MACROSCOPIC AND QUALITATIVE PHYTOCHEMICAL EXAMINATION OF RED BETEL LEAVES AND GREEN BETEL LEAVES AS HERBAL MEDICINE FOR GINGIVITIS
(PEMERIKSAAN MAKROSKOPIK SERTA UJI FITOKIMIA KUALITATIF DAUN SIRIH MERAH DAN DAUN SIRIH HIJAU SEBAGAI OBAT HERBAL GINGIVITIS)

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ABSTRACT

Gingivitis is inflammation of the gums that occurs in response to plaque bacteria that become more easily accumulated and difficult to clean in the gum area. The Red betel plant (*Piper crocatum*) and green betel leaf (*Piper betle L.)* are plant species from the *Piperaceae* family empirically used as antibacterial in gingivitis patients due to the presence of secondary metabolite compounds used as medicine. This study aims to determine the macroscopic description and the content of qualitative phytochemical compounds in red betel leaf and green betel leaf. The research method of this study was a laboratory experiment. The red and

green betel leaves from Manoko Lembang, West Java, were examined for macroscopic images in color, smell, taste, and leaf size. A betel leaf qualitative phytochemical examination of flavonoids, alkaloids, flavonoids, tannins, polyphenols, saponins, and quinones. The results of the macroscopic analysis showed that the red betel leaf was green and silver with red grooves, the aromatic smell of betel, bitter taste, and the average leaf size was 3x5 cm. The green betel leaf was green, had a distinctive smell of betel slightly bitter taste accompanied by spicy, and the average leaf size was 2x4 cm. Qualitative phytochemical examination showed that red and green betel leaves contain compounds containing alkaloids, flavonoids, tannins, polyphenols, saponins, and quinones. It is necessary to examine the quantity of quantitative phytochemical components, so their potential as a gingivitis herbal medicine is clear.

Keywords: gingivitis; green betel; red betel; phytochemicals

ABSTRAK

Gingivitis merupakan peradangan pada gusi yang terjadi sebagai respons terhadap bakteri plak yang menjadi lebih mudah terakumulasi dan sulit dibersihkan di daerah gusi. Tanaman sirih merah (Piper crocatum) dan daun sirih hijau (Piper betle L.) merupakan jenis tanaman dari keluarga Piperaceae yang secara empiris daunnya dapat digunakan sebagai antibakteri pada pasien gingivitis oleh adanya kandungan senyawa metabolit sekunder yang dapat digunakan sebagai obat. Penelitian ini bertujuan untuk mengetahui gambaran makroskopis serta kandungan senyawa fitokimia kualitatif pada daun sirih merah dan daun sirih hijau. Metode penelitian merupakan eksperimen laboratoris. Daun sirih merah dan hijau dari Manoko Lembang Jawa Barat diperiksa gambaran makroskopis daun sirih berupa warna, bau, rasa, dan bentuk ukuran daun. Pemeriksaan kualitatif flavonoid yaitu kandungan alkaloid, flavonoid, tanin, polifenol, saponin, dan kuinon. Hasil pemeriksaan makroskopis menunjukkan bahwa daun sirih merah

berwarna hijau perak dengan alur merah, bau khas sirih, rasa pahit, dan bentuk ukuran daun lonjong meruncing rerata 3x5 cm sedangkan daun sirih hijau berwarna hijau, bau khas sirih, rasa sedikit pahit disertai pedas, dan bentuk lonjong runcing ukuran daun rerata 2x4 cm. Pemeriksaan fitokimia kualitatif menunjukkan bahwa daun sirih merah dan daun sirih hijau mengandung senyawa kandungan alkaloid, flavonoid, tanin, polifenol, saponin, dan kuinon. Perlu dilakukan pemeriksaan jumlah komponen fitokimia kuantitatif sehingga jelas potensinya sebagai obat herbal gingivitis.

Kata kunci: *gingivitis; sirih hijau; sirih merah; fitokimia*

INTRODUCTION

Dental and oral health is essential to support the general health of each individual. Unfortunately, many still do not realize the importance of maintaining dental and oral health. The Riset Kesehatan Dasar (Riskesdas) in 2018 showed that the proportion of dental and oral diseases in Indonesian society was still relatively high at 57.6%. One of the most common dental and oral diseases is Gingivitis.[1] Gingivitis is inflammation of the gums, which can also be associated with anti-inflammatory and hormonal effects in the body. Gingival inflammation occurs in response to bacterial plaque, which becomes easier to accumulate and challenging to clean due to fixed orthodontic treatment and crowding of the anterior maxillary teeth. Poor OH control or a tool used when cleaning teeth only with a toothbrush. The primary treatment for Gingivitis is mechanical therapy which aims to eliminate the causative bacteria.[2] Indonesian people often use betel leaf stew as a toothache therapy.

Indonesia is a tropical country with plants and natural resources. Plants and natural resources have been used for generations as herbal medicines. Herbal to prevent disease (preventive), cure (curative), recovery (rehabilitative), and health improvement (promotive). Today the use of herbal medicine or traditional medicine from natural ingredients is widely used by the community to cure diseases. People are starting to use medicines from natural ingredients because chemical-based medications are known to have side effects on body health. In addition to easy and inexpensive treatment, herbal medicines also have minimal side effects because their composition consists of natural ingredients.

