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Research Article

COMPARATIVE STUDY OF BUFFERING CAPACITY OF AN INNOVATIVE *CYMBOPOGAN* FLAVOURED HERBAL MOUTH WASH AGAINST COMMERCIAL CHEMICAL MOUTH WASH IN ORAL HEALTH

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Abstract
Urbanization and economic development has resulted in rapid changes in diet and lifestyles. Saliva is one of the most important factors in determination and regulation of human oral health status. Saliva is studied by researchers to evaluate the oral health status. The aim of present study was to record and compare the effect of consumption of various food articles on the pH of saliva. This case study is also aimed at comparing the effectiveness of a commercial mouthwash against an innovative herbal mouthwash in regulation of after effects of food consumption.
Baseline pH measurement was carried out for 15 selected individual's saliva sample. Further study was carried out to see the effect of herbal mouthwash on oral pH after consumption of beverage and food and smoking. For all tests saliva samples were collected at specific time intervals in sterile tubes. pH of the saliva samples was further analyzed in comparison with the baseline values. Our herbal mouth wash exhibited better pH correction potential.
It was concluded through our preliminary study that innovative herbal mouthwash was more efficient over commercial product.

Key Words: *Oral health, saliva, pH, microbiological quality, herbal mouthwash, smoking.*

Introduction:
Oral health is integral to general well-being and relates to the quality of life that extends beyond the functions of the craniofacial complex. Saliva is one of the most important factors in regulating oral health by way of its buffering action and controlling the demineralisation and promoting remineralisation, occurring continuously at the enamel surface [1]. There has been a substantial increase in consumption of carbonated beverages and fruit juices especially in the urban and younger population, although people are aware of their deleterious on oral hygiene, they do prefer to consume these things [2, 3, 17, 18]. Smoking is also a common practice. About 20% of the world population smokes tobacco in spite of its very well known harmful effects. [4]

A mouth rinse is a chemotherapeutic agent used as an effective home care remedy to enhance oral hygiene and prevent dental caries by targeting the cariogenic bacteria. The use of mouthwash has increased because of attention to oral hygiene. [5,19]

About 25 % of drugs are derived from plants and many other are formed from prototype compounds isolated from plant species [6]. It was reported that about two million traditional health practitioners use over 7500 medicinal plant species [10]. Herbal medicine is both promotive and preventive in its approach. It is a comprehensive system, which uses various remedies derived from plants and their extracts to treat disorders and to maintain good health. The major strength of these natural herbs is that they do not cause any side effects and are safe to use in comparison to their chemical counterparts [8].

Commercial mouthwashes available in market contains water (chief constituent); ethanol, dyes, surface active agents, zinc chloride /acetate, aluminium potassium sulphate (astringent): and phenolic compounds, quaternary ammonium compounds and essential oils such as oil of peppermint (as antibacterial agents) among others.[10,19] These chemicals affect oral health by changing the pH of saliva and by reducing the number of normal oral microflora.[7] Present study aims to understand the role of a herbal mouthwash over commercial products.

Materials and Methods:
Preparation of the herbal mouthwash:
Ingredients of the mouthwash:

- *Cymbopogon spp. – 6.5g*
- *Ociumum santum – 5g*
- *Trachysperimum ammi – 5g*

- *Syzygium aromaticum* and *cinnamomum spp.*- *5.5g*
- *Foeniculum vulgara-9g*
- *Menth spp. – 5g*

All the ingredients were taken in above proportion and boiled in 150ml of sterile distilled water till the volume was reduced to 100ml. The contents were allowed to steep overnight after which they were crushed, filtered and the filtrate was used as the herbal mouthwash.

Subject selection:

The present study was conducted on fifteen adults between the age group of 18 to 40 years of age. Students and the non-teaching staff of a reputed college were selected as subjects. Ethical clearance was obtained from the institute and written consent was taken from the subjects.

