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A study on the contamination of communal used species of powder (Asafoetida) in India.

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Abstract

In the modern era, Food adulteration has become a major apprehension in all over the globe. Adulteration is the process that compromises the quality of a product i.e. by supplementing the integrity's bulk with cheaper substances which contain the inferior quality. Now a day, many substances that are harmful for consumption have been used as an adulterant. Therefore, it becomes an important issue to understand the types of adulterants and their hazardous effect on human health. In this present study, we focus on two Indian commonly used powder spices that are Asafoetida (Hing). The purpose of this study was to determine the presence of adulterants in these spices by using preliminary examination. All the samples were collected from local markets of different states of India and various different brands of such spices were also incorporated for the study. The study revealed all samples of Asafoetida to be almost free from adulteration, only 10% cases were brought in notice. This signify that, this powder has contaminants of adulteration or not? If present, then what will be the percentage of the integrity?

Keywords: Food, adulteration, species, analysis, human health, material.

Introduction

Food adulteration has been in practice since a very long time. Greek botanist Theophrastus (370-285 BC) reported use of artificial flavors in food. Pliny and Elder (23- 79 AD) also gave details on the use of adulterants in various food products. Adulteration is the process of altering a product's integrity by supplementing its bulk, either partly or completely (Accum F., 1920), with cheaper substances which are of inferior quality. It can be described, any kind of additive that is deliberately used for altering the quality of a product and hence deceiving the consumer. The removal of a valuable ingredient was either used in the shortage of production, to increase the prices, consumer demand, lack of awareness, negligence and indifference among consumers, Inadequate enforcement of food laws and food safety measures (Browne C. A.; 1925). Adulterants that are used in food products range from organic to synthetic substances; and the intention behind this act is to make the product seem like that of a higher quality by availing monetary benefits to the seller. Food adulteration not only involves the inclusion or substitution of substances that can greatly hamper the product's nature. Therefore, it has been widely transforming due to discoveries and synthesis of new chemical substances.

In the 19th century, some poisonous adulterants were commonly used such as alum [K_2SO_4. $Al_2(SO_4)_3$. $24H_20$], which was used to make whiter looking bread, chalk powder added to flour and sawdust, clay, Plaster of Paris (calcium sulphate), mashed potatoes etc. These were used to increase weight (Cole R.J.; 1951). Wheat flour was replaced with rye flour or dried powdered beans and ammonium carbonate was used to develop the sour taste of stale flour.

Not unlikely for a developing country, In India the industrial sector goods are more reliable than the non- industrial counterpart since they are subjected to quality checks and statutory controls. According to, **The Prevention of Food Adulteration Act of India, 1954, (Section 2**)- "Adulterant means any material which is or could be employed for the purpose of adulteration." If the article contains any other substance which affect, or if the article is so processed as to affect injuriously the nature, substance or quality. Although it is very difficult to describe all the species of powder here, yet some common used powders with the contaminants which are mixed are given below in table-

S. No.	Spice	Adulterants
1.	Chili powder	Chemical dyes (Sudan dyes, rhodamine B etc.)
2.	Cumin powder	Sawdust, dirt
3.	Pepper	Papaya seeds, light black berries, charcoal
4.	Saffron	Dyed maize filaments
5.	Turmeric	Lead chromite, Melanil yellow
6.	Coriander powder	Sawdust
7.	Cloves	Volatile oils extracted
8.	Mustard seeds	Argemone seeds
9.	Powdered spices	Added starch
10.	Whole spices	Dirt, dust, straw, insects other seeds etc.

Table 1; Represent some common species of powder and contaminants which are mixed

In this study, Asafoetida was studied to examined the adulteration. Asafoetida (***Ferula assa-foetida L.***) is a spice composed of oleoresin obtained from the tap root or rhizome of several different species of ***Ferula*** plant (Smith S. D.; 2001). This perennial herb (which grows up to 1-1.5m) is distributed from the Mediterranean region of Central India. It is well known by the name of "**Hing**" across India (Clayton E. G. & et. Al.; 1908).

Figure 1; showing the Asafoetida in different forms.

