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Research Article

Starfruit extract (*Averrhoa bilimbi*) as an alternative ingredient in the treatment of aphthous stomatitis and gingivitis

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ABSTRACT

Background: Stomatitis is a lesion of the oral mucosa, inner cheek, inner lip, tongue, gums, and palate. Although it is not dangerous, canker sores are very annoying. Gingivitis is inflammation of the gingival area and is the most common disease in the community. The content of starfruit (*Averrhoa bilimbi*) includes saponins, tannins, glucosides, and calcium, one of the best known as thrush drugs. In addition, the use of herbal plants such as star fruit (*Averrhoa bilimbi*) to reduce the risk of caries because this plant has antibacterial ability. Objective: This study aimed to analyze the efficacy of starfruit on the healing of aphthous stomatitis and gingivitis. Methods: the type of research used is quasi-experimental, with a pre and post-test design. The sampling technique used purposive sampling. The data collection instrument used to measure the diameter of stomatitis was using a caliper and measuring gingivitis using the WHO standard measuring instrument, namely the gingival index. Analysis of the data used was a paired sample test to compare stomatitis and gingivitis before and after the intervention. Result: the application of starfruit (*Averrhoa bilimbi*) showed $p=0.000$ and the gingival index showed $p=0.016$, meaning that starfruit extract (*Averrhoa bilimbi*) was effective in treatment of aphthous stomatitis and gingivitis. Conclusion: starfruit extract (*Averrhoa bilimbi*) is effective as an alternative ingredient in the treatment of aphthous stomatitis and gingivitis.

Keywords: Starfruit, aphthous stomatitis, gingivitis.**ARTICLE INFO:** Received; 28 Jan 2022 Review Complete; 15 March Accepted; 5 April 2022 Available online; 15 April. 2022**Cite this article as:**Eliati Sri Suharja, Starfruit extract (*Averrhoa bilimbi*) as an alternative ingredient in the treatment of aphthous stomatitis and gingivitis, *Asian Journal of Pharmaceutical Research and Development*. 2022; 10(2):10-12.DOI: <http://dx.doi.org/10.22270/ajprd.v10i2.1114>***Address for Correspondence:**

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INTRODUCTION

Many people are still reluctant and afraid to go to the dentist because of the fear of pain during treatment and the high cost to get treatment, because the drugs used for dental care, including removing canker sores, are expensive ingredients. Besides the high price, there are still many side effects for each drug such as albothyl which can irritate tissues, so it would be better if you use traditional medicine to treat canker sores such as starfruit.¹⁻³ In Indonesia, starfruit is one of the plants that has not been specially cultivated. Starfruit is a species of the *Averrhoa* family. The population of this plant is very abundant, because in general starfruit is grown in the form of garden culture.⁴

Starfruit (*Averrhoa bilimbi*) is used to treat various diseases such as cough, diabetes, rheumatism, mumps, stomatitis, toothache, and bleeding gums. The parts that are usually used are the fruit, stem, leaves and flowers. The four parts contain a lot of nutritious compounds. Among them are

saponins, tannins, glucosides, to calcium, one of which is best known by starfruit people as a canker sore. The sour taste contains high vitamin C, because it is widely used for stomatitis drugs, its use is by chewing or affixed to the canker sores.⁵⁻⁷

stomatitis is inflammation that occurs in the oral mucosa, visible yellowish white patches. The spots can be single spots or in groups. Stomatitis can attack the mucous membranes of the inner cheeks, inner lips, tongue, gums, and the roof of the mouth. Although harmless, canker sores are very annoying. Canker sores can be caused by poor oral hygiene conditions, installation of dentures, wounds in the mouth due to food or drink that is too hot and body conditions, such as allergies or inflammation.⁸⁻¹⁰

Gingivitis is inflammation of the gingival area and is the most common disease in the community, inflammation is almost always found in every gingival disease. This situation is understandable, because the inflammation is

caused by local irritation and microorganisms that are always found in the gingival environment.¹¹⁻¹³

METHODS AND MATERIALS

This research is a quasi-experimental design with pretest and posttest. The study was conducted on students of the Department of Dental Health, Poltekkes KemenkesTasikmalaya. The sampling technique was purposive sampling as many as 22 respondents, inclusion criteria: had cases of stomatitis and gingivitis, not currently taking medication for stomatitis and gingivitis, willing to be respondents.

The research variable is the independent variable is the application of starfruit, while the dependent variable is aphthous stomatitis and gingivitis. The data collection instrument used to measure the diameter of stomatitis was using a caliper and measuring gingivitis using the WHO standard measuring instrument, namely the gingival index.

The application intervention for starfruit extract was carried out for 14 days by means of the respondent's stomatitis and gingivitis dripping with starfruit extract for 1-2 minutes, then continued in the dormitory 2 times every morning and night before going to bed for 2 weeks and recorded on the check list. Data analysis was carried out using the SPSS statistical program, paired sample test to determine the comparison before and after the intervention

RESULTS

Table 1: Frequency distribution of respondent characteristics

No	Gender	n	%
1	Men	2	9.1
2	Women	20	90.9
	Total	22	100

Table 1 shows that the characteristics of respondents based on gender obtained were 2 men (9.1%) and 20 women (90.9%)

Table 2: Frequency distribution of gingival index before and after intervention

No	Gingival index	Before		After	
		n	%	n	%
1	Healthy	0	0	6	27.3
2	Mild	19	86.4	15	68.2
3	Moderate	2	9.1	1	4.5
4	Severe	1	4.5	0	0
	Total	22	100	22	100

Table 2 shows that the results of the measurement of the respondent's gingival index before being given gingival intervention (0%) gingivitis (86.4%) gingivitis (9.1%) and gingivitis (4.5%) while after being given healthy gingival intervention (27.3%) mild gingivitis (68.2%) moderate gingivitis (4.5%) and severe gingivitis (0%).

