The Bioscan
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
20(2): S2: 853-858, 2025 www.thebioscan.com

A QUALITY EVALUATION OF COMMON SPICES MARKETED IN PACKAGED AND UNPACKAGED FORMS

Pritika Joshi[2] and Dr. Ankita Srivastava [1]

[1]Research Scholar, Institute of Biosciences and Technology, Sri Ramswaroop Memorial University (SRMU), Deva Road, Lucknow, Uttar Pradesh, INDIA-225003

[2] Assistant Professor, Institute of Biosciences and Technology, Sri Ramswaroop Memorial University (SRMU), Deva Road, Lucknow, Uttar Pradesh, INDIA-225003

E-mail- ankitasrivastava.ibst@srmu.ac.in

Phone- 9651080266

DOI: 10.63001/tbs.2025.v20.i02.S2.pp853-858

KEYWORDS
Spices, Adulteration, Food Safety, Health Hazards, FSSAI Standards

Received on:

18-04-2025

Accepted on:

19-05-2025

Published on:

26-06-2025

ABSTRACT

Spices hold a pivotal position within the culinary traditions of India, esteemed for their unique flavors, alluring aromas, and health-promoting properties. However, the phenomenon of adulteration in spices has surfaced as a pressing concern, endangering food safety and public health. The objective of our study was to assess the quality of both packaged/branded and unpackaged/non-branded spices purchased in a metropolitan area. Furthermore, consumer perceptions and price differences were evaluated. A total of 70 spice samples (including 35 packaged and 35 unpackaged) were procured and subjected to rapid testing in accordance with FSSAI standards. The findings reveal that among the 35 unpackaged spices, all 35 were recognized as unhygienic and of inferior quality, whereas all 35 packaged spices were determined to be clean and safe. Findings of this study may aware people about using safe and hygienic spices, which is a major intention of food safety and quality management. We strongly recommend consumer awareness and monitoring of the enforcement of FSSAI standards that are crucial for ensuring the availability of pure and safe spices in the open market that is a major site for street food owners also.

INTRODUCTION

Spices add flavor and aroma to make a dish appetizing and delicious. India is well known for its spices. The fine aroma, texture, taste and medicinal value of Indian spices are the most sought- after globally. In the world, India has the largest domestic spice market as well as largest manufacturer, consumer and exporter of spices in the world. India spices market size reached INR 160,676 Crores in 2022. India is 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 (Maske S V *et al*, 2020). There is a massive range of spices like turmeric, red chili black pepper cinnamon, clove, coriander which give a particular flavor to Indian food. Curry powder, ground spices, and other blended powders hold an important position in flavour and aroma. Basically, the dried part of plant which includes seed, fruit, root, bark, bud or vegetable substance other than leaves are used spice. Along with It's primarily use for flavouring, colouring and seasoning a recipe it is also used as food preservative (Bharathi *et al*, 2018) and some of the spices exhibit its medicinal importance too. India produces over 7 million tons of different spices per year (Bharathi *et al*, 2018). India is called as "the spice bowl" of the world (Pradhan K *et al*, 2018). Food is one of the basic necessities of life. People spend significant amount of money on food. But at the end of the day, they come to know that the food is not up to the standards rather they are consuming dyes, stones, brick, and other contaminants. Adulteration in foods decreases our moral and social value. 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 is called adulteration (Maske S V *et al*, 2020). Further, Meduri, A *et al*, 2005 explained how adulteration in food is a threat for human. There are several reasons of making a product adulterated. When demand is greater than supply, foods are usually adulterated to get more profit. Often by reducing commodity expenditures and 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. ISI thus defines and develops general standards for all spices to be appropriate for marketing or export (Callaway *et al*, 1962). Spices are always in demand because of their good taste and flavour.

