



Use of Sansevieria Trifasciata to Reduce Computer Radiation in Internet Cafe Operators

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June 12, 2021

USE OF *Sansevieria trifasciata* TO REDUCE COMPUTER RADIATION IN INTERNET CAFE OPERATORS

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ABSTRACT. Prolonged computer use can put you at risk of eye fatigue or asthenopia. The decrease in visual acuity is caused by increased or forced accommodation. The purpose of this study was to determine the benefits of *Sansevieria trifasciata* (*S. trifasciata*) in reducing computer radiation in internet cafe operators. This type of research is a quasi experiment using a pretest-posttest group design. The object of research is computer radiation at internet cafe operators. The research sample consisted of 15 computers in internet cafe operators. This research was conducted from February to April 2019 in Wonosobo, Central Java. The research instruments were radiation detector, stopwatch, *S. trifasciata* "golden hahnii" and *S. trifasciata* "lorentii", computer, research form. The difference in percentage reduction in computer radiation between before and after being contacted by *S. trifasciata* "golden hahnii" was 37.31%. Meanwhile, the difference in the percentage of reduction in computer radiation between before and after being contacted by *S. trifasciata* "lorentii" was 53.86%. The results of the study were data normality using Shapiro Wilk, and continued with the Independent T-Test with a significant level $\alpha = 0.05$. The results showed that there was a significant difference between pre-computer radiation and computer radiation after contact with *Sansevieria trifasciata* ($p = 0.000$). There is a significant difference between the effectiveness of *Sansevieria trifasciata* "golden hahnii" and *Sansevieria trifasciata* "lorentii" in reducing computer radiation to internet cafe operators.

Keywords: Computer, operator, radiation, reduction, *Sansevieria trifasciata*.

1. Introduction

Computers are electronic devices that are widely used by the general public, both housing and offices because they are considered to facilitate their work. Computers have many benefits, but they also cannot be separated from the negative effects. All positive effects received by humans are also various negative effects, both physically and mentally. One of the negative effects of computer technology is radiation, the effects of which can be felt after 15 or 20 years later. The negative impact of prolonged and continuous computer use will damage health, especially the eyes (Murtopo and Sarimurni, 2005).

The study by researchers showed that computer operators who were constantly looking at the monitor experienced more eye problems than workers who did not use the monitor. Prolonged computer use can put you at risk of eye fatigue or asthenopia. The decrease in visual acuity is caused by increased or forced accommodation (Rahayu, et al., 2013).

The term radiation is often considered creepy, something that is dangerous, disturbs health and even safety. Even though all around us, at home, at work, and in public places, there is a lot of radiation. Basically, radiation is a way of propagating energy from energy sources to the environment. Some examples are the propagation of heat, light and radio waves (Swamardika, 2009).

Suhendi & Fitriyana (2013) states that radiation has many effects and dangers, both in the short and long term on health. Following are the short-term effects of computer radiation, including:

- a) Asthenopia, is a vision disturbance with multiple causes and symptoms involving physical, physiological, psychological, and even social factors. The impact is due to the influence of computer radiation, the pupil of the eye becomes slow to react to light, due to prolonged exposure to excessive light, according to a report by the World Health Organization (WHO) that can reach 75-90%.
- b) The eyes become tired and watery. Eye fatigue from being in front of the computer for too long is usually referred to as computer vision syndrome. This condition affects 50-90% of workers who work using computers.

Based on the initial survey on December 14, 2018, radiation measurements used a radiation tester at the internet cafe operator's workplace, the distance between the measurements and the monitor screen was 30 cm. Radiation measurements at 4 points, namely from the front of the monitor screen, the result is 1.11 micro Tesla (mT), the back of the

monitor screen is 9.6 mT, the right side of the screen is 0.47 mT and the left side of the screen is 1.22 mT.

The Regulation of the Minister of Health of the Republic of Indonesia Number: 70 of 2016 concerning Industrial Work Environment Health Standards and Requirements, it states that the quality standard for electric magnetic field radiation throughout the working day or for 24 hours is a maximum of 0.5 mT and for a short time of up to 2 hours per day, so that the measurement results exceed the applicable radiation quality standards.

Sansevieria is a plant that is easy to grow, although naturally its growth requires an environment that is suitable for sufficient sunlight intensity, in fact this plant is able to grow in a room with very little light, its growth is also in dry conditions, so that if a few days it is not watered this plant is still able to grow (Sitanggang and Maloedyn, 2008).

