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AIR BACTERIOLOGICAL QUALITY IN TAHA AL-QURAN EDUCATION PARK, BIMA DISTRICT

Sri Wahyuningsih[1*]. Wahyudin[2], and Mulhidin2
[1]Undergraduate Program in Environmental Engineering, Mataram College of Environmental Engineering, Mataram, Indonesia
[2]Environmental Engineering Study Program, Mataram College of Environmental Engineering, Mataram, Indonesia
*Email: sriw7634@gmail.com

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Abstract: Qur'an Education Park is a nonformal education facility that has many students. Apart from being a place for learning knowledge, Quran Education Park also has the potential to become a place of a transmission. One of the factors influencing the spread of disease is the presence of germs in the Air. This study aims to determine the air quality in the classroom. The study showed the number of bacteria in the classroom at the Taha Qur'an Education Park, Sanggar District, Bima Regency. This type of research is analytic observational with a cross-sectional study approach. The highest number of bacterial colonies was in room 2, with the measurement time in the afternoon with a total of 2569 CFU/m^3. Characterization showed that the average bacteria were gram-positive, and characteristics according to the average colony were pinpoint size. Conclusions from the research on quality air bacteriology in the Taha Quran Education Park do not meet the requirements according to KEPMENKES RI No. 1204/MENKES/SK/X/2002 concerning classroom (200-500 CFU/m^3).

Keywords: *Bacteriological, Air, Qur'an Education Park*

INTRODUCTION

Indoor air quality is a problem that needs attention because it will influence human health [1]. In developed countries, it is estimated that the death rate per year due to indoor air pollution is 67% in rural areas and 23% in urban areas. In contrast, in developing countries, the mortality rate due to indoor air pollution is 9% in urban areas and 1% in rural areas [2]. A study that examined buildings' factors for indoor air pollution found that 52% of buildings that were not properly ventilated were a factor causing indoor air pollution. Research on 350 employees from 18 offices in Jakarta for six months (July-December 2008) showed a decrease in the health of indoor workers due to indoor Air being polluted by free radicals (chemicals) originating from indoors and 50% of people working in buildings experiencing Sick Building Syndrome (SBS) [3]. *One* of the microorganisms that are often found in the room is bacteria. Bacteria in the Air is a significant element of pollution because it can cause upper respiratory tract infections, tuberculosis, pneumococcal pneumonia, meningococcal meningitis, and troop disease. According to the Decree of *the* Minister of Health of the Republic of Indonesia, the number of bacteria in the room must meet indoor air quality standards. Types of bacteria such as Staphylococcus sp and Streptococcus sp are found in the Air through coughing, sneezing, and talking. Several other species were detected to contaminate the Air, including Pseudomonas sp Klebsiella sp, Proteus sp, Bacillus sp, and fungi[4]. Airborne transmission occurs in closed spaces such as hospital buildings, schools, offices, and other closed places. Indoor air bacteria are commonly found in public places, including classrooms. As one of the educational institutions, the factors that can support the teaching and learning process must be met. One of the factors that can support the teaching and learning process is health and the learning environment [5].

The existence of microorganisms in the room is influenced by temperature, humidity, lighting, occupancy density, and ventilation systems [6]. Sources of air pollution can be in the form of physical, chemical, and biological pollution. Microorganisms cause sources of indoor biological air pollutants. Based on data from research conducted by the National Institution for Occupational Safety and Healthy (NIOSH), it is explained that microorganisms are one of the harmful pollutants in indoor Air. Microorganisms present in the Air are identified as the cause of various diseases, such as irritation of the eyes and skin and respiratory problems. Air can be a medium for spreading infectious diseases such as diphtheria, tuberculosis, pneumonia, and whooping cough [7]. If the humidity in the room is above 60%, it will cause the development of pathogenic organisms and allergenic organisms. Sources of humidity in the room can come from rainwater and stagnant water in the air conditioning system.[8]

Based on the results of research conducted by previous researchers, it was obtained the results identification of bacteria in the research location, namely bacteria in the genus Micrococcus sp and fungi in the genus Aspergillus sp. Based on the correlation test, there is a relationship between temperature and the number of bacteria (r = 0.22), humidity and the number of bacteria (r = 28), and lighting and the number of bacteria [9].

Based on the results of research conducted by previous researchers in the classrooms studied at the Darur Abror Foundation school, two rooms did not meet the healthy air quality standards based on the Minister of Health Regulation No. 1405/MENKES/SK/2002. The two classrooms at the Darur Abror Foundation obtained some colonies, 2,699 CFU/m^3.[10] The classroom at Taha Al-Qur'an Educational Park is used as a place for teaching and learning. Rooms that are frequently used can pollute indoor air quality—especially microorganisms in the form of bacteria if good hygiene is not carried out. As explained above, poor air quality will put you at high risk of contracting a disease. According to the Decree of the Minister of Health of the Republic of Indonesia No. 1405/Menkes/SK/XI/2002, the indoor air bacteria count index has a maximum concentration limit of 200-500 CFU/m^3.

