Green Solutions : The Role of Spider Plant (*Chlorophytum comosum)* and Peace Lilies (*Spathiphyllum wallisii*) in Mitigating Indoor Formaldehyde

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Abstract. Formaldehyde is one type of pollutant that is often found in indoor air and can have negative impacts on human health. Therefore, a solution is needed to reduce formaldehyde compounds in the room. According to Indonesia's Ministry of Health, the permissible indoor formaldehyde concentration is 0,1 ppm. This study aims to determine the remediation ability of spider plants (*Chlorophytum comosum*) and peace lilies (*Spathiphyllum wallisii*) to reduce indoor formaldehyde levels. In this study, formaldehyde measurements were conducted in office room using an Air Quality Detector. The types of plants used were spider plants (*Chlorophytum comosum*), peace lilies (*Spathiphyllum wallisii*), and a combination of both. Baseline measurements were taken without plants, followed by measurements after placing the plants. The collected data were analyzed using the One-Way ANOVA method. The results indicated that spider plants (*Chlorophytum comosum*) and peace lilies (*Spathiphyllum wallisii*) are capable reducing formaldehyde compounds in the room to below 0,1 ppm. Using a combination of both plants is more efficient than using just one type of plant. The average reduction in formaldehyde concentration within 24 hours, due to one pot of spider plants (*Chlorophytum comosum*) is 0,0071 mg/m^3, while one pot of peace lilies (*Spathiphyllum wallisii*) is 0,0058 mg/m^3.

1 Introduction

Air pollution is a significant public health issue. A large number of epidemiologic studies have shown a clear link between air quality and adverse health effects. Air pollution causes a wide range of health problems in the general population, from subclinical effects to premature death [1]. The Environmental Protection Agency (EPA) is responsible for overseeing both outdoor and indoor air quality. According to the EPA, indoor pollutant levels can be up to 100 times higher than outdoor levels. This is because enclosed spaces can trap more contaminants than open areas [2]. Indoor air pollution encompasses various biological contaminants, such as allergens like dust mites, insects, pollen, mold, and bacterial endotoxins. It also includes chemical pollutants, such as gases, particulate matter,

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formaldehyde, and volatile organic compounds (VOCs) [3]. Several factors can impact indoor air pollution, including the amount of time spent indoors, the quality of outdoor air, and the existence of pollution sources within the indoor environment [4].

Some of the most important sources of indoor air pollution are Volatile Organic Compounds (VOCs) and Particulate Matter (PM). There is a wide range of VOCs produced from modern household products, such as paints, lacquers, cleaning products, furniture, photocopiers, printers, glues, adhesives, and permanent markers [5]. There is a wide range of Volatile Organic Compounds (VOCs) in the atmosphere, which contribute to the complexity of indoor air pollution. Some indoor VOCs, like toluene, are toxic, while others, such as formaldehyde and benzene, can be carcinogenic at elevated concentrations [6]. One type of VOC is formaldehyde, which is one of the most common VOCs found indoors. It is present in many household items, including cleaning supplies, personal care products, and pressed wood products like particleboard and plywood. Consequently, formaldehyde is a common indoor air pollutant found in nearly all homes and buildings [7].

Formaldehyde is commonly utilized as a chemical compound due to its unique properties and its natural presence within the structure of living organisms [8]. Exposure to formaldehyde can harm human health, often causing nasal irritation and contributing to tumor development. Long-term exposure may also elevate the risk of nasopharyngeal cancer [9]. In 2004, the International Agency for Research on Cancer (IARC) classified formaldehyde as a Group 1 human carcinogen. In June 2014, the European Commission categorized formaldehyde as a Category 1B carcinogen and a Category 2 mutagen. In 2010, the WHO conducted a reassessment and confirmed an indoor formaldehyde guidance value of 0,1 mg/m^3. This air quality guideline is regarded as protective against both acute and chronic sensory irritation in the airways for the general population and can help prevent various types of cancer [10]. In Indonesia, guidelines for indoor formaldehyde exposure levels are outlined in the Regulation of the Minister of Health of the Republic of Indonesia No. 48/2016 on Occupational Safety and Health Standards in Offices. According to this regulation, the maximum allowable concentration of formaldehyde in office environments is 0,1 ppm or 0,12 mg/m^3 to meet occupational health standards.

