Journal of Science and Technology
ISSN: 2456-5660 Volume 5, Issue 6, Nov-December 2020

www.jst.org.in *DOI: https://doi.org/10.46243/jst.2020.v5.i6.pp42-45*

Adulteration of Spices: A Review

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To Cite this Article
Maske Sachin V, Ashutosh Dhami, Nongmaithem Mangalleima and Niamcha Lowang, "Adulteration of Spices: A Review", Journal of Science and Technology, Vol. 05, Issue 06, Nov-December 2020, pp42-45

Article Info
Received: 15-06-2020 Revised: 25-08-2020 Accepted: 15-09-2020 Published: 24-09-2020

Abstract: *Food is one of the basic needs for every living being and is very important aspect for life. But now a day's foods are affected by different adulterants. Adulteration is a substance which reduces the vital importance of food. Adulterants like metanil yellow (an artificial colour) is used to intensify the colour of the turmeric powder also adulterants like chalk powder, brick powder and toxic substances are added to gain profit and to lower the cost so as to compete with the market. Such adulterants can lead to anaemia, paralysis, brain damage, stomach disorders and also cancer. Spices may also be contaminated because of conditions under which they are cultivated and harvested. Contaminated spices have been reported to cause some diseases and spoilage caused by food. This article provides some information about adulteration of spices.*

Keywords*:spices, adulteration, human disease, chilli powder, turmeric powder, metanil yellow, food spoilage, chalk powder.*

I. Introduction

India, known as the "Spices House". Today, given their exquisite fragrance, texture, taste and medicinal value, Indian spices are the most sought-after globally. In the world, India has the largest domestic spice market. India is the largest manufacturer, consumer and exporter of spices in the world, producing approximately 75 out of the 109 varieties listed by the International Organization for Standardization (ISO) and accounting for half of the world's spice trade. Spices, because of their inherent existence, high demand and high price, become easy substances for gross adulteration among food products. Adulteration means, according to the Food Adulteration Act, 1976(of India), the mechanism by which the quality or nature of a given standard is diminished by adding an inferior material or by removing a vital element. ISI thus defines and develops general standards for all spices to be appropriate for marketing or export **(Callaway, 1962)**.

When demand is greater than supply, for more benefit, foods are usually adulterated. Often, by reducing commodity expenditures, to meet market competition. In addition, the object of adulteration was to increase the value of the commercial property of the commodity in general. Even, because of the scarcity of genuine products at reasonable prices.

Some Common Adulterants In Spices Are:

Spices	Adulterants
Whole turmeric	Coating with lead chromate or coal tar dye
Turmeric powder	Coal tar colour, yellow earth, starch or talc coloured yellow with coal tar dye, metanil-yellow, Tapioca starch, yellow aniline dyes.
Curry powder	Starch coloured brown with coal tar dye
Coriander seed	Other seeds coloured green
Coriandерseed powder	Powdered bran or saw dust coloured with dye
Chilli powder	Starch coloured red with coal tar dye, brick powder, saw dust, artificial colours, sudan dyes.
Mustard seed	Argemone seeds
Cumin seed	Artificial cumin seed like product
Black pepper	Dried papaya seeds, thick bark of cassia
Asafoetida	Resins and other plant gums, starch

Table no. 1: List of Common Adulterants in Spices (Ghosh et al., 2017).

II. Most Common Spices and Their Detection Procedure of Adulterant

Turmeric

Turmeric (*Curcuma longa*) contains curcumin (yellow colored chemical) which is often used to colour foods and cosmetics. Turmeric is commonly used for conditions involving pain and inflammation, such as osteoarthritis. It is also used for hay fever, depression, high cholesterol, a type of liver disease, and itching. In food, it is used majorly as a powder but nowadays adulteration in turmeric is quite common, some of the adulterations and their harmful effects on human health are enlisted below

Metanil yellow adulteration

Metanil yellow adulteration is quite common form of adulteration which causes serious health issues. These effects on the major neurotransmitter systems indicate that chronic consumption of metanil yellow can predispose both the developing and the adult central nervous system (CNS) to neurotoxicity.

Detection of metalin yellow

To identify the presence of metanil yellow adulterant, the sample of turmeric is taken and followed by addition of sulphuric acid to the sample; disappearance of yellow colour after the addition of distilled water indicates the presence of metanil yellow in the sample.

Chalk powder adulteration

Yet another major adulterant, chalk powder can be identified by taking a sample with further addition of distilled water and few drops of hydrochloric acid. If effervescence (bubbles) is observed, it indicates presence of chalk powder in the sample. Chalk powder can cause nausea and dysentery.

Aniline dyes adulteration

Aniline dyes are used as an adulterant to enhance the colour of turmeric powder artificially , identification can be done by adding few drops of distilled water followed by 4 – 5 ml spirit in a sample. The disappearance of color indicates adulteration.

Yellow lead salt adulteration

Lead increases the risk of heart and brain disease in adults and interferes with children's brain development , lead salt adulteration can be found by adding conc. HCl to the sample , development of purple/ magenta color indicates the presence of yellow salt adulteration.

Other adulterants can be checked using simple water test, sample is added to luke warm water with no stirring done and is left for about 30 minutes, appearance of cloudy water indicates adulteration.

Chilli Powder

Chilli (*Capsicum annuum*) is an important spice used for its flavour and colour, it adds a lovely red glow and sharp flavour to dishes without making it unpalatable.