They are most commonly found in ground or powdered form, which makes them a top target for adulteration. Adulteration of spices can be defined as loss of natural composition and quality of spices due to addition or subtraction of foreign substance to and from the spices. The substances which are used to lower the quality of spices are called as adulterants. They make spices unhygienic and contaminated which affects the health of individual and causes various harmful diseases like stomach disorder, lead poisoning, cancer etc (Mohiuddin, *et al*, 2020). Common adulterants now can be detected in common spices (Mishra M *et al*, 2016, Jaiswal S *et al*, 2016). This study have been conducted to make a clear understanding about the difference in packaged and unpackaged spices marketed in terms of quality.

MATERIALS AND METHODS

Collection of samples

For the proposed study, packaged samples of chili powder (*Capsicum annum*), turmeric powder (*Curcuma longa*), coriander powder (*Coriandrum sativum*), black pepper (*Piper nigrum*), asafetida, cinnamon and salt (sodium chloride) were collected from supermarkets. Unpackaged /non-branded samples were collected from local market of Barabanki district during January 2024-June 2024.

Evaluation of Quality of spices

To evaluate the quality and authenticity of different spice samples through physical tests based on FSSAI, DART were done. For the physical assessment, 100 grams of each spice were examined under controlled lighting, following specific guidelines. The tests for adulteration were carried out on 70 different samples of spices and condiments that have taken from urban area of Barabanki district. Samples were collected in clean, dry and sterilized collection container. The spices and condiments were tested for the physical quality of spices including visual, tactile, and smell tests to assess color uniformity, texture, and flavor, while also looking for possible contaminants like mold, insects, rodent evidence, and foreign materials such as plant debris or stones. Turmeric powder tested for starch, lead chromate and metanil yellow, while red chili powder underwent sedimentation to identify adulterants like brick powder, sawdust, and artificial color. Samples of coriander powder were analyzed for husk and salt samples were tested for the presence of soluble impurities and chalk powder. Purity of asafetida purity were checked by water test and physical appearance. Black pepper samples were checked for papaya seeds contamination using microscopic and floating tests. Cinnamon samples were checked for purity and authenticity based on visual features. All the tests were performed by standards and procedures as prescribed by Food Safety and Standard Authority of India (FSSAI, 2012) which helps the consumers to detect the common adulterants in spices and condiments.

RESULTS

The study aimed to compare the quality of packaged and unpackaged spices by evaluating the quality and analysing consumer preferences. A total of 70 samples (35 packaged, 35 unpackaged) were tested using FSSAI methods. Further a questionnaire was used to assess consumer perception. The qualitative tests conducted on both packaged and unpackaged spices showed clear differences in quality. Unpackaged samples had visible contaminants, while packaged spices met FSSAI standards.

Quality variation in packaged and unpackaged spices

Turmeric Powder- On quality analysis of unpackaged turmeric powder samples,02 samples were found adulterated with clay, metanil yellow was found in 01 sample and 02 samples were found adulterated with starch powder (Figure 1). All 05 samples of packaged turmeric powder were free of any contaminants.