The utilization of plants to absorb, assimilate or reduce air pollutants is known as phytoremediation, which could be an effective approach in reducing indoor air pollution. Numerous studies have emphasized the potential of phytoremediation to enhance indoor air quality by employing plants to eliminate pollutants like volatile organic compounds (VOCs), formaldehyde, and other harmful substances [11]. Plants eliminate air pollutants from indoor environments through a process known as phytoremediation. This process involves the interaction between the aerial parts of plants and the microorganisms in the phyllosphere and rhizosphere to remediate air contaminants. Research has demonstrated that indoor plants play a significant role in reducing air pollutants and enhancing indoor air quality. Several plant species have been identified as effective in absorbing and processing volatile organic compounds (VOCs) such as benzene, xylene, and formaldehyde [12].

Plants remove formaldehyde from the air through various biological processes. They primarily absorb formaldehyde via stomata, small pores on their leaves that facilitate gas exchange. During photosynthesis, plants take in carbon dioxide along with formaldehyde, which is then metabolized through enzymatic pathways. A key enzyme involved is glutathione-dependent formaldehyde dehydrogenase, which converts formaldehyde into formic acid and subsequently into carbon dioxide and water for metabolic use. Additionally, microorganisms in the soil around plant roots contribute to breaking down formaldehyde, enhancing its removal. Some formaldehyde may also be absorbed and stored in plant tissues, such as leaves and stems [13]. Some plants capable of absorbing formaldehyde indoors include *Chlorophytum comosum, Aloe vera, Epipremnum aureum, Spathiphyllum wallisii, Areca palm, Ficus benjamina, Ficus elastica*, and *Nephrolepis obliterate* [12].

This study will investigate indoor exposure to formaldehyde and remediation methods using the plants *Chlorophytum comosum* and *Spathiphyllum wallisii*. *Chlorophytum comosum*, a significant member of the monocot family *Liliaceae*, is a small herbaceous plant that develops from a tuberous rhizome. Its primary root is thick, fleshy, and fusiform in shape. Native to southern Africa, this horticultural plant is known for its high biomass production and ease of cultivation [14]. *Chlorophytum comosum* is one of the 120 plant species evaluated for their phytoremediation capabilities in improving indoor air quality. This plant can effectively remove formaldehyde, nitrogen dioxide, carbon monoxide, ozone, benzene, toluene, cigarette smoke, and ammonia [15]. *Chlorophytum comosum* is renowned for its effectiveness in purifying indoor air by absorbing harmful gases, including formaldehyde. It outperforms many other household plants in reducing formaldehyde levels in the surrounding air. Studies indicate that the plant's formaldehyde removal efficiency can reach up to 95% within a day, particularly at high concentrations ranging from 1 to 12 mg/m³ [16].

Meanwhile, the *Spathiphyllum wallisii* plant was capable of reducing formaldehyde levels within 24 hours. This demonstrates its potential for phytoremediation of indoor air contaminated with formaldehyde [17]. *Spathiphyllum* is commonly known as *Spath* or Peace Lilies. Several of its species are popular as indoor ornamental plants. *Spathiphyllum* has the ability to purify indoor air by removing various environmental contaminants, such as benzene, formaldehyde, and other pollutants [18]. Spathiphyllum wallisii has the ability to absorb formaldehyde at concentrations ranging from 0,09 to 1,006 ppm per cubic meter within a 24-hour period. This indicates that *Spathiphyllum wallisii* is effective as a formaldehyde absorber [17].

2 Methodology

This study aims to determine the ability of Chlorophytum comosum and Spathiphyllum wallisii plants to reduce formaldehyde (CH2O) pollutant levels in the room. The first thing to do is preliminary research. This preliminary research includes measuring the concentration of formaldehyde in the office space and measuring the humidity and temperature in the office space. This room is on the second floor and there is no production process in the building. So that the focus of the source of formaldehyde compounds only comes from indoors.

