
ANTIBACTERIAL EFFECTIVENESS TEST OF ETHANOL EXTRACTS OF PARE FRUIT (MOMORDICA CHARAN) AGAINST STREPTOCOCCUS MUTANS, THE CAUSE OF DENTAL CARIES IN THE PHARMACEUTICAL LAB OF EFARINA UNIVERSITY PEMATANG SIANTAR

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Abstract

Bitter gourd (*Momordica charantia* L) is a plant that contains quite a lot of compounds such as alkaloids, flavonoids and saponins in its fruit. Based on this, bitter melon has considerable potential to be used as an antibacterial for *Streptococcus mutans*. The bacterium *Streptococcus mutans* belongs to a group of round-shaped Gram-positive bacteria that cause dental caries. This study aims to determine the antibacterial effectiveness of several concentrations of ethanol extract of bitter gourd against *Streptococcus mutans* bacteria. Antibacterial testing of the ethanol extract of bitter gourd was carried out by measuring the Diameter of Inhibitory Area (DDH) through the paper disc diffusion method and the Minimum Inhibitory Concentration (MIC) through the agar dilution method. DDH testing was carried out on bitter melon extract concentrations of 70%, 60%, 50%, 40%, 30% and amoxicillin 30 µg/mL as positive control and distilled water as negative control. While MIC testing was carried out at concentrations of 30%, 35%, 40%, 45%, 50%, 55% and 60%. The results showed that the ethanol extract of bitter melon was less effective as an antibacterial against *Streptococcus mutans*, because the inhibition zone formed on the DDH test was not absolute or did not form a perfect circle. However, in MIC it can be seen that at a concentration of 50% the ethanol extract of bitter gourd fruit can inhibit it slightly and at a concentration of 60% it is seen that there is no bacterial growth, so it can be concluded that MIC is at a concentration of 60%. The results showed that the ethanol extract of bitter melon was less effective as an antibacterial against *Streptococcus mutans*, because the inhibition zone formed on the DDH test was not absolute or did not form a perfect circle. However, in MIC it can be seen that at a concentration of 50% the ethanol extract of bitter gourd fruit can inhibit it slightly and at a concentration of 60% it is seen that there is no bacterial growth, so it can be concluded that MIC is at a concentration of 60%. The results showed that the ethanol extract of bitter melon was less effective as an antibacterial against *Streptococcus mutans*, because the inhibition zone formed on the DDH test was not absolute or did not form a perfect circle. However, in MIC it can be seen that at a concentration of 50% the ethanol extract of bitter gourd fruit can inhibit it slightly and at a concentration of 60% it is seen that there is no bacterial growth, so it can be concluded that MIC is at a concentration of 60%.

Keywords: Bitter melon fruit (*Momordica charantia* L), Ethanol extract, *Streptococcus mutans*, antibacterial effectiveness

INTRODUCTION

Cavities (caries) are one of the most common diseases that often interfere with human activities. This disease occurs due to decreased enamel on the teeth. The results of research from the Faculty of Dentistry, University of Indonesia stated that 80% of Indonesians suffer from cavities. Survey data states that the prevalence of caries (cavities) in Indonesia is 90.05% (Muis, 2010). Caries is mostly caused by a bacterial infection that causes toothache. So, prevention so that infection and cavities do not occur is more

Mustaruddin, Beta Hanindiya

important than treatment, for example by using mouthwash and brushing your teeth regularly. So good dental care is the right way to avoid complications caused by bacterial infections that cause toothache (Muis, 2010).

