

Detection of Adulterants in Selected Spices Sold in Garo Hills, Meghalaya

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Abstract—West Garo Hills is one of the important districts in Meghalaya with a population of around 643291, which constitutes 21.68% of Meghalaya's population. The food products especially the grocery is mainly imported from outside and the food quality had hardly been checked. Hence, it becomes important to check the quality of food items in the district so the study entitled "Detection of Adulterants in Selected Spices Sold in Garo Hills, Meghalaya," was done to know the status of the quality of different food items sold in the district. For this, spices from the local market of three different areas from Garo Hills, Meghalaya had been selected and all the selected food items were unbranded and the ones sold loose. The detection tests were performed as per the manual prescribed by FSSAI and both chemical and physical analyses were done. The results obtained showed that out of the selected 12 items, 8 items were adulterated.

Keywords: Adulteration, FSSAI, DART, spices.

1. INTRODUCTION

Spices add aroma and flavour to our food. It is also known for its anti-microbial properties, healing properties and is also a good preservative. India is the spice capital of the world, contributing to 75% of the global spice production.

It is an irony today that spices are prone to adulteration. Spices adulteration is one of the major concerns of the nation. Lookalike substances and cheap substances are either added to the spices or the spices are being completely replaced by them. This leads to various health diseases which may be fatal, for example metanil yellow in turmeric, which is an added colour, is actually a carcinogen[3]. Many cases have been reported from various parts of India like the Jaipur, Hyderabad and Kolkata. In Kolkata, the sellers were caught selling coriander stalk in place of coriander powder. The common adulterants found were sand, dirt, chalk powder, artificial colour, sawdust, argemone seeds, lead chromate etc.[12-15]

But no work has been done in the remote areas like Hills, Meghalaya, which constitutes 21.68% of Meghalaya's population[9]. There are various initiatives taken by the Government of India, to control the threat of adulteration. Many works have been done to detect adulteration, like HPLC, ELISA, gas chromatography etc. But these methods are too sophisticated to use not accessible by the normal people[2]. Hence, The Food Safety and Standard Authority of India (FSSAI) was founded on August 2011, to monitor the food quality all over the country. The Fssai came up with the manual named DART (Detection of Adulterants with Rapid Test), which is available in the Fssai website and is meant to educate the local citizens of our country about the various physical and chemical detection tests for adulteration [11]. Taking the manual as the objective, works on detection was done by Abhirami and Radha (2015)[1] on some selected items of Chennai and Sen *et al.* (2017)[7] on the spices procured from Vellore.

2. MATERIALS AND METHODS

The spices were sampled from the local market of three different sites of Garo Hills and all the selected food items were unbranded and the ones sold loose. The sampling procedure and the following methodology of detection tests were replicated three times. The following methodology is based on DART (Detection of Adulterants with Rapid Test) manuals prescribed by FSSAI [11].

Table 1: Methodology for identification of adulterates in spices using rapid test