Based on the results of a study conducted by the United States National Aeronautics and Space Administration (NASA) and released in 1999, it shows that *Sansevieria* has the active ingredient pregnan glycoside which is able to absorb 107 elements contained in air pollution including as an antidote to radiation.

Research Larasati, et al. (2016), *S. trifasciata "golden hahnii"* was able to reduce computer radiation by 0.351×10^{-4} mT. The leaf surface area of *S. trifasciata "golden hahnii"* was 1,530-1,710 cm², capable of reducing computer radiation by 56.07%. Meanwhile, in the research of Ramadhan (2014), using *S. trifasciata "lorentii"*, was able to reduce computer radiation by 0.0151 mT.

For this reason, researchers want to determine the effectiveness of the tongue-in-law plant in reducing computer radiation. The formulation of the research problem is how the effectiveness of the tongue-in-law plant in reducing computer radiation at internet cafe operators in Wonosobo? The purpose of this study was to determine the effectiveness of the tongue-in-law plants (*S. trifasciata "golden hahnii"* and *S. trifasciata "lorentii"*) in reducing computer radiation in cafe operators in Wonosobo, Central Java.

2. Materials and Methods

This type of research is a quasi experiment using a pretest-posttest group design. The object of

research is computer radiation in internet cafes. The research sample consisted of 15 computers in internet cafe operators. The research was conducted from February to April 2019. The location of this research was conducted at 15 internet cafes in Wonosobo, Central Java.

The research instruments were radiation detector, stopwatch, *S. trifasciata "golden hahnii"* and *S. trifasciata "lorentii"*, computer, research form. Collecting data by measuring computer radiation using a radiation detector and recording the results. Computer radiation measurements were carried out before and after the treatment came into contact with *S. trifasciata "golden hahnii"* and *S. trifasciata "lorentii"* plants, within 4 cm from the monitor screen for 4 hours. Measurement of radiation with a distance of 30 cm from the computer monitor screen and as high or parallel to the eyes of the cafe operator. Computer radiation measurements were repeated twice on 15 internet cafe operator computers, from 8 am to 8 pm. The research was started by contacting the *S. trifasciata plant "golden hahnii"*, then continued with contacting *S. trifasciata "lorentii"*.

The research data were processed and analyzed descriptively and analytically. The data were then entered into the table and the mean reduction in computer radiation contacted with *S. trifasciata "golden hahnii"* and *S. trifasciata "lorentii"* was calculated. Furthermore, the data on the reduction of computer radiation were compared, between those contacted by *S. trifasciata "golden hahnii"* with *S. trifasciata "lorentii"* in reducing computer radiation. The research data were analyzed using SPSS 16.0 For Windows program and data normality was carried out using Shapiro Wilk. The research data were normally distributed, then continued with the Independent T-Test, using a significant level of α , namely 0.05.

3. Results and Discussion

Computer radiation measurements on internet cafe operators were carried out before and after treatment by contacting *S. trifasciata "golden hahnii"* and *S. trifasciata "lorentii"*, with 2 repetitions. The detailed research results are as follows.

3.1. *Sansevieria trifasciata "golden hahnii"*

The results of computer radiation measurements by contacting *S. trifasciata "lorentii"* are presented in the following table.

Table 1 Computer radiation measurement results between pre and post by contacting *Sansevieria trifasciata "golden hahnii"* to internet cafe operators in Wonosobo in 2019

Cafe operators	Computer radiation in the treatment group			Percentage (%)
	Pre (mT)	Post (mT)	Difference (mT)	
1	0.075	0.060	0.015	20.00
2	0.070	0.050	0.020	28.57
3	0.060	0.045	0.015	25.00
4	0.125	0.085	0.040	32.00
5	0.055	0.030	0.025	45.45
6	0.195	0.165	0.030	15.38
7	0.060	0.030	0.030	50.00
8	0.150	0.125	0.025	16.67
9	0.160	0.095	0.065	40.62
10	0.080	0.055	0.025	31.25
11	0.090	0.050	0.040	44.44
12	0.060	0.035	0.025	41.67
13	0.115	0.080	0.035	30.43
14	0.175	0.080	0.095	54.28
15	0.140	0.075	0.065	46.42
Amount	1.290	1.065	0.540	559.65
Average	0.086	0.071	0.036	37.31

Source: Primary data (2019)

Table 1 shows the average reduction in computer radiation at pre of 0.086 mT, while at post 0.071 mT, so the average difference is 0.036 mT or 37.31%. The largest decrease in computer radiation was 50%, with radiation levels from 0.160 mT to 0.095 mT, occurring at cafe number 9 operators. While the lowest decrease in computer radiation occurred at cafe number 6 operators by 15.38%, with radiation levels from 0.195 mT to 0.165. mT.

