

Efficiency of Snake Plants Absorb Carbon Dioxide in Offices

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Abstract: *The study of application of snake plant absorbed carbon dioxide in the offices. The aim of this research was to measure the concentration of carbon dioxide in offices with snake plants. The measuring time is during working time 8.30 am to 4.30 pm, at three offices. The first room was the academic affair at engineering building with volume of room is 360 m³. The second room was the water resources research room with volume of 192 m³. The third room was control room, empty room with the volume of 165 m³. The difference numbers of snake plant were used. The result found that the academic affairs, 360 m³, with three staffs working used four of snake plants. The water resources research room, 192 m³, with four staffs working using the five of snake plants. At control room, empty room, the percentages of carbon dioxide absorption were 27.28, 28.36, 27.13 and 23.51, respectively for using the snake plant 5, 4, 3 and 2. The data of this study can be using the future research and applying to the other offices and houses.*

Keywords: Snake plant, Carbon Dioxide, Offices

1. Introduction

Carbon dioxide affects the health of people who work in the office. The high concentration of carbon dioxide in office will affect the health of the occupants and the work performances of the staffs were down. Many researchers studied the houseplants improved indoor air quality and carbon dioxide in the offices. Plants absorbed the Carbon Dioxide indoor air environment of both offices and houses.¹⁻⁴ The study of Phonthawat and Pasinee, those studied the four types of houseplants absorbed Carbon Dioxide in home under system was close chamber.⁵⁻⁶ The study of snake plants absorb carbon dioxide in the Naresuan University's offices was done under the green university project. Therefore, it is interesting to study the snake plants absorb carbon dioxide in the office and the optimum numbers of plants were used for the different size of rooms.

2. Objective

- 1) To providing the better life quality when staff working in university.
- 2) To study on the optimum numbers of plants were used for the different of room size.

3. Research Methodology

Snake plant, *Sansevieria trifasciata.*, (fig. 1) is a native species of flowering plant in the family Asparagaceae, throughout tropical west Africa,⁷ The plants use for these experiments were one year old and the bunch sizing was approximately 60 cm, the plants height were 60 to 80 cm. These plants grow in the plastic pots diameter of 30 cm. The weight of soil was 4.2 kilogram .5 which consisting of 50% of soil, 20% of coconut fiber, 10% of the rain tree leaf and 10% of the fertilizer and 10% of black rice husk



Fig. 1: Snake plant

3.1 Study of Carbon dioxide absorption by plant samples

1. Carbon dioxide concentration was measured one point in the office without the plants on Monday to Friday for ten days during working hours 8.30 am to 4.30 pm.
2. Calculate the number of the snake plant use in the room. The parameters of design were different room sized and carbon dioxide concentration in a room. The calculate was follow Phonthawat's , Somprasong's and Phatthaporn's research. ^{5,8-9} The effective of Carbon dioxide absorption of snake plant was 0.49 ppm/m³/sec. in the closed system.
3. The snake plant set in the rooms for one week to adjust the air environment. Then measure the concentration of carbon dioxide from Monday to Friday for five days during working hours 08.30 am to 4.30 pm.
4. The number of the plants used in the room was 1, 2, 3 ,4 and 5 of snake plant.
5. Carbon dioxide, the air in office pumps into Sodium Hydroxide (NaOH) solution of 0.7 M with 500 ml for 8 hours. The CO₂ level is measure from the Sodium Hydroxide (NaOH) solution.

