mutation of V1016G in *Aedes aegypti* mosquitoes resistant to cypermethrin in Kedungmundu, Semarang.

**Method:** a descriptive study with a cross-sectional design. *Aedes aegypti* mosquitoes were collected by installing ovitrap and single larva colonized from four community units (known as RW/*Rukun Warga*) in Kedungmundu (6°50'-°10' of South Latitude and 109°35'- 110°50' of East Longitude) from March to May 2022. The entomological indicators were analyzed using the entomological survey data (Ovitrap index/OI, Larva index/LI, and Maya index/MI). The resistance status was tested using a CDC bottle bioassay method, while the mutation of V1016G was detected using AS-PCR and sequencing method further visualized using electrophoresis.

**Results:** the value of OI was 50%-89.29%, the value of LI (HI was 0%-14.29%; CI was 0%-4.32%; BI was 0%-14.29%; and ABJ was 85.71%-100%), and the value of MI (was low at 30%-51.43%, medium at 34.29%-45.24%, and high at 14.29%-30%). The resistance status of *Aedes aegypti* mosquitoes to cypermethrin was with the mortality rate of 0%-2.6%. Meanwhile, the mutation of V1016G was detected in 39 samples; yet, no mutation (V/V) was only found in 1 sample, and validated using sequencing with differences in results.

**Conclusion:** The analysis results on entomological status respectively based on the values of OI, LI, and MI showed that the mosquito density in all research locations was classified into high category, larval density was classified into medium category in community unit 2, 3, and 4, yet no larvae was found in community unit 1. Thus, the research locations had the low risk level as *Aedes aegypti* mosquitoes' breeding sites and were classified having good cleanliness. The status of *Aedes aegypti* was resistant to cypermethrin. In addition, the mutation of V1016G was detected in most research locations. There were differences in results between using the AS-PCR method and the sequencing method.

**Keywords:** *Aedes aegypti*, AS-PCR, cypermethrin, entomological indicators, resistance, mutation, V1016G