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Quality Assesment of Turmeric Spices

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ABSTRACT
Turmeric powder, derived from the rhizomes of Curcuma longa, is a widely used spice and natural food coloring. This study aimed to evaluate the quality of turmeric powder samples from different sources. Physicochemical parameters such as moisture content, ash content, and particle size were analyzed. Microbiological examination included total bacterial count, yeast, and mold count. Phytochemical analysis involved the quantification of curcuminoids, including curcumin, demethoxycurcumin, and bisdemethoxycurcumin. The results showed significant variations in physicochemical and microbiological parameters among the samples. The curcuminoid content ranged from 2.5% to 5.5%. The study highlights the importance of quality control measures to ensure the safety and efficacy of turmeric powder for culinary and pharmaceutical applications.

Keywords: Turmeric powder, quality assessment, physicochemical analysis, microbiological examination, phytochemical evaluation, curcuminoids.

Physical and Chemical Parameters

1. Moisture content
- Ash content
- Particle size
- Bulk density
- Colorimetric analysis

2.Microbiological Parameters
- Total bacterial count
- Yeast and mold count
- Salmonella detection
- E. coli detection

3.Phytochemical Parameters
- Curcuminoid content
- Curcumin analysis
- Demethoxycurcumin analysis
- Bisdemethoxycurcumin analysis

I. INTRODUCTION:

Turmeric, which is derived from Curcuma longa rhizomes, is a popular spice, natural food coloring, and traditional medicine. Turmeric powder is one of the most consumed turmeric types, which is utilized extensively across various industries including food, pharmaceutical, and cosmetics. The quality of turmeric powder is most critical since it determines its safety, efficacy, and value.Quality of turmeric powder is affected by one or a combination of numerous factors, namely farm practices, process techniques, storage, and handlingpractices. A complete quality examination of turmeric powder, as such, has to be ensured to certify it against well-determined specifications and standards.

The purpose of this quality evaluation is to analyze the physical, chemical, microbiological, and phytochemical properties of turmeric powder. The results of this research will be useful in assessing the quality of turmeric powder and guiding quality improvement and control interventions**.**

II. MATERIALS AND METHODS

Plant material Samples of turmeric were bought from various herbal shops in Istanbul. 15 varied samples were subjected to analysis.

Macroscopical Evaluation Evaluations:

Were set for all samples of turmeric in terms of colour, odour, taste, and appearance. The colour of the powder must be orange-yellow. Spicy is aromatic in terms of description. It possesses an aromatic, bitterish taste of turmeric. In appearance, it must not possess macro particles. Microscopic examination

When microscopically viewed with Sartur reagent, it will contain gelatinized and deposited starch grains in starch paste; sometimes ovoid starch granules may be observed. Under examination in chloral hydrate solution, the following turmeric characters may be observed:Parenchyma fragments containing secretory cells with brown-yellow lipid aggregates

- Reticulated or dimpled xylem
- Pieces of the epidermis, fragments of cover hairs laying down a thin, irregularly thickened film on the walls; at times long and convoluted, thick-walled, solitary-celled

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trichomes torn or adherent to free or epidermal cells
- Occasionally long and curved, thick-walled, unicellular trichomes; shredded, free, or attached to epidermal cells
- Scanty periderma fragments, often epiderm-continuous (Turkish Pharmacopoeia Journal,Physicochemical analysis methods

Preparation of the extracts:

10 mL of 96% ethanol was added to 1 g of powdered sample, shaken in the ultrasonic water bath left at room temperature for 30 minutes. It was cotton filtered. The filtrate was employed in the analysis (Turkish Pharmacopoeia Journal**,**

Reference solution:

NovasolCurcuminLicaps (liquid filled capsule) was taken as a reference. 20 mg of curcuminoids in liquid capsule is mixed with 10 mg of 96% ethanol (double check).

Thin-layer chromatography:

Thin-layer chromatography was used to detect the curcuminoids in the samples. The diluted reference solutions and the turmeric samples were spotted as 10 mm bands over silica gel plate. A mobile phase of glacial acetic acid and toluene was used.

