Ipomoea carnea Leaf Extract As Antibacterial Drinking Water Deep Wells

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ABSTRACT

Drinking water is a basic necessity of living. It will be a problem if it contains microorganisms. Drinking water Standard based on WHO and the Republic of Indonesia Regulation No. 492 / Menkes / Per / IV / 2010 where microorganisms must be zero and must be processed. The society has not done drinking water treatment either chemically or by other methods. As a natural alternative, *Ipomoea carnea* contains active ingredients such as alkaloids and flavonoids which can be used as antibacterial subtances. The study aims to prove the extract of leaves of *Ipomoea carnea* in reducing the bacteriological content of drinking water source of deep well. This research is an experimental research in the laboratory and the field. Samples in the from of sources of drinking water from springsdeep wells that do not quality bacteriological with purposive sampling. Maserasi methods the extract of leaves of *Ipomoea carnea* with MPN *Coliform* test with one way anova analysis. The results obtained revealed that the results obtained revealed that consentrations 0,15g/100mL samples water drinking source springs extract of leaves of *Ipomoea carnea* can reduce bacteriological content 80,33%.

Keywords: Water drinking, *Ipomoea carnea*, deep well

INTRODUCTION

Water is a very important need for life. Sufficient, safe and accessible supplies must be met so that they are of significant health benefit. All efforts should be made to achieve safe drinking water quality. Supply of clean water for every home in developing countries, access to clean water and unhygienic sanitation causes water-borne infections. Clean water that does not meet bacteriological requirements will have an impact on human health, including *Salmonella typhosa, Shigella dysentriae, E. coli* and *Vibrio comma*. These bacteria grow in the intestines of humans and warm-blooded animals. Human feces and animal waste containing these bacteria when it enters a water body, the bacteria can still live for several days. When humans drink water, pathogenic bacteria that are still alive enter the intestines and will grow which can cause disease. Water serves as a carrier of disease [1].

WHO[2] requires that all pathogenic bacteria should not be present in water. Parameters that are directly related to health for water microbiological parameters in Indonesia are based on the Regulation of the Minister of Health Number 429/MENKES/PER/IV/2010 concerning Drinking Water Quality Requirements. The requirement states that drinking water must not contain all types of bacteria (*E coli* and *Coliform Bacteria*)[3]

Chlorination requirements for the environment and humans as a chlorine disinfectant in drinking water are at a maximum concentration of 0.2-1 mg/L[4]. Exposure to chlorine, hypochlorous acid, and hypochlorite ion for household consumption as drinking water if it exceeds the concentration it will cause irritation of the throat and mouth, asthma, skin irritation, High Density Lipoprotein (DHL) and cholesterol will increase, the most serious risk is having a carcinogenic effect especially the bladder. The more the impact of chlorine on the environment and health is known, it is necessary to seek alternatives to replace chlorine. Especially in the treatment of clean water or drinking water, chlorine is replaced with other technologies such as ozonation, membrane processes and ultraviolet[5].

Antimicrobial activity of *Ipomoea carnea* leaf extract against several test bacteria. Leaf powder extracts of Ipomoea carnea family Convolvulaceae sub-family fistulosa tested were n-hexane extract, ethyl acetate, acetone, ethanol and acetone fraction[6]. Potential of *Ipomoea carnea* leaf extract with reference to phytochemicals, pharmacological activities and others, where *Ipomoea carnea* as a medicinal plant is used as an anti-bacterial, anti-fungal, anti-oxidant, antimicrobial, anti-cancer, anti-convulsant, immunomodulatory, anti-diabetic, hepatoprotective, anti-inflammatory. Inflammatory, anxiolytic, sedative, cardiovascular,

inhibitory and wound healing activities also toxicological effects with extract[7]. From the several studies above, there is still no research on *Ipomoea carnea* as an antibacterial for drinking water.
The Magetan community has not treated drinking water from deep wells. Sources of drinking water still contain microorganisms (total *Coliform*) that exceeds the quality standard of 93.64% and still do not meet the bacteriological requirements, namely 2 to 1898 /100 mL of water sample. For this reason, research on drinking water treatment through intervention using extracts will be carried out. *Ipomoea carnea*.
The purpose of this study was to test the leaf extract of *Ipomoea carnea* to reduce the number of germs in drinking water from deep wells.

