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RESEARCH ARTICLE

EFFECT OF CONSUMPTION OF MANGO FRUIT, FRESH MANGO JUICE AND COMMERCIALY AVAILABLE MANGO JUICE ON DENTAL PLAQUE PH AT DIFFERENT TIME INTERVALS

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ABSTRACT

Introduction: Fruits and fruit juices are considered to be an important component of diet and good source of minerals, vitamins and antioxidants. Fruit juices are popular among people of all ages as they are perceived to be important for health. The consumption of low pH fruit juices causes a drop in the oral pH and if it persists even for minutes, it causes a potential damage to teeth.

Aim: Evaluate the effect of consumption of mango fruit, fresh mango juice and commercially available mango juice of mango on pH of dental plaque at different time intervals.

Materials and method: 20 children in the age group of 8-14 years were selected for the study with two groups i.e. Caries free and Caries active. After oral prophylaxis plaque was collected at baseline. Then the subjects were asked to consume mango fruit. Post consumption plaque samples were collected after 5 minutes, 10 minutes, 20 minutes, 30 minutes and 60 minutes and plaque pH were estimated. The pH reading was determined using digital pH meter. After the washout period same procedure was repeated on same group of subjects using fresh mango juice and commercially available mango juice.

Result: The maximum drop in plaque pH was found after the consumption of commercially available mango juice in comparison to fresh mango juice and mango fruit. However the fall in plaque pH below the critical pH was observed in caries active group.

Conclusion: Hence it was concluded that consumption of mango fruit is a better option as commercially available mango juice had more acidogenic potential as compared to fresh mango juice and mango fruit.

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INTRODUCTION

Fruits are considered to be an important component of diet and it is one of the five major food groups in the Food Guide Pyramid. Mango is one of the most popular of all tropical fruits¹. It is also the fruit of choice among children of all age groups. Mango contains sugars and organic acid with the concentration varying according to the type and maturation status of fruit. The fruit pulp contains vitamins A and C. Fresh Juice of mango contains all the goodness of the whole product in a condensed form. However as fruit is juiced, the liquids are separated from the fibre, resulting in a concentrated blend of flavour and colour, as well as carotenoids and minerals. The carotenoids present in the mango are good for oral health. Fiber present is important to the human body as it aids in digestion and provide provide bulk to the food we eat.

Since the diet we are consuming has become more refined, the trend towards readymade fruit juices has increased. Commercially available juice is becoming popular among². People of all ages as they are perceived to be important for health.

Commercial fruit juice has concentrates of fruit, added sugar, citric acid as the acid regulator and ascorbic acid as preservative. On consumption of the fruit and fruit juices (fresh juice and commercially available juice), the sugar content present in them is utilized by the microorganisms which lead to production of acids. A fall in plaque pH caused by intraplaque bacterial fermentation of dietary carbohydrate leads to a shift in the equilibrium concentration and consequently to enamel dissolution.

As literature regarding the acidogenic potential following consumption of fresh mango fruit and its fresh and commercial juice is sparse, so it is important to study which form of fruit is better for consumption of children. Hence the present study was carried out to assess the effect of mango fruit, fresh mango juice and commercially available mango juice on plaque pH at different time intervals.

MATERIALS AND METHOD

This study was carried out on twenty children in the age group of 8-14 years, to evaluate the effect of consumption of mango fruit, its fresh juice and commercially available juice on plaque pH at different time intervals in the Department of

Pedodontics and Preventive Dentistry, Govt. Dental College and Hospital, Patiala.

Sample selection

20 children in the age group of 8-14 years were selected for the study and they were divided into two groups according to the following criteria:-

- Group A; Caries free (DMFT = 0): 10 children
- Group B; Caries active (DMFT 3 and 5): 10 children
- Surfaces with caries and fillings were not considered for plaque sample collection.

