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Application Of Sansevieria Sp Sp And Cymbopogon Nardus Extract Formula As Control Of Mould And Germ Numbers In The Air With The Humidifier Method

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Abstract

The purpose to be achieved is Analyzing Sansevieria sp sp and Cymbopogon Nardus Extract Formula as Control of Mould and Germ Numbers in the Air with The Humidifier Method. The experimental design used in the study was the One Group Pretest Posttest Design. The independent variables were extracts of Sansevieria sp and Cymbopogon Nardus with concentrations of 50%, 60% and the dependent variable was the number of moulds and numbers of germs. Analysis of the data used in the form of the Mann Whitney test. The results showed that the average number of airborne germs in the room before being treated with a concentration of 50% and after being given treatment there was a decrease of 86.64%. The 60% concentration treatment decreased by 87.35%. Meanwhile, with the number of air moulds in the room before being treated with a concentration of 50%, after being given treatment there was a decrease of 80.34%. Likewise, the average number of air moulds in the room after being treated with a concentration of 60% decreased by 85.45%. From the results of statistical tests, it was stated that the extracts of Sansevieria sp and Cymbopogon Nardus with concentrations of 50% and 60% had the same ability to reduce the number of germs and the number of moulds Room air. In conclusion, the germ numbers and numbers of room air mussels before and after exposure to Sansevieria sp sp and Cymbopogon (Pasqua et al., 2018)

Keywords: Germ Number, Humidifier Mold Number, Sansevieria sp sp and Cymbopogon Nardus extract

Introduction

Air pollution in space is not only influenced by the presence of abiotic agents but also by biotic agents such as dust particles and microorganisms including bacteria, fungi, viruses and others (Salo and Zeldin, 2009). Air pollution is the cause of the most frequent causes of death than any other pollution in the world (Pasqua et al., 2018). Air pollution is very complex pollution that involves a mixture of gases and particles based on place and time(Health Effects Institute, 2017). It is well known that air pollution has several detrimental effects on human health and is considered a major problem for the global community (Franchini and Mannucci, 2011), (Mannucci et al., 2015), (Franchini et al., 2015),(Newby et al., 2015),

(Franchini and Mannucci, 2012). Air pollution can harm the respiratory system, cardiovascular system, digestive system, skin, reproductive system, and can cause cancer (Li et al., 2018). Air pollution has various health effects, some of which are Chronic Obstructive Pulmonary Disease, cough, shortness of breath, asthma (Eze et al., 2014), respiratory disease (Manisalidis et al., 2020). Several studies have stated that air pollution can increase due to forest fires and other human activities (Burhan and Mukminin, 2020).

In Indonesia, air pollution in the province of Sumatra shows typical symptoms, such as respiratory problems by 71.4% and a decrease in lung function by 72.6%. The effect of smog on the fetus has been studied which states that air pollution has caused 15,600 deaths in fetuses, children and infants (Jayachandran, 2009). In developing countries, air pollution will be very complex because it is influenced by population growth, urbanization and industrialization and the lack of awareness of protecting the environment(Mannucci and Franchini, 2017)

Air has a very important meaning in the life of living things and the existence of other objects. So that air is a natural resource that must be protected for life, human life and other living things. This means that its use must be done wisely by taking into account the interests of present and future generations. To get air following the desired quality level, it is very important to control air pollution (Kementrian kesehatan republik indonesia, 2011)

Based on the community's need for clean and healthy air, the air pollution control program became one of the ten leading programs in the 2010 Indonesian Health Development. According to the National Institute of Occupational Safety and Health (NIOSH) cited by the Indonesian Ministry of Health (2005), the cause of quality problems Indoor air is generally caused by several things, namely the lack of air ventilation (52%), the presence of sources of contaminants in the room (16%), contaminants from outside (10%), microbes (5%), building materials (4%), others (13%). Indoor air quality is the air in a building that is inhabited or occupied for a period of at least 1 hour by people with different health statuses (Suharyo Widagdo, 2009)