Spices		Adulterant	Rapid test	Inference
1. Asafoetida	a)	Foreign resin	A small quantity of asafoetida was burned in a stainless steel spoon.	Pure asafoetida would burn like camphor.
	b)	Soap stone	Asafoetida was soaked in water and allowed to settle.	If adulterated, soap stone would settle down to the bottom.
2. Black pepper	a)	Papaya seeds	Few perets of pepper sample were poured in water.	Papaya seeds could be separated out from pepper as they would be shrunken, oval in shape and greenish brown or brownish black in colour.
	b)	Light black berries	A few perets of pepper sample were taken and made to float in alcohol.	The mature black pepper berries would sink while the papaya seeds and light black pepper float.
	c)	Mineral oil coating	The black pepper was smelled.	If coated, then it would give kerosene like smell.
3. Cloves	a)	Volatile oil extracted	Visual examination	Exhausted smell could be identified by its small size and shrunken appearance.
	b)	Exhausted cloves	Visual examination	The characteristic pungency of genuine cloves was less pronounced in exhausted cloves.
	c)	Coated with mineral oil	The sample was smelled.	If coated, it would give kerosene like smell.
4. Cumin seeds	a)	Fennel seeds	Visual examination	
	b)	Grass seeds coloured with charcoal dust	A small amount of cumin seeds was rubbed on palm.	If adulterated, palm turned black.
5. Coriander powder	a)	Dung powder	5 gm of coriander powder was added to water.	Dung would float and could be easily detected by its foul smell.
	b)	Common salt	A few drops of silver nitrate were added to 5 ml of the sample.	White precipitates indicated adulteration.
	c)	Salt	The sample was tasted.	The sample would taste salty if salt was present.
6. Cinnamon	a)	Cassia bark	Visual examination. Smell of cinnamon.	If adulterated, on close visual examination, cassia bark that comprised of several layers in between the rough outer and inner most smooth layers could be differentiated from cinnamon. Cinnamon barks would be very thin that could be rolled around a pencil. It had a distinct smell.
7. Mustard seeds	a)	Argemone seeds	Visual examination	Mustard seeds would have a smooth surface. When mustard seed was pressed, inside it was yellow while for argemone it was white.
8. Red Chilli Powder	a)	Water soluble coal tar colour/ Artificial colour or water soluble synthetic colour.	Chilli powder was sprinkled in a glass of water.	The water soluble coal tar would immediately start descending in colour streaks.
	b)	Rhodamine B	5 ml of acetone was added to 2g of the sample.	Immediate appearance of red colour indicated presence of rhodamine.
	c)	Brick powder, salt powder or talc powder	1 tsp of the sample was poured in a glass of water.	When the residue was rubbed and any grittiness was felt, it indicated the presence of brick powder or sand. When the white residue was rubbed, soapy and smooth feel indicated the presence of soap stone.
	d)	Starch	A few drops of starch were added to the sample solution.	Occurrence of blue colour would indicate presence of starch.
	e)	Sawdust and powdered bran	The sample was sprinkled on the water surface.	Pure sample would not have any sawdust or powdered bran on the surface of water. If adulterated, sawdust or powdered bran would float on the surface.

9. Saffron	a)	Coloured dried tendrils of maize	Small quantity of saffron was introduced in a glass of water.	If adulterated then the colour would dissolve rapidly. Pure saffron would continue to give its saffron colour as long as it lasts.
10. Iodised salt	a)	White powder	¼ tsp of the sample was stirred in a glass full of water.	Pure salt would dissolve completely and would give a clear solution or would give a slightly turbid solution due to presence of permitted anti-caking agent in the salt.
	b)	Common salt	A piece of potato was cut and salt was smeared on it. 2 drops of lemon were then added.	If it's an iodised salt then blue colour would develop.
11. Powdered turmeric	a)	Metanil yellow	13 N sulphuric acid was added to the sample.	Appearance of red colour (which would persist even after adding little distilled water) would indicate the presence of added colours. However, if the colour disappeared upon adding distilled water to the sample, then it would be pure.
	b)	Yellow clay	The sample was mixed with water and allowed to stand for some time.	The yellow clay would settle at the bottom leaving turmeric in the top.
	c)	Artificial colour	A teaspoon of turmeric in a glass of water.	Natural turmeric would leave light yellow colour in water while settling. Adulterated turmeric would leave a strong yellow colour in water while settling down.
12. Turmeric whole	a)	Lead chromate	A small quantity of turmeric whole is added in a glass of water.	Pure turmeric would not leave any colour while adulterated turmeric would appear bright and would leave colour immediately.

