Development of Green Tea incorporated Ayurvedic toothpaste

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Introduction

The tea plant *Camellia sinensis* is native to South East Asia and consumed worldwide, although in greatly different amounts. It is generally accepted that, next to water, tea is the most consumed beverage in the world, with per capita consumption of 120mLd $^{-1}$. Green tea contains polyphenolic compounds, which include flavanols, flavandiols, flavonoids, and phenolic acids and account for 30% of the dry weight of green tea leaves. Green tea contains compounds that appear to control inflammation and fight bacterial infection. This drink is also rich in antioxidants, which have many oral health properties as Cavity prevention, Gum health, Less tooth loss, Cancer control, Better breath (Lisa, 2011). But the oral health benefit of the green tea is less aware by the people (Narotzki *et al,* 2012). This study is aimed to develop green tea incorporated ayurvedic toothpaste by addition of five different herbs to enhance the natural flavor of the tooth paste while increasing the oral health benefits.

The main objective is to develop ayurvedic toothpaste incorporating green tea and evaluate it for selected quality parameters. Other objectives are to determine the appropriate green tea and herbal oil incorporation quantity, to evaluate taste of the toothpaste (strength, bitterness), liquor color, smell, freshness after washing and the overall acceptability as quality indicators.

Materials and Methods

The green tea ayurvedic toothpaste consists with chemical mixture, green tea extract and herbal oil. To prepare the toothpaste chemical mixture 325g of powdered Calcium Carbonate ($CaCO_3$), 5g of Carboxy Methyl Cellulose (CMC), 10g of Sodium Lauryl Sulfate (SLS) and 2g of Methyl Paraben were mixed well during 15 minutes. And 110 mL of distilled water, 70 mL of glycerol and 70 mL of sorbitol were mixed in a separate dish and poured in to the solid chemical mixture and mixed together until 30 minutes. It was stored in a sealed container.

To extract the herbal oil 110g of each powdered Clove, Welmee, Munamal and Aralu were ground by adding 100 mL of distilled water until herbal pulp was formed. And the pulp was boiled during 10 minutes at constant temperature while mixing with 500 mL Sesame oil until evaporated the total water amount. Green tea – water extraction was done using reflux extractor (ISO 1574:1980). To prepare the green tea ayurvedic toothpaste all the three ingredients (chemical mixture, green tea and herbal oil) were mixed together at 1% , 2% of green tea extract and herbal oil levels.

Sensory evaluation with 30 untrained panelists was carried out to select the best green tea, and herbal oil incorporation quantity for the formulated toothpaste. Five point hedonic scale was used to evaluate samples for taste (strength, bitterness), color of the paste, smell, freshness after wa shing and the overall acceptability. Data were statistically analyzed using Freidman test at 5% level of significance using MINITAB statistical software.

The pH value of the developed toothpaste was measured with electronic pH meter. Determination of Moisture and Volatile Matter, Foaming Volume and Stability of the toothpaste were done based on SLS 275:2006 specifications.

Determination of polyphenol content of the toothpaste was done according to the ISO 14502-1 specifications. Prepared green tea ayurvedic toothpaste and control were tested for well diffusion assay using experimental microorganism included *Strephylococcs aureus* and the mean zone inhibition was measured (Awadalla *et al*, 2011). A total plate count test was done to determine the microbial evaluation of the toothpaste. The prepared mouthwash was subjected to a storage study by observing color and the smell at two weeks intervals and the pH of the product also measured.

Results and Discussion

Analyzed statistical data of the sensory evaluation of first experiment revealed that, there was a significant difference ($p<0.05$) among five treatments in respect to the all the sensory attributes tested. According to the Figure 1, Second treatment combination (475) which consisted of 1% of green tea extract and 2% of herbal oil amounts were selected as the best treatment to develop the new product since each of the significantly different attribute bears the highest rank mean and median values except colour of the product.