The purpose of the indoor air quality control program is to minimize the occupants' exposure to indoor pollutants. One of the rooms that have a high potential to experience indoor air pollution problems in the classroom for lectures. Classroom conditions in Levels I, II and III of the Health Polytechnic of the Ministry of Health of Surabaya are one of the spaces that are considered to have the potential to pollute indoor air pollutants in the form of air microorganisms, namely fungi and germs. This is because every day there are so many students who come in and out of the room with approximately more than 40 people every day and not just at one time, it can happen more than 3 sessions in 1 day. students can come in and out of the room carrying pollutants from outside and can also be caused from within the room itself, namely the condition of the building and the position of the building where some of the rooms do not get sunlight from outside. This triggers high air humidity, which can be a comfortable place for the growth of air microorganisms in the form of fungi and bacteria. The Indonesian government has regulated the

requirements for air quality in office spaces, namely the Decree of the Minister of Health of the Republic of Indonesia No. 1405/MENKES/SK/XI/2002 in the decision it is stated that the germ number is less than 770 colonies/m3 of air, free of pathogenic germs.

microorganism that can cause problems about indoor air health is fungal growth. Because the growth of the fungus will produce vegetation, organic material, capable of producing mycotoxins, which are substances that are toxic to humans when inhaled, ingested and in contact with the skin. Eradicate all fungi and microbes in the room is not easy, therefore, it is necessary to continue to make efforts to find antifungals and new antimicrobials, especially from materials or plants that are easy to grow in Indonesia. Many types of plants can be used, one of which is a plant that has been known for a long time in Indonesia. More than 2400 species of plants belonging to 255 families are reported to contain plant-based pesticides, one of which is Sansevieria sp sp leaf and citronella. This is because, in several studies, Sansevieria sp plants are known to have potential as antifungal substances(Elsberry, 2007)

Citronella (Cymbopogon Nardus (L.) Rendle) belongs to the Poaceae family is one of the plants that contain essential oils. Essential oils from several plants are biologically active as antifungal and antibacterial so that they can be used as natural antimicrobials (Lely, Sulastri and Meisyayati, 2018). Based on research that has been carried out using the stocking cup method, it is known that citronella oil (Cymbopogon Nardus (L.) Rendle) has antifungal and antibacterial activity. The active compounds in citronella oil that functioned as antifungals in this study were citronellal and linalool (Nakahara et al., 2003).

According to research results (Rusmiati; Rachmaniyah; A.T Diana Nerawati, 2020), Sansevieria sp sp extract based on phytochemical tests showed the presence of alkaloids, saponins, steroids, and triterpenoids. Sansevieria sp sp leaf extract antibacterial substances include saponins, alkaloids and tannins. The content of chemical compounds that have an antifungal effect is the tannin group. Tannins have several benefits apart from being an antibacterial agent, namely as an antifungal agent, and an antiviral. Lemongrass is one of the traditional medicinal plants where the essential oil contained in it has antifungal activity. Citronella essential oil contains the main components, namely citronellal, citronellol and geraniol.

Efforts to deal with air pollution originating from microbes need to be worried, especially when air pollution occurs in classrooms where the level of risk of danger is greater than outdoors. By reducing the number of air moulds and the number of germs in the classroom, it is an effort so that the number of moulds and the number of germs in the air is below the standard threshold and is not harmful to a humans health. Based on the description above, it is necessary to conduct in-depth research on controlling classroom air pollution by using extracts of Sansevieria sp sp and Cymbopogon Nardus in reducing the number of moulds and numbers of germs in the room air through a humidifier.

The purpose to be achieved is Analyzing Sansevieria sp sp and Cymbopogon Nardus Extract Formula as Control of Mould and Germ Numbers in the Air with The Humidifier Method

Materials and Methods

The design of this study was Post-test Only Controlled Group Design (Mulyaningsih, 2012) in which the treatment group was given treatment while the control group did not receive treatment and then the quality of both groups was measured (post-test). The difference between the two measurement results is considered as a treatment effect. The data obtained will be collected, processed and analyzed. Data analysis using Mann Whitney

Results and Discussion

a. Calculation of Germ Numbers before and after using Sansevieria sp and Cymbopogon Nardus extracts at a concentration of 50% with an exposure time of 3 hours, the following results were obtained:

