CHAPTER 5

Conclusions and Recommendations

5.1 Conclusions

NTP treatment using a GA discharge successfully degraded pesticide residues including chlorpyrifos, cypermethrin and carbendazim covered on Nam Dok Mai mango by spraying and immersing methods. In particular, the levels of chlorpyrifos, cypermethrin and carbendazim decreased with high removal efficiency of 74.02 %, 60.72 % and 74.34 %, respectively after 5 min of NTP treatment at 5 L/min flow rate of Ar gas.

The employed NTP treatment conditions could also cause some significant changes on the physicochemical indexes of mango comprising TSS, TA, ascorbic acid, carotenoid and total phenolic content. There were some minor alterations in color and texture parameters of the fruit treated NTP when compared to the control as well. However, the moisture content of mango showed the insignificantly change after NTP treatments together with high acceptance level in sensorial attributes of fruit applied this cold plasma which were not different significantly when comparing with untreated controls.

Additionally, the NTP produced by applying GA discharge could be used effectively for slowing down the growth of *C. gloeosporioides* caused anthracnose disease in mango fruit for both *in vivo* and *in vitro* tests, especially at 5L_7min condition meaning 5 L/min of Ar gas flux for 7 min of treatment time. The GA discharge operating with different flow rate of Ar gas was also observed to be a source of reactive oxygen species by optical emission spectroscopy. High emission signal of hydroxyl ($OH^{\bullet}$) radicals and a large amount of hydrogen peroxide (H_2O_2) were obtained in respect of NTP conditions to degrade pesticide residues and inactivate *C. gloeosporioides* mold.

Despite still having limitations and open questions, NTP suggests the high promise as an alternative safety sanitizing method to decontamination agro-chemical residues and pathogens from various types of fresh fruits and vegetables due to many advantages of it including high efficiency, low temperature, independence of chemicals together with openly and continuously operation.

5.2 Recommendations

Further investigations should be carried out to obtain the better understanding about various reactive species derived from GA discharge, their fundamental and advanced properties in the process of pesticide decontamination and microbial inactivation treatment as well as identifying their possible degradation products. Besides, further elucidation for the chemical kinetics mechanisms of NTP affecting on quality properties of fresh produce together with scale up studies for pilot and industrial application need to be investigated also.