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## The combinations of entomopathogenic nematodes and entomopathogenic fungus for control melon fruit fly *Zeugodacus cucurbitae* (Coquillett) (Diptera: Tephritidae) in Thailand

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### Abstract

The use of synthetic insecticides against melon fruit fly (*Zeugodacus cucurbitae*) has been the most popular practice among farmers, however, these insecticides can not reach and kill all potential threats, as the last instar larvae and pupae live underground, resulting in less mortality effectiveness. The purpose of this study, therefore, was to investigate the possibility of combining the use of two natural enemies entomopathogenic nematodes (EPNs) 4 species: *Steinernema carpocapsae* (Weiser), *S. siamkayai* (Stock, Somsook and Reid), *Heterorhabditis indica* (Poinar, Karunakar and David), *H. bacteriophora* (Poinar) and entomopathogenic fungus (EPF) *Metarhizium anisopliae* (Metchnikoff) Sorokin isolate PSUM02. We tested seven EPNs concentrations: distilled water (control), 1,000, 5,000, 10,000, 15,000, 20,000 and 25,000 dauer juvenile (DJ)/host and five EPF concentrations: distilled water (control),  $1 \times 10^5$ ,  $1 \times 10^6$ ,  $1 \times 10^7$  and  $1 \times 10^8$  spores ml<sup>-1</sup>. The effects of each EPN species and concentrations showed that *S. carpocapsae* at 25,000 DJ<sub>s</sub>/host presented the highest mortality rate among all species; last instar larvae (97.50 %) and pupae (95.00 %), respectively. *M. anisopliae* PSUM02 ( $1 \times 10^8$  spores ml<sup>-1</sup>) produced relatively low mortalities in both the last instar larvae and pupae at rates of 61.25 % and 59.38 %, respectively. In summation, the combined efforts of EPNs and EPF terminated both the last instar larvae and pupae up to 100.00 and 85.00 %, respectively; whereas the nematode alone recorded death rates of 87.50 % and 80.00 %, respectively. We anticipate that the results of this study can be used as a guideline for the selection of the most appropriate combination of both entomopathogens and concentration for more effective control of the melon fruit fly.

**Keywords:** Biological control, entomopathogenic nematodes, melon fruit fly, *Metarhizium anisopliae*, *Zeugodacus cucurbitae*