Characterization and evaluation of fungicides for control of Phytophthora palmivora on cocoa (Theobroma cacao)

ABSTRACT

Studies were conducted to characterize and evaluate selected fungicides against *Phytophthora palmivora* on cocoa (*Theobroma cacao*) from Sarawak, Malaysia. Based on morphological characteristics and molecular data (sequence analysis of internal transcribed spacer region and phylogenetic analysis), the causal pathogen was identified as *P. palmivora*. Fungicides, including copper oxychloride, metalaxyl, benzalkonium chloride, and a biofertilizer, *Bacillus subtilis* were evaluated for their ability to inhibit the mycelium growth of *P. palmivora* isolates. Benzalkonium chloride and metalaxyl exhibited 100% inhibitory effect against *P. palmivorain vitro*, at effective concentration (EC_{50}) of 0.2% and 0.3 µg/mL, respectively. *B. subtilis* and copper oxychloride provided over 85% efficacy, with EC_{50} estimated at 0.35% and 1500 µg/mL, respectively. Therefore, benzalkonium chloride and *B. subtilis* are a good alternative for rotation with the commonly used active ingredients (metalaxyl and copper oxychloride) for *P. palmivora* control and management of resistance. The *in vitro* study has demonstrated good control of *P. palmivora* but *in vivo* study is required to account the environment factor and systemic response of the plant.