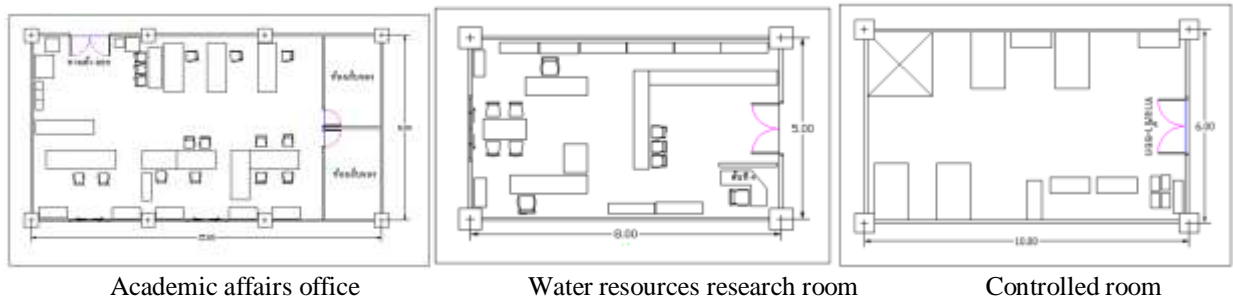


Fig. 2: Layout of the three offices

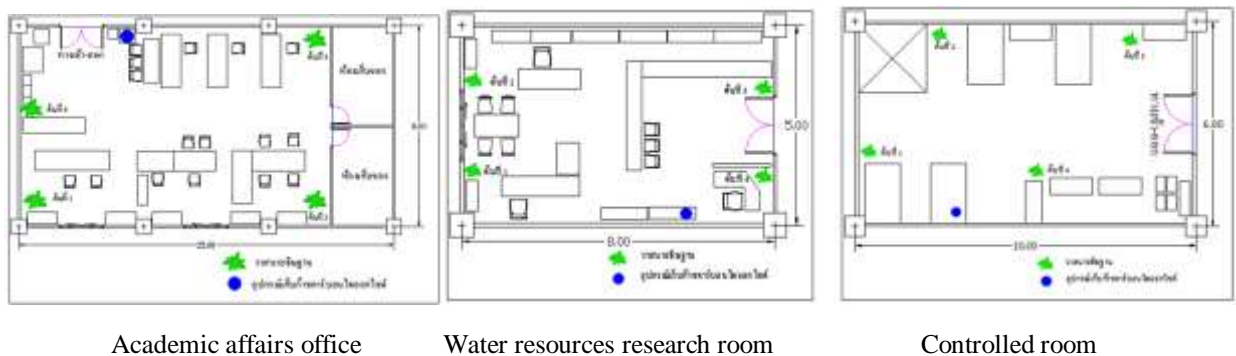


Fig. 3: Layout of the snake plants cultured in the three offices

3.2 Equipment Of Carbon Dioxide Study Equipment



Fig. 4: Equipment of Carbon dioxide study equipment

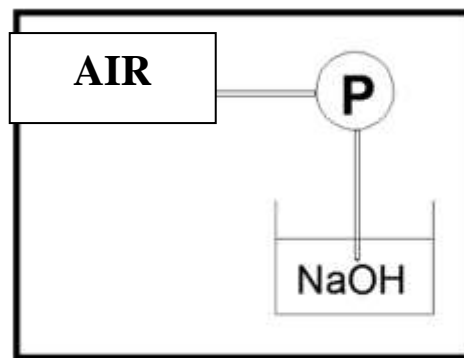


Fig. 5: Carbon dioxide, the air in office pumps into Sodium Hydroxide (NaOH) solution

4. Results and Discussion

The initiated concentration levels of carbon dioxide (CO₂) in controlled room (165 m³), academic affair office (360 m³) and water resources research room (192 m³) show in table 1. The averages of CO₂ concentration were 298.4, 393.4 and 465.8 ppm. at controlled room, water research room and academic affairs. CO₂ concentration is used as an indicator when assessing indoor air quality. The CO₂ concentration in indoor air is limit value at 1000 ppm. The fresh air is lower than 400 ppm of the CO₂.

TABLE I: The initiated of carbon dioxide in offices

| | Carbon dioxide concentration (ppm) | | | | | |
|--------------------------|------------------------------------|---------|-----------|----------|--------|-------|
| | Monday | Tuesday | Wednesday | Thursday | Friday | Mean |
| Academic affairs | 488 | 478 | 462 | 445 | 456 | 465.8 |
| Water resources research | 406 | 407 | 396 | 380 | 378 | 393.4 |
| Controlled room | 307 | 311 | 296 | 293 | 285 | 298.4 |

The concentration of CO₂ in controlled room was shown in table 2. The carbon dioxide level was slowly down in five day. The highest carbon dioxide absorption was used four and five snake plants.

TABLE II: The effective of Carbon dioxide absorption by plants cultured in controlled room

| Day | The effective of carbon dioxide concentration (ppm/m ³ /sec) | | | | | |
|----------------|--|----------------------|----------------------|----------------------|----------------------|----------------------|
| | Initiated CO ₂ (ppm) | Snake plant 1 pot | Snake plant 2 pot | Snake plant 3 pot | Snake plant 4 pot | Snake plant 5 pot |
| Monday | 307 | 0.80 | 1.10 | 1.41 | 5.21 | 5.12 |
| Tuesday | 311 | 1.10 | 1.67 | 1.78 | 4.90 | 4.80 |
| Wednesday | 296 | 1.43 | 1.62 | 1.86 | 4.51 | 4.51 |
| Thursday | 293 | 1.38 | 1.62 | 1.91 | 4.47 | 4.41 |
| Friday | 285 | 1.26 | 1.56 | 1.80 | 4.41 | 4.36 |
| Average | 298.4 | 1.19 | 1.51 | 1.75 | 4.71 | 4.64 |

The percentage of CO₂ absorption in three offices was shown in table 3. The highest carbon dioxide absorption used four snake plants in controlled room and academic room. The highest carbon dioxide absorption used five snake plants in water resources. The highest of percentage of carbon dioxide absorption was 28.36 in controlled room.

TABLE III: The percentage of carbon dioxide absorption by snake plants cultured in offices

| | Controlled room | | Water resources research | | Academic affairs | |
|-------------------|------------------------------------|--|------------------------------------|--|------------------------------------|--|
| | Initiated CO ₂ (ppm) | The percentage of carbon dioxide concentration (%) | Initiated CO ₂ (ppm) | The percentage of carbon dioxide concentration (%) | Initiated CO ₂ (ppm) | The percentage of carbon dioxide concentration (%) |
| Snake plant 2 pot | 311 | 23.51 | 407 | 6.21 | 478 | 9.62 |
| Snake plant 3 pot | 296 | 27.13 | 396 | 7.81 | 462 | 17.84 |
| Snake plant 4 pot | 293 | <u>28.36</u> | 380 | 9.19 | 445 | <u>22.93</u> |
| Snake plant 5 pot | 285 | 27.28 | 378 | <u>10.55</u> | 456 | 22.30 |

5. Conclusion

The academic affairs, 360 m³, with three staffs working used four of snake plants. The water resources research room, 192 m³, with four staffs working using the five of snake plants. At control room, empty room, the percentages of carbon dioxide absorption were 27.28, 28.36, 27.13 and 23.51, respectively for using the snake plant 5, 4, 3 and 2. The data of this study can be using the future research and applying to the other offices and houses.

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