Table 2: Frequency distribution of stomatitis before and after intervention

No	Stomatitis	Before		After	
		n	%	n	%
1	Healthy	0	0	21	95.5
2	Mild	6	27.3	1	4.5
3	Moderate	16	72.7	0	0
4	Severe	0	0	0	0
	Total	22	100	22	100

Table 3 shows that the results of the respondents' stomatitis measurements before being given the intervention were healthy (0%), mild stomatitis (27.3%) moderate stomatitis

(72.7%) and severe stomatitis were absent (0%) after being given the intervention, healthy (95, 5%) mild stomatitis (4.5%) moderate stomatitis (0%) and no severe stomatitis (0%)

Table 4: Results of Paired Samples Test gingival index and stomatitis before and after intervention

Variable		Mean± SD	P-value
Gingival index	Pre-test	0.409±0.734	0.016
	Post-test		
Stomatitis	Pre-test	1.681±0.476	0.000
	Post-test		

Table 4 shows that the Paired Samples Test Gingival index obtained a mean of 0.409 with a standard deviation of 0.734, and p-value = 0.016 (p<0.05) while stomatitis means 1.681 with a standard deviation of 0.476, and p-value = 0.000 (p<0.05) then it can be interpreted that starfruit extract (Averrhoa bilimbi) is effective as an alternative ingredient in the treatment of aphthous stomatitis and gingivitis.

DISCUSSION

This study aims to analyze the efficacy of starfruit on the healing of aphthous stomatitis and gingivitis. The research sample was students with the characteristics of respondents based on gender obtained were 2 men (9.1%) and 20 women (90.9%).

The results showed that the application of starfruit (Averrhoa bilimbi) showed p= 0.000 and the gingival index showed p=0.016, meaning that starfruit extract (Averrhoa bilimbi) was effective in treatment of aphthous stomatitis and gingivitis.

This is influenced by several possibilities, firstly the concentration of the compound in the extract given. The second possibility is the presence of other organic substances contained in star fruit that affect the mechanism of action of the active substance as an antibacterial in inhibiting microorganisms. This is in accordance with aliningrum's research proving that 70% ethanol extract of starfruit (Averrhoa bilimbi) as a mouthwash has an effect on inhibiting the growth of Streptococcus sanguinis bacteria.¹⁴

Antibacterial active substances contained in starfruit (Averrhoa bilimbi) include flavonoids, tannins, and saponins.³ Flavonoids have antibacterial ability to damage bacterial cell walls because they bind to proteins that lyse bacterial cells so that bacteria die. Flavonoids can also agglomerate proteins, are lipophilic, so that the lipid layer of the bacterial cell membrane will be damaged. The content of other active substances, namely tannins, has the ability to interfere with the metabolism and permeability of bacteria, as a result, cells cannot carry out living activities so that bacterial growth will be inhibited and even die.^{15,16}

The flavonoid active compounds in star fruit haveability to form complexes with bacterial proteins through hydrogen bonds. This situation causes the structure of the cell wall and cytoplasmic membrane of bacteria containing proteins to become unstable so that the bacterial cell loses its biological activity. Furthermore, the permeability function of bacterial cells will be disrupted and bacterial cells will

undergo lysis which results in bacterial cell death. Phenol components can also cause cell wall damage.^{17,18}

Tannins are phenol derivatives which are naturally. The general antimicrobial mechanism of phenolic compounds. Tannins are growth inhibitors, so the growth of many microorganisms can be inhibited by tannins. Tannins have a target on cell wall polypeptides. This compound is a chemical substance found in plants that has the ability to inhibit the synthesis of bacterial cell walls and the synthesis of gram-positive and gram-negative germ cell proteins. Activity of tannins as antimicrobial This can occur through several mechanisms, namely inhibiting antimicrobial enzymes and inhibiting bacterial growth by: react with cell membranes and inactivate essential enzymes or genetic material. Furthermore, tannin compounds can form complexes with proteins through hydrophobic interactions so that in the presence of hydrophobic bonds denaturation will occur and ultimately disrupt cell metabolism.^{4,19}

Starfruit extract also contains the active substance of saponins. Saponins are compounds that have antibacterial properties by damaging bacterial cell membranes. The cell membrane serves as a pathway for the entry and exit of important materials needed by the cell. If the function of the cell membrane is damaged, it will cause the cell to die. Tannins also have antibacterial activity through reactions with cell membranes, inactivation of enzymes, and destruction of the function of genetic material.^{4,20}

CONCLUSIONS

Based on the research results, it can be concluded that starfruit extract (*Averrhoa bilimbi*) is effective as an alternative ingredient in the treatment of aphthous stomatitis and gingivitis.

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CONFLICT OF INTEREST

The authors declare that they have no conflict interests.

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