Parents were explained about the procedure and their consent was taken prior to the investigation. Each child was given thorough oral prophylaxis. After the oral prophylaxis, subjects were asked to refrain from oral hygiene procedures for 24 hours and instructions were given not to consume anything 2 hours prior to the initiation of the procedure. Before taking recordings on the pH meter, the instrument was checked and standardized with standard buffers of pH 4.00 and 7.00

PLAQUE COLLECTING [SAMPLING] METHOD

Plaque was collected with a blunt spoon excavator from the accessible surfaces of the teeth before the consumption of mango. The plaque sample was pooled in 5ml of double distilled deionised water kept in a test beaker and the resting pH was determined using calibrated digital pH meter. Then the subjects were asked to consume the mango fruit. Post consumption, plaque sample was collected in the same manner at 5 minutes, 10 minutes, 20 minutes, 30 minutes and 60 minutes and plaque pH was estimated. After collection of the sample, subjects were allowed to brush and instructed to follow the normal oral hygiene procedure.

After the washout period of fifteen days the same procedure was repeated on same subjects. They were asked to drink 100 ml of fresh mango juice of the earlier given fruit and to swish the juice carefully around the teeth before swallowing to maintain uniform method in drinking. The data was obtained after 5 minutes, 10 minutes, 20 minutes, 30 minutes and 60 minutes.

After the similar washout period same subjects were provided with 100 ml of commercially available mango juice and were asked to swish the juice carefully around the teeth before swallowing to maintain uniform method in drinking. The readings were noted after 5 minutes, 10 minutes, 20 minutes, 30 minutes and 60 minutes. The data was collected, compiled and then analyzed by using the ANOVA and Tukeys post hoc. P-value of less than 0.05 [p < 0.05] were considered to be statistically significant.

RESULTS

The resting plaque pH in group A was found to be higher [6.93±0.9 to 7.00±0.08] than that in group B [6.64±0.11 to 6.70±0.08], which was statistically significant after the unpaired t-test.

In GROUP A (table no. 1 & fig. 1) the mean pH values remained below baseline values, but not below critical pH for mango fruit & fresh mango juice. For commercial mango juice it attained a value which was below critical pH at 10 minutes but the results were not statistically significant at all time intervals.

Table1 Changes in Plaque pH levels after Consumption of mango fruit, fresh mango juice and commercial mango juice at different time intervals in Group A

GROUP A- CARIES FREE						
	BASELINE Ph	5 min	10 min	20 min	30 min	60 min
	MEAN ±SD	MEAN ±SD	MEAN ±SD	MEAN ±SD	MEAN ±SD	MEAN ±SD
MANGO FRUIT	7.000 ± .08	6.200 ± .08	6.700 ± .08	6.770 ± .04	6.860 ± .05	6.980 ± .07
FRESH MANGO JUICE	6.920 ± .07	5.920 ± .07	5.620 ± .07	6.430 ± .07	6.820 ± .07	6.880 ± .06
COMMERCIAL MANGO JUICE (REAL)	6.930 ± .09	5.840 ± .11	5.440 ± .11	6.220 ± .09	6.770 ± .08	6.870 ± .09

Graph-1 showing fall in plaque ph at various time intervals in group-A

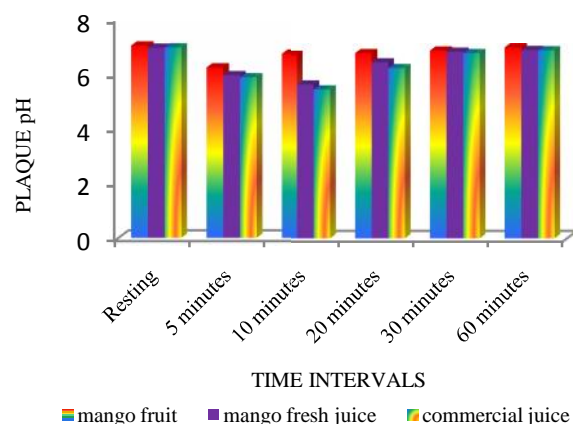


Figure 1

In GROUP B (table no. 2 & fig. 2) the mean pH values remained below baseline values, but not below critical pH for mango fruit & fresh mango juice. For commercial mango juice it attained a value below critical pH at 5 minutes and it remained below critical pH even after 20 minutes. The results were statistically significant at 5, 10 and 20 minutes.

