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MORTALITY OF *GLOBITERMES SULPHUREUS* (FAMILY: TERMITIDAE) AGAINST *GLIRICIDIA SEPIUM* (FAMILY: FABACEAE)

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ABSTRACT

The mortality of *Globitermes sulphureus* against essential oil *Gliricidia sepium* was investigated. High mortality was shown by hexane extract compared to methanolic extract and DCM extract. 50% mortality was achieved after 15 hours exposure towards 2.96 µg/ml (LD_{50}) of *G. sepium*. neophytadine and coumarine are the compounds that cause mortality to termites.

Keywords: *Gliricidia sepium*, Essential oil, Mortality, *Globitermes sulphureus.*

ABSTRAK

Kajian ini dijalankan untuk mengenalpasti kadar mortaliti *Globitermes sulphureus* terhadap pati minyak *Gliricidia sepium.* Kadar mortality yang tinggi direkodkan dengan penggunaan ekstrak heksane berbanding ektrak metanol mahupun DCM. Kajian ini telah menunjukkan 50 peratus mortaliti anai anai *Globitermes sulphureus* telah berlaku setelah terdedah selama 15 jam kepada 2.96 µg/ml (LD_{50}) pati minyak G*liricidia sepium*. Sebatian neophytadine dan coumarine menyebabkan kematian anai-anai dalam kajian ini.

Kata kunci: *Gliricidia sepium,* Essential oil, Kematian, *Globitermes sulphureus*

INTRODUCTION

Botanical essential oils from seed, bark, leaf, fruit and wood have been recognized to have anti-termitic activities (Ahmed *et al*., 2011; Abdullah *et al*, 2015). *Gliricidia sepium* (Jacq.) Walp. (Family: Fabaceae) is native in North American and an exotic plant species in Malaysia (Orwa *et al*., 2009). This plant functions as a traditional remedy (Berger *et al*., 1998; Jose and Reddy, 2010), while in Mexico; it is used for shade in cocoa and coffee plantations (Jose and Reddy, 2010). This study was conducted to investigate the toxic properties of *G. sepium* essential oil against termite using *G. sulphureus*.

MATERIALS AND METHOD

Gliricidia sepium leave extract

Ten kg of fresh *G. sepium* leaves was collected from Kampung Pian, Kuala Krau, Pahang (N03 47’20.2”, E102 14’09.7”), weighed and dried at 30ºC for 24 hours, ground into 4 kg of powder form. Hexane, DCM and Methanol extracts were

prepared by soaking 1.33 kg each for 24 hours in 1000ml then concentrated in rotavapor then kept in refrigerator until used in bioassay.

Mortality Bioassay

10µl of 50ppm of *G. sepium* hexane, DCM and Methanol extracts were separately pipetted onto 2x2 cm Whatman filter paper, allowed to dry for 1-2 min then placed into petri dish containing ten worker termites. Ten replicates were prepared. The bioassay is repeated using 100, 300, 500, 1000, 5000 ppm hexane, DCM and Methanol extracts. Pure solvent was used as control. The petri dishes were observed in darkness at 28°C. Number of dead termite was recorded per hour until 100% mortality reach. Termites used in this study was collected from Kuala Kurau and maintained at 513B, Toxicology lab, University Malaya.

Statistical analysis

Analysis of Variance (ANOVA) and Probit analysis were used to determine values of LC_{50} (concentration at which 50% death occur). This analysis was been done by StatPlus 2009 software.

RESULTS

Figure 1 shows that, all treatments were significantly different from control experiments. 50% death of termites occurred after 17 hour exposure to hexane extract compared to 21 hours exposure to DCM extract and to 22 hours of methanolic extract respectively. A total of 3500 worker termites were used for bioassay.

Figure 2 shows that LD_{50} calculated using Probit analysis. In 15 hours application, 2.96 ppm was needed for 50% (LD_{50}) for worker mortality to occur, while in 1.23ppm will reduce the worker population only after 40 hours. The regression line showed that decrease in concentration expose to

termite will cause mortality to termites after a longer period (Figure 2).

