

Development of the Potential of Extrak Lidah Mertua (*Sansevieria sp*) and Lemongrass (*Cymbopogon Nardus*) in Lowering the Number of Air Germs of Space through Humidifier Modification

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Abstract

According to Regulation of the Minister of Health No.1077 of 2011, indoor air pollution especially houses are very dangerous to human health, because in general people spend more time doing activities indoors so that the house becomes very important as a micro environment related to the risk of air pollution. Efforts to deal with indoor air pollution caused by germs need to be carried out, especially indoor air pollution the danger level is greater than outdoors. The goal is to test the decrease in germ rate in the air of the room with humidifier modification using sansevieria and lemongrass ekstrak. The experimental design used in the study is One Group Pretest Posttest Design. As a humidifier modification material to lower the Air Germ Number of the Room. The achievement of this goal was done using pre-experiments with the form of One Group Pre- Post Test Design. The free variables are Sansevieria ekstrak with concentrations of 30%, 40% and 50% and the bound variables are germ numbers. Analysis of the data used in the form of a paired t test and Anova test. The results showed that the average ekstrak air germs of Sansevieria and Lemongrass concentrations were 30% before treatment of 15.6 CFU/dm³ and after treatment of 3.4 CFU/dm³, while the concentration of 40% of space air germs before treatment is 19.8 CFU/dm³ and after treatment 5.6 CFU/dm³ and the concentration of 50% of space air germs before treatment is 17.2 CFU/dm³ and after treatment is 6 CFU/dm³. The result of the paired t test showed that $p < 0,05$, means there is a significant difference in the decrease in the number of germs before and after treatment at all conditions. Extrak Sansevieria and Lemongrass are able to lower the number of air germs of space. at ekstrak concentrations Sansevieria 30% and lemongrass 0.1 % the average decrease in the germ rate is 78.2%, while for concentrations 40% the average decrease in germ rate is 74.24% and the average 50% concentration decrease in the germ rate is 65.11%. Anova test results obtained that tongue in-laws extract (Sansiviera,sp) concentrations of 30% 40% and 50%, have a p value of > 0.05 , which means there is no meaningful or insignificant difference. The results of this study are ekstrak Sansevieria sp and Cymbopogon Nardus as humidifier fluid modification at concentrations of 30%, 40% and 50% have the same effectiveness in lowering indoor air germs. Recommendations for development and trials modify sansievera and lemongrass ekstrak solutions with other oceans that can also absorb air pollution.

Keywords: Germ numbers, Humidifier, Extrak sansievera and cymbopogon nardus, air spaces.

Introduction

Based on WHO data, it is estimated that around 400-500 million people, especially in developing countries, are currently facing the problem of indoor air pollution and it is estimated that every year there are about 3 million deaths due to air pollution. Of the 2.8

million of them due to indoor air pollution and another 0.2 million due to outdoor air pollution [1]. According to the American Industrial Hygiene Association, air pollution problems in small amounts, mold spores are usually harmless, but when they are in wet

places in the home, mold and germ colonies can start to develop. When fungi grow on the surface, spores can be released into the air where they can be easily inhaled [2]. The results of Oom Kumala's research stated that the extract of the tongue-in-law based on phytochemical tests showed that saponins, flavonoids, steroids, and triterpenoids were anti-bacterial [3]. The antibacterial substances of Lidah Mertua leaf extract include flavonoids, saponins, and tannins.

The content of chemical compounds that have an antifungal effect is a class of flavonoids. The flavonoid content in 100 grams of fresh tongue-in-law is 5.3-16 μmol apigenin, 18-51 μmol apigenin glycoside, 7.1-21 μmol luteolin glycoside, and 13-38 μmol chrysoeriol glycoside [4]. The results of previous studies illustrate that the methanol extract of Mertua's Tongue is used as an antifungia, proven by a 50% dose effective in reducing levels of mold / mold in space. This research is the development of previous research with the title "Decreasing the number of room air molds through modification of a humidifier with a solution of the in-law tongue extract (*Sansevieria* sp)".

As well as from another journal that describes lemongrass as an antifungal with the title "Anti-fungal activity of essential oils against banana anthracnose in storage under laboratory conditions," the results of this study showed that the 0.1% dose was quite effective in reducing the number of fungi.

Another study from Nilda Lely 2018, proves that lemongrass leaf extract (*Cymbopogon nardus* Rendle) contains citronellal active substances that can be anti-microbial, from experiments conducted at (*Cymbopogon nardus* Rendle) doses of 50%, 25%, 12.5% and 6.25%, can inhibits the growth of the fungus *Mallasezia furfur*, which causes dermatomycosis, which often grows in tropical areas, is contagious [5].