Table 2 Changes in Plaque pH levels after consumption of mango fruit, fresh mango juice and commercial mango juice at different time intervals in Group B

GROUP B- CARIES ACTIVE						
	BASELINE pH	5 min	10 min	20 min	30 min	60 min
	MEAN ±SD	MEAN ±SD	MEAN ±SD	MEAN ±SD	MEAN ±SD	MEAN ±SD
MANGO FRUIT	6.700 ± .08	5.800 ± .08	6.020 ± .07	6.260 ± .14	6.680 ± .04	6.760 ± .05
FRESH MANGO JUICE	6.640 ± .11	5.570 ± .08	5.370 ± .08	5.910 ± .05	6.580 ± .15	6.660 ± .14
COMMERCIAL MANGO JUICE (REAL)	6.750 ± .09	4.800 ± .10	4.330 ± .14	5.230 ± .26	6.100 ± .11	6.550 ± .15

In both the groups, the maximum plaque pH fall was noted at 10 minutes, the maximum being for commercial mango juice followed by fresh mango juice and mango fruit. Intra group comparison by the unpaired t test was significant for all the subgroups, at different time intervals for both the groups.

Pairwise comparison by Tukeys post hoc showed that commercial mango juice significantly reduced plaque pH more as compared to fresh juice and mango fruit.

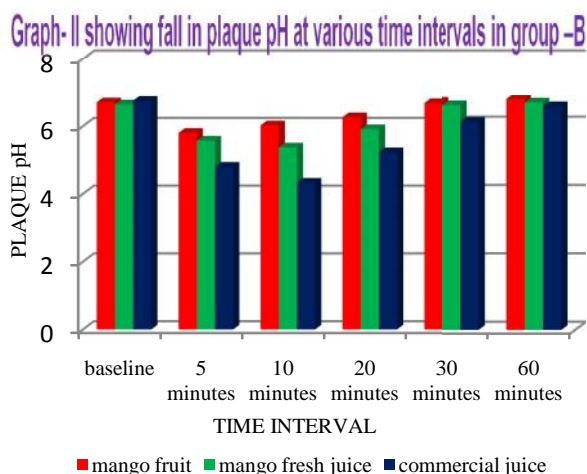


Figure 2

DISCUSSION

The consumption of fruit juices is considered to be healthy as compared to other carbohydrate beverages, however safety of these fruit juices for the teeth are unsubstantiated. Commercially available mango juice contains organic acids as acid regulator and preservatives that have the potential to damage the teeth. They also contain fermentable carbohydrates that may serve as a source of substrate diffusing into the dental plaque, from which micro-organisms inhabiting the plaque can generate the acid that brings about the destructive process of dental caries initially in the sub-surface of the enamel beneath the plaque.

In our present study when intergroup comparisons were made between the commercial mango juice, fresh mango juice and mango fruit it was evident that the fall in plaque pH is more for the commercially available juice followed by fresh mango juice and mango fruit respectively at all time intervals. This showed that mango fruit has least cariogenic potential as compared to fresh mango juice and fresh mango juice have less cariogenic potential in comparison to commercially available mango juice. This is in concordance with the studies of Beighton D *et al*³ who studied the intra-oral acid production associated with eating whole fruits. They concluded that the acids which were produced from the fermentation of sugars present in the fruit are cleared rapidly from the mouth by the increased salivary flow, occurring as a direct consequence of consuming the fruit thus leading to a lesser change in plaque pH.

In our study we also reported that when fresh juice was consumed the fall in plaque pH was significantly more as compared to when fruit was consumed. This can be attributed to the fact that fresh juice is devoid of any fibrous content and also there is no masticatory stimulation of saliva thus leading to a slower salivary clearance.

In this study yet another finding was that commercial mango juice showed the maximum change in the plaque pH at all times. Saha *et al*² reported similar findings and concluded that this greater fall in plaque pH can be ascertained to the difference in the composition of fresh fruit juice and

commercial fruit juice. The commercial fruit juice has fruit concentrate, added sugar, citric acid as the acid regulator and antioxidants. The low pH and high titrable acidity leads to a decreased pH and contributes in keeping the plaque pH lowered for a considerable amount of time.

In our present study the plaque pH does not fall below the critical pH in caries free group after exposure to mango fruit, its fresh juice and commercial juice but in caries active group the plaque pH drops below critical pH.