Inclusion criteria:

1. Subjects who were medically fit and healthy were selected.
2. Subjects who had DMFT and DMFT less than 2.

Exclusion criteria:

1. Individuals undergoing topical fluoride therapy, other chemotherapeutic procedures and antibiotics therapy were excluded from the study.
2. Individuals suffering from any systemic diseases/ taking any medication that affects salivary secretion were also excluded.
3. Individuals suffering from any other condition, which is contraindicated for clinical examination, were excluded.

Test Sample:

1. Carbonated beverage (commercial product procured from local market)
2. Fruit (seasonal fruit)
3. Chocolate (from market)
4. Bidi (local vendor).

Bench type pH meter having an accuracy of ± pH 0.01 was used to determine the pH of saliva. The pH meter was calibrated prior to measurement for accurate reading and the accuracy of the pH meter was checked at regular intervals to ensure correct reading

Saliva collection: For saliva collection, each subject was instructed not to eat or drink anything for a period of 2 hours prior to undergoing the test.(fasting for two hours)

At the time of saliva collection, subjects were seated with head inclined forward so that the saliva will collect in the floor of the mouth cavity. Individuals were made to gargle 5 ml of sterile water for two minutes. Test sample saliva was collected in a sterile container.

Subjects were divided into two groups. Group 1 (N=10) was tested for carbonated beverage, fruit and chocolate and group 2 (N=5) consisted of people who were regular smokers.

Each subject in group 1 was asked to come for 4 days regularly for the test of one of the products on each day.

Day1: assessment of baseline value
Day2: assessment of salivary pH changes with carbonated beverage.
Day3: assessment of salivary pH changes with fruit.
Day4: assessment of salivary pH changes with chocolate.

Three food articles (chocolate, fruit and carbonated beverage) were given to ten individuals. Subjects maintained common oral hygiene practice throughout the course of the study.

Sampling after food consumption:

After the baseline score was recorded, beverage and food items were tested on all subjects on three subsequent days. The subjects were asked to drink the beverages from a glass without using a straw. After consumption of beverage & eatables, salivary pH was measured at an interval of 0, 5, 10 and 15 minutes.
Sampling after food consumption and use of commercial mouth wash:

The subjects were made to consume the food item and rinse their mouth with the herbal mouthwash. A similar procedure for collection of saliva sample was followed.
Sampling after food consumption and use of herbal mouth wash:

The subjects were made to consume the food item and rinse their mouth with the commercial mouthwash. A similar procedure for collection of saliva sample was followed.
Each subject from group 2 was called for 2 days. Baseline samples were analysed on day1.
Sampling after smoking:

The above procedure was repeated for a subject with smoking habit.
The collected saliva samples were analyzed for pH using pH meter. The pH-sensitive electrode was dipped in sample for the reading. The digital reading was allowed to stabilize for a few seconds and the pH reading was taken. In between readings, the electrode was cleaned with distilled water and placed in a standard buffer solution of pH 7·0. This ensured stable readings and provided a constant check on the drift. The pH was measured immediately after collection. All the experimental steps were carried out in duplicate and mean values were considered.

Result and Discussion:

Table1; Effect of beverage consumption on salivary pH

Time (in minutes)	pH without mouthwash	pH with herbal mouthwash	pH with commercial mouthwash
0	7.4	6.6	7.5
5	7.4	6.5	6.8
10	6.8	6.6	6.7
15	8.1	7.3	6.1