Since pure asafoetida has an intense flavor, it is mixed with starch and gum. It is sold as compounded asafetida (brick form), powder form or tablet form. It contains asafetida resin (30%) as well as rice flour (50%) and gum Arabic (to prevent lumping) (J. Burnett; 1966). It is used to give flavor in food, antibiotic in medicine, anti-flatulent. The integrity which are added contains grit, sand, dirt, filth, chalk, soapstone, and foreign resin. These integrities caused the stomach, diarrhea, poisioning, renal, like renal, musculoskeletal, reproductive, ocular, neurological etc.

Material and Method

In this study, only the preliminary examination was conducted to determine the adulteration such as the presence of earth materials, chalk, lead or the foreign resin in Asafoetida. As Asafoetida is an indispensable spice in the Indian kitchens and easily available in market so for the present study, 15 sample were collected from the different places & markets. It was hypothesized and estimated that any one or more than that may be present in the Asafoetida.

Method

The analysis of the samples was conducted as follows: Physical tests, Solubility test, Chemical tests, Test for Starch, Test for Chalk, Burn test, Test for Lead.

Solubility test

Take a small portion (1 -2 gm,) of sample and shake it with 10 ml of water and allow settling. Soap stone and other earthy materials will settle at the bottom. A slight turbid solution may be produced in case of compounded asafoetida which will settle down after some time (Weise Elizabeth 2006).

Chemical examination

i. ***TEST FOR STARCH:*** Take small amount of the (1-2 gm.) sample and make sample solution using a 25 ml of distilled water**.** Add 2 drops of iodine tincture to the sample solution (Lucol's iodine solution.). Appearance of blue colour indicates the presence of starch. Compounded asafoetida constitutes starch which will be declared on the label.

ii. ***TEST FOR CHALK****;* Take a 1gm of the sample and add 2ml of Carbonte-trachloride in a test tube. Now, shake it very well so that the asofoetida could settle down. Now, decant the top layer and add diluted HCl to the leftover residue. Effervescence indicates the presence of chalk (Noel G. Coley; 2005).

iii. ***BURN TEST****:* Take a pinch of sample (approximated 2-3 gm.) on a metal spoon. Burn the sample on a spirit lamp. If the sample burns like aromatic camphor, the sample doesn't contain any foreign resin (Jeffery M. Pilche; 2006).

iv. ***TEST FOR LEAD*****;** Make sample solution in the test tube by adding distilled water to the sample. Now, add Potassium Iodide (KI) to the solution followed by the Sulphuric acid solution. The change in colour (Yellow) found then the precipitate indicates the presence of lead (Sattin Morton; 2007).

Result and discussion

In this study, it was observed that the integrities were present, but their concentration differ in different experiments. During the experiment, it was observed that, when the solubility experiment was conducted; white precipitate, and turbidity which settled down after some time at the bottom. The white precipitate indicated the content of soap mixed with the spices of asafetida powder. Further, when the test for starch was carried out to confirm the integrity, the colour changes slowly and becomes blue. The presence of starch may be labeled in the list of the content of the powder. During the test for chalk, if no effervescence was found then it confirms the presence of the chalk in the asafetida. When the test for lead which is considered the metallic poison and gives the serious effects on human health was not found in form of the integrity in the powder of asafetida. At last, the burn test was preformed, in which it was noticed that it burned readily by producing the black

reside with a crackling sound. Which confirm that some part of the integrity was present in it. The observation of all the experiments which were carried out, are given in the below table-2-

SAMPLE NO	**PHYSICAL TESTS**	**CHEMICAL TESTS**			
	SOLUBILITY TEST	**TEST FOR STARTCH**	**TEST FOR CHALK**	**BURN TEST**	**TEST FOR LEAD**
1	White precipitate, turbidity that settled after some time.	Blue colour developed slowly.	No effervescence.	Burned readily producing black residue, crackling sound.	No formation of yellow precipitate.
2	White precipitate, turbidity that settled after some time.	Intense Blue colour produced.	No effervescence.	Burned readily producing black residue, crackling sound.	No formation of yellow precipitate.
3	Brown residue, turbidity that settled after some time.	Blue colour developed slowly.	effervescence.	Burned readily producing black residue, crackling sound.	No formation of yellow precipitate.
4	White precipitate, turbidity that settled after some time.	Blue colour developed slowly.	No effervescence.	Burned readily producing black residue, intense crackling sound.	No formation of yellow precipitate.

