

# An assessment of the erosive potential of commonly used Indian spices

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## ABSTRACT

**Introduction:** Spices are an important part of Indian cooking. They not only increase the flavor of food but also have several medicinal and antibacterial properties. However, these spices can lower the pH of the mouth thereby causing erosion of the teeth. This study aims at assessing the erosive potential of the spices which are commonly used. **Materials and Methods:** Five extracted lower molars were chosen, and five commonly used spices were selected - chili powder, turmeric powder, cumin powder, coriander powder, and garam masala. 5 g of each individual spice powder was mixed with 50 ml of water to obtain an aqueous solution. The obtained mixture was stirred vigorously to get a homogenous solution. One tooth was immersed in each homogenous spice solution and left undisturbed for a period of 10 days. After 10 days the tooth was removed from the solution the iodide permeability test was used to evaluate the erosion of the teeth. **Results:** According to our study turmeric powder has the highest erosive potential whereas coriander powder had the least erosive effect. **Conclusion:** All the spices had an erosive effect on the tooth immersed in them; hence, we should consume all spices with caution.

**KEY WORDS:** Dental erosion, Diet modification, Indian spices, pH

## INTRODUCTION

A spice is a seed, fruit, root, bark, or other plant substance primarily used for flavoring, coloring, or preserving food.<sup>[1]</sup>

In olden days, spices were deemed valuable enough to require protection. They conjure up images of bitter struggles, fascinating expeditions, and long seafaring journeys. Spices were viewed as a measure of wealth: The more spices one used or owned, the more prosperous they were thought to be.<sup>[2]</sup>

Spices were indeed the catalysts for a number of attempts to establish trade routes, throughout history. We have the examples of numerous people such as Christopher Columbus, Marco Polo, and Vasco da Gama who set sail in the hopes of finding the “Land of Spices,” to establish the supremacy of their own country or empire.<sup>[3]</sup> In the early 1300’s Marco Polo reached China. Inspired by Marco Polo’s writings Columbus, in

his quest to discover a spice route, accidentally found the “New World” in 1492. Vasco da Gama proved to be more successful in setting up trade relations with India.

With time prices may have gone down and spices are not considered as dear as they were then but they still have a great many benefits and uses. In the Eastern world, spices are considered the food of the soul whereas in the West they evoke images of exotic tropical islands and epic adventures.

Spices were, and still are, an integral part of cooking. They help to enhance taste and increase the flavor of food. They help to make the food visually as well as gustatorily appealing. Spices turn food into culinary art. However, apart from their use in cooking, spices also have numerous beneficial properties.

Health benefits of spices are wide-ranging. Together, all the spices in the world encompass almost every aspect and the element of health. Spices help to fight infection, regulate metabolism, boost the immune system, detoxify the system, cure colds, improve cardiac health, lose weight, reduce inflammation, rejuvenate the skin, fight against hormonal imbalance, improve

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ISSN: 0975-7619

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Received on: 26-05-2018; Revised on: 28-06-2018; Accepted on: 23-07-2018

appetite, protect oral health, prevent malignancies, and strengthen bones and also reduce stress.<sup>[4,5]</sup> Spices are also believed to increase salivary flow and gastric acid secretion thereby aiding in digestion.<sup>[6]</sup> The list of benefits is extremely significant and endless.

However, these spices may also have certain disadvantageous attributes. Spices may cause oral and gastric ulcers, heartburn, excessive sweating, and even acne.<sup>[7]</sup>

Spices may also be a chief etiological factor in dental erosion due to their high acidic content.

Dental erosion is defined as a loss of dental hard tissue by a chemical process that does not involve bacteria. It is the most common non-carious cause of tooth structure loss. Dental erosion will gradually lead to sensitivity and eventually cause caries.

There are multiple factors responsible for erosion such as dry mouth, low salivary flow, gastrointestinal problems, soft drinks, medication, friction, and wear and tear. One of these factors is spices.

Spices are a vital part of Indian cooking. This study aims at assessing the erosive potential of commonly used Indian spices on teeth. This will help during the diet counseling of patients.

## MATERIALS AND METHODS

A sample size of five teeth was selected [Figure 1]. All extracted lower molars were chosen. These teeth did not show any sign of erosion or caries.

Five commonly used spices were selected:

- Chili powder
- Turmeric powder
- Cumin powder
- Coriander powder
- Garam masala.

5 g of each individual spice powder was mixed with 50 ml of water to obtain an aqueous solution. The obtained mixture was stirred vigorously to get a homogenous solution.

One tooth was immersed in each solution and left undisturbed for a period of 10 days. After 10 days, the tooth was removed from the solution and rinsed thoroughly under running water. The iodide permeability test was then used to evaluate the erosion of the teeth.

