

Activity Evaluation of Cocoa Pod Borer Sex Pheromone in Cacao Fields

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ABSTRACT The previously identified female sex pheromone of cocoa pod borer, *Conopomorpha cramerella*, was re-evaluated for its attractive activity in different field conditions. It was found that lures containing 100- μ g of synthetic sex pheromone blend, (*E,Z,Z*)- and (*E,E,Z*)-4,6,10-hexadecatrienyl acetates, and the corresponding alcohols in a ratio of 40:60:4:6 in a polyethylene vial attracted male *C. cramerella* moths in Sabah and peninsular Malaysia and in Sumatra and Sulawesi, Indonesia, suggesting that the same pheromone strain existed in a wide stretch of the Indo-Malayan archipelago. Of the three kinds of trap designs tested, the Delta traps were more effective than Pherocon V scale traps. Male captures were not significantly different among traps baited with 100-, 300-, or 1,000- μ g doses of sex pheromone. A release rate study of pheromone formulation conducted in the laboratory showed that volatile active ingredients were desorbed from polyethylene vials following first-order kinetics, which indicates a satisfactory “half-life time” of a 100- μ g loading is \approx 6 wk under laboratory conditions. A satisfactory attractiveness of the lure with a 100- μ g loading was \approx 1–2 mo in the fields.

KEY WORDS *Conopomorpha cramerella*, (*E,Z,Z*)- and (*E,E,Z*)-4,6,10-hexadecatrienyl acetates, release rate, field activity, *Theobroma cacao*

The cocoa pod borer, *Conopomorpha cramerella* (Snellen) (Lepidoptera: Gracillariidae), has been reported as the most serious pest of cacao, *Theobroma cacao* L., in Southeast Asia (Lim et al. 1982, Mumford 1986, Mumford and Ho 1988), and losses can be in excess of 30% of the crop (Beevor et al. 1986a). The management of *C. cramerella* has heavily relied on the applications of pesticides (Wood et al. 1992, Beevor et al. 1993). The sex pheromone components of *C. cramerella* were identified in 1986 (Beevor et al. 1986a, b,

Ho et al. 1987) and field tested in Sabah, Malaysia. A mass trapping trial using sex pheromone was shown to reduce *C. cramerella* infestation in large-scale pilot studies (>200 ha) (Beevor et al. 1993), and a mating disruption trial was shown to reduce mating of females (Tay and Sim 1989, Alias et al. 2004). However, the use of pheromones against *C. cramerella* was halted in the early 1990s, partly because of economic reasons and partly because of lack of commercial quantities of pheromone preparations available for large-scale use. The failure of the previous attempts to manage *C. cramerella* using sex pheromone was also attributed to the possibility of existence of more than one strain of *C. cramerella* in Asia that behaved differently to the pheromone blend (Beevor et al. 1993, Matlick 1998). This would make it much harder to use species- or strain-specific pheromones in an integrated pest management (IPM) strategy.

Research on mate-seeking behavior of male *C. cramerella* that improves management tactics is therefore warranted. The availability of a sex pheromone and trapping system provides an opportunity to detect and monitor the infestation level of *C. cramerella*. Therefore, a new initiative was started in 2004, and the objectives of this study were to (1) re-evaluate the attractiveness of the *C. cramerella* sex pheromone in both Sabah and peninsular Malaysia and (2) determine whether the same or different pheromone strains of *C. cramerella* existed. This article describes

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