Common Adulterants Found In Chilli Includes

Red lead salts adulteration

A sample of chilli powder is taken, dilute nitric acid is added to the sample followed by filteration. 2- 3 drops of PotassiumIodide is added to thefiltrate. Formation of yellowcoloured precipitate indicates the presence of red lead salts.

Oil soluble coal tar adulteration

Sample of chilli powder is taken and few drops of ether solvent are added followed by vigorous shaking. Ether layer is decanted into a test tube containing 2 ml of dilute Hydrochloric acid and is shaken. Pink to red colour of the lower acid layer will indicate the presence of oil soluble coal tar in the sample.

Brick powder adulteration

Chilli powder is added in a container containing water. Brick powder settles down while pure chilli powder floats.

III. Methods for Detection of Adulteration In Others Spices

Food protection and regulatory issues have ensured the production of different techniques for food detection, such as physical, biochemical / immunological and molecular techniques. When it comes to the identification of biological adulterants in food, molecular methods are more preferable, while physical and biochemical techniques are preferable for detecting other adulterants in food.

Foreign Resin in Asafoetida (Hing)

Burn a small amount of asaphoetide in a spoon made of stainless steel. Like camphor, pure asafoetida can burn. Like camphor, adulterated asafoetida will not create a bright flame. Powder a gramme of asafoetida and put it in a bottle of glass. One tea spoon of water is added. Mix by shaking thoroughly. Pure asafoetida is a milky white solution containing no sediment.

Soap stone or other earthy matter in Asafoetida (Hing)

Shake a small sample with water and allow it to settle down. Pure asafoetida will not leave the bottom of any soap stone or any other earthy matter. The soap stone or other earthy matter will settle down at the bottom if asafoetida is adulterated **(Jaiswal *et al.*, 2016).**

Starch in Asafoetida (Hing)

Connect water to the sample. The artificial dyes would instantly begin to decrease in colour streaks.

Papaya seeds in Black pepper

To a glass of water, add a certain amount of black pepper. At the bottom, pure black pepper settles down. Papaya seeds float in the adulterated black pepper on the surface of the water. On the white board, spread the spice. Observe the presence using the magnifying glass of the sample. The black pepper is orange. It has a wrinkled surface and has a distinctive taste and pungent scent. Shrunken papaya seeds have a smooth surface and an oval shape. In colour, it is greenish brown or blackish brown and has a repulsive taste.

Light Berries in Black Pepper

With the aid of your thumbs, click the berries. The light berries will quickly break, while the black pepper berries will not break. OR. OR. Float the black pepper sample with alcohol (rectified spirit). While the light black pepper floats, the mature black pepper berries sink.

Artificial/ water soluble synthetic colours in chilli Powder

Sprinkle the chilli powder in a glass tumbler on the surface of the bath. The artificial dyes would instantly begin to decrease in colour streaks.

Saw dust in chilli powder

Connect water to the sample. The saw dust would float on the top of the water while the bottom of the Chilli powder would settle down.

Chalk in Common Salt

In a glass of water, stir a spoonful of sample salt. The presence of chalk will make the solution white and settle down with other insoluble impurities..

Exhausted Cloves in Cloves

Take a glass of water and place some cloves in it. Genuine cloves settle on the bottom, while depleted cloves float on the surface.

Cassia bark in Cinnamon

Put a small amount of cinnamon on a glass plate. If adulterated, cassia bark, which consists of many layers between the rough outer and inner layers, can be distinguished from cinnamon on close visual inspection. Cinnamon barks are very small and a pencil or pen can be rolled around them. It has a scent that is distinct **(Vaclavik *et al.*, 2009)**.

According To FSSAI Guidelines, A Buyer or Consumer Must Be Aware of Few Things While Buying The Production Order To Be Safe (Thilagavathi & Indira):

- Avoid buying powdered spices sold loose.
- Buy packaged spices from trusted brands especially that have the AGMARK logo as these are AGMARK certified
- Check for the FSSAI license number on the packaging
- Whole spices must be bought from known/ reputed stores or dealers and ground at home after they have been cleaned and washed. Since adulteration in whole spices can be visually identified so chances of these being adulterated are low.
- Do not buy spices that have extra shine or bright colours as they are likely to be adulterated
- Do not buy spices that are lumpy and which have an unpleasant odour
- Read the manufacturing date, manufacturer details, best before the date and other labelling declarations before buying spices
- If the package is damaged do not buy the ground spices
- When buying organic spices always look for the FSSAI organic logo (Jaivik Bharat)

III. Conclusion

Finally, we can summarise from the above analysis and discussions that the adulteration added to food products can have a tremendous effect on health without our knowledge. Adulteration can be avoided by our society's few warning measures. The government should monitor the rise in the price of food products. When buying food products, selection of wholesome and non-adulterated food is important to make sure that such food do not cause and health problems. Though lack of adulterants can not be assured by visual examination as toxic pollutants are present in very low level but visual examination before purchase may ensure absence of insects, fungus and other foreign materials. For our healthier life, the above general consciousness is quick and easy to initiate. If we tend to actively engage in these changes then we can bring For the next centuries, about a stable and non-venturous future.

IV. Acknowledgment

We thank Dr. John David and Dr. Ranajit kumar for comments that greatly improved the manuscript.

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