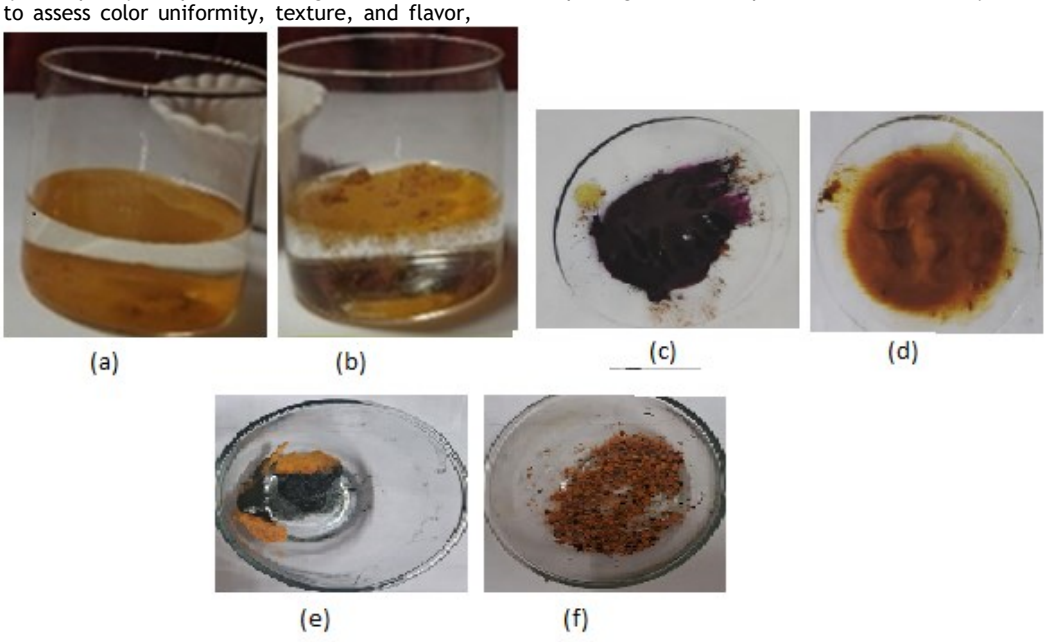


Figure 1: Presence of adulterants in packaged and unpackaged samples of turmeric. *presence of clay in unpackaged sample that settled down on rest (a), No clay is present in packaged sample (b), purple colour on addition of HCl indicates the presence of metanil yellow in unpackaged sample (c), Absence of metanil yellow in packaged sample (d), blue -black colour on adding Iodine solution indicates added starch in unpackaged sample (e)No starch addition in packaged sample (f)*

Sample	**Clay powder**		**Metanil Yellow**		**Starch**	
Turmeric powder	**Packaged**	**Unpackaged**	**Packaged**	**Unpackaged**	**Packaged**	**Unpackaged**
	NIL/5	2/5	NIL/5	1/5	NIL/5	2/5
Number of samples	packaged samples-05, unpackaged samples-05 (Total -10 samples)					

Table 1. Summary of adulterants in branded and non-branded turmeric powder samples

Chilli Powder- Out of 05 unpackaged samples, brick powder was found in 02 samples and artificial colour was present in 01 sample while husk is present in 02 samples of chilli powder collected from local market (Figure 2). All 05 samples of packaged chili powder were free of any contaminants.