5	White precipitate, turbidity that settled after some time.	Blue colour developed slowly.	effervescence.	Burned readily producing black residue, crackling sound.	No formation of yellow precipitate.
6	Yellow precipitate, turbidity that settled after some time.	Blue colour developed slowly.	No effervescence.	Burned readily producing black residue, crackling sound.	yellow precipitate.
7	White precipitate, turbidity that settled after some time.	Blue colour developed slowly.	No effervescence.	Burned readily producing black residue, crackling sound.	yellow precipitate.
8	White precipitate, turbidity that settled after some time.	Blue colour developed slowly.	No effervescence.	Burned readily producing black residue, crackling sound.	yellow precipitate.
9	White precipitate, turbidity that settled after some time.	Intense Blue colour.	effervescence.	Burned readily producing black residue, crackling sound.	No formation of yellow precipitate.
10	White precipitate,	Blue colour developed	No effervescence.	Burned readily	No formation of yellow

	turbidity that settled after some time.	slowly.		producing black residue, sparse crackling sound.	precipitate.
11	White precipitate, turbidity that settled after some time.	Blue colour developed slowly.	No effervescence.	Burned readily producing black residue, sparse crackling sound.	yellow precipitate.
12	White precipitate, turbidity that settled after some time.	Intense blue colour developed.	No effervescence.	Burned readily producing black residue, crackling sound.	yellow precipitate.
13	White precipitate, turbidity that settled after some time.	Blue colour developed slowly.	effervescence.	Burned readily producing black residue, sparse crackling sound.	yellow precipitate.
14	White precipitate, turbidity that settled after some time.	Blue colour developed slowly.	No effervescence.	Burned readily producing very less black residue, sparse crackling	No formation of yellow precipitate.

				sound.	
15	White precipitate, turbidity that settled after some time.	Intense blue colour developed.	No effervescence.	Burned readily producing black residue, sparse crackling sound.	yellow precipitate.

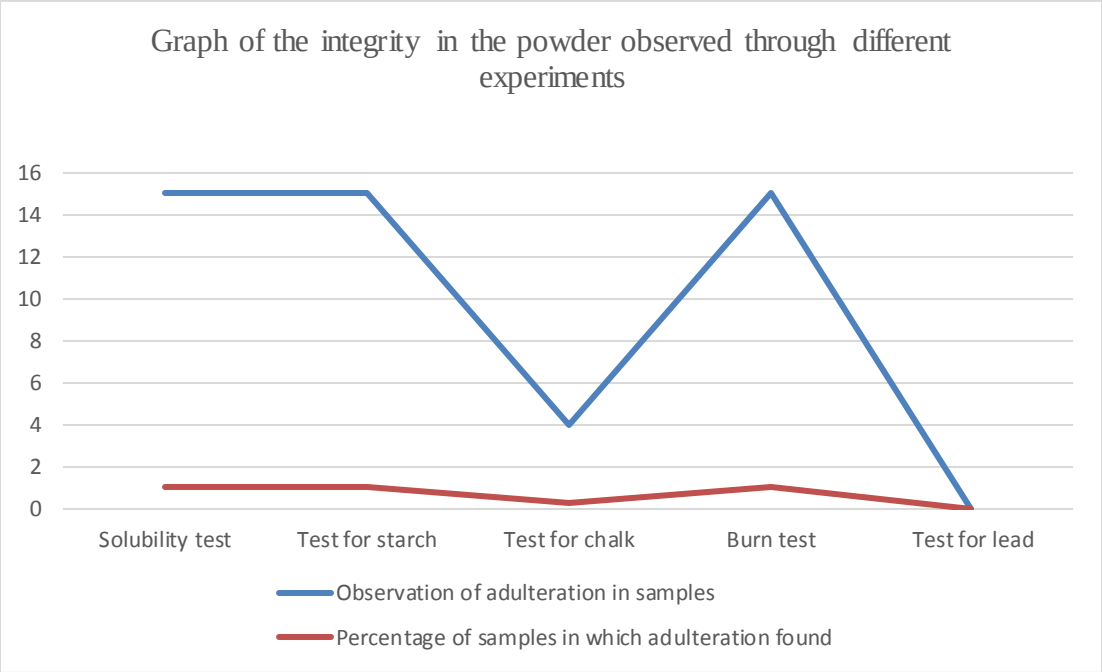
Table 2; represent the observation of the different conducted experiments.