The formaldehyde concentration, humidity, and temperature are measured directly using the Air Quality Detector tool, which can simultaneously measure all three factors. This air quality monitor features a built-in fan that quickly draws in surrounding air, enabling real-time readings. It is equipped with an electrochemical semiconductor sensor that measures formaldehyde in a range of 0-5 mg/m³ with a precision of two decimal places and an accuracy of ±5% F.S. It also measures humidity from 0% to 100% RH with an accuracy of ±3.5% RH. This preliminary research will be carried out over five working days during office hours. The Air Quality Detector used is shown in Fig. 1. The selection of this room was based on the furniture in the room which has the potential to produce high formaldehyde compounds and the room had just undergone interior renovations. The use of new furniture and carpets are the reasons for the for the use of these rooms. The condition of the rooms can be seen in Fig. 2.

After preliminary research, the initial formaldehyde compound produced in the workers' room was obtained. From the formaldehyde compounds that have been obtained, the determination of plant needs for *Chlorophytum Comosum*, *Spathiphyllum wallisii,* and mix plants is carried out. Determination of plant needs is also obtained from the area of the room used. Plants will be placed in a standing shelf to create an organized appearance and contribute to improving the aesthetics in the room as can be seen in Fig. 3 Each type of plant, including *Chlorophytum comosum, Spathiphyllum wallisii*, and the mix of plants, will have its concentration measured daily during working days. In this main study, formaldehyde compounds, humidity, and room temperature will be measured using the Air Quality Detector, with measurements taken during working hours from 9:00 AM to 4:00 PM WIB. The plants will be maintained by watering them every two days.

Fig. 1. Air Quality Detector

Fig. 2. Room Condition

Data analysis and discussion were conducted after data collection was completed. The formaldehyde concentrations collected from each plant species were organized into tables and graphs to facilitate interpretation. in the form of tables and graphs to facilitate interpretation. The data obtained then compared to determine the ability of the plants used in reducing formaldehyde exposure in the room. The data that has been obtained will be statistical test using One-Way Anova with the help of SPSS software.

Fig. 3. Placement Plant in Standing Shelf

3 Result and Discussion

3.1 Preliminary Indoor Formaldehyde Identification

The formaldehyde concentration in the workspace was monitored over five days on weekdays, with measurements conducted between 9:00 AM and 4:00 PM. The measurement devices were alternately placed on the staff's desks at a height of approximately 120 cm from the floor. This workspace, located on the second floor, is occupied by 12 employees. The room features a large glass window covered with curtains, allowing sunlight to filter in. It is also equipped with an air conditioner. The floor is carpeted, and several electronic devices, such as photocopiers, which can emit formaldehyde, are present. The average formaldehyde concentrations recorded from Monday to Friday during the observation period are shown in Table 1.

Table 1. Average Concentration Formaldehyde (mg/m^3)

Times	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**
09.00	0,173	0,161	0,171	0,155	0,162
10.00	0,183	0,161	0,156	0,146	0,195
11.00	0,211	0,163	0,178	0,178	0,220
12.00	0,223	0,205	0,205	0,210	0,215
13.00	0,218	0,233	0,215	0,226	0,223
14.00	0,235	0,223	0,203	0,225	0,203
15.00	0,226	0,205	0,198	0,233	0,187
16.00	0,188	0,161	0,171	0,155	0,162

As shown in Table 1, the formaldehyde concentration in the workspace ranges from 0,15 mg/m^3 to 0,24 mg/m^3. The concentration generally increases throughout the day, peaking around 2 PM. Factors such as indoor air humidity and ongoing activities contribute to hourly variations in formaldehyde levels. The formaldehyde concentration in this room is comparable to the levels reported in the study by Wonho Yang [19]. Their research, conducted in a school building in Korea with an age of less than one years, found that the formaldehyde concentration in the high school building reached 0,16 ppm.

The formaldehyde concentration observed in that study is similar to the levels measured in this research. This similarity may be attributed to the relatively new age of the building in Yang's study, which could result in formaldehyde concentrations exceeding established quality standards. In newly constructed buildings, formaldehyde can be continuously emitted and absorbed from various sources within the interior during the initial stages. In the initial phases of a new building's interior, formaldehyde is likely to be continuously emitted and absorbed from various sources within the space [19]. This situation is similar to the condition of the workers' room in this study, as it has just undergone renovations to the interior of the building.

