

CHAPTER 4

CONCLUSIONS

Dumb cane (*Dieffenbachia seguine*) and little prayer plant (*Calathea vaginata* Petersen) were employed as test plants for testing of their capabilities on NO₂ absorption in a closed chamber. Their physical characteristics were investigated in order to find the relationship between NO₂ concentration in air and physical damage of exposed plants. The stomatal density of the dumb cane (180±16 number/mm²) was found to be slightly higher than that of little prayer plant (167±9 number/mm²). Moreover, the stomatal size of the dumb cane (6.8 µm x22.8 µm) was also slightly larger than that of the little prayer plant (5.0 µm x17.8 µm).

An investigation of NO₂ absorption by the test plants in the chamber constructed in this work consisted of four conditions, namely a control, soil, plant and a combination of soil and plant. Firstly, the NO₂ concentration in the chamber was set at approximately 20 ppm and its concentrations were measured every 30 minutes using a gas analyzer until 8 hours. The dumb cane was firstly tested and it was found that the pot containing soil alone and the pot containing both plant and soil showed almost the same capability of absorbing NO₂ from air. The final concentration of NO₂ was almost zero after 6 hours. Therefore, the starting NO₂ concentration was set to 40 ppm, which was 2 times higher than the previous condition. It was found that there was no significant difference ($p < 0.05$) of NO₂ absorption by the soil alone or by a combination of plant and the soil. Whereas NO₂ uptake by a combination of plant and soil was about 2 times greater than those of plant alone. All conditions showed higher

NO₂ absorption when the concentration in the environment was high. The capabilities of NO₂ removal of the 3 conditions in descending order were plant+soil > soil > plant. As for the ion contents, ion chromatography was utilized to determine NO₂⁻ and NO₃⁻ accumulated on and in plant leaves in obtain NO₂ adsorption and absorption capabilities of the test plants. Based on the concentrations of nitrate in the plant leaves, the dumb cane was found to absorb higher amounts of NO₂ from air than the little prayer plant. This is probably due to the higher stomatal density of the dumb cane. In terms of NO₂ adsorption, the little prayer plant was found to adsorb higher amount of NO₂ from air than the dumb cane, possibly due to larger leaf areas of the little prayer plant.

It was also found that NO₂ affected physiology and health of the little prayer plant more than those of the dumb cane. About 60% of leaves necrosis was observed on the dumb cane leaves. However, not every single leaf was affected. The dumb cane test plants were found to recover and survive after the NO₂ exposure. Unlike the dumb cane, the little prayer test plants were found to show injured leaves containing dark spots which were expanded to the whole leaf surface. After these test little prayer plants were left for 3 days in normal environment, they did not survive and eventually die.

Recommendations for Future Work

Since there are some limitations of plant selection for NO₂ exposure as well as the detection limit of the gas analyzer, the following points are suggested.

1. In this study the test plants were exposed to high NO₂ concentration in a closed chamber. However, in the real environment, much lower level of NO₂

is present. Therefore, future experiments should be carried out in the real environment or the concentrations of NO_2 in the test chamber should be set at lower levels than the levels attempted in this study in order to obtain data representing actual capabilities of plants in the environment. In such experiments, detection limits of the gas analyzer or any suitable NO_2 measuring device should be better, i.e. ppb level, than what was available at ppm level in the present work.

2. All test plants to be used for this type of experiment should have the same age and should be controlled in the same environment in all steps, including the plantation stage.