Purpose

The purpose of this study was to determine the effectiveness of *Sansevieria* sp and *Cymbopogon Nardus* extracts as a modification of the liquid in a humidifier in reducing the number of germs in room air.

Materials and Method

The design of this study was an experimental design with One Group Pretest Posttest

Design. Namely the design carried out on the first observation (pretest) which is to test the changes that occur after the experiment, where in this study the difference between the two measurement results is considered a treatment effect [6]. The research was conducted at the Poltekkes Laboratory of the Ministry of Health in Surabaya, Laboratory

of the Department of Environmental Health and Integrated Laboratory) and the Surabaya City Health Laboratory. The object of this research is the number of germs in the experimental room with a size of (45 x 45 x 45) cm³, which is equivalent to 91.125 cm³ (0.091) m³. Determination of the sample for calculating the germ count based on purposive sampling. The sample size is determined based on Federer's formula [7] From the calculation formula above, it is obtained the results of 9 repetitions with 3 treatment groups with 2 observations in the sample before and after using a modified humidifier with a solution of *Sansevieria* sp and *Cymbopogon Nardus* lemongrass extract, so that the sample size a total of 54 samples.

The research materials used in the study were: *Sansevieria* sp and *Cymbopogon Nardus* extract, agar plate count, saboraaud dextrose agar, SIM agar (Sulfur, Indol, Motility), nutrient broth (NB), sugars (glucose, lactose, sucrose, maltose, mannitol), simon citrate, TSIA (Triple Sugar Iron Agar), gram staining (Gentian violet, lugol, 70% alcohol, safranin), distilled water, LPCB staining (Lactophenol Cotton Blue). The research equipment includes: Destilator, Humidifier, Stop Watch, Hygrometer / Thermometer, the modified room contains 9 numbers of squares made of acrylic, with a size (45 x 45 x 45) cm³, which is equivalent to 91.125Cm³ (0.091) m³. The research data were analyzed using the Paired T-test which is included in the parametric statistical test with α (0.05).

This one way ANOVA test is used to determine the concentration of the in-laws' tongue to determine the level of effectiveness in reducing the number of germs.

Results

The Results Of Calculating The Number Of Room Air Germs Before And After Using *Sansevieria* Extract, A Concentration Of 30% And 0.1% Lemongrass In A Humidifier.

Calculating the number of germs before and after using Sansevieria extract 30% and

Cymbopogon Nardus with a concentration of 0.1% with an exposure time of 3 hours, the following results were obtained:

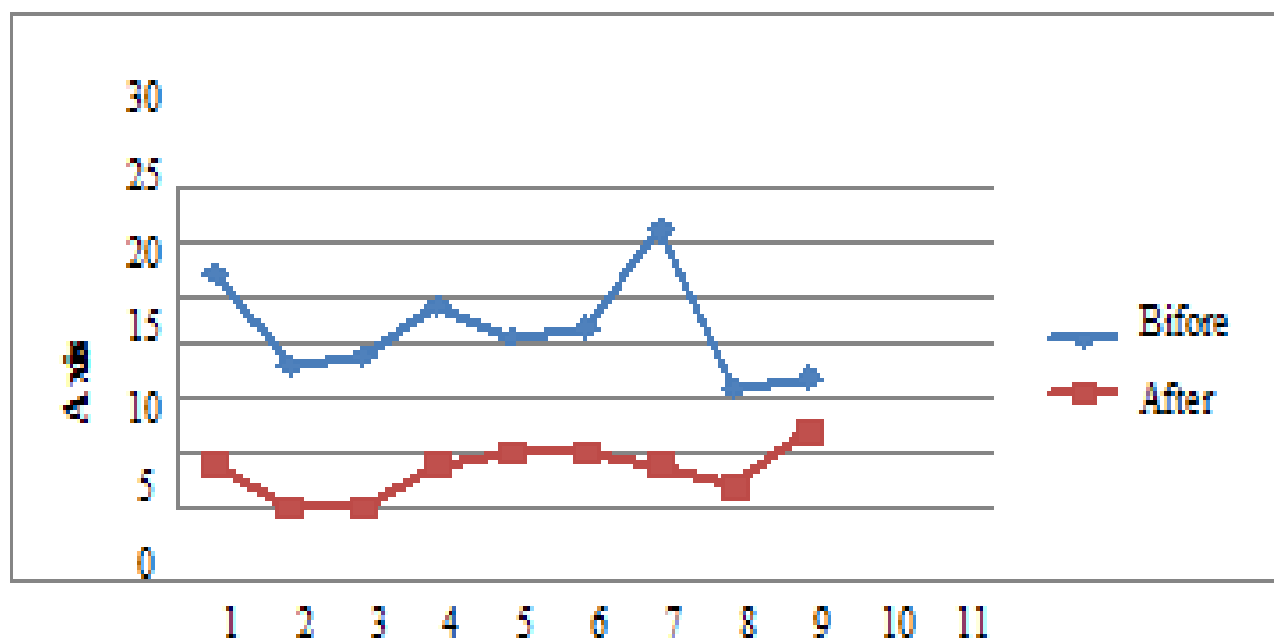


Figure 1: Differences in room air germ numbers before and after using Sansevieria 30% and 0.1% lemongrass as a modification of the humidifier solution

Figure 1 shows that the difference between the average number of room air germs before and the number of room air germs after using the Sansevieria 30% extract and Cymbopogon Nardus 0.1% as a modification of the humidifier solution as a modification of the

humidifier solution is 12.2 CFU / m³ (78.2%). counting the number of room air germs.

The results of the calculation of room air germs before and after using the Sansevieria extract with a concentration of 40% and 0.1% lemongrass in a humidifier

Table 1: Results of Calculation of Room Air Germs Figures before and after the tool Humidifier given Sansevieria extract 40% and Lemongrass 0.1%

Replication	Number of bacteria		Number of bacteria	Percentage drop
	After	After		
1	19	4	15	78.94
2	16	7	9	56.25
3	17	6	11	64.70
4	24	6	18	75.00
5	19	6	13	68.42
6	18	5	13	72.22
7	19	4	15	78.94
8	23	5	21	91.30
9	24	7	17	70.83
Total	179	47	132	73.74
Average	19.8	5.2	14.6	74.24

Based on table 1 above, it can be seen that the difference between the number of room air germs before and after using the Sansevieria 40% extract and 0.1%

lemongrass as a modified humidifier solution, it is known that the average difference in the number of room air germs before and after using Sansevieria 40 extract % and 0.1% lemongrass as a modified humidifier solution

is 14.6 CFU / 0.091 m³ which is equivalent to 160.43 CFU / m³.

Air Germs before and after using the Sansevieria extract 50% and 0.1% lemongrass in a humidifier

The Results of the Calculation of Room

Table 2: The results of calculating the number of room air germs before and after the tool the humidifier was given 50% Sansevieria extract and 0.1% lemongrass

Replication	Number of bacteria		Difference Decline	Percentage drop
	Affter	Before		
1	19	5	14	73.68
2	14	7	7	50.00
3	13	8	5	38.46
4	16	6	10	62.5
5	17	6	11	64.70
6	20	9	11	55.0
7	18	5	13	72.22
8	19	8	11	57.89
9	19	0	19	100
Total	155	54	101	65.16
Average	17.2	6	11.2	65.11

Table 2 above, it can be seen that the difference between the number of room air germs before and after using the Sansevieria extract 50% and 0.1% lemongrass as a modified humidifier solution, it is known that the average difference in the number of room air germs before and after using Sansevieria extract is 40% and 0.1% lemongrass as a modified humidifier solution is 11.2 CFU /

0.091 m³, which is equivalent to 122.89 CFU / m³.

Decreasing Room Air Germs Numbers by using Sansevieria and Lemongrass extracts with a concentration of 30%, 40% and 50% as a modified humidifier solution

Table 3: Results of Decreasing Room Air Germs Numbers before and after the humidifier were given Sansevieria extract 30%, 40%, 50% and 0.1% lemongrass

Replication	Percentage Decrease in Number of Germs		
	30 %	40%	50%
1	81.8	78.94	73.68
2	100	56.25	50.00
3	100	64.70	38.46
4	78.9	75.00	62.5
5	68.8	68.42	64.70
6	70.6	72.22	55.0
7	84.6	78.94	72.22
8	81.8	91.30	57.89
9	41.7	70.83	100
Total	79.3	73.74	65.16
Average drop	78.2	74.24	65.11

The results of the study table 3. It can be seen that at the concentration of Sansevieria extracts of 30% and 0.1% lemongrass the average reduction in the number of germs is 78.2%, while for the concentration of 40% the average decrease in the number of germs is 74.24% and the average concentration of 50% decrease the germ rate is 65.11%.