RESEARCH METHODS

Tools

The tools used are stationery, incubators, petri dishes, test tubes, beakers, round loops, dropper pipettes, light microscopes, ice flasks, bunsen, tube racks, funnels, glass preparations, glass covers, colony counter, Laminar Air Flow (LAF), analytical balance, Erlenmeyer, tube rack, mask, and autoclave.

Materials

The tools used are spirit, NA (Nutrient Agar), Violet Crystals, Iodine Solution, Alcohol, Ethanol, and Safranin.

Work procedures Sampling

Petri dishes containing NA (Nutrient Agar) media were placed and opened for 30 minutes in the classroom. After that, the petri dish was closed and stored inside an ice flask to bring the Laboraturium

Planting and breeding

NA media (Nutrient Agar) containing the research sample was incubated upside down at 37 ^{O}C for 2 x 24 hours. The number of growing bacteria was counted using the colony counter.

Counting the number of bacterial colonies

Colonies that grew after being incubated for 2 x 24 hours at 37ºCcounted on the media using a colony counter with units of CFU/m^3.

RESULTS AND DISCUSSION

Air samples in this study were taken at the Taha Qur'an Education Park. The Taha Qur'an Education Park is located in Boro Village, Sanggar District, Bima Regency. The total area of the Taha Qur'an education park is 1300 x 2500. There are several rooms in the Taha Qur'an Education Park, including two classrooms, a warehouse, a bathroom, and a separate building used as a mosque. The classrooms in the Qur'an Education Center are 10 x 10m in size.

Total Number of Bacteria

The results of measuring the germ count at the Taha Quran Educational Park showed that the total germ count was far below the KEPMENKES RI standard No.1405/MENKES/SK/2002 concerning Classroom Environmental Health Requirements (200-500 CFU/m^3). The measurement results can be seen in the table below.

Table 1. Bacterial Aging Index in the TAHA Quran Educational Park

Room	Number of Bacteria (CFU/m^3) WITA		Standard 200-500 CFU/m^3	
	09.00	15.00	Morning	Afternoon
A	3678	5644	TMS	TMS
B	3988	12569	TMS	TMS

Description:
TMS: Does Not Meet The Requirements

Characteristics of Types of Bacteria

Characteristics are the characteristics of one bacterium, the characteristics of the bacteria seen from the shape, size, surface, color, elevation, and margins. Characteristic observation can be done in 2 ways: macroscopic and microscopic. The macroscopic observation of morphology is to look at the characteristics of bacteria according to size, shape, surface, color, elevation, and margin. The results of macroscopic observations can be seen in table 2.

Characteristics of Colonies Based on Color

Color is one of the more visible differentiators of a bacterium. Based on the results of research on Taha's Quranic education, the colors of the bacteria obtained were white, yellow, pink, and orange. The color of the bacteria obtained can be seen in table 3.

Colony characteristics based on surface

The surface is one of the visible differentiators of bacteria. Based on the research

results in two rooms at the Taha Quran Education Park, two bacterial surfaces were obtained: rough and smooth. Bacterial surface calcification can be seen in table 4.

Table 2. Characteristics according to the colony

No	Time WITH	Size				Room
		Pinpoint	Small	Moderate	Large	
1	09.00	7	5	5	6	A
	15.00	20	9	19	4	
2	09.00	13	7	10	11	B
	15.00	22	9	5	7	
	Amount	62	30	39	28	

Table 3. Characteristics of Colonies Based on Color

No	Time WITH	Color				Room
		White	Yellow	Pink	Orange	
1	09.00	1	8	5	6	A
	15.00	10	11	1	4	
2	09.00	4	4	1	2	B
	15.00	9	7		9	
	Amount	24	29	16	21	

Table 4. Colony characteristics based on surface

No	Time WITH	Surface Type		Room
		Rough	Fine	
1	09.00	5	4	A
	15.00	4	21	
2	09.00	7	3	B
	15.00	8	11	
	Amount	24	39	

Air bacteriological quality in the classrooms of Taha Quran Education Park

The rooms chosen in this study are two rooms, wherein these two are classrooms where students study the Koran. There are several rooms in the Taha Qur'an Education Park, including two classrooms, a warehouse, a bathroom, and a separate building used as a mosque. Based on research on colonies that grew after being incubated for 2 x 24 hours at 37°C, they were counted on media using a colony counter with CFU/m^3 units. The number of germs exceeds the limit determined regarding the number of germs in the classroom according to the Minister of Health No. 1405 / MENKES/SK /2002. The number of germs in classrooms determined by the Minister of Health Decree is 200-500 CFU/m^3.