3.2. *Sansevieria trifasciata "lorentii"*

The results of computer radiation measurements by contacting *S. trifasciata "lorentii"* are presented in the following table.

Table 2 Results of pre and post computer radiation measurements by contacting *Sansevieria trifasciata "lorentii"* to internet cafe operators in Wonosobo in 2019

Cafe operators	Computer radiation in the treatment group			Percentage (%)
	Pre (mT)	Post (mT)	Difference (mT)	
1	0.120	0.065	0.055	45.83
2	0.060	0.025	0.035	58.33
3	0.135	0.065	0.070	51.85
4	0.085	0.045	0.035	41.17
5	0.080	0.035	0.045	56.28
6	0.340	0.145	0.195	57.35
7	0.065	0.040	0.025	38.46
8	0.070	0.040	0.030	42.85
9	0.160	0.050	0.110	68.75
10	0.110	0.035	0.075	68.18
11	0.090	0.030	0.060	66.67
12	0.065	0.025	0.040	61.53
13	0.115	0.040	0.075	65.21
14	0.170	0.090	0.080	47.05
15	0.065	0.035	0.030	42.85
Amount	1.695	0.765	0.945	807.90
Average	0.113	0.051	0.063	53.86

Source: Primary data (2019)

Table 2 shows the average computer radiation at pre is 0.113 mT, while at post is 0.051 mT, so the average difference is 0.063 mT or 53.86%. The highest reduction in computer radiation was 68.75%, with radiation levels from 0.160 mT to 0.050 mT, occurring at cafe number 9, while the lowest decrease in computer radiation occurred at cafe operator number 7 by 38.46%, with radiation levels of 0.065 mT to 0.040 mT.

3. 3. Comparison of decreased computer radiation between contacting *S. trifasciata "golden hahnii"* with *S. trifasciata "lorentii"*

The difference between all computer radiation measurements after contact with *S. trifasciata "golden hahnii"* and *S. trifasciata "lorentii"* is presented in the following table.

Table 3 Difference in percentage reduction in computer radiation between contacting *Sansevieria trifasciata "golden hahnii"* and *Sansevieria trifasciata "lorentii"* on internet cafe operators in Wonosobo in 2019

Cafe operators	A reduction in computer radiation is contacted with	
	<i>S. trifasciata "golden hahnii"</i> (%)	<i>S. trifasciata "lorentii"</i> (%)
1	20.00	45.83
2	28.57	58.33
3	25.00	51.85
4	32.00	41.17
5	45.45	56.28
6	15.38	57.35
7	50.00	38.46
8	16.67	42.85
9	40.62	68.75
10	31.25	68.18
11	44.44	66.67
12	41.67	61.53
13	30.43	65.21
14	54.28	47.05
15	46.42	38.46
Amount	559.65	807.90
Average	37.31	53.86

Source: Primary data (2019)

Table 3 shows the percentage reduction in computer radiation in contact with *S. trifasciata "golden hahnii"* with the lowest 15.38%, the highest 54.28% and the average 37.31%. Meanwhile, the percentage of reduction in computer radiation contacted with *S. trifasciata "lorentii"* was the lowest 38.46%, the highest was 68.75% and the average was 53.86%.

The results of computer radiation measurements were analyzed using the SPSS 16.0 For Windows program. Analysis of data normality using the Shapiro Wilk test, obtained data with a normal distribution. The results of statistical tests using the Independent T-Test, obtained Sig (2-tailed) 0.000, which means that there is a significant difference between the decrease in computer radiation after contacting *S. trifasciata "golden hahnii"* with *S. trifasciata "lorentii"*.

3. 4. Discussion

Measurement of computer radiation at 15 internet cafe operators in Wonosobo with 2 repetitions, aims to avoid errors in measurement. The treatment was contacted by contacting *S. trifasciata "golden hahnii"*, which was placed on the left with a distance of 4 cm from the monitor screen and contacted for 4 hours. Measurement of computer

radiation before contact with *S. trifasciata "golden hahnii"* obtained an average result of 0.086 mT. Meanwhile, the results of computer radiation measurements after contact with *S. trifasciata "golden hahnii"* the average result was 0.071 mT. The decrease in computer radiation between before and after treatment was an average of 0.036 mT or 37.31%. This is possible because the leaf surface area is smaller than that of *S. trifasciata "lorentii"*.