Fig1; Effect of beverage consumption on salivary pH

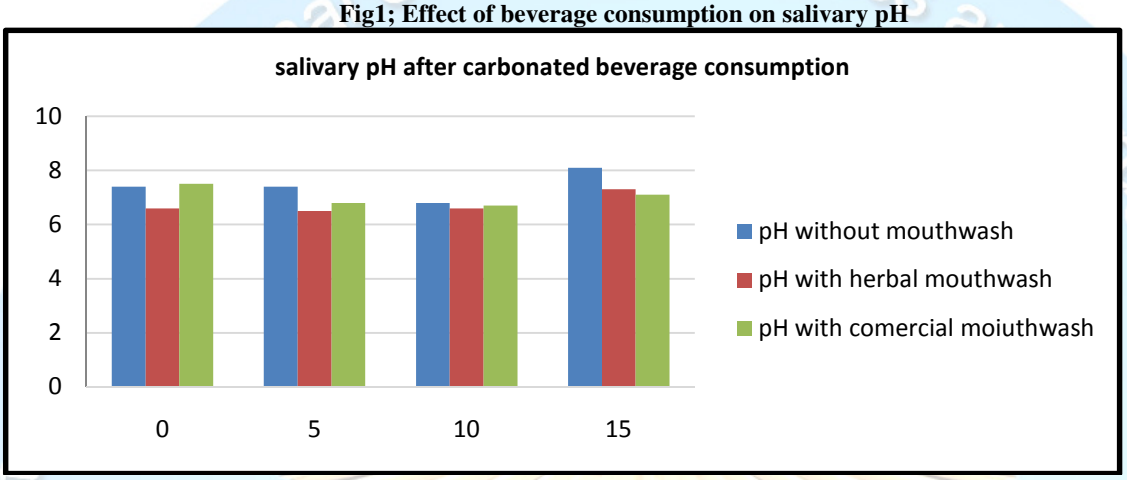


Table2; salivary pH measured under different conditions

Time (in minutes)	pH without mouthwash	pH with herbal mouth-wash	pH with commercial mouthwash
0	8.0	8.0	7.5
5	7.0	7.0	7.0
10	6.6	7.2	6.8
15	6.3	7.3	6.5

Fig2; salivary pH measured under different conditions

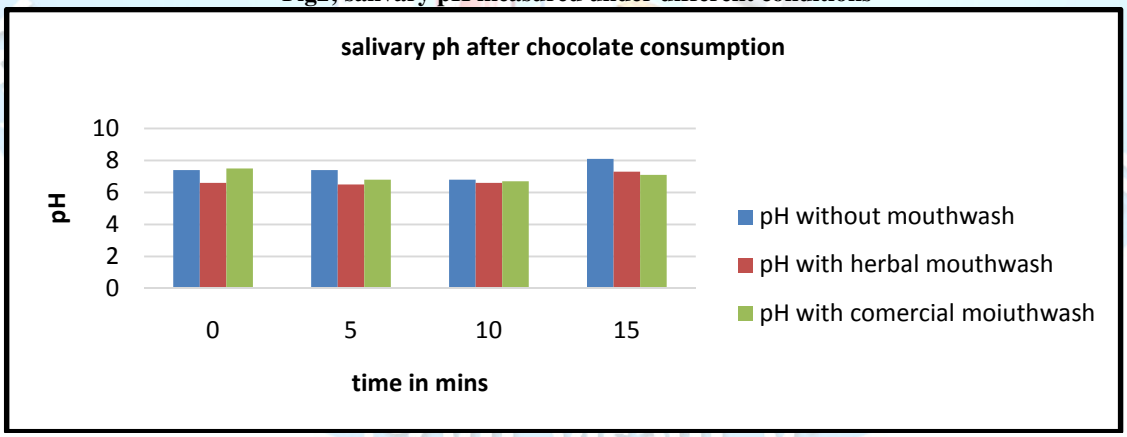


Table 3; Salivary pH in different conditions post fruit consumption

Time (in minutes)	pH without mouthwash	pH with herbal mouth-wash	pH with commercial mouthwash
0	7.4	6.4	7.4
5	6.9	6.6	7.7
10	6.9	6.6	7.9
15	7.3	7.3	8.4