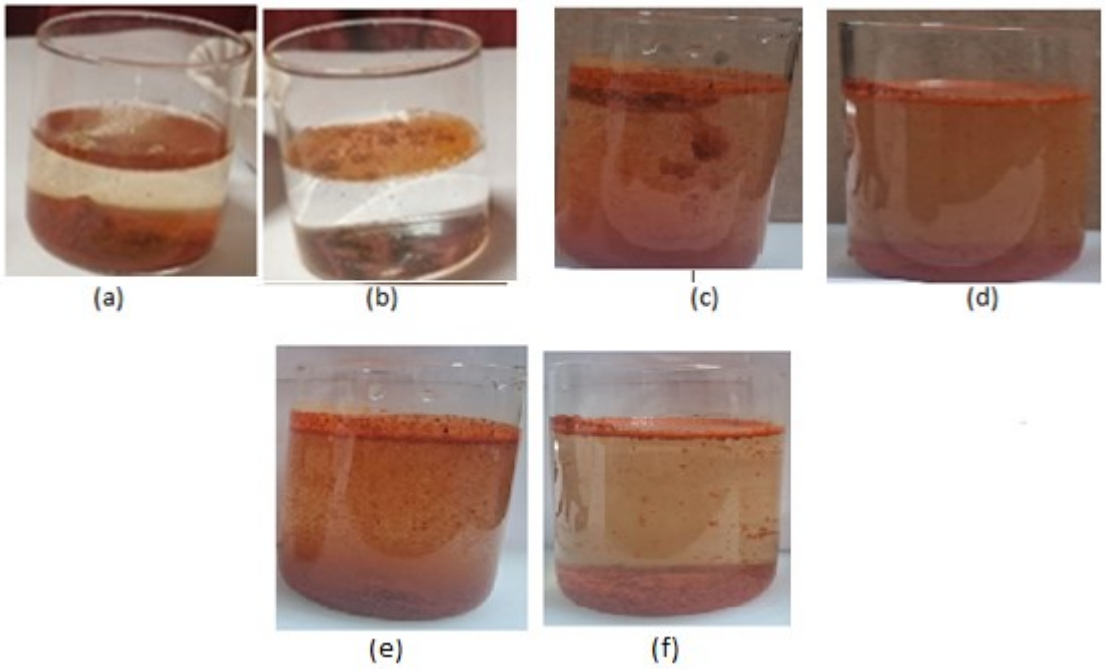


Figure 2: **Presence of adulterants in packaged and unpackaged samples of chili.** *Presence of brick powder in unpackaged sample that settled down on rest (a), No brick powder is present in packaged sample (b), artificial colour streaks were visible when added to water in unpackaged sample (c), Absence of artificial colour in packaged sample (d), husk and ash present in packaged samples in suspended form (e) No husk and ash in packaged sample (f).*

Sample	**Brick powder**		**Artificial color**		**Husk and ash**	
Chili powder	**Packaged**	**Unpackaged**	**Packaged**	**Unpackaged**	**Packaged**	**Unpackaged**
	NIL/5	2/5	NIL/5	1/5/	NIL/5	2/5
Number of samples	Packaged samples- 05, unpackaged samples-05, Total samples- 10					

Table 2. Summary of adulterants in branded and non-branded chili powder samples

Coriander Powder- The quality analysis of unpackaged coriander powder, 04 out of 05 samples were found adulterated with sawdust (Figure 3). All 05 samples of packaged coriander powder were free of any contaminants.

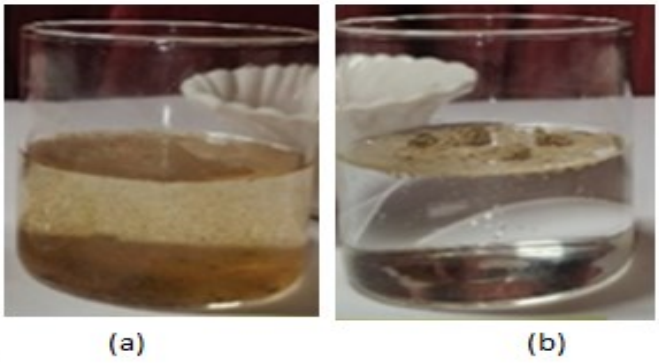


Figure 3: **Presence of adulterants in packaged and unpackaged samples of coriander powder.** *Presence of sawdust in unpackaged sample that is suspended in water (a), No sawdust is present in the packaged sample (b)*

Sample	**Saw dust/powdered bran**	
Coriander powder	**Packaged**	**Unpackaged**
	NIL/5	4/5

Number of samples	Packaged samples- 05, unpackaged samples-05, Total samples- 10

Table 3. Summary of adulterants in branded and non-branded coriander powder samples

Salt- 05 out of 05 unpackaged samples salt were found adulterated with insoluble impurities such as chalk powder (Figure 4). All 05 samples of packaged salt were free of any contaminants.