The results of the formaldehyde concentration measurements in the room were grouped and averaged to serve as a reference for the phytoremediation research conducted there. However, it is necessary to convert these results to Standard Temperature and Pressure (STP) because the measurements were not taken under normal atmospheric conditions, specifically at a temperature of 25°C. The initial formaldehyde concentration in the workers' room under standard conditions was found to be 0,21 mg/m^3, whereas the standard set by the Regulation of the Minister of Health of the Republic of Indonesia Number 48 of 2016 is 0,12 mg/m^3. This indicates that the formaldehyde level in the workers' room exceeds the established quality standard, necessitating efforts to reduce it through phytoremediation.

3.2 Requirements for Ornamental Plants

After measuring the initial formaldehyde compound, it is possible to plan the needs of each ornamental plant. Formaldehyde concentration values in worker's room becomes a reference in calculating the number of ornamental plants needed.

3.2.1 Calculation of Ornamental Plant Requirements

Research conducted by Wulandari [20] revealed that *Chlorophytum comosum* can reduce formaldehyde by 0,00467 ppm per leaf, starting with an initial formaldehyde concentration of 0,6 mg/m³. In that study, the average number of leaves per pot was 60. Referring to Wulandari's research, this study will use several *Chlorophytum comosum* plants with an average of 50 leaves per pot. As a result, each pot of *Chlorophytum comosum* is expected to reduce formaldehyde by 32,06%/m³. Meanwhile, research by Suárez [21] demonstrated that *Spathiphyllum wallisii* plants can reduce formaldehyde by 2,9 mg/m³ per leaf. This reduction is achieved by plants with a total leaf area of 6306 cm² per pot. In this study, *Spathiphyllum wallisii* plants with an average leaf area of 150 cm² and a total of 15 leaves per pot will be used. Consequently, each pot of *Spathiphyllum wallisii* used in this study is expected to reduce formaldehyde by 28,04%/m³.

To determine the number of plants needed, the first step is to identify the amount of formaldehyde pollutants to be reduced per cubic meter, which requires determining the average concentration of formaldehyde in the room. Once the reduction target for formaldehyde by each plant is established, the required number of plants can be calculated. The number of ornamental plants needed depends on the room's volume, which in this case is 150 m³. According to [22], the number of plants placed in a room is determined by the room's size and the concentration of compounds present in it.;

a. Formaldehyde reduction target per m³ of room

$$\frac{\frac{Average\ Formaldehyde\ Concentration - Threshold\ Value}{Threshold\ Value} x\ 100\%}{Volume\ of\ the\ Room} \quad (1)$$

b. Number of plants needed

$$\frac{Formaldehyde\ Reduction\ Target}{plant\ reduction\ ability}\ x\ Room\ Volume \quad (2)$$

Based on the calculations, it was determined that 6 pots of *Chlorophytum comosum* and 6 pots of *Spathiphyllum wallisii* are required. For the mixed-plant treatment, an equal number of both plant types will be used. Thus, the mixed setup will consist of 3 pots of *Chlorophytum comosum* and 3 pots of *Spathiphyllum wallisii*. The reduction capabilities of *Chlorophytum comosum* and *Spathiphyllum wallisii* plants are not significantly different, so the required quantities of both plant types follow the same ratio.

3.2.2 Ornamental Plant Placements

In this study, a total of six *Chlorophytum comosum* plants will be required, each with an average of 50 leaves per pot. Similarly, six *Spathiphyllum wallisii* plants will also be needed, each having an average leaf area of 150 cm² and a total of 15 leaves per pot. The plants will be placed in pots with a diameter of 17 cm. The pot size was chosen based on the size of the plants and to optimize the use of available space. The plants will be arranged on a standing shelf with a height of 60 cm, which will be positioned in the corner of the room.

The placement of plants impacts air circulation, humidity, and pollutant absorption. Grouping plants can boost humidity and improve their efficiency, while positioning them near pollutant sources enhances their ability to capture contaminants before they spread. Strategic arrangements can also create microclimates with localized variations in temperature and humidity, further influencing pollutant distribution and absorption. For example, clusters of plants can retain more moisture and establish cooler zones, affecting how pollutants are distributed and absorbed [23].