Fig 3; Salivary pH in different conditions post fruit consumption

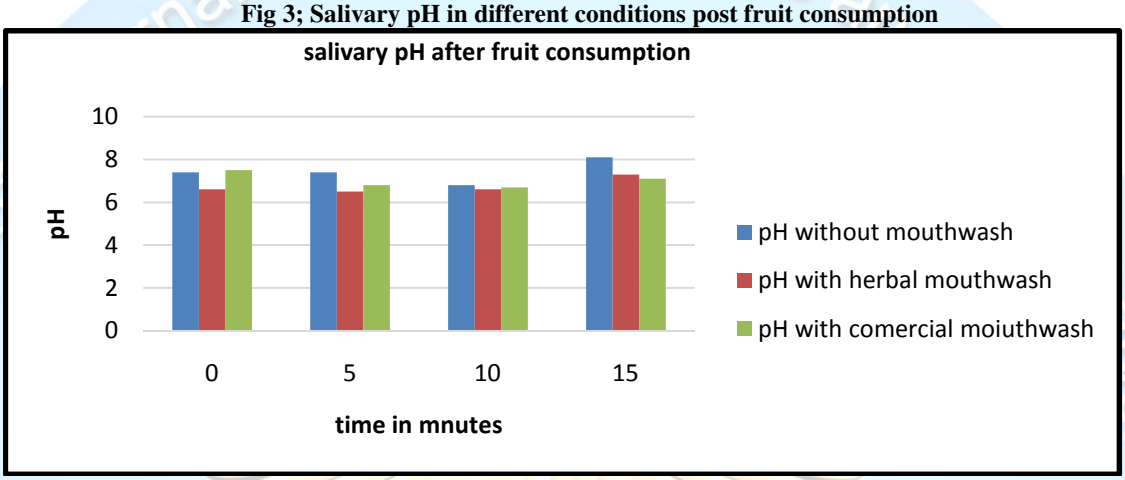
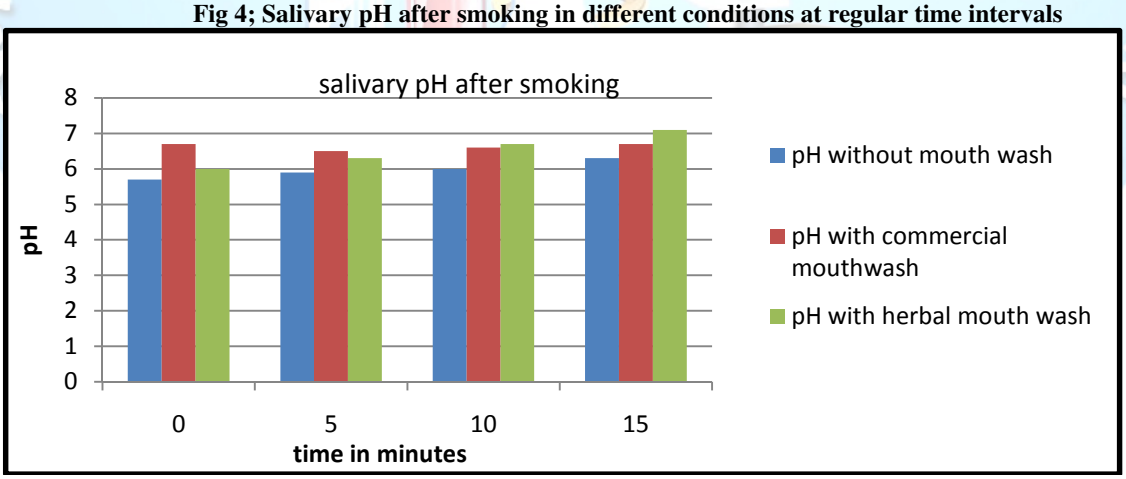


Table 4; After smoking- Salivary pH in different conditions at regular time intervals

Time in minutes	pH without mouth wash	pH with commercial mouthwash	pH with herbal mouth wash
0	5.7	6.7	6
5	5.9	6.5	6.3
10	6	6.6	6.7
15	6.3	6.7	7.1

Fig 4; Salivary pH after smoking in different conditions at regular time intervals



Determination of pH showed that consumption of food affects the pH of the saliva for a considerable period of time. Normal oral pH (6.2-7.4) was altered towards acidic range upon consumption of fruit juice, chocolate and carbonated beverages. Smoking also adversely affected the oral health by reducing the salivary pH. The

present study shows that the innovative herbal mouthwash gives a better pH correction as compared to the commercial mouthwash.