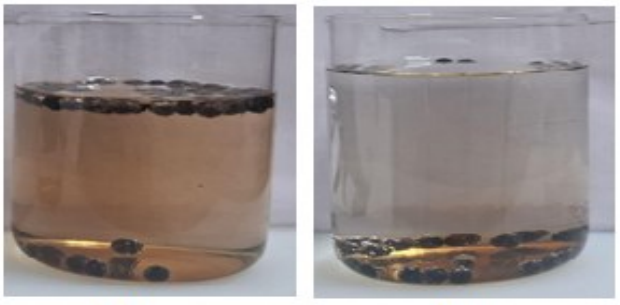
(a) (b)

Figure 4: Presence of adulterants in packaged and unpackaged samples of salt. *Presence of chalk powder in unpackaged sample that gives cloudy appearance in water (a), No chalk powder is present in the packaged sample (b)*

Sample	**Chalk powder**	
Salt	**Packaged**	**Unpackaged**
	NIL/4	5/5
Number of samples	Packaged samples- 05, unpackaged samples-05, Total samples- 10	

Table 4. Summary of adulterants in branded and non-branded salt samples

Black pepper- The unpackaged samples of black pepper revealed that, 04 out of 05 samples were found adulterated with papaya seeds (Figure 5). All samples of packaged black pepper were free of any contaminants.



(a) (b)

Figure 5: Papaya seeds adulteration in Black pepper samples. *Presence papaya seeds in unpackaged sample (a), No papaya seeds present in the packaged sample (b)*

Sample	**Papaya seeds**	
Black pepper	**Packaged**	**Unpackaged**
	NIL/5	4/5
Number of samples	Packaged samples- 05, unpackaged samples-05, Total samples- 10	

Table 5. Summary of adulterants in branded and non-branded black pepper samples

Cinnamon- The unpackaged samples of Cinnamon revealed that, 05 out of 05 samples were found to be cassia bark (Figure 6). All 05 samples of packaged cinnamon bark were genuine by physical observations.

Figure 6. Analysis of packaged and unpackaged samples of cinnamon. *Packaged samples of cinnamon bark (a). Cassia bark was found either mixed with cinnamon bark or solely traded as cinnamon bark in unpackaged samples (b)*

Sample	**Cassia bark**	
Cinnamon bark	**Packaged**	**Unpackaged**
	NIL/5	5/5
Number of samples	Packaged samples- 05, unpackaged samples-05, Total samples- 10	

Table 6. Summary of adulterants in branded and non-branded cinnamon samples

Asafoetida- The unpackaged samples of asafoetida exhibited that, 05 out of 05 samples were found to be adulterated with either resins or earthy matter (Figure 7). All 05 samples of packaged asafoetida were found to be pure.

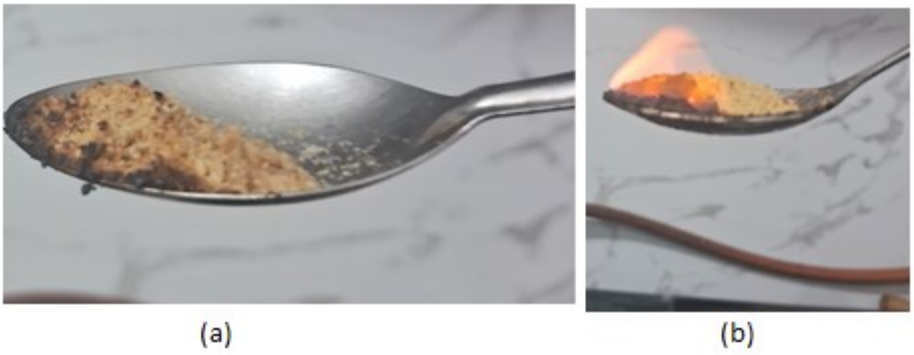


Figure 7: Presence of adulterants in packaged and unpackaged samples of asafoetida. *Unpackaged sample of asafoetida did not burn with a flame due to presence of foreign resin (a), pure asafoetida burnt with a flame in the packaged sample (b)*

Sample	**Foreign resin**	
Asafoetida	**Packaged**	**Unpackaged**
	NIL/5	5/5
	Packaged samples- 05, unpackaged samples-05, Total samples- 10	

Table 7. Summary of adulterants in branded and non-branded asafoetida samples.