The placement of these plants follows the guidelines of Khalifa [23], which suggest that plants should be positioned around sources of formaldehyde emissions, such as furniture or materials containing urea-formaldehyde. This allows the plants to be optimally exposed to the pollutants, enabling direct interaction with formaldehyde for effective removal from the air. Therefore, the plants are placed at a height not too far from the floor, considering the presence of carpets and relatively new marble surfaces. The standing shelves are positioned in the corners of each room, ensuring both effective plant placement and enhancing the room's aesthetic appeal. The layout of the ornamental plant arrangement in the room is shown in **Fig. 4.**

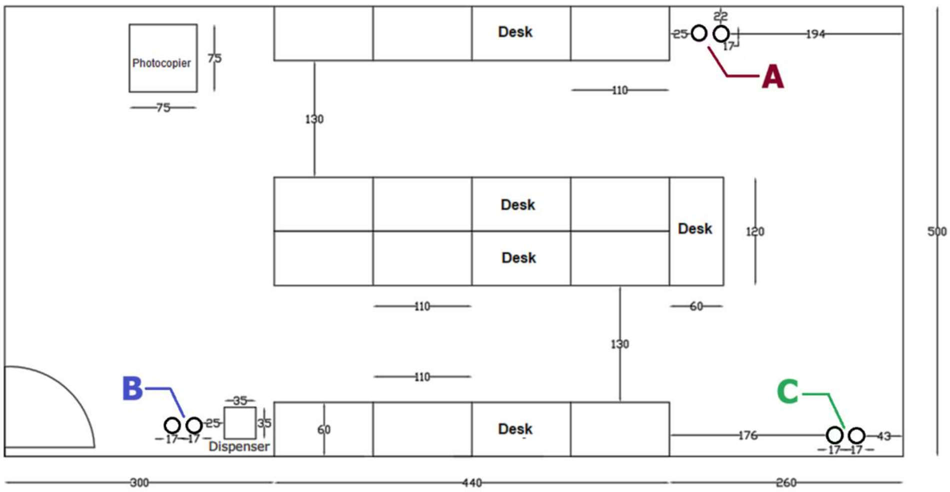

Fig. 4. Layout of Plant Placement in the Room

As shown in Figure 4, points A, B, and C represent the locations where plants are placed, with two pots at each point. During the first week, only *Chlorophytum comosum* plants will be placed. In the second week, *Spathiphyllum wallisii* plants will be introduced. Finally, in the third week, a combination of both plant types will be arranged, with a total of three pots for each type.

3.3 Identification od Plants Ability to Reduce Formaldehyde

Formaldehyde concentration measurements are carried out from 09:00 to 16:00. The plants will be placed in the room every Monday at 09:00 and removed only after 16:00 on Friday, ensuring that the plants remain in the room from Monday night to Thursday night. The results of the formaldehyde compound measurements in the workers' room after the plants were placed are shown in Fig. 5. The figure illustrates that all three plant treatments in the workers' room were able to reduce formaldehyde levels each day. For four days, all plant treatments successfully reduced formaldehyde levels to below the quality standard of 0,12 mg/m^3.

Chlorophytum comosum, as shown in Figure 5, can reduce formaldehyde levels to below the quality standard within four days of being placed in a room. Similarly, peace lily plants

(*Spathiphyllum wallisii*) also take four days to lower formaldehyde levels to meet the standard. a combination of both plant types can reduce formaldehyde levels to meet quality standards within just three days. After five days, the mixed plant treatment reduces formaldehyde levels to 0.02 mg/m³. When used individually, *Chlorophytum comosum* decreases formaldehyde concentration to 0.03 mg/m³ in five days, while *Spathiphyllum wallisii* reduces it to 0.05 mg/m³ in the same period. These findings demonstrate that *Chlorophytum comosu*m is more effective at reducing formaldehyde levels than *Spathiphyllum wallisii*.