Analysis of the effectiveness of Sansevieria and lemongrass extracts with a concentration of 30%, 40% and 50% as a modified humidifier solution

The results of the analysis using Paired T-test, to test the mean difference before and after treatment, namely treatment with

Sansevieri and Cymbopogon Nardus 30% and 0.1% lemongrass were obtained mean results before treatment; the measured germ count was 15.7 and after treatment were 3.6. Furthermore, the paired T-test was carried out with the results of the value $t = 6,531$ with $p = 0.00$, which means $p < 0.05$, so there is a significant difference.

The results of the study with treatment with Sansievera 40% and Sereh 0.1%, obtained the mean before treatment, the measured germ count was 19.88 and after treatment was 5.22. Furthermore, the Paired T-test was carried out with the result of the value $t = 11,975$ with $p = 0.00$, which means $p < 0.05$, if there is a significant difference.

The results of the analysis were based on treatment research data with *Sansevieria* and *Cymbopogon Nardus* 40% and 0.1% lemongrass, showing the mean results before treatment, the measured germ count was 17.2 and after treatment were 6. Furthermore, the Paired T-test was carried out with the result of $t = 8,366$ with $p = 0.00$, which means $p < 0.05$, then there is a significant difference.

The One Way ANOVA test is a test used to see whether there is antimicrobial power in each group, but it cannot be used to see how much significance the difference in the average reduction in the number of germs in each treatment group is carried out so the next test is the LSD test.

The significance of the difference in the average reduction in germ numbers of each treatment group in this study was tested by the LSD (Least Significance Difference) test. Based on the results of the LSD test as attached, it shows that each treatment has a significant reduction in the number of germs. The most effective reduction in the number of germs by comparing the control with the extract of the tongue-in-law (*Sansevieria*, sp).

The results obtained in the extract of the tongue-in-law (*Sansevieria*, sp) with a concentration of 30%, 40% and 50%, have a p value > 0.05 , which means there is no significant or insignificant difference. So that this research can be concluded that *Sansevieria* and lemongrass extracts have the same effective antibacterial power.

Discussion

The germ number is the number of pathogenic or non-pathogenic microorganisms floating in the air either with / attached to droplets (water), or particles (dust) that are cultured with media to form colonies that can be observed visually or with magnifying glasses, then calculated based on The colonies were converted into colony forming units per cubic meter (CFU / m³) [8]. The results showed that there was a significant difference in the number of room air germs before and after based on the concentration of the in-law tongue extract (*Sansevieria*, sp) and lemongrass. The average room air germ value from the results before treatment was 171 CFU / m³ not exceeding the standard of the Minister of Health Decree RI No. 1077 / MENKES / PER / V / 2011,

namely < 700 CFU.m³ [9]. These results indicate that in the room air there are microbiological pollutants that can affect human life, in this case the number of germs. The results of this study are in line with Susilowati's statement that many pathogenic germs are spread in the air through dust grains or dry saliva droplets. The standard of Permenkes 1077 is < 700 CFU.m³ [9, 10].

These results indicate that the number of room air germs has decreased after being treated with *Sansevieria* and lemongrass extracts through a humidifier. Another factor that causes a decrease in the number of room air germs is the adsorption ability of *Sansevieria*. According to the results of Tahir's research, *Sansevieria* extract is able to absorb various harmful pollutants in the air such as lead, fungi and bacteria [11]. Likewise, research produced by the Wolfereton Environmental Service, which states that the ability of each *Sansevieria* leaf blade can absorb 0.938 micrograms per hour of formaldehyde.

For a room of 100 m³, it is enough to place *Sansevieria trifasciata* adults with 5 leaves so that the room is pollutant free. Specific characteristics that are rarely found in other plants, including being able to live in a wide range of temperature and light. In this study, the *Sansevieria* concentrations were used 30%, 40% and 50%. At concentrations of 50% and 70% the number of germs is still below the Permenkes 1077 standard [9-11]. The extract of the tongue-in-law (*Sansevieria*, sp) is a solution containing tannins. The higher the concentration of the tongue extract, the higher it is as an absorbent material for germs.

The decrease in the number of room air germs is thought to be due to the potential for active compounds contained in *Sansevieria* and lemongrass extract according to Philip et al. (2011). The tongue-in-law contains saponins, flavonoids and alkaloids which function as antioxidants. Flavonoids have antimicrobial activity. The mechanism of flavonoid toxicity can damage the cell membrane of fungi. Tannins can induce the formation of complexes of bonding compounds against enzymes or microbial substrate and the formation of a complex of tannin bonds to metal ions which can increase the toxicity of the tannin itself [12, 13].