DISCUSSION

Spice is an indispensable need for us now. The act of intentionally degrading the quality of food offered for sale either by adding or substituting inferior materials or by the removal of some valuable ingredients is 'Food adulteration'. Just for limited economic benefits, major ingredients of foods are being adulterated (Bansal *et al.*, 2017). But adulterants can be detected using simple test at home also (Sudhabindu K *et al*, 2020). The present study has been conducted to compare the quality of packaged and unpackaged spices in an urban area. In qualitative analysis, the investigations were carried out on total 70 different samples of spices (packaged/branded and non-branded/unpackaged). The study includes the use of standards and procedures as prescribed by the FSSAI and results revealed that out of 05 unpackaged samples, all 05 samples of turmeric were found adulterated with clay (02), metanil yellow (01) and starch powder (02). Quality deterioration in turmeric with various adulterants is in practice and has also been previously reported (Sohini R *et al*,2020)Further out of 10 samples of chili powder in unpackaged form were found adulterated with brick powder (02) artificial colour (01), husk (02). Adulteration in chili powder is very common and previously reported (Pantola P *et al*, 2021). In unpackaged/open spices, compromised quality and presence of common adulterants found in spices like artificial colour found in chilli powder, metanil yellow in turmeric powder, clay in turmeric and chalk powder in salt indicates potential serious health issues due to harmful adulterants. Metanil yellow and artificial color can be potential cause of cancer, if used for a long time (Gupta S *et al*, 2003, Ghosh *et al*, 2017). Unpackaged coriander powder samples were also found adulterated with sawdust (05), while all 05 unpackaged salt

samples were found to be adulterated with chalk powder. 04 out of 05 unpackaged samples were found to be mixed with papaya seeds and all 05 samples of unpackaged asafetida were found to be mixed with resin material purchased from open market. When asked for cinnamon in open market, cassia bark is being provided in place of cinnamon bark. Therefore, we observed that all 05 samples of unpackaged cinnamon were mixed with cassia bark. Cassia and cinnamon are very much similar and fine differences make them unrecognizable, but low cost analytical methods are now available to detect the difference between both of them (Cantarelli A *et al,* 2020). On the contrary, all packaged samples have been found as per FSSAI standards. Cheap adulterants like chalk powder, saw dust not cause adverse Being such a low cost of unpackaged spice shows the profit business of sellers but adverse health effect to consumers. Consumers/purchaser generally consider packaged/branded spices as safer and of better quality, especially those who are concerned about hygiene. On the other hand, unpackaged/non-branded spices appealed those buyers mainly who wish to gain profit because they are cheaper. Several street food vendors/owners go for cheap raw materials to gain profit in their business without worrying about customer's health. The findings confirm that unpackaged spices are more prone to adulteration, posing health risks. While packaged spices offer better safety, price remains a deciding factor for many consumers. These results emphasize the importance of better consumer education and stricter quality control measures.

CONCLUSION AND RECOMMENDATIONS

Due to lack of proper awareness and knowledge, majority of consumers don't find fraudulent practices and tactics adopted by manufacturers and sellers relating to food adulteration. To ensure the safety and quality of food, it is very important that various food materials purchased by consumers should be free from adulteration. Indian spices are used not only for food purposes but also for the treatment of diseases and our study may aware people about using safe and hygienic spices, which is a major intention of food safety and quality management. We strongly recommend stronger regulations, consumer awareness, and monitoring of enforcement of FSSAI standards are crucial to ensuring the availability of pure and safe spices in the open market also.

Acknowledgement

This study has been funded by seed money grant sanctioned by Research and consultancy, Shri Ramswaroop Memorial University, Lucknow-Deva road, Barabanki-225003. (FY-2024-25/SMG/002 dated 12 dec,2024)

CONFLICTS OF INTEREST

There is no conflicts of interest between authors.