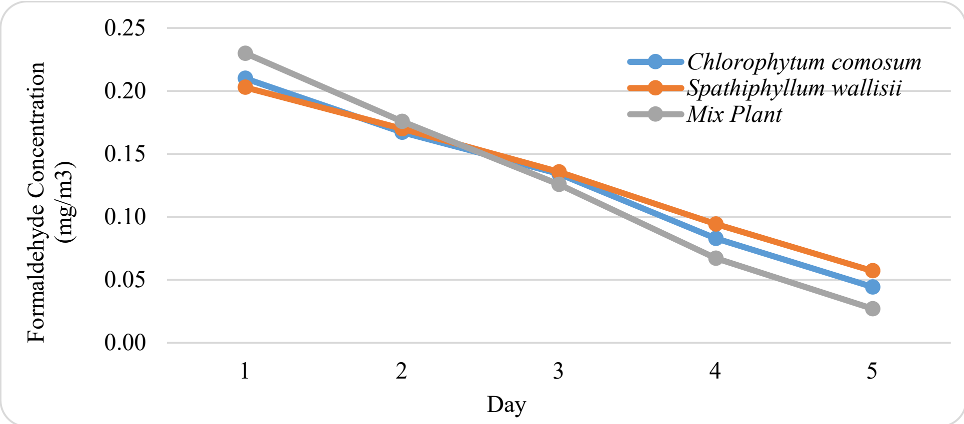

Fig. 5. Average Formaldehyde Concentration After Placing Plants

Based on the results of the measurements, the reduction capabilities of each plant in the workers' room are shown in **Table 2**. The table indicates that, of the three treatments used to reduce formaldehyde compounds in the workers' room, the mixed plant treatment was able to reduce formaldehyde more quickly than the other treatments. The difference in leaf structure likely provides a more varied surface area for formaldehyde absorption. *Chlorophytum comosum* plants have long, thin leaves, whereas *Spathiphyllum wallisii* has broader leaves. This difference in leaf structure provides a greater surface area for formaldehyde absorption, potentially enhancing the efficiency of absorption [16]. As a result, the combined treatment of both plant types was more effective in reducing formaldehyde than the other treatments. Within 24 hours, the combination of *Chlorophytum comosum* and *Spathiphyllum wallisii* reduced formaldehyde by 23,6%, and after five days, it reduced formaldehyde by 88,2%, with an average final concentration of 0,03 mg/m³.

Table 2. The Ability of Plants to Reduce Formaldehyde Concentration

Plant Type	%Removal (24 H)	%Removal (48 H)	%Removal (72 H)	%Removal (96 H)
Chlorophytum comosum	20,4	36,1	60,5	78,9
Spathiphyllum wallisii	16,2	33,1	53,5	71,8
mix plant	23,6	45,3	70,8	88,2

Research conducted by Haslina [24], the use of *Chlorophytum comosum* plants was able to reduce formaldehyde compounds in the classroom to levels below 0.01 mg/m³ after five days. This also applies to this study, *Chlorophytum comosum* successfully reduced formaldehyde levels by over 70% after five days and achieving a final concentration well below the prescribed quality standards. This also applies to the *Spathiphyllum wallisii* treatment. Meanwhile, the mix plant setup over 5 days can reduce formaldehyde compounds by more than 80%. This differs from the findings of Suárez [21], which showed that *Spathiphyllum wallisii* plants could reduce formaldehyde by 79% within 24 hours. In this study, *Spathiphyllum wallisii* plants were only able to achieve a 16,2% reduction within 24 hours. These discrepancies may be attributed to differences in room activities, variations in plant size, and the sources of formaldehyde in the room.

Formaldehyde levels in the morning were expected to remain high. However, after introducing plants into the room, a consistent decrease in formaldehyde levels was observed each morning from Tuesday to Friday. This occurs because plants can steadily reduce formaldehyde over several days, absorbing the compound through a combination of their roots and microorganisms in the soil. As a result, plants are capable of continuously reducing formaldehyde levels over extended periods [13].

The research conducted in the workers' room required 6 pots of *Chlorophytum comosum* plants and 6 pots of *Spathiphyllum wallisii plants*. The results showed that the average decrease in formaldehyde concentration due to one pot of *Chlorophytum comosum* and one pot of *Spathiphyllum wallisii* within 24 hours was 0,0071 mg/m³ and 0,0058 mg/m³, respectively. One pot of *Chlorophytum comosum* contains an average of 50 leaves, while one pot of *Spathiphyllum wallisii* contains an average of 15 leaves. The *Spathiphyllum wallisii* plant treatment showed the smallest reduction compared to the other plant treatments. However, by the fourth day, the *Spathiphyllum wallisii* treatment reached a concentration below the quality standard. Therefore, the use of both *Chlorophytum comosum* and *Spathiphyllum wallisii* plants can effectively reduce formaldehyde compounds in the workers' room.

