Pengaruh Eugenol dan Piperin terhadap Mortalitas, Aktivitas Enzim Detoksifikasi, dan Kelainan Histopatologi Midgut dari Larva Aedes aegypti L (Diptera: Culicidae) = Effects of Eugenol and Piperine on Aedes aegypti L (Diptera: Culicidae) Larvae Mortality, Detoxification Enzymes Activity, and Midgut Histopathological Changes

Ayleen Huang, author

Abstrak

Minyak esensi dari tanaman telah terbukti dapat membunuh larva nyamuk. Penelitian ini mengevaluasi aktivitas larvisida dari minyak esensi eugenol dan piperin terhadap larva Aedes aegypti serta mekanismenya meliputi detoksifikasi enzim dan perubahan histopatologi. Bioassay larva Ae. aegypti instar III-IV terhadap eugenol dan piperin konsentrasi 1, 5, 10, dan 30 ppm dilakukan mengikuti protokol WHO selama 72 jam dengan ulangan 5 kali. Larva yang mati diperiksa dengan pemeriksaan histopatologi HE rutin. Evaluasi aktivitas enzim detoksifikasi: AChE, GST, dan oksidase dilakukan mengikuti protokol CDC. Piperin memperlihatkan toksisitas yang lebih baik dibandingkan eugenol dengan persentase mortalitas lebih tinggi serta nilai LC50 dan LC90 lebih rendah. Piperin dan eugenol terbukti menghambat aktivitas AChE dan oksidase ($p < 0.05$), sedangkan pengaruhnya terhadap GST tidak bermakna. Piperin dan eugenol mengakibatkan kerusakan masif pada midgut larva meliputi kerusakan food bolus dan membran peritrofik, terputusnya lapisan epitel, serta perubahan sel epitel dan mikrovili.

.....Essential oils from plants were proven to kill mosquito larvae. This research evaluates larvicidal properties of essential oils piperine and eugenol against Aedes aegypti larvae with its mechanism in detoxification enzymes and histopathological changes. Bioassay of III-IV instar Ae. aegypti larvaes exposed to eugenol and piperine with concentration of 1, 5, 10, and 30 ppm was conducted according to WHO protocol for 72 hours with 5 replications. The dead larvae went through routine histopathology H&E examination. Evaluation for detoxification enzymes activity: AChE, GST, and oxidase was conducted according to CDC protocol. Piperine exhibited better toxicity compared to eugenol with higher mortality percentage and smaller LC50, LC90 values. Piperine and eugenol were proven to inhibit AChE and oxidase activity ($p < 0.05$), but not GST activity. Both substances caused massive destruction to larvae midgut including degradation of food bolus and peritrophic membrane, discontinuity of the epithelium layer, irregular epithelium cell and microvilli shape.