The results of this study are also in line with the results of Oom Kumala's research, that the extract of the leaves of the in-laws contains saponins, flavonoids, steroids and triterpenoids which are shown with positive results. Other ingredients of the tongue-in-law include polyphenols and saponins. Alkaloids are the largest group of phenolic compounds. Exist in nature. The biological activity of alkaloid compounds against *C. albicans* yeast is carried out by damaging the cell walls and these compounds can enter the nucleus of yeast cells.

Flavonoid compounds are phenolic compounds that have properties as disinfectants. Because flavonoids are polar, flavonoids can easily penetrate the peptidoglycan layer which is also polar, so flavonoids are very effective in inhibiting the growth of Gram positive bacteria. Flavonoids have the same way of working as saponins in terms of inhibiting bacterial growth, namely by denaturing bacterial protein which causes bacterial cell metabolism to cease.

Cessation of metabolic activity results in cell death. Extracts of the leaves of the in-laws (*Sansevieria trifasciata* Prain) and lemongrass can inhibit the growth of germs [3, 9, 10]. The results of this study show that at the concentration of *Sansevieria* extracts of 30% and 0.1% lemongrass the average decrease in germ numbers is 78.2%, while for a concentration of 40% the average decrease in germ numbers is 74.24% and a 50% concentration the average reduction in germ numbers is 65.11%.

The results of this study indicate that *Sansevieria* and lemongrass extract can reduce the number of room air germs, this is supported by the results of phytochemical tests, it is known that *Sansevieria* and Lemongrass extract contains flavonoids, alkaloids, phenols, quinones, steroids. Compounds that have antimicrobial activity are flavonoids which are polyphenol derivatives. The mechanism of action of phenol derivatives is by denaturing and coagulating microbial cell proteins.

The results of this study are in line with Omm Komala's research [3], the mean number of germs was 6 (50% concentration), 4.87 (40% concentration) 3.36 (30% concentration) with exposure to 50% *Sansevieria* extract and *Cymbopogon Nardus* extract 0.1%.

These data indicate a concentration of 30% , is better in reducing the number of germs. The decrease in the number of germs after exposure to the 30% SS extract was 78.2% (before and after), and SS 40% was 74.24% and SS 50% was 65.11%. Meanwhile, the average numbers of germs before treatment or without exposure were 15.7, 19.8 and 17.2.

These results indicate a stable high number of germs without exposure to humidifier with *sansiviera* extract. Based on the results of the analysis of variance using the One Way ANOVA test, the p.value was 0.000 ($P < 0.05$), it can be concluded that there was a significant effect on the concentration of the extract of the tongue-in-law (*Sansiviera*, sp) and lemongrass with the number of room air germs.

From the results of the study, it can be concluded that at the concentration of the tongue-in-law extract of 30%, 40% and 50% its effectiveness in reducing the number of room air germs has the same ability. This may indicate that at concentrations of 30%, 40% and 50% contain almost the same number of flavonoids, alkaloids so that they have the same ability to reduce the number of air germs in space. This shows that the active compounds contained in the extracts of the tongue-in-law (*Sansiviera*, sp) are saponins, tannins, alkaloids. The room air germ numbers are influenced by the concentration of the extract of the tongue-in-law (*Sansiviera*, sp). This shows that the higher the concentration given, the more tannins, saponins and alkaloids that are received [3].

Conclusion

The number of room air germs before and after the humidifier modification with the *Sanievera* extract solution was significantly different; this was in accordance with the paired test statistical test. The number of room air germs decreased after going through a humidifier modified with the in-law's tongue extract solution. The average difference in reduction at a concentration of 30% was 13.2 CFU / dm³, at a concentration of 40% was 14.6 CFU / dm³ and at a concentration of 50% the difference in reduction was 11.2 CFU / dm³. *Sansiviera* and lemongrass extract at a concentration of 30%, 40% and 50% all have

the same effectiveness in reducing the number of room air germs. Recommendations for the development of appropriate science and technology for environmental health related to the control of indoor air pollution need to be developed and tested to modify the Sansievera and lemongrass extract solutions with other solutions. Besides that, it can also absorb air pollutants. Besides that, other research is also needed related to the parameters of physical and chemical air pollution. The existence of innovations in room air sanitation by modifying the solution in the humidifier can be used as an effort to make the air healthy for residential/ residential, hospital, office and industrial room air sanitation.

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