METHODS

This research was conducted in the laboratory and in the field, to test the extract of *Ipomoea carnea* as an antibacterial for drinking water from deep wells. In the laboratory, extracts are made using the maceration method and total *Coliform* test, in the field it is an application of the results of laboratory tests
This study used green leaves of *Ipomoea carnea* plants at least 2 weeks old, from their natural habitat, not cultivated in Magetan Regency, East Java, Indonesia, which is located at (7°30”34”'-7°47”49”') South Latitude and (111°10”54” -111°30”46”') BT.
The independent variable is the concentration of *Ipomoea carnea* leaf extract, and the dependent variable is the bacteriological content (germ count) of deep well water sources.
The sampling method is purposive sampling, namely the sample as desired by the researcher according to the goals achieved, with a population of deep well water sources managed by the community, the sample in the form of community managed deep well water sources whose bacteriological standards do not meet WHO requirements and the Indonesian Minister of Health Regulation No. 492/2010.
The data obtained are both primary and secondary data. Primary data from the results of measurements in the laboratory and measurements in the field, namely drinking water from deep wells in community reservoirs and the results of observations through observation sheets. The experimental process starts from the manufacture of *Ipomoea carnea* leaf extract, treatment of deep well water samples, analysis of the Most Probobality Number (MPN) *coliform* and conversion applications in the field in community reservoirs. Making extracts using the maceration method. Maceration is done by soaking the simplicia powder in a liquid filter. Maceration is used for simplicia extraction that contains active substances that are easily soluble in the liquid filter, does not contain substances that easily expand in the liquid filter, does not contain benzoid stirrak and others. The advantage of the extraction method using maceration is that the way of working and the equipment used is simple and easy to cultivate. Wetting the powder prior to sieving is intended to provide the greatest opportunity for the liquid to enter all the pores in the simplicia so as to facilitate the subsequent extraction process. At the time of making simplicia powder, some cells had their walls broken and some were still intact. Cells whose walls have been broken have nothing to block the process of extracting juice, so that the process of extraction takes place by diffusion. The process of filtering the cell wall that is still intact, the active substance dissolved in the filter fluid will come out of the cell must pass through the cell wall, so that the filtration takes place by osmosis. Diffusion events are much more influential when compared to osmosis events[8]. The principle of MPN is to grow bacteria in a liquid medium and the calculation is carried out based on the number of positive tubes after incubation at a certain temperature and time[9]
The analysis of the test of *Ipomoea carnea* leaf extract in reducing the bacteriological content in drinking water from deep wells is the one way ANOVA statistical test.

RESULTS

This research was carried out in the laboratory and in the field, to test the extract of Ipomoea carnea as an antibacterial in drinking water, using *Ipomoea carnea* leaves to reduce the bacteriological number of deep well water sources by the maceration process. The results showed a decrease in the number of germs presented in Figures 7 and 8.



Figure 1. Natural habitat *Ipomoea carnea*

Figure 2. Sampling of deep well drinking water sources

Figure 3. Extract of *Ipomoea carnea* leaves

Figure 4. Inoculation

Figure 5. Incubation

Figure 6. Check for positive bacteria

The number of germs before treatment or without treatment with the highest value of 96 colonies/100m, was replicated three times for each sample., the results are presented in Figure 7

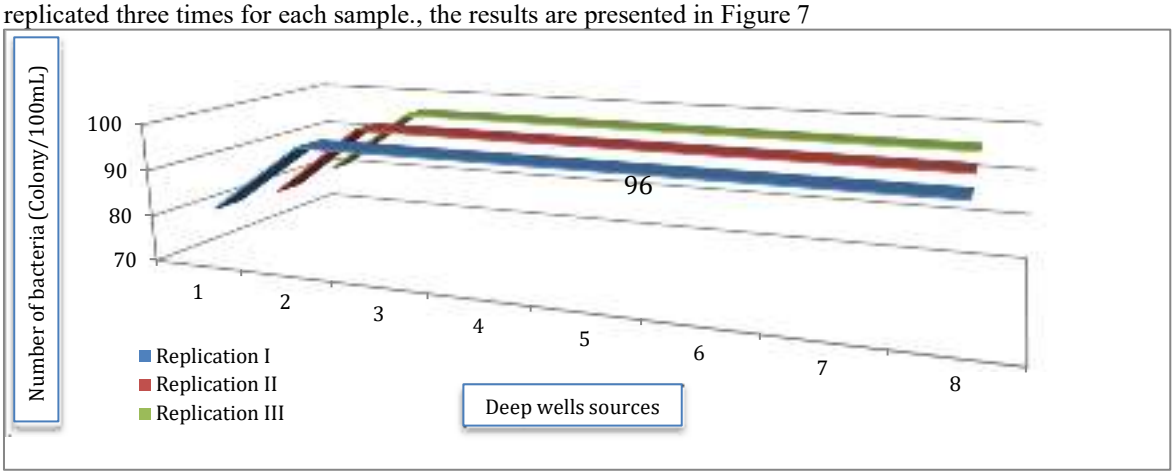

Figure 7. Germ count of deep wells water sources without antibacterial treatment of *Ipomoea carnea* leaf extract

Figure 9 presents the germ number with the addition of antibacterial treatment of *Ipomoea carnea* leaf extract with a concentration of 0.15 gram/100mL, the highest germ number value was 32 colonies/100mL and the lowest was 2 colonies/100mL, with three replications for each sample. The highest germ number values were obtained from deep wells water 3 and 4.