Bacteria that play an important role in plaque formation are bacteria that are capable of forming extracellular polysaccharides, namely bacteria from the genus *Streptococcus*. The bacteria found in large numbers in the plaque of caries sufferers is *Streptococcus mutans* (Roeslan, 1996). Bitter melon fruit can be used as anthelmintic, antibacterial, antibiotic, antidiabetic, anti-inflation, antimicrobial, antileukemic, antioxidant, antitumor, antiviral, laxative, aphrodisiac, astringent, carminative, cytostatic, cytotoxic, hypotensive, hypoglycemic, immunostimulant, insecticidal, stomatic, and tonic (Karpu et al, 2006). While the data obtained from the Technical Data Report For Bitter Melon Herbal Secret of the Rainforest 2 Edition bitter melon leaf extract, bitter melon extract, and bitter melon juice with water, ethanol, and methanol have been through clinical trials showing antibacterial activity against *E.coli*, *Staphylococcus*, *Pseudomonas*, the bacteria that causes *Helicibacter pylori*. Although all parts of the plant have shown active antibacterial activity, none have shown activity against fungi or yeasts. Bitter melon fruit (*Momordica charantia* L) is one of the plants that contains quite a lot of compounds such as tannins, flavonoids and alkaloids in its fruit (Gunawan, 2009). bitter melon fruit (*Momordica charantia* L.) against *Streptococcus mutans* causing caries bacteria with ethanol solvent. Although all parts of the plant have shown active antibacterial activity, none have shown activity against fungi or yeasts. Bitter melon fruit (*Momordica charantia* L) is one of the plants that contains quite a lot of compounds such as tannins, flavonoids and alkaloids in its fruit (Gunawan, 2009). bitter melon fruit (*Momordica charantia* L.) against *Streptococcus mutans* causing caries bacteria with ethanol solvent. Although all parts of the plant have shown active antibacterial activity, none have shown activity against fungi or yeasts. Bitter melon fruit (*Momordica charantia* L) is one of the plants that contains quite a lot of compounds such as tannins, flavonoids and alkaloids in its fruit (Gunawan, 2009). bitter melon fruit (*Momordica charantia* L.) against *Streptococcus mutans* causing caries bacteria with ethanol solvent.

METHODS

Research has been conducted for three months out of the month. May-July 2018 at the Pharmacy Laboratory of the Faculty of Health, University of Efarina Pematang Siantar.

The tools used are glassware, incubator, analytical balance, digital balance, test tube, 40 mesh sieve, lid crucible, petri dish, oven, brown glass bottle, excitator, rotavapor, grinder, water bath, stir bar, aluminum foil, scales, autoclave, moisture balance, measuring cup, filter paper, heater, beaker glass, bath cloth, refrigerator, electric stove, stir bar, tube rack, spirit lamp, disc paper, candle jar and ose.

The materials to be used are bitter melon extract (*Momordica charantia* L), *Streptococcus mutans* isolate, 70% ethanol, Nutrient Agar medium, Nutrient Broth,

Mustaruddin, Beta Hanindiya

Mueller-Hinton, test disc paper, aqua desdilata, hydrochloric acid, bouchardat reagent, dragendorf, mayer, magnesium, and Amoxicillin Iron (III) chloride solution 30 UL.

RESULTS AND DISCUSSION

Plant Determination Results

Based on the results of the determination in the "Herbarium Bogoriens" in the field of Botany, the LIPI USU Biology Research Center stated that the sample or material used in the study was the fruit of the bitter melon plant (*Momordica charantia* L) belonging to the Curcubitaceae tribe. The results of the determination can be seen in Appendix 1.

Result of Determination of Total Ash Content and Extract Moisture Content

Result of Determination of Total Ash Content of Extract

In this study, the total ash content of bitter melon extract was 7.24% (Table 3), this value was not met because it slightly exceeded the ash content of bitter melon in the Ministry of Health (1997), namely 7.2%. This may be due to the large mineral content of bitter melon, but it can also occur due to heavy metal contamination from the environment.

Determination of the total ash content was carried out to see contamination in the form of inorganic materials in the simplicia which is difficult to evaporate even when heated at high temperatures. Most of the food, which is about 96% consists of organic matter and water.

Results of Determination of Extract Water Content

In this study the water content of bitter melon extract was 7.43%, this value indicated that the extract used met the requirements for a thick extract.

Determination of the simplicia water content is carried out to find out whether the simplicia used meets the requirements for good quality simplicia moisture content. The water content must be determined because the remaining water in the simplicia is a growth medium for mold and microorganisms. The growth of mold and other microorganisms can cause chemical changes to the active compounds and can lead to a decline in the quality of simplicia, certain molds, for example *Aspergillus*, can produce toxic substances called mycotoxins alfatoxins which are detrimental and dangerous (Ditjen POM, 1985). The permissible moisture content of fruit simplicia is 10% (Ditjen POM, 1985).

Identification of Phytochemical Compounds

Determination of phytochemical tests was carried out to determine the class of compounds contained in bitter melon extract: Based on the results of the study it was found that bitter melon extract contains alkaloids, saponins, flavonoids and does not contain tannins.

Identification of Alkaloid Compounds

Based on the results of the phytochemical test (table 5), the ethanol extract of bitter melon fruit showed positive results for containing alkaloid compounds because when the extract mixture was added a few drops of Mayer's reagent formed a white precipitate. Alkaloids according to Harbone (1987) are compounds containing one or more nitrogen atoms which are usually in combined form, some are part of the cyclic system Alkaloids according to Jouvenaz et al (1972) and Karou (2006) can inhibit the growth of Gram positive and Gram negative bacteria. Alkaloid compounds as an antibacterial *Streptococcus* mutant is strongly influenced by the biological activity of these compounds. Alkaloid

Mustaruddin, Beta Hanindiya

compounds take advantage of the reactive nature of the basic groups in alkaloid compounds.