A defined sample of enamel on the tooth was soaked for a few minutes with potassium iodide, which was then recovered from the tooth using a filter paper [Figure 2]. The amount of iodide recovered from the tooth is measured from the filter paper using a



**Figure 1:** All extracted lower molars were selected



**Figure 2:** Potassium iodide recovered from the tooth using a filter paper



**Figure 3:** The amount of iodide recovered is measured using a Vernier caliper

Vernier caliper [Figure 3]. This helps to measure the amount of erosion. There is a linear relationship between the iodide permeability and the calcium loss of the teeth.

## RESULTS

A sample size of five was decided. Five extracted lower molars were selected. These teeth had no signs of caries or erosion.

Five commonly used spices were selected based on their frequency of usage for cooking on a daily basis [Table 1].

- A - Chili powder
- B - Turmeric powder
- C - Cumin powder
- D - Coriander powder
- E - Garam masala.

From Table 1, we can deduce that the most amount of erosion is seen with turmeric powder whereas the least amount of erosion is seen in relation to coriander powder.

Visually, when the immersed teeth were observed before and after erosion, the roots of the tooth (B) immersed in turmeric powder showed a yellowish discoloration. Similarly, the tooth (D) immersed in coriander powder also showed a grayish greenish tinge.

## DISCUSSION

There have been many types of research that have tested the pH of soft drinks,<sup>[8-11]</sup> but the effect of the spices used in Indian cooking has not been studied extensively. In this study, five spices were selected, and their erosive effects on teeth were checked.

Turmeric has a number of health benefits. Studies show that turmeric helps to prevent Alzheimer's disease<sup>[12]</sup> and joint inflammation and minimizes liver damage. Turmeric is also sometimes used for treating the common cold<sup>[13]</sup> and also has potent antibacterial properties.<sup>[14]</sup>

Cumin contains iron and is used in the treatment of anemia. It is also used in the treatment of the common cold as it helps to boost the immune system. Cumin has good antioxidant activity<sup>[15]</sup> and is used in the treatment of a large number of digestive ailments.

Coriander powder has been in use for almost 7000 years and is used chiefly for its antioxidant properties.<sup>[4]</sup>

Chilies contain antioxidants, including Vitamin C and carotenoids and a substance is known as capsaicin.<sup>[16]</sup> Several studies show that capsaicin provides potent pain relief.<sup>[17]</sup> Chili powder to has a number of health

advantages. Chili powder helps to improve cognitive functioning,<sup>[18]</sup> soothes stomach pain, enhances blood circulation, promotes weight loss, and stimulates saliva production.<sup>[19]</sup>

Garam masala is basically a mixture of a number of spices, which may differ regionally or with the recipe being used for a particular dish.<sup>[20]</sup> A garam masala typically contains black and white peppercorns, cloves, cinnamon, nutmeg, cardamom, bay leaf, cumin, and coriander.<sup>[21]</sup>

Just because all these spices have health benefits and advantages, we cannot afford to ignore the fact that they may have detrimental and potentially harmful effects on our well-being too.

According to the results of our study, we found that turmeric powder had the most erosive effect when left in contact with teeth for a period of 10 days. This was followed by chili powder and cumin powder. The least amount of erosion, in relation to these five spices, was seen with coriander powder.

According to a study conducted by Verma *et al.*, which measured the pH of different spices, they found that pani puri masala had the lowest pH while cumin powder had the highest.<sup>[22]</sup> They concluded that all spices had an endogenous pH less than that of critical pH. Critical pH is the pH at which saliva and plaque fluid ceases to be saturated with calcium and phosphate, thus permitting the hydroxyapatite in dental enamel to dissolve.<sup>[23]</sup>

However, we should remember that no spice is consumed in concentrated form. Spices are always eaten along with meat, vegetables, rice, and other cereals. The amount of spice being used also differs from region to region and varies with personal taste and the dish being prepared. Hence, the amount of erosion which occurs will also differ based on all these factors.

On the other hand, Indian cooking is generally spicy. Spices have been known to trigger GERD and increase acid reflux.<sup>[24]</sup> There are several articles that prove that GERD can lead to erosion of teeth.<sup>[25,26]</sup> Hence, spices may also, indirectly, be responsible for non-carious tooth substance loss.

The results of this study indicate that spices are capable of erosion and therefore have the potential to cause non-carious tooth substance loss, especially among people who consume extremely spicy food. However, there are various parameters which influence this erosion, and our study has certain limitations. More detailed studies can be carried out in the future to assess the erosion and other commonly used spices can also be studied to evaluate the amount of erosion they cause.

**Table 1 : Illustrates the amount of erosion due to different spices**

Samples	Spices	Diameter (cm)
A	Chili powder	0.30
B	Turmeric powder	0.31
C	Cumin powder	0.27
D	Coriander powder	0.26
E	Garam masala	0.28

## CONCLUSION

According to our study, we found that turmeric powder has the highest erosive potential whereas coriander powder has the least amount of erosive potential. Nevertheless, our study indicates that all spices do have an erosive potential on teeth; hence, we should consume all spices with caution.