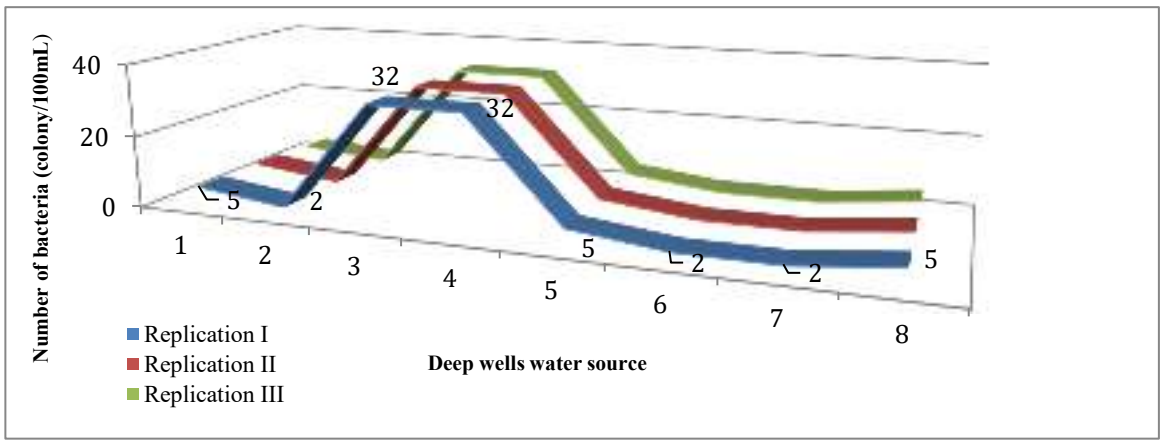

Figure 8. Germ count of deep wells water sources with antibacterial treatment of *Ipomoea carnea* leaf extract

DISCUSSION

The more the impact of chlorine on the environment and health is known, it is necessary to seek alternatives to replace chlorine. Especially in the treatment of clean water or drinking water, chlorine is replaced with other technologies[5]. The effects of using chlorine on humans include: irritation of the throat, burning sensation in the mouth and throat, spontaneous vomiting, asthma, skin irritation, impact on the liver. Chlorine as a disinfectant in drinking water must have a concentration of 0.2-1 mg/liter[4]. Utilization of *Ipomoea carnea* as an antibacterial in drinking water is an alternative effort to replace chlorine. The test of the effectiveness of *Ipomoea carnea* leaf extract obtained results at a concentration of 0.15g/100 mL of drinking water samples can reduce the largest number of bacteria, namely 80.33%, so that it has effectiveness as an antibacterial that can be used by the community to treat drinking water.

Ipomoea carnea as an antibacterial drinking water contains active ingredients of alkaloids and flavonoids. Leaf extract contains the active ingredients of 3,141 g/g alkaloids and 11.65% w/w flavonoids, having the largest content than other parts of *Ipomoea carnea*. This is due to the fact that many alkaloid compounds are contained in roots, fruit, wood, leaves and animals[11]. Alkaloids are the largest group of secondary plant substances[9]. While most of the flavonoids collected in plant cell vacuoles. Blue wavelength light increases the formation of flavonoids and flavonoids increase plant resistance to ultraviolet radiation[12]. Alkaloids are compounds in plants from the largest secondary metabolite group. Alkaloids have the ability to act as antibacterials by interfering with the peptidoglycan constituent components of bacterial cells, so that the cell wall layer is not fully formed and causes cell death[9]. The ability of alkaloids as an antibacterial by interfering with the peptidoglycan constituent components in bacterial cells, so that the cell wall layer is not fully formed and causes cell death[13]. The mechanism of action of flavonoids in inhibiting bacterial growth, among others, is that flavonoids cause damage to the permeability of bacterial cell walls. Flavonoids are the largest group of phenolic compounds, phenolic compounds have effective properties to inhibit the growth of viruses, bacteria, and fungi. Generally, flavonoid compounds are antioxidants and many are used as a component of raw materials for medicines. Flavonoids contain phenolic compounds. Phenol is a type of alcohol that is acidic so it is also called carbolic acid. Phenol has the ability to denature proteins and damage bacterial cell walls[11].

CONCLUSION

Based on the results of the discussion and the research objectives, it can be concluded that the most effective concentration of *Ipomoea carnea* extract as an anti-bacterial in drinking water managed by the community is 0.15 grams of Ipomoea carnea leaf extract in 100 mL of drinking water deep walls samples can reduce the number of germs up to 80.33%.

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