One of the herbs that are good for health is betel leaf.[3] Betel leaf is a type of plant from the *Piperaceae* family, two of which are green betel (*Piper betle L.*) and red betel (*Piper crocatum*). Green betel and red betel leaves are antibacterial, and antiseptic.[4] Green betel and red betel are easy to find. The two plants are from the same genus, Piper, which contains almost the same active compounds used in medicine. According to several research sources, betel leaf also has other pharmacological activities, such as antibacterial, anti-inflammatory, and antioxidant. Red and green betel leaves can potentially be used as gingivitis drugs.[5,6] Research on betel leaf is relatively extensive, but research on red betel leaf for Gingivitis, especially those from the Bandung area, has not been found. The macroscopic description and red and green betel leaf are essential to accelerate the optimal healing of Gingivitis.

METHOD

This experimental laboratory study examines macroscopic features such as color, smell, taste, and leaf size of red and green betel leaves. A qualitative examination included alkaloids, flavonoids, tannins, polyphenols, saponins, and quinones in red and green betel leaves. The test material used in this study was the leaves obtained from the Manoko Lembang plantation, Bandung, West Java.

Research carried out at the Biochemistry Laboratory of the Faculty of Medicine, Jenderal Achmad Yani University, for two months, from May to June 2022.

Tool and Material

Tools that used in this study were object glass, digital balance, water bath, petri dish, dropper pipette, stirring rod, test tube, label sticker, incubator, oven, autoclave, and caliper.

Materials that used in this study were red betel leaf and green betel leaf taken from the third to fifth leaves from the shoots, distilled water, 0.9% physiological NaCl solution, Dragendroff's reagent, Mayer's reagent, 2% HCl, concentrated H_2SO_4, H_2O_2, magnesium powder, FeCl, distilled water.

Simplicia Preparation of Fresh Leaves of Red Betel Plant (*Piper crocatum*) and Green Betel Leaf (*Piper betle L.)*

Fresh red and green betel leaves were brought from the Manoko plantation and washed. Ten red and green betel leaves cut into 1 X 1cm.

Macroscopic Examination of Fresh Leaves of Red Betel Plant (*Piper*

***crocatum*) and Green Betel Leaf (*Piper betle L.*)**

The macroscopic examination carried out in this study was in the form of color, odor, taste, and leaf size shape of each fresh leaf of the red betel plant and green betel leaf .[7]

Qualitative Phytochemical Test of Red Betel Leaf and Green Betel Leaf [9-10]

Qualitative phytochemicals determined and confirmed the content of the active compound in tuberose flowers. Phytochemical tests tested alkaloids, flavonoids, saponins, tannins, polyphenols, and quinones.

1) Alkaloid Test

The alkaloid test was carried out with 0.5 grams of betel leaf water (8 drops of H_2SO_4 2N and 3 drops of Dragendroff's tester were added. The results were with an orange precipitate in Dragendroff's reagent.

2) Flavonoid Test

The flavonoid test was carried out with 0.5 grams of betel leaf and dripped with concentrated H_2SO_4. The results were of a yellowish-green or blackish-green color appearance.

3) Saponin Test

Saponin test with 0.5 gram added 10 ml of warm distilled water, then shaken for 30 seconds. The result showed the presence of foam in the solution.

4)Test of Simplicia Tannins and Polyphenols

Simplicia powder of as much as 1 g is heated with water in a water bath, then filtered hot. The filtrate was into two equal parts. The first part is dripped with 2-3 drops of iron(III) chloride reagent so that a green-black color is formed, which indicates the presence of natural polyphenols. The second part was retested by adding five drops of 1% gelatin solution. The presence of a white precipitate indicates that the simplicia contains tannins. An example of the results of this screening can be seen in the following image.

5. Quinone Test

A 1 g of Simplicia powder is heated with water in a water bath, then filtered. The filtrate added 2-3 drops of potassium hydroxide solution. The formation of a solid red color indicates the presence of a group compoundquinone in Simplicia fruit peel natural ingredients.

RESULT

The red and green betel leaves obtained from the Manoko Lembang plantation; in West Java shows in Figure 1.

A. Daun sirih merah.

(Source: Private documentation)

Figure 1. Red betel leaf and green betel leaf.

The results of the macroscopic examination of red and green betel leaves show in Table 1.

Table 1. Macroscopic examination of red betel leaf and green betel leaf

Checking type	Red Betel	Green Betel
Color	Leaves: upper surface silver green, lower surface red	Leaves: Green all over the surface
Smell	Aromatic smell	Aromatic smell
Flavor	Bitter	Spicy
Leaf shape and size	Shape: tapered oval Size: ±3x5cm	Shape: tapered oval Width : ± 2x4 cm

Phytochemical Content of Red Betel Leaf and Green Betel Leaf

Based on the phytochemical test of red betel leaf and green betel leaf, the extract contained alkaloids, flavonoids, saponins, quinones, polyphenols, and tannins show in Table 2.

