QUALITY EVALUATION OF GUAVA (*Psidium guajava* L.) CHEWABLE TOOTHPASTE TABLETS – A PRELIMINARY STUDY

Zaidatul Shakila Mohamad Ashari*, Nunshaimah Salleh
Faculty of Applied Sciences, Universiti Teknologi MARA Perak Branch Tapah Campus, 34500 Tapah Road, Perak, Malaysia

*zaida@uitm.edu.my

Abstract: This project's goal is to assess the quality of guava (*Psidium guajava* L.) chewable toothpaste tablets. Toothpaste tablets with charcoal, without charcoal, without humectant, and with charcoal using liquid stevia were the four different formulations created. In this study, the functional groups found in guava powder and formulated guava chewable toothpaste tablets were compared using FTIR, and the cleaning ability efficacy of guava chewable toothpaste tablets using eggshells were determined.

Keywords: *Psidium guajava L., chewable toothpaste tablets, quality evaluation.*

INTRODUCTION

The guava (*Psidium guajava* L.), which has a significant additional therapeutic potential, has been utilised in folkloric practises to promote dental cleanliness. Additionally, it has long been recognised for its anti-inflammatory, antibacterial, antioxidant, antidiarrheal, and antimutagenic qualities (Parvez *et al*., 2018). Previous research has demonstrated that guava leaf extract has an antibacterial impact on periodontal bacterias *A. actinomycetemcomitans* and *P. gingivalis* (Shetty *et al*., 2018). Guava could be used in mouth rinse, as Nayak *et al*. (2019) reported in their work that guava mouth rinse has antibacterial properties and can be used as an adjuvant to professional oral prophylaxis. As far as we know, there are lacks on work that use guava fruit as antimicrobial agent for dental care. In the current work, an attempt was made to develop and to evaluate the quality of a toothpaste with guava fruit as a key ingredient in order to convey the advantageous characteristics of guava to commonly used products. Additionally, the goal of the current research is to include economically affordable, easily accessible, and effective herbal components in personal hygiene products.

METHODOLOGY

Formulation of Guava Toothpaste

The guava variety employed in this study is GU9, which is popularly recognised as a guava clone in Malaysia. The fruit's drying technique and the preparation formula of the guava chewable toothpaste tablets were similar to our previous work but with a slight change (Md. Helmi *et al*., 2020). The guava fruit was carefully sliced thinly to ensure that drying process takes the least amount of time. The oven was pre-heated 15 minutes at 90℃. The guava fruit was put in the oven for about four hours or more depending on the thickness and dryness of the guava at 90℃. The dried guava slices were blended and then further pounded in a pestle and mortar until they became a fine powder. Guava toothpaste chewable tablets with charcoal (G1), without charcoal (G2), without humectant (G3), and with charcoal and liquid stevia (G4) were the four different formulations created. Each formula was created by combining peppermint, glycerol, sea salt, stevia, sodium bicarbonate, methyl cellulose and sodium benzoate.

Fourier Transform Infrared Spectroscopy (FTIR) analysis

FTIR analysis was used for the detecting the functional groups and characterising covalent bonding data for the guava powder and all formulated guava chewable tablets. The peaks from the spectrums were compared to the wave number.

Cleaning Ability Test

The cleaning ability test of each formula was evaluated using the Shaheena et al., (2019) method with a few adjustments. Boiled egg was used as the composition of eggshell's calcium is similar to the to the teeth enamel. Ten tablespoons of vinegar and two tablespoons of red syrup were poured to boiling water. The boiled eggs were dipped into the solution and left to stain for 5 minutes after chilling. The eggs were taken from the solution and blotted dry with a paper towel. The eggshell was then cleaned with 0.5 g, 1.0 g, and 1.5 g powder of each formula using wet tooth brush followed by washing. For colour removal, 5 to 10 brush strokes, once a day for one week with each fornula on eggshell were prescribed. All of the formulated guava chewable toothpaste tablets were brushed with the same amount of pressure and motion. The cleaning ability of the four formulas were observed by comparing the results before and after brushing.

FINDINGS

The FTIR Characterization of Formulated Guava Chewable Toothpaste Tablets

A review done by Sharma & Borah (2021) showed that there were 37 bioactive compounds found in the guava fruit. However, the important constituents that are known as antibacterial agent in treating oral disease are the quercetin and guaijaverin (Divyashree & Ravi, 2014). The bonds that form the structure of quercetin and guaijaverin are O-H (alcohol/phenol), C=C (aromatic), C=O (carbonyl group), C-O (ether) and C=C (alkenes) bonds (Parasuraman *et al*., 2016; Prabu *et al*., 2006). Figure 1 and Table 1 showed the analysis FTIR spectra on guava powder and the formulated toothpaste tablets; G1, G2, G3 and G4. Based on the analysis, guava powder and all formulations showed similar functional groups; O-H (phenol), C=C (aromatic) and C=C (alkenes).