Computer radiation in the operator's station can decrease after contact with *S. trifasciata "golden hahnii"*. This is because the existing computer radiation will release energy (ionization) when it passes through or penetrates the material or object. The ionization process occurs in plant tissues, causing changes in cell genomes, chromosomes, and DNA or genes. These changes are called mutations, it's just that the intensity of computer radiation is so low that the mutations that occur in plants are very slow (Seed, 2015).

S. trifasciata "lorentii" was placed on the left side of the screen with a distance of 4 cm, contacted for 4 hours, then measurements before and after contact with plants with a distance of 30 cm from the front of the computer monitor screen. Computer radiation measurements before contact with *S. trifasciata "lorentii"* obtained an average result of 0.113 mT. While the average yield after treatment is 0.051 mT. So that the difference in the average reduction in computer radiation between before and after treatment is 0.063 mT or 53.86%.

This study compares the effectiveness of *S. trifasciata "golden hahnii"* with *S. trifasciata "lorentii"* in reducing computer radiation to cafe operators. The arrangement and layout of the computer equipment of the cafe operator, as well as the presence of other electronic devices can affect the results of computer radiation measurements.

The arrangement and layout of computer equipment as well as the presence of other electronic devices at 15 internet cafe operators are different. There are internet cafes that have special rooms for operators, some do not have special rooms for operators. The computer's central processing unit (CPU) is placed under the liquid crystal display (LDC), one is next to the LCD. The placement of the CPU also affects the radiation level of the computer. This central processing unit (CPU) cannot be moved, and there are several electronic devices that cannot be turned off, such as printers, telephones, and speakers.

During the measurement, radiation sources other than computers cannot or may not be turned off.

This is because it will interfere with the ongoing process of the cafe operator's work. Other electronic devices such as printers, telephones, and speakers can cause differences in the results of computer radiation at each cafe.

Based on the Regulation of the Minister of Health of the Republic of Indonesia Number 70 of 2016, states that the quality standard for electric magnetic field radiation during the working day or for 24 hours is a maximum of 0.5 mT and for a short period of time up to 2 hours per day is 5 mT. The result of the mean measurement of computer radiation was 0.097 mT, calculated from the three pre-treatments in the three treatments then divided by three.

The results of computer radiation measurements still meet the established quality standards. However, the results of the Independent T-Test, it turns out that there is a significant difference between the decrease in computer radiation after being contacted using *S. trifasciata "golden hahnii"* with *S. trifasciata "lorentii"*.

The results of Ramadhan's research (2014) show that the radiation produced does not exceed quality standards so that it can be said to be harmless. However, based on the results of interviews with 8 computer user respondents, 7 respondents or 88% said that doing too long activities at the computer can cause watery eyes and dizziness or headaches.

Also, using a computer for a long period of time can put you at risk of eye fatigue or asthenopia. The decrease in visual acuity is caused by increased or forced accommodation (Rahayu, et al., 2013). Not only that, in the long term, the effects of radiation include sexual disorders, dermatitis, and cataracts (Suhendi & Fitriyana, 2013).

The type of radiation emitted when the computer is turned on is producing ultraviolet light. Monitors produce several types of radiation, all of which cannot be felt by the five senses. There are various ways to deal with radiation in the workplace, one of which is isolating the radiation source (Diana, 2003).

An isolation that can absorb radiation is the Mother-in-Law's Tongue plant. This plant can reduce electromagnetic wave radiation generated by computers by ionizing existing radiation, so that it can reduce electromagnetic radiation. Based on the results of a study conducted by the United States National Aeronautics and Space Administration (NASA) and released in 1999, it shows that *Sansevieria* has the active ingredient

pregnan glycoside which is able to absorb 107 elements contained in air pollution including as an antidote to radiation.

Radiation generated by computers is included in the type of non-ionizing radiation. Non-ionizing radiation is defined as the spread or emission of energy, if through a medium and an absorption process occurs, the radiation energy beam will not be able to induce an ionization process in the medium concerned. Tools and processes that produce non-ionizing radiation are widely used in the fields of industry, medicine, telecommunications, entertainment, laboratories, transportation, and even households (Anies, 2009).