Table 2. Phytochemical qualitative test of red betel leaf and green betel leaf

Test Sample	Red	Green	Information
Alkaloids	+	+	Formation
Flavonoids	+	+	Formed a dark brown
Saponins	+	+	coloron
Saponins	+	+	Foam layer is formed
Quinone	+	+	Formed a
Tannins	+	+	There is a
Polyphenol	+	+	color change Formed in

DISCUSSION

The results of the macroscopic examination of the red betel leaf have a silver-green color with red grooves, a distinctive smell of betel, and a bitter taste, and the shape of the oval leaf size is 3x5 cm. In contrast, the green betel leaf is green, has a distinctive betel odor, tastes slightly bitter with spicy, and is oval. Pointed leaf average size 2x4 cm. Red and green betel leaf contain active compounds: alkaloids, flavonoids, saponins, quinones, polyphenols, and tannins. Environmental

and chemical factors also influence differences in the macroscopic morphological content of compounds in plants. Environmental factors are geography, soil elements (organic and inorganic), weather, temperature, light, water, and atmosphere. Chemical factors that influence are qualitative and quantitative, and levels of active compounds contained in tuberose flowers. [11.12]

In phytochemical testing based on polarity and solubility, polar compounds will readily dissolve in polar solvents, while nonpolar compounds will easily dissolve in nonpolar solvents. The saponin examination results on red betel leaf samples were positive. The foam is visible, and what happened to green betel foam or foam was formed on the test sample. Saponins are generally in the form of glycosides, so they tend to be polar. Saponins are surface-active compounds that can cause foam when shaken in water. It happens because saponins have polar and nonpolar groups that will form micelles. When micelles include, the polar groups will face out, and the nonpolar groups will face inwards, and this condition looks like foam.

The flavonoid test on samples of red betel leaf showed positive results, with the addition of H_2SO_4 producing a brick-red color. Flavonoids are a group of phenolic compounds. These compounds are responsible for plants' red, purple, blue, and yellow dyes. The flavonoid test on green betel leaves obtained two positive results with a blackish-green or dark-green color change. Flavonoids are generally more soluble in water or polar solvents because they have bonds with sugar groups. Testing for alkaloids on samples of red betel leaf obtained one positive result. In contrast, samples of red betel leaf received positive results of two using Dragendroff's solution, indicated by the presence of red sediment. Alkaloids can be attracted to ethanol solvents because alkaloid compounds are polar. The positive reaction in the alkaloid test was the formation of an orange precipitate on the Dragendorff reagent, which was due to a ligand replacement reaction. Alkaloids with a nitrogen atom with a lone pair of electrons can replace the ions in these reagents. Testing of tannin compounds on samples of red betel leaf obtained one positive result, while pieces of green betel leaf obtained two positive results with a bluish-green color change. The tannins, which are phenolic compounds, tend to be soluble in water, so they tend to be polar. The tannin test showed that the tannins contained in the sample were condensed tannins because a blackish-green color was formed after being

added with $FeCl_3$.[13] Examination of the presence of tannin compounds in this study was tested on samples of red and green betel leaves.[8-10.13]

The content of red betel leaf has potential as a gingivitis herbal medicine because it contains antibacterial properties, namely alkaloids and tannins, and especially flavonoids. Flavonoid is a phenolic compound that can bind protein, inhibit membrane function, inhibit metabolic processes, and inhibit enzymes in bacteria. In addition, this compound will inhibit the ions, oxygen, and adenosine triphosphate (ATP) transport from bacteria.[14] Flavonoids have a protein denaturing mechanism so that the bacterial cell wall is damaged, and the hydroxyl group enters the bacterial nucleus, which causes bacteria not to survive. In addition, flavonoids can also inhibit the synthesis of nucleic acids and peptidoglycan.

Flavonoids can inhibit the work of the efflux pump on bacteria which is one of the bacterial defense systems against foreign substances such as antibiotics.[15] Polyphenols have a mechanism as an antibacterial by damaging bacterial cell membranes, inhibiting fatty acid synthesis, and enzyme activity so that bacterial growth and development are inhibited.[16]

Further research is needed to determine the quantitative phytochemical content, antibacterial activity, and in vivo test on experimental animal models of Gingivitis from red betel leaf and green betel leaf.

CONCLUSION

Based on the research results, the macroscopic examination shows that the red betel leaf has a physical aspect of silver-green with red grooves, characteristic betel odor, and bitter taste. The shape of the oval leaf size was 3x5 cm. In contrast, green betel leaf has green color, a distinctive betel odor, a slightly bitter taste accompanied by spicy, and a pointed oval shape with an average leaf size of 2x4 cm. Qualitative phytochemical examination showed that red and green betel leaves contain compounds containing alkaloids, flavonoids, tannins, polyphenols, saponins, and quinones. Green betel leaves show better results in qualitative phytochemical content.

CONFLICT OF INTEREST

We declare no potential conflict of interest in the scientific articles we write.

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