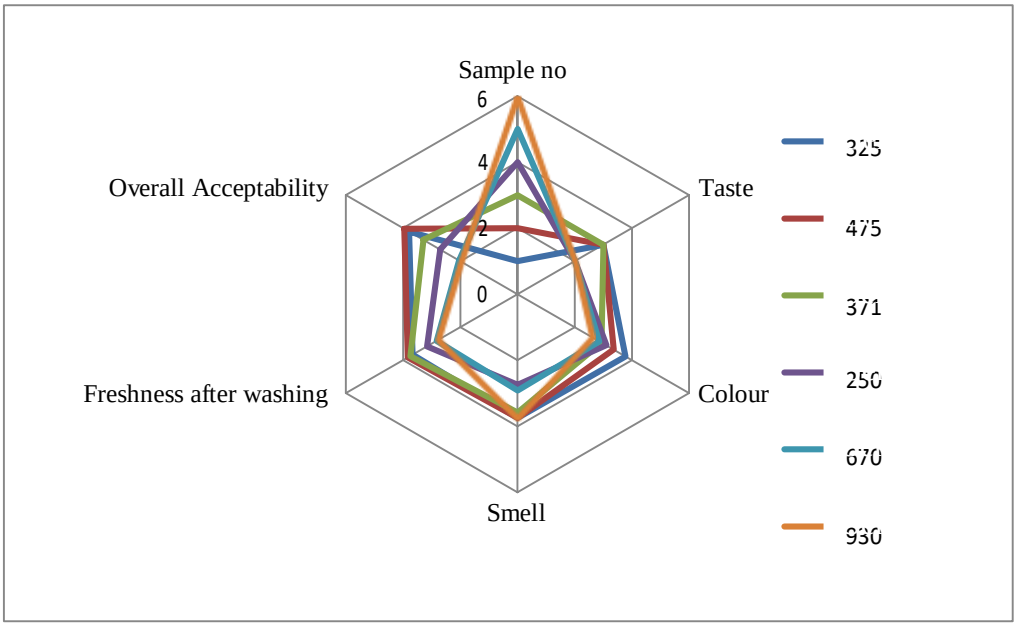

Figure 1: Sensory profiles of different treatments tested

The pH value of the toothpaste was 7.12. It was in the favorable pH range 5.8 – 10.5. As well as there was no any variations of the pH values during the storage. The toothpaste was consisted with 52% of moisture and volatile matter. It was in the favorable range 12 to55 percent by mass. Foaming volume of the toothpaste was 51 mL by fulfilling minimum SLS requirement

Toothpaste was having good stability at 0 C to 45 C temperature range and the total polyphenol content of the toothpaste was 23%. The fluoride concentration of the toothpaste was 4 ppm and it was having good effectiveness against the *Strphylococcus aureus* and free from coliform bacteria based on microbial evaluation (Figure 2), zone of inhibition and coliform test.

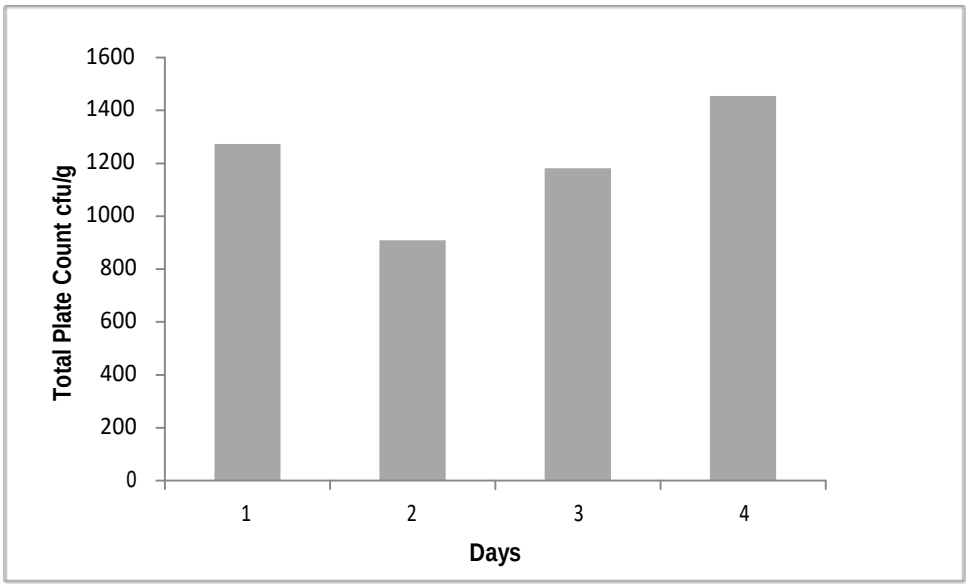

Figure 2: Variation of Total Plate Count with the Time

The total colony count was increased during 4 days period.The cost of production of 1g of toothpaste was Rs.1.80 based on cost for all chemical and non-chemical ingredients.

Conclusion

To develop good quality ayurvedic toothpaste 1% of green tea extract and 2% of herbal oil amount were selected. The new product contains an appropriate polyphenol content, foaming volume, stability, pH value by fulfilling SLS requirement. The new product can store in cool and dry place at 0℃ to 45℃ temperature range. Based on the microbial studies, ayurvedic toothpaste was having good effectiveness against *S.aureus* and coliform bacteria.

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