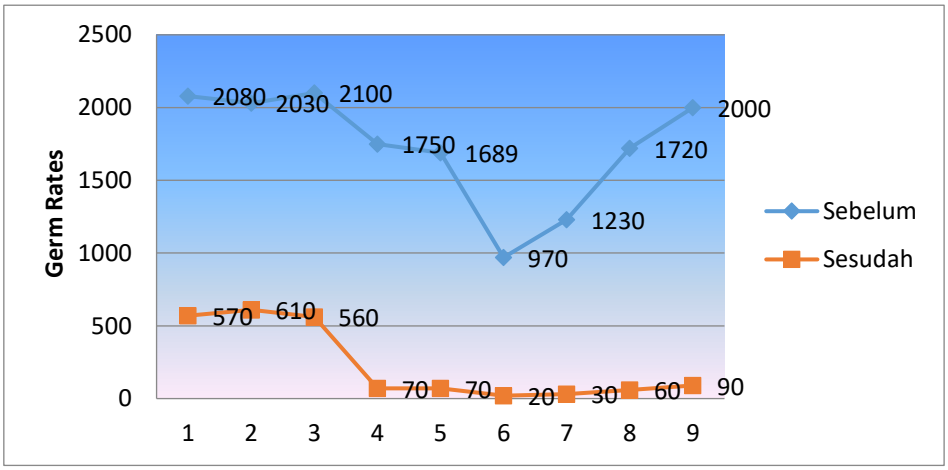

Figure 1. Differences in Air Germ Rates Before and After being given the Sansevieria sp Extract and Cymbopogon 50%

Based on the graph above, it is known that the mean before treatment the germ number measured was 1729.89 CFU/m3 and after treatment was 231.11 CFU/m3. Furthermore, the Wilcoxon test was carried out with the results of $p < 0.05$, so there was a significant difference. This means that there is a significant reduction in the number of germs

b. Calculation of Germ Numbers before and after using extracts of Sansevieria sp and Cymbopogon Nardus at a concentration of 60% with an exposure time of 3 hours, the following results were obtained:

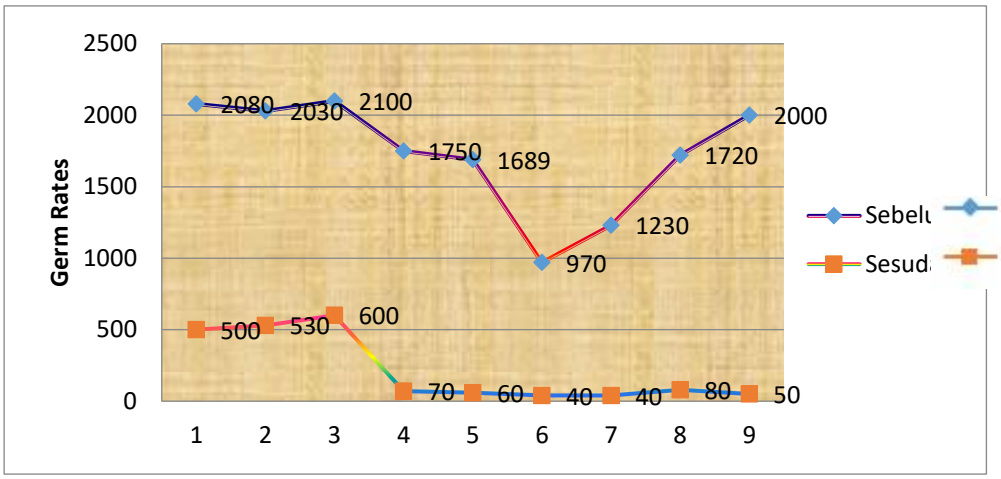

Figure 2.Differences in Airborne Germ Rates Before and After being given the Sansevieria sp Extract and Cymbopogon 60%

Based on the graph above, it is known that the mean before treatment the germ number measured was 1729.89 CFU/m3 and after treatment was 218.89 CFU/m3. Furthermore, the Wilcoxon test was carried out with the results of $p < 0.05$, so there was a significant difference. This means that there is a significant reduction in the number of germs

c. The calculation of the number of moulds before and after using the extract of Sansevieria sp and Cymbopogon Nardus with a concentration of 50% with an exposure time of 3 hours, the following results were obtained:

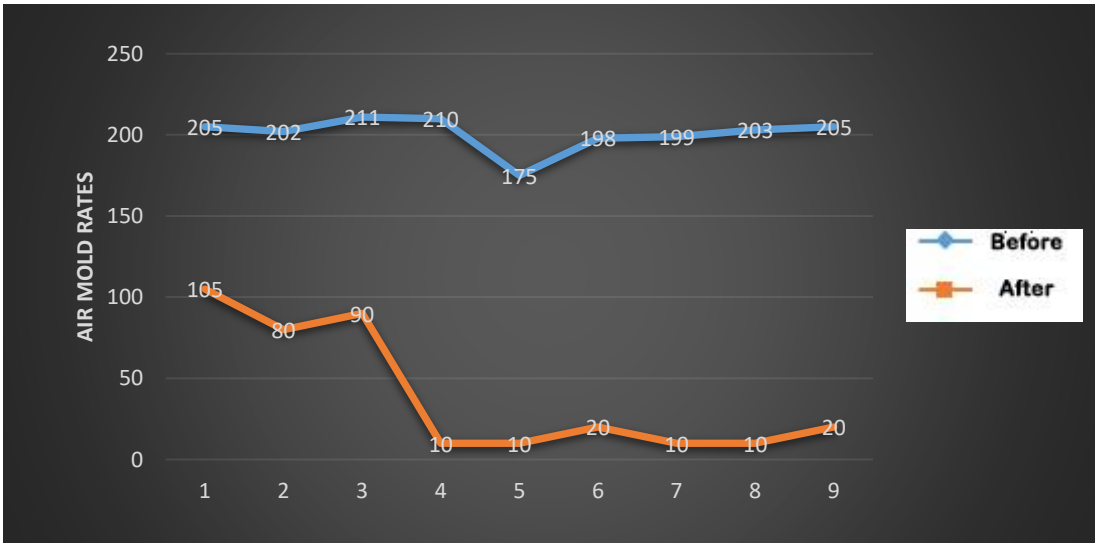

Figure 3.Differences in Air Mold Rates Before and After being given the Sansiviera Extract and Cymbopogon 50%

Based on the graph above, it is known that the mean before treatment the mould number was 200.89 CFU/m3 and after treatment was 39.49 CFU/m3. Furthermore, the Wilcoxon test was carried out with the results of $p < 0.05$, so there was a significant difference. This means that there is a significant reduction in the number of germs

d. The calculation of the number of moulds before and after using the extract of Sansevieria sp and Cymbopogon Nardus with a concentration of 60% with an exposure time of 3 hours, the following results were obtained

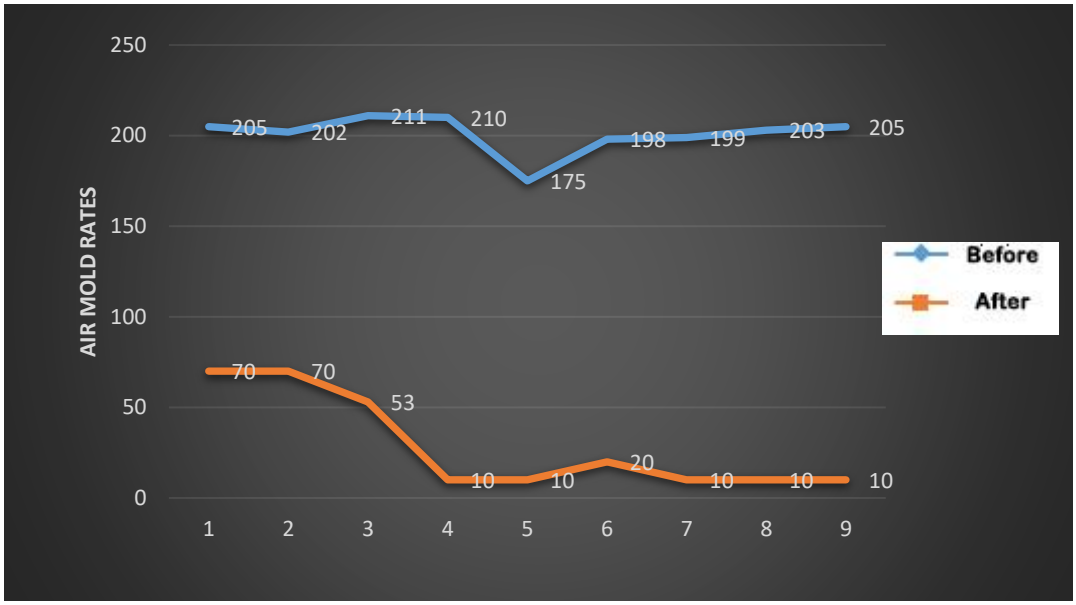

Figure 4. Differences in Air Mold Rates Before and After being given the Sansiviera Extract and Cymbophogon 60%