3. RESULTS

Table 2: Results of rapid detection tests

Food item	Adulterant	Sample sites								
		I			II			III		
1. Asafoetida	i. Foreign resin	+	+	+	+	+	+	+	+	+
	ii. Soap stone	+	+	+	+	+	+	+	+	+
	iii. Starch	+	+	+	+	+	+	+	+	+
2. Black pepper	i. Papaya seeds	+	+	+	+	+	+	+	+	+
	ii. Mineral oil coating	-	-	-	-	-	-	-	-	-
3. Cloves	i. Volatile oil extracted	+	+	+	+	+	+	+	+	+
	ii. Exhausted cloves	+	+	+	+	+	+	+	+	+
	iii. Coated with mineral oil	-	-	-	-	-	-	-	-	-
4. Coriander powder	i. Powdered bran	+	+	+	+	+	+	+	+	+
	ii. Dung powder	+	+	+	-	-	-	-	-	-
	iii. Added starch	-	-	-	+	+	+	+	+	+
	iv. Common salt	+	+	+	-	-	-	-	-	-
5. Cinnamon bark	i. Cassia bark	-	-	-	-	-	-	-	-	-
6. Cumin seeds	i. Fennel seeds	-	-	-	-	-	-	-	-	-
	ii. Grass seeds	-	-	-	-	-	-	-	-	-
7. Iodised salt	i. White powder	+	+	+	+	+	+	+	+	+
	ii. Common salt	+	+	+	+	+	+	+	+	+
8. Mustard seeds	i. Argemone seeds	-	-	-	-	-	-	-	-	-
9. Red Chilli Powder	i. Excess bran	+	+	+	+	+	+	+	+	+
	ii. Rhodamine B	+	+	+	-	-	-	+	+	+
	iii. Brick powder	-	-	-	-	-	-	-	-	-
	iv. Water soluble coal tar	-	-	-	-	-	-	-	-	-
	v. Added starch	-	-	-	-	-	-	+	+	+
10. Saffron	i. Maize cobs	-	-	-	-	-	-	-	-	-
11. Turmeric powder	i. Sawdust and powdered bran	+	+	+	+	+	+	+	+	+
	ii. Yellow clay	+	+	+	+	+	+	+	+	+

	iii.	Artificial colour	-	-	-	-	-	-	-	-	-
	iv.	Metanil yellow	-	-	-	+	+	+	-	-	-
12.		Turmeric whole	i.	Lead chromate	-	-	-	-	-	-	-

4. DISCUSSION

Out of the 12 items, 8 were found to be adulterated. Hence, 66.7% of samples were adulterated, thus making the situation in Garo Hills not safe. It is so because, the spices are not grown in the region and are imported from the other states of India. The major adulterants found were foreign resin and soap stone in asafoetida, dung powder, powdered bran, starch and common salt in coriander powder. Excess bran, rhodamine B and starch in red chilli powder. While turmeric powder contained excess bran, yellow clay and metanil yellow. The adulterants found are not permitted by Fssai. Metanil yellow is very toxic and if ingested may be toxic to neurons, lead to cancer in liver cells, tumour development, deleterious effect on gastric mucin and lymphocytic leukemia[3]. Foreign resin and soap stone matter of asafoetida may cause stomach problems like dysentery[1]. Powdered bran is poisonous and if taken with food then may causes skin rashes[1]. Excessive intake of common salt leads to hypertension [7]. Dung powder causes food poisoning and yellowish discolouration of skin[8]. Rhodamine B is carcinogenic[7]. Consumption of papaya seeds leads to liver and stomach problems [1].

5. CONCLUSION

Adulteration is a serious issue which is neglected in remote areas like Garo Hills. The unawareness of the people regarding the issue is benefitting the traders to fool them. Though initiative has been taken by the Government of India, but not much work had been done to detect adulteration in the backward hilly areas of North-East, especially Garo Hills. This resulted in the findings of some dangerous adulterants in the food items procured from the local market. Spices and condiments are prone to adulteration than any other items, therefore special care should be taken while selecting and buying spices. Initiatives should be taken to start awareness programmes to make the common people aware of the serious crime of adulteration, as it is the only way that could stop adulteration.

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