

SYNERGISTIC ACTIVITY OF *PIPER ADUNCUM* FRUIT AND *TEPHROSIA VOGELII* LEAF EXTRACTS AGAINST THE CABBAGE HEAD CATERPILLAR, *CROCIDOLOMIA PAVONANA*

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ABSTRACT

One of the strategies for increasing the biological activity of botanical insecticides is through the synergistic mixtures of plant extracts. In order to assess the insecticidal joint action of both *Piper aduncum* (Pa) fruit and *Tephrosia vogelii* (Tv), leaf extract mixtures were assayed on the cabbage head caterpillar, *Crocidolomia pavonana*. This study was conducted at Bogor Agricultural University, Indonesia, from October 2010 to August 2011. Pa fruit and Tv leaf powder were extracted using ethyl acetate (1:8 w/v) through maceration done four times for Pa fruit, and three times on Tv leaf. Pa and Tv extracts, and the mixture of both extracts were assayed through leaf-feeding of the second-instar larvae of *C. pavonana* with a 48 h feeding treatment. The mixtures were tested at three concentration ratios, i.e. 1:5 (Pa:Tv), 1:1, and 5:1 (w/w). Based on a comparison of LC₅₀ at 72 h after treatment, mixtures of both *P. aduncum* and *T. vogelii* extracts at ratios of 1:5, 1:1, and 5:1 were 3.0, 3.1, and 4.3 times more toxic than *P. aduncum* extract, respectively. Meanwhile, the same mixtures of both plant extracts at the same ratios of 1:5, 1:1, and 5:1, was 2.4, 2.5, and 3.4 times more toxic than *T. vogelii* extract, respectively. Based on the independent joint action model, *P. aduncum* and *T. vogelii* extract mixtures at the three concentration ratios showed a strong synergistic effect on *C. pavonana* larvae, at both LC₅₀ and LC₉₅ levels, in which the 5:1 mixture was the most synergistic. Thus, the use of synergistic Pa and Tv extract mixtures was more effective than individual Pa or Tv extracts in controlling *C. pavonana*.

Key words: botanical insecticides, cabbage pest, extract mixtures, synergism, tropical plants

INTRODUCTION

Endowed with rich botanical resources, Indonesia is a source of plants purportedly possessing insect control properties. Insecticidal preparations from plants, or botanical insecticides, are biodegradable and mostly safe to non-target organisms (Prakash and Rao, 1997). Because of such, they can be compatibly incorporated into an integrated pest management program. Moreover, the increase in organic farming practices, which precludes use of synthetic insecticides, has brought back the demand for botanical insecticides (Isman, 2006). Society's heightening awareness on food safety has also increased the need for safe and biodegradable insecticides, including botanicals, which are expected to leave only negligible amounts of insecticide residues, if any, in food (Koivunen, 2013).

A potential source for botanical insecticides is the fish-poison bean, *Tephrosia vogelii* (Leguminosae) (Sunarno 1997). Easily grown in Indonesia, their leaves contain the insecticidal rotenone and other rotenoids, including deguelin and tephrosin (Delfel *et al.*, 1970; Marston *et al.*,