Based on Permenkes No. 1405 / MENKES / SK / 2002, the number of bacteria in the Taha Al-Qur'an Education Park exceeds the threshold the Minister of Health determined. Many factors influence the presence of air bacteriology in the room, one of which is occupancy density. With a room area of 10 x 10m, the classroom is filled with 30 students in one room, which causes air circulation in the classroom not to work correctly. In addition to the density of habitation, humidity is another factor affecting the bacteriological presence in the Air. The humidity in the Taha Qur'an Education Park classrooms is very high. It is due to the seepage of rainwater on each wall. In the research results for bacterial numbers, different results were obtained. It was because the sampling was carried out in two different rooms. And the time of sampling is the time of the Teaching and Learning Process. So the number of visitors affects the number of bacteria in the room [11].

Based on previous research, several factors so that the number of bacteria in each Based on previous research, the difference in the number of bacteria in each room is influenced by several microbiologically. It can be seen from the indicator of the number of bacterial colonies in the room that cleaning the room that is not done correctly is one of the triggering factors for the number of bacterial colonies in the Air. Besides that, other factors affecting the number of bacterial colonies in the room are high humidity, high humidity will increase the growth of microorganisms, and air temperature that is too hot will affect air quality.

Indoor lighting must be considered because lighting also acts as a disinfectant to kill bacteria. The condition of the door not being closed can cause contamination from outside, and contamination of microorganisms in the room can also be influenced by several factors such as ventilation area, occupancy density, level of individual activity in the room, and the area of the room occupied [12].

The environment or habitat strongly influences the growth of bacteria. Several factors that can affect the growth of bacteria are nutrients, temperature, lighting, humidity, and Air Conditioning (AC) maintenance [13]. Bacteria need nutrients for life and growth. Bacteria need nutrients as a carbon source, nitrogen source, energy source, and growth factor [14]. In general, bacteria are classified into three groups based on the growth temperature of the bacteria, namely psychrophiles (10°C to 20°C), mesophyll (20°C to 45°C), and thermophiles 50°C to 60°C). If the room temperature does not match the optimum temperature for each bacterium, it can result in protein denaturation and other essential cell components, so the cell will die [15].

This research is in line with other studies where research results were obtained from the seven rooms studied, namely PIII (Flamboyan) class I B, II B and III A, PIV (Asoka) class I A, II A and III A, and PV (Palem) class III Edi RSUD H. Padjonga Daeng Ngalle District. The room Takalar needed to meet the healthy air quality requirements based on the number of colonies obtained [16].

It is in line with other research where the highest germ count was obtained in the ASP-B room of 5 colonies/m^3. The occupancy density did not meet the requirements, namely, 6 m2/person. Ventilation in the room is not functioning properly because it is not functioning properly and is covered with a cloth [17]. Ventilation functions as a place for Air to enter and exit, which can neutralize pollutant levels in the room. Besides that, at the time of sampling in the ASP-A room, the humidity was quite high at 67%, where high humidity will accelerate the growth of germs in the Air. In contrast, the lowest number of germs was found in the ASP and KLS A rooms of 0 colonies/m^3. It looked clean when sampling, which affected the number of germs in the room [18].

The influence of poor indoor air quality can interfere with the comfort, safety, and health of its users [19]. Categories vulnerable to poor indoor air quality effects are children, infants, the elderly (elderly), people with respiratory disorders (asthma), people with weak immune systems, and smokers. If space users (students) are indoors for more than 8 hours daily, poor air quality can affect student health, performance, and achievement [20].

Based on previous research, the number of bacteria in each room is influenced by several things: microbiologically, with indicators of the number of bacterial colonies in the room. Cleaning the room that needs to be carried out correctly or according to standards will affect the number of bacterial colonies in the room. High humidity will increase the growth of microorganisms. The air quality will be affected if the air temperature is too hot. Lighting in the room should be considered because the lighting is also a disinfectant to kill bacteria. The condition of door is not closed, which can cause contamination from outside.[21]

CONCLUSION

Based on the results of the study, it was found that the two classrooms in the Taha Quran Education Park did not meet the requirements according to the Minister of Health requirements / No. 1405 / MENKES/SK/XI /2002. The number of germs in the classroom, determined by the Decree of the Minister of Health, is 200-500 CFU/m^3. The highest number of colonies is in room B during the afternoon measurement. The foundation should pay more attention to the condition of the classroom by paying attention to air circulation and lighting in the classroom.

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