Conclusion:

Food is prerequisite for survival. It is through oral route that water, beverages and food is consumed. Oral health is of prime concern for mankind since centuries.[2] Carbonated beverages and fruit juices are known to produce a tremendous drop in the salivary pH as they contain organic acids and sugars. In dental literature pH of 5.5 is reported as critical pH in saliva. [4, 5, 9] A further fall in pH disturbs the calcium and phosphate regulation leading to dental caries.[7] The erosive effect of fruit juices has been recognized for a long time as evident in the studies of Darby (1892) [10] and W.D. Miller (1907) [13, 14] reported tooth decalcification due to excessive fruit juice consumption.

The oral environment provides highly favorable conditions for the proliferation of bacteria, which may lead to erosion of tooth and gum. Pathogenic infections frequently cause dental caries and lower the pH of oral cavity under an acidic environment around.

The development of dental caries is highly dependent upon an individual's lifestyle and oral hygiene, therefore dental caries is likely to remain a very common infection throughout an affected individual's lifetime.[17,18] The prevalence of pathogens that cause dental caries can be successfully reduced through effective oral hygine strategies such as regular tooth-brushing after consumption of food, use of tongue cleaners, regular visit to dentist for assessment of oral health, inter-dental cleaning whenever necessary, and the use of antimicrobial mouthwashes. Mouth-rinsing was first described in Chinese medicine in 2700 B.C as a remedy.[27] Since 1960s, the scientific record of antimicrobial mouthwashes has been well documented Daily use of mouthwashes is recommended by may researchers and medicos for maintenance of oral hygiene. Commercial mouthwashes contain various antibacterial agents such as, ethanol, cetylpyridinium chloride (CPC) and essential oils (EO).[25]

Many commercial mouthwashes are alcohol based. They temper the optimum pH of saliva. Their clinical benefits are not clearly stated and their frequent use is detrimental to quality and number of oral normal bacterial flora. They also adversely affect the organoleptic properties of the saliva. Use of alcohol and other chemical based mouthwash is not recommended by many researchers since it increases susceptibility to oral infections and cancer. Commercial mouthwash cannot be used by younger individuals and pregnant women.

Scientists have attempted use of herbal ingredients over chemicals to overcome the side effects of chemical mouth wash. [26] This research work is an extension of such efforts and we propose use of our natural mouth wash post food and beverage intake. Regular use of our formulation would help in restoration of oral pH, which is a requirement for survival of normal oral bacterial flora. Correction of pH also reduces chances of pathogenic bacterial proliferation and invasion by opportunistic flora. Alcohol consumption and Smoking is detrimental to one's health. Both the factors are known to be the cause behind most oral cancers. [22, 23] Smoking and alcohol also kills normal bacterial flora, leading to faul smell and dental caries. Based on our experiments, we strongly recommend use of our mouthwash to improve oral health post smoking. [2,3]

Our mouthwash reduces the tendency to smoke amongst smokers after use due to its organoleptic properties. It also increases the salivary flow rate which would play a vital role in maintenance of oral flora.[10] Herbal mouth washes are free from chemicals and hence from any side effects [11] Our *Cymbopogon* based herbal mouthwash overcomes many drawbacks of chemical mouth wash. It is safe to use by children and pregnant women besides all other age group.[19] There is tremendous scope for further research in development of our herbal mouthwash at commercial scale.

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