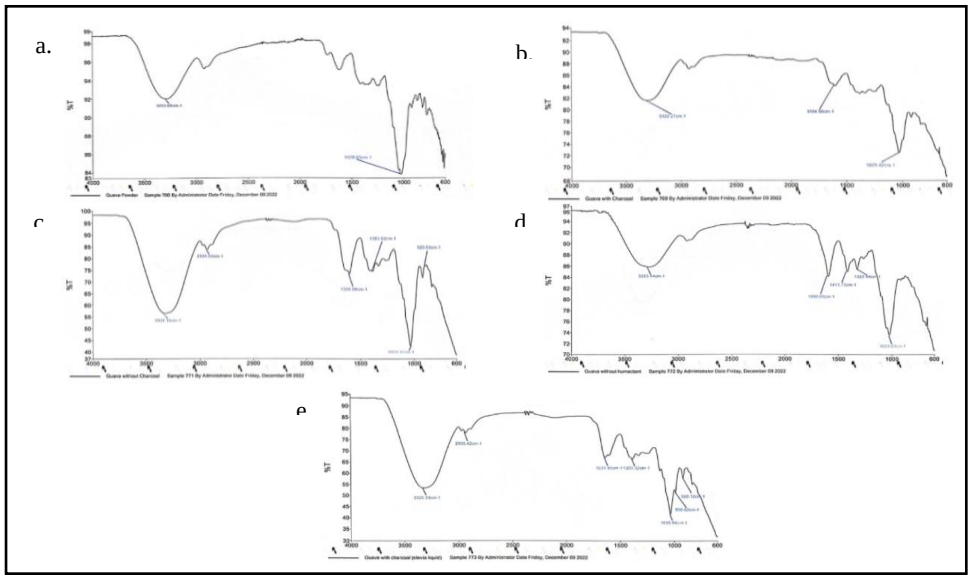

Figure 1. FTIR graph analysis from guava powder (a.), G1 (b.), G2 (c.), G3 (d.) and G4 (e.)

Table 1. FTIR analysis from guava powder, G1, G2, G3 and G4

	Wave number (cm^{-1})	Types of bond
Guava powder	3202.05	O-H (Phenol)
	1658.04	C=C (Aromatic)
	1450.72	C=C (Alkenes)
G1	3322.27	O-H (Phenol)
	1594.96	C=C (Aromatic)
	1431.17	C=C (Alkenes)
G2	3332.15	O-H (Phenol)
	1596.04	C=C (Aromatic)
	1383.92	C=C (Alkenes)
G3	3283.44	O-H (Phenol)
	1590.89	C=C (Aromatic)
	1413.73	C=C (Alkenes)
G4	3325.04	O-H (Phenol)
	1631.46	C=C (Aromatic)
	1350.32	C=C (Alkenes)

Cleaning Ability Test

Based on the colour change appeared on the pigmented eggs after 7 days, all formulations have shown high cleaning ability as the stain can easily removed, with the exceptional for G2 (guava toothpaste with charcoal), there were toothpaste residue that clogged the egg shell pores. The diameter of the eggs were also calculated after 7 days and the result showed that G1, G2 have no changed in the diameter. G3 and G4 have shown that there were small changes in the diameter of the egg and this suggest that these formulations unable to neutralise the vinegar's acidic component. . Table 2 summarized the cleaning ability test of all formulations.

Table 2. Cleaning ability test for G1, G2, G3 and G4

Formulations	Weight used (g)	Initial color and diameter (mm)	After 7 days of cleaning and diameter (mm)	Observations
G1	0.5	 42.3	 42.3	High cleaning ability. A little toothpaste residue clogs the egg shell pores.
	1.0	 42.4	 42.4	High cleaning ability. A little of toothpaste residue clogs the egg shell pores.
	1.5	 42.7	 42.7	High cleaning ability. A lot of toothpaste residue clogs the egg shell pores.
G2	0.5	 41.9	 41.9	High cleaning ability. No toothpaste residue clogs the egg shell pores.
	1.0	 42.2	 42.2	
	1.5	 40.1	 40.1	
G3	0.5	 42.8	 41.7	High cleaning ability. No toothpaste residue clogs the egg shell pores. Small change in diameter.
	1.0	 43.0	 42.4	
	1.5	 42.4	 42.3	
G4	0.5	 42.3	 42.0	High cleaning ability. No toothpaste residue clogs the egg shell pores. Small change in diameter.
	1.0	 41.7	 41.5	
	1.0	 42.3	 42.1	

CONCLUSIONS

As a result of this research, the toothpaste tablets with antimicrobial and cleaning capabilities were created using guava fruit powder as a key ingredient. Other ingredients in the toothpaste tablet formulations were also effective at removing stains. Further study is warranted to confirm that the bioactive compounds from guava fruit are responsible for the oral bacterial inhibition. While these findings support the qualities of guava toothpaste tablets for oral care, more research is needed to ensure that the formulations are safe with no adverse effects.

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