

**Thesis Title** Study on UV-C irradiation in fruits: Ripening quality and bioactive compounds in mango and defense mechanism in tangerine

**Author** Amelia Safitri

**Degree** Master of Science  
(Technology Management of Agricultural Products)

**Advisor** Asst. Prof. Sutthiwal Setha, Ph.D.

## ABSTRACT

In the experiment I, effects of UV-C irradiation in Nam Dok Mai mangoes and Sai Nam Phung tangerine were investigated. Mango fruit at commercial stage was treated with UV-C ( $4.93 \text{ kJ/m}^2$ ) then stored at  $14^\circ\text{C}$  and 90% of relative humidity for 20 days. The UV-C treated fruit was higher in  $a^*$  value but lower in  $L^*$  and hue values appeared as blackened lenticel and skin browning on its peel compared to that in control. However, UV-C treatment did not significantly affects respiration rate, texture, total soluble solids, and titratable acidity. Antioxidant capacity measured as total phenolic compounds, DPPH, and FRAP were decreased after UV-C treatment compared to that in control. This study suggested that  $4.93 \text{ kJ/m}^2$  of UV-C may not suitable to be applied in conserving Nam Dok Mai Si Thong, thus further evaluation on the efficacy of UV-C in mango, both in flesh and peel are required.

In the experiment II, effects of UV-C postharvest treatments on DPPH values, total phenolic concentrations, superoxide dismutase (SOD) enzyme activity, jasmonic acid concentrations, and disease development were investigated in pathogen-

inoculated tangerine (*Citrus reticulata Blanco* cv. Sai Nam Phung). For the *in vitro* test, 7-day old *Penicillium* spp. mycelium was placed on potato dextrose agar and was exposed to 5  $\text{kJ/m}^2$  and 10  $\text{kJ/m}^2$  of UV-C treatments. Tangerine at commercial stage used in *in vivo* test was artificially inoculated with *Penicillium* spp. and then subjected to UV-C similarly in *in vitro* experiment. All experiments were done at room temperature. Infected and non-infected areas of the peel from each fruit were separated and collected for different analysis purposes. Both of UV-C treatments, 5  $\text{kJ/m}^2$  and 10  $\text{kJ/m}^2$ , delayed mycelium growth *in vitro* and mycelium density in fruit exposed to high dosage of UV-C compared to that in the control. The values of DPPH, total phenolic concentrations, and jasmonate concentrations at first 24 h were significantly increased in UV-C treated fruit compared to that in the control. SOD values of UV-C treated samples were higher during the measured period. These results suggest UV-C irradiation of 5 and 10  $\text{kJ/m}^2$  possess direct germicidal effect and provoke some alteration in the bioactive compounds and jasmonic acid concentrations that may disrupt *Penicillium* spp. development.

In the experiment III, effects of UV-C postharvest treatments on quality attributes, DPPH values, total phenolic concentrations, superoxide dismutase (SOD) enzyme activity, and jasmonic acid content were investigated in tangerine (*Citrus reticulata Blanco* cv. Sai Nam Phung). Tangerine fruit at commercial stage was treated with 5 and 10  $\text{kJ/m}^2$  of UV-C then stored at 10  $^{\circ}\text{C}$  and 90% of relative humidity for 4 weeks. The peel from each fruit was collected for bioactive compound analysis. There was no significant difference in color index observed between control and UV-C treated fruit. Both of UV-C treatments, 5  $\text{kJ/m}^2$  and 10  $\text{kJ/m}^2$  did not produce such harmful effect on fruit skin surface. The values of DPPH, total phenolic concentrations, SOD enzyme activity, and jasmonate concentrations were in general significantly higher in UV-C treated fruit compared to that in the control. These results suggest UV-C irradiation of 5 and 10  $\text{kJ/m}^2$  possess hormetic effects, which

involve in the bioactive compounds accumulation and generate jasmonic acid production that may useful for preserving tangerine.

**Keywords:** Bioactive Compounds/*Citrus reticulata/Mangifera indica/Penicillium spp./Ultraviolet Radiation*