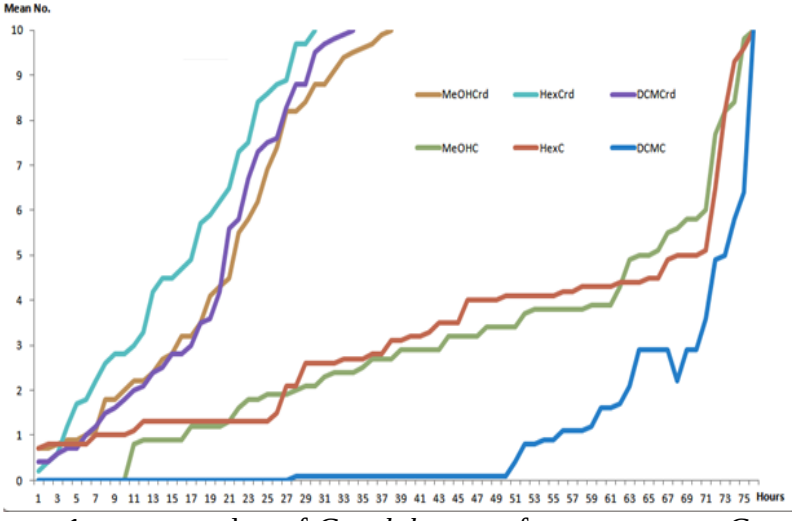

Figure 1. mean number of *G. sulphureus* after exposure to *G. sepium* extract

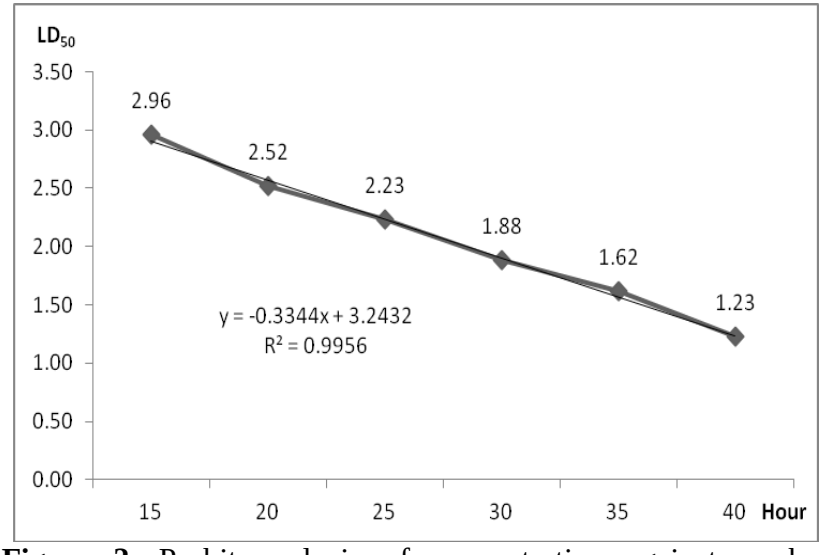

Figure 2. Probit analysis of concentration against worker termite.

Figure 3 shows the analysis of *G. sepium* essential oil using Gas Chromatography-Mass Spectrometry (GCMS). The chromatogram identified four compounds of which Neophytadiene (90.23%) was the major area compound followed by pentadecanal (2.92%), coumarine (2.45%) and β-ionone (0.52%).

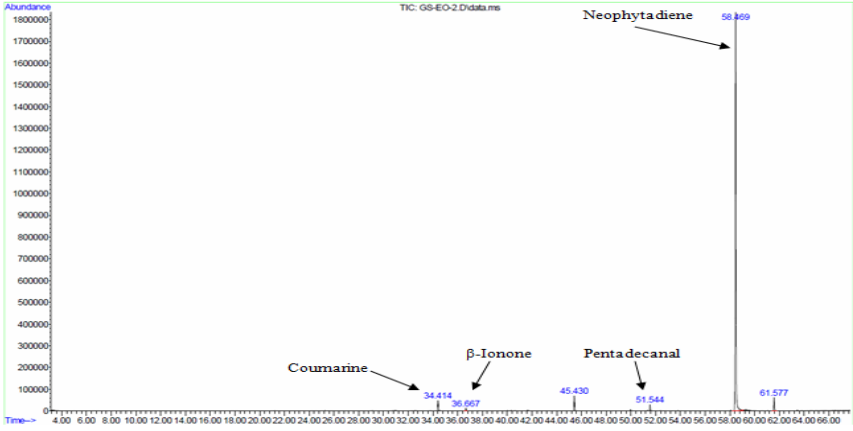

Figure 3. GC-MS spectrum of *Gliricidia sepium*.

DISCUSSION

Various compounds, including alcohols, aldehydes, fatty acid derivatives, terpenoids, and phenolics contributed jointly or independently as insecticidal, ovicidal, repellent and antifeeding activities (Yang *et al*., 2004). In this study, constituents from *G. sepium* that caused mortality were coumarine and neophytadine. Coumarine was reported to have larvacidal and adulticidal activities towards *Anopheles gambiae* and *Culex quinquefaciatus* (Joseph *et al*., 2003). Other researchers also reported coumarin has repellent activity on *Ixodes ricinus and Aedes aegypti* (Tunón *et al*., 2006). Hadaček *et al.* (1994) reported eight plants contain coumarin were effective against

Spodoptera littoralis. Neophytadine compound has larvacida properties against mosquitoes *Aedes aegypti* and *Culex quinquefasciatus* (Kumar and Maneemagalai, 2008). This plant was found to be grown in cocoa and banana plantation in Kampung Pian. This plant probably has been effective to repel insect pests from damaging the small cropping of the indigenous people.

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