Sansevieria is a desert plant that is very tolerant of water shortages and dry air. The thick fleshy leaves of *Sansevieria* store a lot of water, so they can survive in dry areas. Therefore, this plant is very suitable to be used as an indoor plant, both indoors and in office buildings. *Sansevieria* has a high adaptability to its environment, so this plant can thrive anywhere.

The National Aeronautics and Space Administration (NASA) Clean Air Study found *S. trifasciata* has air purity qualities, removing 4 of the 5 major toxins. The microscopic pores on plant leaves, called stomata, are used for gas exchange, and are only opened at night to prevent water from escaping through evaporation in the hot sun. These plants release oxygen at night, unlike most plants which only exchange gases during the day.

Previous research Larasati, et al. (2016), using the *S. trifasciata "golden hahnii"* plant was able to reduce computer radiation by 0.351×10^{-4} mT with a distance of 4 cm between the plants and the monitor and contacted for 2 hours. Whereas in the study (Ramadhan, 2014) using the *S. trifasciata "lorentii"* plant with 4 leaves that were contacted for 4 hours, the decrease in computer radiation was 0.0151 mT.

Computer radiation after using *S. trifasciata "golden hahnii"* plants can reduce radiation by an average difference of 0.036 mT or a percentage of 37.31%. Treatment by contacting *S. trifasciata "lorentii"* can reduce computer radiation with an average difference of 0.063 mT or 53.86%. So that the treatment by contacting *S. trifasciata "lorentii"* was able to reduce computer radiation the most.

It is known that the leaf surface area of *S. trifasciata "golden hahnii"* is smaller, so that the decrease in computer radiation is 37.31%. When compared to *S. trifasciata "lorentii"* has a larger

leaf surface area, so it can reduce computer radiation by 53.86%. The wider the leaf surface area of *S. trifasciata*, the more computer radiation is absorbed.

Sansevieria trifasciata uses its stomata as a vacuum cleaner, to suck up computer radiation and enter the metabolic system in the plant body. The absorbed radiation is then sent to the leaves and then to the roots. In the roots of *S. trifasciata*, microbes carry out the detoxification process. This detoxification process uses the active substance pregnane glycoside. Through this process, microbes will produce substances needed by plants such as amino acids, sugars and organic acids. After being detoxified, computer radiation can decrease, resulting in clean air (Mlipaki, 2013).

Computer radiation on computer operators can decrease after contact with *S. trifasciata "golden hahnii"* and *S. trifasciata "lorentii"*, although the decrease is not maximal. Based on the research that has been done, it can be concluded that *S. trifasciata "lorentii"* is more effective in reducing computer radiation, because the leaf surface area is larger than *S. trifasciata "golden hahnii"*.

Radiation can cause health effects in a short time, or in a matter of new years the effects will be felt. The health effects in a short time are watery and tired eyes, reduced production of the hormone melatonin which causes headaches to insomnia, and asthenopia or impaired vision function. Meanwhile, the health impacts that can be felt after years are cataracts, dermatitis, and sexual disorders (Suhendi & Fitriyana, 2013).

With the many health effects caused by computer radiation, there are efforts to reduce computer radiation by adjusting the visibility to the computer screen at least 30 cm, and placing *S. trifasciata "lorentii"* next to the monitor screen to reduce radiation emitted.

4. Conclusion

- a. There is a difference in effectiveness between *Sansevieria trifasciata "golden hahnii"* and *Sansevieria trifasciata "lorentii"* in reducing computer radiation to the cafe operator with Sig. (2-tiled) 0,000.
- b. The decrease in computer radiation between before and after contacting *Sansevieria trifasciata "golden hahnii"* on the cafe operator was 0.036 mT or 37.31% on average, while *Sansevieria trifasciata "lorentii"* was 0.063 mT or 53.86% on average.

- c. Decrease in computer radiation in cafe operators who are more effectively contacted using *Sansevieria trifasciata "lorentii"* by an average of 53.86%.

Acknowledgments

1. Ladies and gentlemen of the internet cafe owner and their employees in Wonosobo who have agreed to give permission and assist in the smooth running of this research.
2. The Director of the Health Polytechnic of the Ministry of Health Yogyakarta and his staff who have guided, supported and directed this research.
3. Student friends as well as all parties that we cannot mention one by one, who have helped carry out this research.

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