

Advances in Turmeric Processing and Detect Adulteration in Turmeric

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Turmeric is known as the “golden spice” as well as the “spice of life.” It is also called as “Indian saffron.” Generally, turmeric is available in the market as the fresh plant’s rhizome and as a dried powder. Commercially, turmeric powder is a convenient and practical form for distribution. However, prices vary depending on factors such as quality, appearance (color), moisture content, curcuminoid content, and phenolic content. Currently, the world market in turmeric is approximately 37,000 tons valued at US\$40,160 million.

Problems associated with traditional turmeric processing

Primary processing of turmeric is still being done with traditional means leading to many losses and difficulties. Farmers use open shallow metal (Mild Steel) pan for turmeric boiling in open fire furnace. Water is added up to 3/4 of the heap height in the pan and covered by gunny bags or plastered. This conventional process of turmeric is time consuming, hazardous and less fuel efficient. Over cooking spoils, the color of the final product and under cooking renders the dried product brittle. These methods when adopted for boiling, fetches lower price in the market, the main reasons being over/under cooking of the rhizomes which on drying and polishing affect the consumer acceptability. Moreover, it has a high labor requirement. Losses during handling, inefficient use of fuel, unhygienic handling of the rhizomes, time consuming and huge cost of processing are some of the disadvantages of these methods.

Adulteration of turmeric

High popularity of turmeric powder has often made some profiteers to adulterate it in order to obtain extra profits. Materials such as wheat flour, rice flour, starch, and chalk dust colored with different dyes and colorants are the stuff often added to turmeric powder. The most commonly used colors among these

colorants are metanil yellow lead chromate and tartrazine. Metanil yellow has a similarity with turmeric powder, it is often added to turmeric powder when the actual curcumin content is low, to create an overall bright yellow color. Spices such as turmeric are offered in powder form in the market due to their nutritional and therapeutic properties, and there is a lot of fraud in turmeric. Traditional methods of sensory evaluation in determining the quality of spices are not widely used, because those methods are time-consuming, costly and result in many errors. The azo dyes are added in the spice powder to enhance the visual appearance, a relatively high concentration (e.g., $\geq 1\text{g L}^{-1}$ Sudan) is needed to make a visual impact on a spice powder. In the recent past, adulteration has become more complicated due to the use of unusual or artificial adulterants, resulting in related health risks. In the modern age, there is an increasing concern with regard to food fraud.

Solution over traditional Turmeric Processing

A novel technique for cooking

Pressure boiling has become the most advanced method in terms of saving time in boiling, drying (Due to a higher degree of starch gelatinization), efficient energy use, and quality retention. It prevents the leaching of Curcumin in the medium which occurs in the case of traditional methods of boiling. The loss of color observed in turmeric is 1.5 to 2.5% in steam cooking whereas in boiling it is 1.6 to 3.5%. Thus, the process of steam treatment is suggested to the turmeric business which is beneficial to farmers and turmeric process industries.

Novel drying technologies

Solar-drying technology offers an alternative which can process the vegetables and fruits in clean, hygienic and sanitary conditions to national and international standards with zero energy costs. It

saves energy, and time, occupies less area, improves product quality, makes the process more efficient, and protects the environment. A typical solar food dryer improves upon the traditional open-air sun system in five important ways.

Novel adulteration detection technique

Rapid, accurate, and automatic determination of food attributes is a practical demand in daily life. Modern techniques, including computer vision, electronic noses, spectroscopy spectral imaging, and so on, have been widely used to detect food attributes. Both the industry and the researchers in the field are willing to maintain the quality of food and pharmaceutical products by providing non-destructive technologies. Different methods were employed to detect metal yellow traces in the turmeric powder such as thin-layer chromatography, high pressure liquid chromatography, and ultraviolet-visible spectroscopy. However, these analytical

methods require a certain degree of expertise in terms of sample preparation and manpower and they may not be suitable for scheduled sample analysis. In some cases, chemical standards may be expensive as well. Thus, there is still a need to build a fast, cost-effective, non-destructive, and chemical-free method for the detection of an adulterant, which can be applicable to a vast range of food products, including spices.

Conclusions

Turmeric is important part of our day today life and consumption of turmeric increases further. In traditional methods quality deterioration of turmeric was more and it results into fetching low price in market. Adaption of novel technologies in turmeric processing is necessary to reduce processing cost and improve the quality of the final product. Detection of fraud in turmeric powder is very essential because it is hazardous to human health and causes serious issues with health.

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