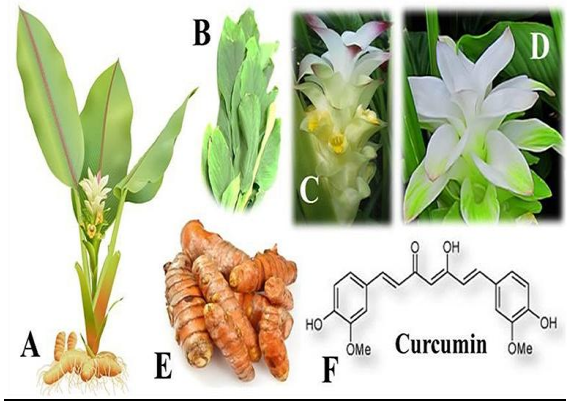
Determination of water content:

A glass weighing container for each sample was swept through ethanol and dried on the etuve. Dry weighing vessels stayed in the desiccator for 30 minutes. Subsequently, each container was weighed empty first, and then with 1 g of material. Each weighed sample was left to the desiccator to await transport to the oven. After all the samples have been weighed, it was left in the oven at 100-105°C for 2 hours. The samples are taken out after 2 hours and left to desiccate again for 30 minutes. All the samples are then reweighed. Yield calculation is carried out. Because of the insistence of the amount of water with 15 gr of the powdered herbal drug is a maximum of 120 mL/kg.

Determination of ash content:-

A porcelain crucible for every sample is subjected to ethanol and oven-dried. Oven-dried crucible is left for 30 minutes in the desiccator. All the crucibles are weighed both with and without 1 g of sample. The weighed crucibles are left in the oven. It is kept in the oven for 1 hour at 200°C and then 3 hours at 600°C. After 4 hours, oven-dried samples are again put into the desiccator to cool for 30 minutes. Weight the cooled sample and calculate the yield. Because of ash determination, total ash should not exceed.

Microbiological content determination:- Turmeric samples of different transfers 1 to 15 were each weighed 1 gram and brought to 10 ml with sterile distilled water. Ten-fold dilutions in sterile saline were done. 10 µl of the dilutions were made, the Tryptic Soy Agar (TSA) for bacteria and Saboroud Dextrose Agar (SDA) for fungi seeded onto the surface of the solid broth and incubated in the oven at 37°C for the bacteria and 25°C for the fungi. Colonies developed after a day were enumerated to gain the number of viable bacteria and total aerobic bacteria and fungi present in a gram of turmeric were determined by colony-forming.



Potential toxicity indications in turmeric:

Heavy Metal Contamination:

1.Lead: Excessive levels of lead are known to inflict neurological injury, kidney injury, and developmental delay.

2. Mercury: Mercury toxicity can result in neurological damage, kidney injury, and congenital defects.

3. Arsenic: Arsenic toxicity can cause skin discoloration, cancer, and neurological damage.

4. Cadmium: Cadmium toxicity can cause kidney damage, bone demineralization, and cancer.

Microbiological Contamination:

1.Salmonella: Food poisoning due to Salmonella contamination can result in diarrhea, fever, and cramps.

2. E. coli: E. coli infection may result in food poisoning, which may lead to diarrhea, urinary tract infections, and kidney failure.

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Other Contaminants:

1.Aflatoxins: Aflatoxin contamination can cause liver damage, cancer, and neurological problems.

2.Polycyclic Aromatic Hydrocarbons(PAHs): PAH contamination can cause cancer, neurological damage, and reproductive problems.

Physical and Chemical Parameters:

1. Moisture content: High moisture content can lead to mold growth and contamination.

2. pH level: Turmeric with high pH levels can indicate contamination or adulteration.

3. Ash content: High ash content can indicate contamination with heavy metals or other impurities.

It should be pointed out that the above toxicity signs may charge according to factors such as the origin of the turmeric, manufacturing process, and storage. Ongoing testing and quality control process can assist maintaining the quality and safety of turmeric product.