REFERENCES

- Banti, M.. Food Adulteration and Some Methods of Detection, Review. International Journal of Nutrition and Food Sciences, 9(3): 86-94. 2020
- Bharathi S, A Sukhita, J Moses, C Anandharamakrishnan.. Instrument-based detection methods for adulteration in spice and spice products – A review. Journal of Spices and Aromatic Crops, 27 (2), 106-118. 2018,
- Callaway, H. M.. Lead: A Materials Survey (Vol. 8083). US Department of the Interior, Bureau of Mines. 1962
- Cantarelli A , Carlos A. Moldes , Eduardo J. Marchevsky , Silvana M. Azcarate , José M. Camiña , Low-cost analytic method for the identification of Cinnamon adulteration. Miguel Microchemical Journal,Volume 159, (2020), 105513
- Chandila, J. and Puri, D. A Comparative Study on Consumer Perception Towards Packaged Spices Among Rural and Urban Women. International Journal of Health Sciences and Research, 9(8): 399-405. 2019
- FSSAI, (2012).Quick test for some adulterants in food. https://www.dfda.goa.gov.in/images/PDFDOCUMENTS/quick test for some adulterants in food-fssai initiative.pdf
- FSSAI, (2018). Detect adulteration with rapid test (DART) -Common quick tests for Encyclopedia of Food Safety. 2014, 3, 413-416
- Ghosh, D., Singha, P. S., Firdaus, S. B., & Ghosh, S. Metanil yellow: The toxic food colorant. Asian Pacific Journal of Health Sciences, 4(4), 65-66. 2017
- J Shweta, SY Digvijay, MK Mishra, AK Gupta. Detection of adulterants in spices through chemical methods and thin layer chromatography for forensic consideration, 6 (8), 8824-8827. 2016
- Jaiswal S, Yadav DS, Mishra MK, Gupta AK. Detection of adulterants in spices through chemical method and thin layer chromatography for forensic consideration. International Journal of Development Research. 06, 08,.8824-8827. 2016
- Maske Sachin V, Ashutosh Dhami, Nongmaithem Mangalleima and Niamcha Lowang, "Adulteration of Spices: A Review", Journal of Science and Technology, . 05, 06, 42-45. 2020
- Meduri, A. An exhaustive commentary on-the prevention of food adulteration act & rules (central and states with state Amendments)-Adulteration in food - A threat to consumers in India. 2005
- Mishra M. Detection of adulterants in spices through chemical methods and thin layer chromatography for forensic consideration. International Journal of Development Research, 6, 8824-8827.2016
- Modi, B., Timilsina, H., Bhandari, S., Achhami, A., Pakka, S., Shrestha, P., Kandel, D., Gc, D. B., Khatri, S., Chhetri, P.M., and Parajuli, N. Current Trends of Food Analysis, Safety, and Packaging. International Journal of Food Science, 1-20. 2021
- Mohiuddin, A. K. Health Hazards with Adulterated Spices: Save the "Onion Tears". Asian Journal of Research in Pharmaceutical Sciences, 10(1): 21-25. 2020
- Pantola P, Pooja Agarwal, Detection of Adulteration in Spices. International Journal of Advance Research and Innovation , 9 , 2, 165-167.2021
- Pradhan K. Exploration and Extrapolation of Extension Strategy for Promotion of Spice Production and Processing In India. Indian Spices, 421-438. 2018
- Sanjay Gupta , Monisha Sundarrajan, K V K Rao. Tumor promotion by metanil yellow and malachite green during rat hepatocarcinogenesis is associated with dysregulated expression of cell cycle regulatory proteins. Teratog Carcinog Mutagen. Suppl 1:301-12. 2003
- Sohini Roy, Susmita Mukherjee, Asmeeta Sircar, Debsikha Dutta Roy, Ishika Banerji, Snejuti Barua1, Sonali Paul. Adulteration in Spices – A Threat to Human Health and Well Being. American Journal of Applied Bio-Technology Research, Vol: 1, 25-28, 2020
- Sudhabindu K and Kailash Chandra Samal. Common adulteration in spices and Do-at-home tests to ensure the purity of spices , Food and Scientific Reports,: 1, 9, 66, 2020