COMPARISON OF HEAT TREATMENTS FOR QUARANTINE CONTROL OF CODLING MOTH IN APPLES AND PEARS

Lisa G. Neven

USDA-ARS, Fruit and Vegetable Insect Research Unit, Yakima, WA

Abstract: Combined heat treatments and cold storage was shown to have potential as a quarantine treatment for 5th instar of codling moth, *Cydia pomonella* (L.). Larvae were subjected to heat treatments of 38°C for 4 days, 42°C for 24 hours, or 46°C for 12 hours. These treatments were followed by cold storage at 0°C for 7 to 28 days. These treatments have been shown to reduce storage scald in apples by researchers in Israel. Combinations of these treatments increased larval mortality compared with either treatment alone. The 38°C treatment had little effect on larval mortality. The 42 and 46°C treatments showed an increase in mortality with increasing intensity and duration of heat treatment and was greatly increased for all heat treatments following cold storage.

Short duration, high intensity heat treatments greatly effected codling moth larval mortality. Twelve heating curves obtained from recording fruit core temperatures during heat treatments of apples and pears in a forced air system. The heating curves were programmed into a computer controlled water bath system to simulate fruit heating for rapid assessment of efficacy in causing codling moth larval mortality. Temperature treatments ranged from 42 to 48°C with heating rates of 10-25°C/hour. Fifth instar larvae were treated in the water bath system and subsequently subjected to 28 days of cold storage. All but three of the treatments resulted in 100% mortality. Treatments of infested fruit showed similar rates of larval mortality to that of the water bath treatments. Heating rates greatly effected larval mortality. Slower heating rates require a longer total treatment at the set point temperature to achieve the same levels of mortality as treatments employing more rapid heating rates. The impact of heating rates on insect mortality in the development of quarantine treatments will be discussed. Combination treatments can be effective in commodities that can endure short periods of high intensity heat stress, such as cherries. Combination treatments can also be effective in commodities that can tolerate slightly lower intensity heating with prolonged cold storage, such as apples and pears.