This is in agreement to the study done by Preethi B P *et al*⁴ who studied the effect of fruit juices on the pH of dental plaque based on the caries experience. The study concluded that the maximum plaque pH drop was observed in commercially available juices as compared to fresh fruit juices. Also the fall in plaque pH below critical pH was observed in caries active group.

This was similar to the observation made by Stephen⁵ in 1944, who found that in caries free individuals, plaque pH didn't fall below critical pH after a glucose rinse. Plaque from caries resistant subjects exhibited an initial higher pH, a modest fall in pH after consumption of different fruit juices and a more rapid return to resting levels as compared to caries susceptible subjects. This finding was also similar to a study conducted by Vratsanos and Mandel⁶ in 1982 after a sucrose challenge. This can be attributed to the neutralizing effects of saliva by virtue of its buffering system which gets activated due to acidogenic challenge.

CONCLUSION

The king of the fruits," mango fruit" is one of the most popular, nutritionally rich fruits with unique flavor, fragrance, taste, and health promoting qualities. The present study states that there has been a considerable decrease in plaque pH with all three forms of mango i.e. fruit, fresh juice and commercially available juice, the least dip was reported with consumption of fresh fruit as compared to fresh fruit juice and commercial fruit juice. However looking at the results obtained; it is evident that consumption of mango as fruit is a better option. They not only provide the benefit of fiber intake but also cause least changes in oral plaque pH along with rapid recovery. Thus children should be encouraged to eat whole fruits to meet their recommended daily fruit intake.

However the data on the plaque pH measurements after the fruit consumption is sparse, so more studies should be attempted to assess the acidogenic potential of various commonly available fruits and their comparison with fresh fruit juices. Pediatricians should routinely discuss the use of fruits, fruit juices and commercially available juices and should educate the parents about differences between them and encourage the consumption of fresh fruits.

References

1. American Academy of Pediatrics: The use and misuse of fruit juice in Pediatrics. *Pediatrics* 2001; 5: 1210-13.
2. Saha S, Jagannath G V, Shivkumar S, Pal S K: Effect of commonly consumed fresh fruit juices and commercially available fruit juices on pH of saliva at various time intervals. *J Int Dent Med Res* 2011; 4(1): 7-11.

3. Beighton D, Brailsford SR, Gilbert SC, Clark DT, Rao S, Wilkins JC, Tarelli E, Homer KA: Intra-oral acid production associated with eating whole or pulped raw fruits. *Caries Res.* 2004; 38:341-349.
4. Preethi B P, Maitreyee D S, Dodawad R: Effect of four fruit juices on pH of dental plaque- A four period cross-over study. *Journal of Clinical and Diagnostic Research* 2010 June; 4; 2587-93
5. Stephan RM: Intra-oral hydrogen ion concentrations associated with dental caries activity. *J Dent Res*1944; 23(4):257-266.
6. Vratsanos SM, Mandel ID.: Comparative plaque acidogenesis of caries resistant vs. caries susceptible adults. *J Dent Res.* 1982; 61(3):465-68.
7. Bhat S.S., Reddy V.V.S.: Effect of consumption of commonly available fresh fruits in "Karnataka" on the hydrogen ion modulations of human dental plaque. *J Indian Soc Pedo Prev Dent* 2001; 19:1:27-37.
8. Bibby B G, Mundroff S A.: Enamel demineralization by snack foods. *J Dent Res* 1975; 54(3): 461-70.
9. Johansson AK, Lingstrom P, Birkhed D: Effect of soft drinks on proximal plaque pH at normal and low salivary secretion rates. *Acta. Odont. Scand.* 2007; 65(6): 352-56.
10. Miller C D: Enamel erosive properties of fruits and fruit juices. *Journal of nutrition.* 1950 January: 63-71.
11. Saeed S, Al-Tinawi M: Evaluation of acidity and total sugar content of children's popular beverages and their effect on plaque pH. *J Ind Soc Pedo Prev* 2010; 28(3): 189-192.
12. Saxena S, Oberoi S S, Tiwari S: Effect of fresh fruit juices on pH of dental plaque. *Annals and Essences of Dentistry* 2010; 2(4): 36-40.