Identification of Saponin Compounds

Based on the results of the phytochemical test (Table 5), the ethanol extract of bitter melon fruit showed positive results for containing tannin compounds because when the extract mixture was shaken vigorously for 10 minutes it caused foam and with the addition of 1 drop of hydrochloric acid the foam did not disappear.

Saponins are a class of combined chemical compounds, one of the secondary metabolites found from natural sources and from various plant species. Specifically, saponins are amphipathic glycosides with a soap foam-like structure which is produced when shaken in an aqueous solution and whose structure consists of one or more hydrophilic glycosides combined with lipophilic triterpene derivatives (Cahyadi, 2009).

Identification of Flavonoid Compounds

Based on the results of the phytochemical test (table 5), the ethanol extract of bitter melon fruit showed positive results for containing flavonoid compounds because when the mixture of the extract and magnesium powder was added to hydrochloric acid a red-orange to purple color was formed.

Antibacterial Testing of Bitter Gourd Fruit Ethanol Extract Against Bakeries

Streptococcus mutans

Diameter of Inhibition Area

From the results of observations and measurements of the diameter of the inhibition zone in the form of an inhibition zone around the paper disc, it shows that the ethanol extract of bitter melon fruit.

Minimum Inhibitory Concentration Testing (MIC)

The results obtained showed that 70% ethanol extract of bitter melon at a concentration of 30% to 45% concentration showed perfect bacterial growth such as bacterial growth in the negative control, this showed that the ethanol extract of bitter melon at this concentration did not provide inhibition against *Streptococcus mutans* bacteria. At a concentration of 50% and a concentration of 55%, the ethanol extract of bitter melon has shown its inhibition, characterized by the growth of bacteria which is rarer compared to a concentration of 30% to a concentration of 45%, this indicates that the concentration of the ethanol extract of bitter melon has bacteriostatic properties, namely the ability of a compound to to inhibit bacterial growth.

CLOSING

Conclusion

Based on the results of this study it can be concluded as follows:

1. The ethanol extract of bitter melon (*Momordica charantia* L) at a concentration of 70% showed the greatest effectiveness against *Streptococcus mutans* bacteria but was partial.
2. In the Minimum Inhibitory Concentration test it was concluded that MIC was at a concentration of 60%.

REFERENCES

- Anonymous. 2000. General Standard Parameters of Medicinal Plant Extracts. Directorate General of Drug and Food Control, Jakarta.
- Agoes G. 2007. Natural Material Technology. ITB Press. London 21, 38-39
- Anonymous. 2008. *Streptococcus mutans*. http://www.emedicine.com/emerg/topic_128.html.
- Bergey. 1998. *Streptococcus mutans* bacteria. <http://wordpress.com> Accessed January 29, 2011.
- Brander, GC, Pough, D. M, Bywater, R. J & Jenkins, WL 1999. Veterinary Applied Pharmacology and Therapeutic. 5th Edition. Braille Tindal, London.
- Cahyadi, Robby. 2009. Acute Toxicity Test of Bitter Gourd (*Momordica charantia* L) Ethanol Extract against *Artemia Salina* Leach Larvae with the Brine Shrimp Lethality Test (BST) Method. Thesis Undergraduate Education Program, Faculty of Medicine, Efarinasitas Efarinasitas University, Dipenogoro: Semarang
- Campbell. 2002. Pare Plants. Erlangga, Jakarta. 197
- Republic of Indonesia Ministry of Health. 1995. Indonesian Medika Materials. Volume VI. Drug and Food Control. Jakarta. 163
- .1977. *Materia Medika Indonesia*, Volume 1. Jakarta
- .1980. *Materia Medika Indonesia* Volume IV. Jakarta
- .1985. Indonesian Medicinal Plants, Jakarta. 1985. How to make Simplicia. Directorate General of Drug and Food Control. Jakarta.
- .1986. Galenic Preparations. Jakarta.
- .1989. *Materia Medika Indonesia*, Volume V. Jakarta
- .1995. Indonesian Pharmacopoeia. IV Edition. Jakarta
- .2000. General Standard Parameters of Medicinal Plant Extracts. ed. 1. Jakarta
- .1979. Indonesian Pharmacopoeia. III Edition. Jakarta.
- .2004. Determination of Water Content. Directorate General of Drug and Food Control Jakarta.