3.4 Temperature and Humidity Identification

In this study, humidity and temperature measurements were conducted. These measurements were taken both before and after the placement of the plants. Temperature and humidity were measured simultaneously with the formaldehyde compound levels in the room. There is a relationship between formaldehyde concentration and indoor humidity levels. Since formaldehyde is water-soluble, water vapor can absorb some of it. Higher humidity levels result in an increased amount of water vapor in the air, which in turn leads to a greater release of formaldehyde from the furnishings in the room [25].

Table 3. Humidity Measurement (%)

Day	Before Placing the Plants	After Placing *Chlorophytum comosum*	After Placing *Spathiphyllum wallisii*	After Placing Mix Plants
1	49,31	53,17	51,46	55,86
2	42,89	54,40	51,33	56,56
3	50,81	55,26	54,86	55,44
4	47,70	55,03	53,66	56,04
5	47,03	55,34	53,43	55,03

In this study, the room's humidity measurements showed a linear relationship with the levels of formaldehyde compounds. The results indicate that the formaldehyde concentration in the room increases as humidity rises and decreases as humidity falls. The humidity in the room tends to be higher compared to the condition before plants were placed in the room. The increase in humidity after placing plants in the room does not show significant daily changes. According to research by Haslina [24], placing plants in a room increases the humidity compared to when there are no plants. This is likely due to the transpiration process of plants, which can affect humidity levels. Additionally, the increase in humidity could also be influenced by the number of people in the room at a given time, contributing more than when the room is empty. The indoor humidity measurement results are shown in Table 3.

In contrast, the temperature in each room did not show significant day-to-day variation due to the use of air conditioning. The temperature in each room remained relatively stable and within safe limits for the workers. The results of temperature measurements in the room after the plants were placed did not show a significant difference compared to the room without plants. The use of air conditioners prevents the air temperature in the room from changing. The indoor temperature measurement results are presented in Table 4.

Table 4. Temperature Measurement (^{o}C)

Day	Before Placing the Plants	After Placing *Chlorophytum comosum*	After Placing *Spathiphyllum wallisii*	After Placing Mix Plants
1	22,81	23,47	22,31	23,49
2	22,69	23,24	22,40	23,40
3	22,07	23,21	22,93	22,07
4	22,20	22,39	22,41	22,43
5	22,23	22,09	22,80	22,71

3.5 Statictical Test

A number of data have been obtained and will be analyzed using SPSS with the one-way ANOVA method. The one-way ANOVA is commonly used to determine whether there are differences in means between several groups of data. This method aims to identify whether any groups show significant differences in measurable parameters [26]**.** By analyzing the data using this method, we can determine whether there is a significant difference in formaldehyde concentration before and after the remediation process.

In the ANOVA test conducted, it was found that the significance value of the formaldehyde compound measurements obtained in the workers' room was less than 0,05. The magnitude of the significance value indicates that each data set has a different mean, or there is a significant difference between the formaldehyde concentration before and after remediation. This indicates that the three types of plants used to remediate formaldehyde compounds in the workers' room can significantly reduce the levels of formaldehyde compounds. The results of the significance value of the Anova test in the worker's room can be seen in **Fig. 6**.

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.168	3	.056	17.555	<,001
Within Groups	.435	136	.003		
Total	.603	139			

Fig. 6. Anova Test Results

4 Conclusion

In this study, the ability of *Chlorophytum comosum* and *Spathiphyllum wallisii* plants to reduce formaldehyde indoors was measured. The results show that both plants can reduce formaldehyde concentrations to below the quality standard of 0,12 mg/m³. For treatment with a single plant type, six plant pots are needed, whereas for the mixed plant treatment, three pots are required for each type. The mixed plant setup reduced formaldehyde concentrations more quickly than using only one type of plant. The mixed plants reached the quality standard in three days, while using a single plant type took four days to reduce formaldehyde levels to below 0.123 mg/m³. The results indicate that the average reduction in formaldehyde concentration within 24 hours from one pot of *Chlorophytum comosum* is 0.0071 mg/m³, while one pot of *Spathiphyllum wallisii* results in a reduction of 0.0058 mg/m³. Therefore, *Chlorophytum comosum* and *Spathiphyllum wallisii* are suitable options for phytoremediation of formaldehyde in indoor environments.

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