Based on the graph above, it is known that the mean before treatment the mould number was 200.89 CFU/m3 and after treatment was 29.22 CFU/m3. Furthermore, the Wilcoxon test was carried out with the results of $p < 0.05$, so there was a significant difference. This means that there is a significant reduction in the number of germs

Decreasing in Room Air Germ Rate

After being treated with Sansevieria sp Extract and Cymbopogon Nardus there was a decrease in the number of airborne germs in the classroom after being treated, this was because, from the results of the

phytochemical test, Sansevieria sp and Cymbopogon Nardus extract had chemical components which included citronellol (1,24%), Geraniol (8.31%) which can inhibit bacterial growth, this is in line with (Brugnera, 2011), essential oil of citronella leaves from Brazil which has chemical components of citronella (34.6%), geraniol (23.17%) and citronellol (12.09%) was also able to inhibit the activity of S. aureus bacteria and was able to inhibit the activity of Gram-negative bacteria, namely E. coli and Pseudomonas aeruginosa.

According to (Rusmiati; Rachmaniyah; A.T Diana Nerawati, 2020), Sansevieria sp and Cymbopogon Nardus contain saponins, flavonoids and alkaloids, phenols/tannins and saponins that function as antioxidants. Flavonoids have antimicrobial and antifungal activity. The mechanism of flavonoid toxicity includes damage to fungal cell membranes. Tannins can induce the formation of complex compounds bonding to enzymes or microbial substrates and the formation of complex bonding tannins to metal ions which can increase the toxicity of tannins themselves. The concentration of Sansevieria sp Extract and Cymbopogon Nardus between 50% and 60% has the same effective antibacterial power.

Decreasing Room Air Mold Rates

The results of the research on the number of air moulds in the Surabaya Regional Health Laboratory the average number of air moulds in the Surabaya Health Polytechnic class did not meet the requirements according to the Regulation of the Minister of Health Number 1077/MENKES/PER/ V/2011, which was 0CFU/m3 (Ministry of Health, 2011). The results of the examination of the average number of air moulds in the room before being treated with Sansevieria sp Extract and Cymbopogon Nardus 50% concentration was 200.9 CFU/m3 and after being treated was 39.44 CFU/m3. 1077/MENKES/PER/V/2011 which is 0 CFU/m3 (Kementrian kesehatan republik indonesia, 2011)

The decrease in the number of moulds in the classroom air after being exposed to Sansevieria sp and Cymbopogon Nardus extracts was caused by: The antifungal activity of the ethanolic extracts of Sansevieria sp sp and lemongrass extracts was thought to be due to the presence of citronellol (C10H16O) and geraniol (C10H18O) compounds which are antifungal compounds. and belongs to the group of terpenoids which are classified as monoterpenes that can suppress the growth of pathogenic fungi. In addition, the decrease in air mould numbers is thought to be due to the potential for active compounds contained in the extract of Sansevieria sp sp and lemongrass itself in line with (Rusmiati; Rachmaniyah; A.T Diana Nerawati, 2020)s research (2020), which states that Sansieviera and lemongrass contain saponins, flavonoids and alkaloids, phenols/tannins and saponins that function as antioxidants. Flavonoids have antifungal activity. The mechanism of citronella essential oil compounds as antifungals is to inhibit the synthesis of ergosterol (the main sterol forming fungal cell membranes) so that the membrane protein structure is damaged and membrane permeability increases which will cause fungal cell death. istianto, Nomer

Conclusion (optional)

1. Germ numbers and room air mussel numbers before and after exposure to extracts of Sansevieria sp sp (Sansevieria sp sp) and lemongrass (Cymbopogon Nardus) concentrations of 50% and 60% decreased significantly, this is following the Mann Whitney test, but between concentrations of 50 % and 60% had p values > 0.05, which means there was no significant or insignificant difference. So in this study, Sansevieria sp and lemongrass extracts between concentrations of 50% and 60% had the same effective antibacterial and antifungal power.
2. The decrease in the number of germs and moulds in classroom air was due to the extracts of Sansevieria sp sp (Sansevieria sp sp) and lemongrass (Cymbopogon Nardus) containing citronellol (C10H16O) and geraniol (C10H18O) compounds, flavonoids. Phenols/tannins, alkaloids, saponins are antifungal and antibacterial compounds.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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