CHAPTER 5
CONCLUSIONS

5.1 Effect of hot water treatment (HWT) on green mold infection in tangerine fruit cv. Sai Num Pung

Preliminary experimentation, fungus were dipped in hot water at 45±2, 50±2 and 55±2°C for 0.5, 1, 2 and 3 minutes. The results showed that a minimum exposure period of 1 minute at 55±2°C was required to inhibit *P. digitatum* spore germination *in vitro* when incubated the fungus at 25±2°C in darkness for 48 hours. *In vivo* studies, tangerine fruit were dipped in hot water at temperature and time mentioned above before and after inoculation compared with the control, untreated and uninoculated fruit, indicated that treated tangerine fruit with hot water dips at 50±2°C for 3 minutes and 55±2°C for 2 and 3 minutes after inoculation was able to delay symptom severity and reduced sporulation of *P. digitatum* when stored at 24±2°C and 90±5% RH for 5days.

5.2 Effect of HWT on anatomy and biochemical changes in tangerine fruit during infection of *Penicillium digitatum* under low-temperature storage

Tangerine fruit were dipped in hot water at 50±2°C for 3 minutes and 55±2°C for 2 and 3 minutes after inoculation with *P. digitatum* and then stored at 4±2°C and 90±5% RH for 30 days. This experiment indicated that a postharvest HWT remarkably reduced green mold rot development in tangerine fruit possibly due to induction of defence system in the fruit peel tissue, as evidenced by the increased chitinase and β-1,3-glucanase activities and some chitinase protein. The SEM observation showed that the HWT removed fungus spores from its surface and

collapsed spores and only few spores germinated and the mycelial mat was very thin due to markedly reduced branching. Whereas, normal spore and mycelial shapes on control untreated fruit was turgor and lush. Likewise, the HWT had smoothed the fruit epicuticular waxes and thus covered and sealed stomata and cracks on the fruit surface, which could have served as potential pathogen invasion sites. There are a narrow range of temperatures and duration that can delay green mold rot development and the suitability of this treatment in Thai citrus packinghouse operations. The advantages of HWT are that it also cleans the fruit and improves its general appearance. In addition, it is a simple method which can be applied for industry use since it can be incorporated into the packinghouse sorting line and does not require any special handling. However, up-scaling of the hot dip method from the laboratory to packinghouse scale demands additional technical solutions to maintain a desired treatment regime with large masses of fruit. It is suggested that if this work would be continued, it is required an engineer to help sorting out the way to increase compression of hot water so that the water can reach the pathogen inside the peel.

5.3 Effect of HWT on chemical component changes and chilling injury in tangerine fruit under low-temperature storage

The HWT at 50±2°C for 3 minutes and 55±2°C for 2 and 3 minutes had no effects on chilling injury symptoms, which no observed chilling injury symptoms of the tangerine fruit in all treatments, percentage of electrolyte leakage, malondialdehyde and soluble solids content during storage at 2±2°C and 90±5% RH for 30 days. These results demonstrate that ‘Sai Num Pung’ tangerine fruit might tolerate to low-temperature storage (2±2°C) due to no observed evidence related to chilling injury symptoms, electrolyte leakage and malondialdehyde occurrences. Besides, the HWT had no lipoxygenase activity incidence during low-temperature storage. This might indicated that no degradation of membrane unsaturated fatty acids.