

**Development of bio-pesticides from bio-oil of oil palm biomass waste (palm kernel shell) against *Metisa plana* Walker bagworm (Lepidoptera: Psychidae)**

ABSTRACT

Despite the abundance of palm-based residues generated, the by-products from thermochemical processing such as bio-oil may create value-added products to the palm industry. The palm-based derived bio-oil contains high aromatic compounds, which are active ingredients in the bio-pesticides formulation. Therefore, this study investigated the formulation of the bio-pesticide from this bio-oil and determines their effect on insect-pest in oil palm such as *Metisa plana* walker bagworm. Prior the formulation, preliminary evaluation of the compatibility between bio-oil and surfactants such as Tween 20 and Tween 80 as the bio-pesticides ingredient were evaluated using the ternary phase diagram. The compatibility results showed the best formulation is at 20% of surfactant. Based on these conditions, the experiment was formulated using an active ingredient (AI) called azadirachtin extracted from neem seed. The formulated bio-pesticide was tested for its effectiveness towards the mortality of the bagworm. The results showed that the formulated bio-pesticide was able to repel 50% of the bagworm population, with a lethal concentration (LC50) of 22.1 g/mL showing a good indicator as an effective repellent. Hence, this study provided new knowledge for waste management towards zero waste strategy for a better environment and sustainability.

**Keyword:** Bagworm; Bio-oil; Bio-pesticide; Neem extract; Surfactant