Disinfestation of apple leaf-curling midge, *Dasineura mali* (Diptera: Cecidomyiidae) on post-harvest apple fruits

by ultraviolet-C radiation

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ABSTRACT

Apple leaf-curling midge (*Dasineura mali* Kieffer) (ALCM) is considered as an important quarantine pest of apple due to fresh fruit contamination by pupal cocoons. To meet the quarantine regulations of export markets and the expectations of customers, a series of non-chemical methods have been investigated for the potential to be applied to control insect pests. One approach, ultraviolet-C (UV-C) radiation, offers potential as a new disinfestation technique. However, the disinfestation effects of UV-C radiation in the control of ALCM have not been investigated previously.

To investigate the disinfestation effect of UV-C radiation, two individual experiments were conducted. Apple fruit-attached and non-fruit attached cocoons of ALCM were treated with a series of UV-C radiation doses, and then maintained in temperature-controlled (daily mean temperature around 20 ^{o}C) dark conditions. For non-fruit attached cocoons, the groups treated with UV-C radiation had significantly higher mortality rates than that of the control groups. For fruit attached cocoons, although the sample size was small, results indicated that cocoons treated with 20 mins, which was the most prolonged UV-C radiation treatment, exhibited the highest mortality rate. The insignificant mortality rate of cocooned larvae when comparing those groups treated with lower UV-C doses and control groups suggests that attachment of cocoons to the apple calyx may be a significant factor in limiting the effect of UV-C for the control of ALCM. To obtain understanding of the effects of UV-C radiation on the potential fecundity of female ALCM, a third experiment was conducted, where adult insects were reared following UV-C treatment of cocoons as before, and egg numbers carried by newly emerged adult females were assessed. Interestingly, although the difference in the egg quantity of female adult ALCM between treatments was not significant, it revealed that the UV-C treated group had a potential higher egg capacity with increased body size than the control group. It is possible that the short duration of UV-C radiation treatments might lead to increased egg capacity of female ALCM, and these effects are worthy of future investigation. Equally, the possibilities to provide greatly increased UV-C doses to potentially kill ALCM cocooned larvae during apple processing should be explored further.

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