## REFERENCES

1. Spice. Available from: <https://www.en.m.wikipedia.org/wiki/Spice>. [Last accessed on 2018 Sep 24].
2. Casey Seidenberg: Spices and their Health Benefits. Available from: <https://www.washingtonpost.com/lifestyle/wellness/spices-and-their-health-benefits/2014/01/07/>. [Last accessed on 2018 Sep 24].
3. Study Guide: A Short History of the Journey of Spices. Available from: <http://www.pilotguides.com/articles/study-guide-a-short-history-of-the-journey-of-spices/>. [Last accessed on 2018 Sep 24].
4. The 10 Most Common Spices of India and their Health Benefits. Available from: <http://www.walkthroughindia.com/lifestyle/the-10-most-common-spices-of-india-and-their-health-benefits/>. [Last accessed on 2018 Sep 24].
5. Health Benefits of Spices. Available from: <https://www.organicfacts.net/health-benefits/herbs-and-spices/spices.html>. [Last accessed on 2018 Sep 24].
6. Patel K, Srinivasan K. Digestive stimulation of spices: A myth or reality? *Indian J Med Res* 2004;119:167-89.
7. Spicy Food in Your Diet – Good or Bad? Available from: <http://www.fitnessihub.com/spicy-food-in-your-diet-good-or-bad/>. [Last accessed on 2018 Sep 24].
8. Preethi P, Maitiyee DS. The effect of four fruit juices on the pH of dental plaque – A four period cross-over study. *J Clin Diagnostic Res* 2010;4:2587-93.
9. Jensdottir T, Holbrook P, Nauntoft B. Immediate erosive potential of cola drinks and orange juice. *J Dent Res* 2006;85:226-30.
10. Chaly P, Rajkumar M. The effect of fruit juices on pH of dental plaque—A clinical study. *J Int Oral Health* 2011;3:1-4.
11. Saeed S, Al-Tinawi M. Evaluation of acidity and total sugar content of children's popular bevarages and their effect on plaque pH. *J Indian Soc Pedod Prev Dent* 2010;28:189-92.
12. Mishra S, Palanivelu K. The effect of curcumin (turmeric) on Alzheimer's disease: An overview. *Ann Indian Acad Neurol* 2008;11:13-9.
13. About Spices. Available from: <https://www.teacoffeespiceofindia.com/spice/spice-health-lifestyle>. [Last accessed on 2018 Sep 24].
14. Neelakantan P, Subbarao C, Sharma S, Subbarao CV, Garcia-Godoy F, Gutmann JL. Effectiveness of curcumin against *Enterococcus faecalis* biofilm. *Acta Odontol Scand* 2013;71:1453-7.
15. El-Ghorab AH, Nauman M, Anjum FM, Hussain S, Nadeem M. A comparative study on chemical composition and antioxidant activity of Ginger (*Zingiber officinale*) and Cumin (*Cuminum cyminum*). *J Agric Food Chem* 2010;58:8231-7.
16. Chili Pepper. Available from: <http://www.whfoods.com/genpage.php>. [Last accessed on 2018 Sep 24].
17. Anand P, Bley K. Topical capsaicin for pain management: Therapeutic potential and mechanisms of action of the new high concentration capsaicin 8% patch. *Br J Anaesth* 2011;107:490-502.
18. 7 Health Benefits of Chili Powder. Available from: <https://www.dovemed.com/healthy-living/natural-health/7-health-benefits-of-chili-powder/>. [Last accessed on 2018 Sep 24].
19. What's Hot about Chili Powder? Health Benefits and Nutritional Facts. Available from: <http://www.foodofy.com/chili-powder.html>. [Last accessed on 2018 Jun 16].
20. Santha RR. The Cooking of India (Foods of the World). USA: Time Life Education; 1969.
21. Garam Masala. Available from: [https://en.m.wikipedia.org/wiki/Garam\\_masala](https://en.m.wikipedia.org/wiki/Garam_masala). [Last accessed on 2018 Sep 24].
22. Verma JS, Padhye L, Mandke L, Sumanthini MV, Shenoy V. A prefatory assessment of erosive potential of commonly used Indian spices. *J Cont Dent* 2010;5:86-9.
23. Higham S. Caries Process and Prevention Strategies: The Environment. Available from: <https://www.dentalcare.com/en-us/professional-education/ce-courses/ce371/critical-ph>. [Last accessed on 2018 Sep 24].
24. Raymond P, Beaver M. How Spices can Trigger Acid Reflux. Available from: <http://www.dummies.com/food-drink/special-diets/acid-reflux-diet/how-spices-can-trigger-acid-reflux/>. [Last accessed on 2018 Sep 24].
25. Ranjitkar S, Kaidonis JA, Smales RJ. Gastroesophageal reflux disease and tooth erosion. *Int J Dent* 2012;2012:479850.
26. Acid Reflux and your Dental Health. Available from: <https://www.colgate.com/en-us/oral-health/conditions/gastrointestinal-disorders/ada-12-acid-reflux-and-dental-health> [Last accessed on 2018 Sep 24].

Source of support: Nil; Conflict of interest: None Declared