Uji aktivitas insektisida ekstrak metanol rimpang curcuma domestica val yang mengandung nanokomposit Ag-TiO2 terhadap larva dan nyamuk dewasa aedes aegypti = Effect of curcuma domestica rhizome extract on the mortality of aedes aegypti

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Abstrak

Latar Belakang: Penyakit demam berdarah dengue (DBD) ditularkan oleh vektor nyamuk A. aegypti dengan tingkat mortalitas manusia yang tinggi disertai dengan peningkatan resistensi terhadap insektisida sintesis akibat penggunaan yang berlebih. Salah satu upaya menurunkan penularan ini dengan pengendalian vektor DBD dengan metabolit sekunder aktif dari tanaman kunyit (Curcuma domestica) dan nanokomposit AgTiO2.
Tujuan: penelitian ini untuk menganalisis aktivitas insektisida ekstrak methanol rimpang C.domestica dan nanokomposit AgTiO2 terhadap larva dan nyamuk dewasa A. Aegypti.
Metode: Penelitian eksperimental yang terbagi menjadi dua subjek perlakuan : 1) Larva Instar III dan IV yang dipaparkan dengan ekstrak (Konsentrasi 500, 1000, 1500, 2000, dan 2500 ppm), nanokomposit AgTiO2 (Konsentrasi 5, 10, 15, 20, dan 25 ppm), dan campuran ekstrak methanol rimpang C.domestica (Konsentrasi 500, 1000, 1500, 2000, dan 2500 ppm) dengan nanokomposit (25 ppm) diulang sebanyak lima kali; 2) Nyamuk dewasa A. Aegypti yang dipaparkan dengan ekstrak methanol rimpang C. domestica (Konsentrasi 2500, 5000, 10000, dan 20000 ppm), nanokomposit AgTiO2 (Konsentrasi 5000, 10000, 20000, dan 30000 ppm), dan campuran ekstrak methanol rimpang C.domestica (Konsentrasi 2500, 5000, 10000, dan 20000 ppm)dengan nanokomposit (30 ppm) diulang sebanyak tiga kali.
Hasil : Pada jam keempat, mortalitas larva 100% pada 2500 ppm dengan LC 50 dan LC9044.6 dan 586.3 ppm. Pada jam keenam, kematian nyamuk dewasa mencapai 100% pada konsentrasi 10,000-20,000 ppm/botol dengan LC50 dan LC901628.9 dan 4385.1 ppm/botol. Terdapat perbedaan bermakna pada mortalitas larva dan nyamuk dewasa pada campuran ekstrak methanol rimpang C.domestica dengan nanokomposit AgTiO2 ($p<0.05$) dengan ekstrak methanol rimpang C.domestica saja. Korelasi positif (+) pada subjek perlakuan larva ($r=0.486$ $p=0.014$) dan nyamuk dewasa ($r=0.938$ $p=0.000$).
Kesimpulan: penambahan nanokomposit AgTiO2 pada ekstrak methanol rimpang C.domestica meningkatkan efektivitas insektisida terhadap larva dan nyamuk dewasa A. aegypti.
.....Background & objectives : Dengue hemorrhagic fever is a widespread arthropod-borne viral disease transmitted by dengue mosquitoes, mainly A. aegypti. Currently, there are no vaccines available against dengue. Hence, medicinal plants containing bioactive compounds able to control the dengue mosquite attract considerable attention. This study evaluates the larvicidal / adulticidal activities of Curcuma domestica rhizome extract against A. aegypti combined with nanocomposite AgTiO2.
Methods: This is an experimental study. Phytochemical analysis of the extract was performed. The third and fourth larvae of A. aegypti were exposed to varying concentrations of the C.domestica rhizome extract (500, 1000, 1500, 2000, and 2500 ppm), nanocomposite AgTiO2 (5, 10, 15, 20, and 25 ppm), and combined between nanocomposite AgTiO2 (25 ppm) with C.domestica rhizome extract in five replicates, while female adult mosquitoes were exposed to the C.domestica rhizome extract (2500, 5000, 10000, and 20000 ppm),

nanocomposite AgTiO2 (5000, 10000, 20000, and 30000 ppm), and combined between nanocomposite AgTiO2 (30 ppm) with C.domestica rhizome extract in three replicates. The phytochemical components consisted of saponin, flavonoid, alkaloid, triterpenoid, essential oil, and tannin.
Results : At 4h, larva mortality was 100% at 2500 ppm, and the LC50 and LC90 were 44.6 and 586.3 ppm, respectively. At 6 h, adult mortality was 100% at 10,000-20,000 ppm/bottle, and the LC50 and LC90 were 1628.9 and 4385.1 ppm/ bottle. Statistically significant differences were observed in the larval and adult mortalities of A.aegypti between the high and low concentrations of the extract ($p<0.05$(. There was a significant, strong positive correlation between the concentrations and larval mortality (=0.486 p=0.014) and between the concentrations and adult mortality of A. aegypti ($r=0.938$ $p=0.000$).
Interpretation & conclusion: C.domestica rhizome and nanocomposite AgTiO2 may be useful as an insecticide in controlling the population of A. aegypti.