The curcumin content was calculated as follows :

Curcumin content

%=

0.00025xA425x100x100/Standard's absorbance (0 .42) × sample weight × 5 (0.42 absorbance at 425 nm is equal to 0.00025 g curcumin)

Oleoresin (%):

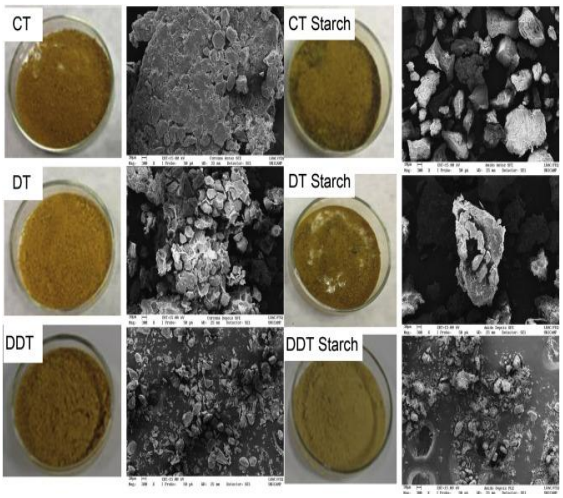
Oleoressin Content:

The oleoresin content was approximated according to the method provided by Ranganna (1986). The finely ground 25 g turmeric powder was poured into a glass column, which was stoppered by cotton plug on the narrow end. A thin cotton layer was covered over turmeric powder in the glass column and 25 ml of acetone was poured. Following the decantation, the red colored liquid in beaker holds all the major constituents of turmeric. The filtrate so collected was filled in a 250 ml volumetric flask and made up to volume with acetone. Turmeric extract was filled in a 250 ml beaker of known weight (W1) and was maintained in water bath at 50-600 C for 15-30 minutes such that acetone evaporates. Next, the weight of the beaker with contents was taken as W2 g. Weight of the oleoresin content in the (W1) turmeric powder was determined and presented in percentage by employing the following formula

%= W2-W1/ Weight of sample X100

Total phenols (mg/g)

Total phenols were estimated y employing Folin-Ciocalteus reagent, as described by Malick and Singh (1980). Approximately g of dry sample was shaken with 80% aqueous methanol (10 ml) on mechanical shaker for 2 h. The suspension was centrifuged at 1000 rpm for 15 min and the supernatant were transferred to polypropylene tubes. Evaporate the supernatant to dryness. Dissolve the residue in a known volume of distilled water (5 ml, pipette varying amounts (0.2 to 2 ml) into test tubes. Complete the volume in each tube to 3 ml with water, 2 ml of 20% Naco3 solution added to each test tube. Shake well, place the tubes in boiling water for just one min, at.



III. CONCLUSION

The quality assessment of turmeric spice reveals that several critical factors—including color, aroma, curcumin content, moisture level, and microbial load—play a vital role in determining its overall quality, safety, and market value. Through physical, chemical, and microbiological analyses, it becomes evident that high-quality turmeric is characterized by a vibrant yellow-orange hue, strong earthy aroma, high curcumin concentration, low moisture content, and absence of contaminants or adulterants.Ensuring quality in turmeric production and processing not only enhances its culinary and medicinal value but also supports consumer health and confidence. Adherence to standardized quality parameters and good agricultural and manufacturing practices (GAP and GMP) is essential for maintaining purity, potency, and shelf life of the spice. Overall, regular quality assessment is crucial for promoting turmeric as a reliable, safe, and effective spice both in local and

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global markets.Letme know if you'd like it shortened, more technical, or tailored for academic or commercial use!

Furthermore, the assessment highlights the importance of supply chain integrity, from cultivation to packaging. Factors such as soil quality, harvesting techniques, drying methods, and storage conditions all significantly influence the final product. Quality lapses at any stage can lead to reduced curcumin content, contamination, or spoilage, which not only affects flavor and color but can also pose health risks.With increasing global demand for natural and functional foods, turmeric has gained attention not just as a spice but also for its therapeutic properties, including anti-inflammatory and antioxidant effects. This elevates the need for stringent quality control to meet both domestic and international standards, such as those set by the Food Safety and Standards Authority of India (FSSAI), ISO, or Codex Alimentarius.

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