

**Title** Development of cold quarantine protocols to arrest the development of the Mediterranean fruit fly (*Ceratitidis capitata*) in pepper (*Capsicum annuum* L.) fruit after harvest

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### Abstract

Sweet pepper (*Capsicum annuum* L.) is one of the most important fruit crops in Israel and other Mediterranean countries. Various pepper-importing countries, such as the USA, demand quarantine security protocols to diminish the risk of accidental introduction of the Mediterranean fruit fly (medfly) *Ceratitidis capitata* (Wiedemann) on imported fruit. Effective quarantine treatment protocols must combine complete insect kill, minimal damage to plant tissue, and reasonable cost. Recently, we developed a method for the successful artificial infestation of sweet pepper fruit with medfly eggs, and improved this protocol to allow medfly larvae to proceed to the L1, L2 and L3 stages, and then to subject them to cold-treatments tests. Our results showed that all tested stages (egg, L1, L2 and L3) were totally killed by simulated in-transit cold quarantine treatments at 1.5 °C or 4 °C for 21 d, which represents an average ship journey from Israel to distant markets such as Japan or the USA. Based on emerging pupae in the control, average numbers of viable organisms under the different treatments were approx. 6235 eggs, and 1000–1250 organisms in each of the treatments with advanced stages (L1–L3). These two cold quarantine treatments, especially the one at 1.5 °C, caused very little chilling reduction in fruit quality of the bag-packed pepper fruit, i.e., chilling injury complied with a commercially required reasonable level of overall quality. In contrast, unbagged peppers suffered significantly higher chilling injury than bagged ones, with accelerated decay and water loss. In conclusion, our results provide the basis for the future establishment of an export quarantine treatment protocol for bell pepper fruit. It should be based on in-transit storage at temperatures of 1.5 °C for 21 d to eliminate the medfly eggs and larval instars from pepper fruit while maintaining the commercial quality of the fruit.