At the conclusion of the table, it was separately listed that in how many samples, integrity was found and what was the percentage? This study was carried out only to observe the integrity which were found in the spices of powder and comes under the adulteration.

During these experiments, it was observed that solubility test confirms 100 % adulteration in the sample of asafoetida, similar like it test for starch and burn test also confirms the content of integrity in the powder of asafetida. While, the experiment for chalk (26.66%) and test for lead (0%) confirm their presence. It indicates that these types of spices of powder which are bought from the market contain the integrity as a content.

Experiment	**Observation of adulteration in samples**	**Percentage of samples in which adulteration found**
Solubility test	15	100%
Test for starch	15	100%
Test for chalk	4	26.66%
Burn test	15	100%
Test for lead	00	00

Table 3; represent the calculative observation of the different conducted experiments and the presence of integrity in powder.



Graph 1; Represent the graph of presence of integrity in the powder.

Graph 1; which is representing the percentage of the integrity present in the asafetida which were observed during the experiments. After the different types of conduction, it was observed that the solubility test, test for starch, burn test confirms the extreme integrity in the powder of asafetida. While test for chalk (26.66%) and test for lead (0%) confirm some concentration of integrity. These types of integrity can cause damages to the human health with whom we are not aware. The regular consumption of the integrity like lead which also act as a slow poison.

Conclusion

From the different conducted experiments in the present study, the presence of adulterants was noticed. In case of Asafoetida, the samples were suspected to be having the physical adulterant and the presence of chemical adulterants was not negligible. It was above the standard which can be responsible for the serious health issues. Although, it was observed that different brands of asafoetida contained varying amounts of chalk, 4 samples containing much higher than others. It describes that the presence of chalk was not negligible which was about 26.66% in a sample. In same experiment, the percentage of lead was about 53.33% that is a considerable issue. This contamination could be due to environmental pollution. From the obtained results of the above study, it inferred that Asafoetida are less likely to be adulterated intentionally as compared to chili

powder, turmeric etc. Very few samples in this study showed positive results to the adulterant detection tests and this is likely to be accidental contamination. The reason behind this could be the ample availability of the spices.

Future prospects

This study focused on the detection of adulteration in spices using basic physical and chemical analytical techniques. These spices need to be further tested using more sophisticated analytical techniques like UV- Visible spectroscopy, GC-MS, HPLC- MS etc for the proper qualitative and quantitative analysis.

References

1. Accum F. (1920); A treatise on adulterations of food and culinary poisons. London: Longman, .
2. Browne C. A. (1925); The life and chemical services of Friedrich Accum, J. Chem. Educ., Vol. **2**,Pp. 829, 1008, 1140.
3. Cole R. J. (1951); Friedrich Accum: a biographical study, Annals Science, Vol. **7**, Pp; 128.
4. Smith S. D. (2001) ; Coffee, microscopy, and The Lancet's analytical sanitary commission, Soc. Hist. Med., Vol.14 Issue (2), Pp; 171.
5. Clayton E. G., Hassall, A.H. (1908); physician and sanitary reformer, a short history of his work in public hygiene and of the movement against the adulteration of food and drugs. London: Ballière, Tindall and Cox,.
6. J. Burnett (1966), Plenty and want, a social history of diet in England from 1815 to the present day. London: Thomas Nelson,
7. Weise, Elizabeth (2006)"Food tests promise tough task for FDA". USA Today. Retrieved 2007-04-29.
8. Noel G Coley (2005), The fight against food adulteration, RSC, Education in chemistry, Issues,
9. Jeffrey M. Pilcher (2006), Food in World History New York: Routledge, Pp; 59.
10. Satin, Morton (2007), Death in the Pot: The Impact of Food Poisoning on History, 262 pages, Prometheus Book , ISBN 1-59102-514-Vol. 1 Issue 2.