COMPARATIVE STUDY ON TURMERIC POWDER COMMERCIALLY AVAILABLE IN DIFFERENT PACKAGING

NAILA AKRAM, *ANILA ANWAR, RUBINA PARWEEN, FARAH KISHWAR, RABIA FARHEEN AND AMINA SULTANA

Department of Chemistry, Federal Urdu University of Arts Science and Technology, Gulshan -e-Iqbal Campus, Karachi, Karachi-75300, Pakistan.
**Corresponding author e-mail khan.anilaanwar@gmail.com*

خلاصہ

پیش نظر تحقیق ہلدی پاوڈر کے نمونوں پر کئی گئی ہے۔ جسمیں برانڈاور غیر برانڈ پیک اور پاوڈر نمونوں کو شامل کیا گیا۔ جبکہ خالص ہلدی کو خشک کر کر پاوڈر تیا کیا۔اور اسے کنٹرول کے طور پر استعمال کیا گیا۔ دھاتی مقداریں(Ca, Mg, Fe,)کو AOAC1996 کے طریقے کے ذریعے معلوم کیا گیااور طبعی اور کیمیائی خصوصیات pH, conductivity TDS,Moisture and ASh کو معلوم کیا گیا۔ مائکروایلمنٹ(Ca, Mg)کا ارتکاز معلوم کیا گیا بذریعہ پیچیدہ پے مائی معائرہ جبکہ Fe اسپیکٹرو میٹری کے ذریع معلوم کیا گیا۔

نتیجہ ظاہر کرتا ہیکہ pH, conductivity TDS,Moisture and ASh کی مقداریں بالترتیب6.760-5.823, 516-742181 S/cm, 2%, 7.435-9.445%, and 11.450-15.550%

جبکہ اوسطارتکاز(Ca, Mg, Fe,) کے بالترتیب-170 Ca, Mg and Fe were obtained in the range 176-190 mg/100g, 196mg/100g and 38.08-42.57mg/100g حاصل ہوئے۔

میٹل کونٹینٹ (RDI) کی حد میں پائے گئے۔ نتائج Statistically جانچ کے گئے بذریعہ t-test معلوم ہوا کہ Ca, Mg میں کوئی Signuificant فرق نہیں پایا گیا($P < 0.05$)۔ جبکہ آئرن میں Signuificant فرق پایا گیا($p > 0.05$)

Abstract

Present study used different packaging materials of turmeric powder including branded and unbranded available in local market. A pure turmeric rhizome was used as a control and subjected to analysis after grind in fine powder form. In this study, AOAC Official method (1996) was carried out to determine the metal content (Ca, Mg, Fe) and physiochemical parameters (pH, conductivity, total dissolved solid, moisture and ash). The concentration of macro elements (Ca, Mg) were determined by using complexometric titration, while (Fe) was analyzed by spectrophotometically. Results showed that the values of pH, conductivity, total dissolved solid, percentage of ash and moisture were recorded in the range of 5.823-6.760, 516-742µS/cm, 2%, 7.435-9.445%, and 11.450-15.550% respectively, While average concentrations of Ca, Mg and Fe were obtained in the range 176-190 mg/100g, 170-196mg/100g and 38.08-42.57mg/100g respectively. It was observed that metal content are within RDI (Recommended Daily Intake) values. The results were statistically analyzed using analysis of t-test indicate that concentration of Ca,Mg ($P < 0.05$) there was no significant difference determined among the different sample, however level of Fe ($p > 0.05$) was significant difference in all turmeric samples.

Introduction

Curcuma longa (Turmeric), belonging to Zingiberaceae family is one of the most useful herbal medicinal plants (Nasri *et al*., 2014). Turmeric is one of the most essential spices all over the world and it is being distinguished for human use particularly in the 4 Eastern civilizations (Ravindran *et al*., 2007). The most important chemical component of turmeric are a group of compounds called Curcuminoids, which include curcumin (diferuloylmethane), demethoxycurcumin, and bisdemethoxycurcumin (Vyas, 2015). Curcumin makes up approximately 90% of the curcuminoid content in turmeric. Other constituents include sugars, proteins, and resins (Louay.2014). Curcumin has ability to lower cholesterol, and to stimulate the eproduction of bile, which is needed to digest fat and to protect the liver from the damaging effects of toxic chemicals and pharmaceutical drugs (Randhawa, 2008). Turmeric and curcumin has been proven to be powerful suppressors of cancer growth (Vyas, 2015). Current traditional medicine claims that turmeric powder is useful in gastrointestinal diseases, especially for biliary and hepatic disorder, diabetic wounds, rheumatism, inflammation, sinusitis, anorexia, coryza and cough (Nasri *et al*., 2014). It is used as a medicine to treat a wide variety of ailments including stomach ache, skin problems, muscular problems and arthritis. Curcuma longa has also been used as a clothing

dye and as a cosmetic (Kapoor, 2000). It is traditionally accepted that turmeric is a potent antioxidant and anti-inflammatory agent (Pal *et al*., 2001).

Increments of environmental pollution reduce the quality of raw as well as processed food. The widespread contamination of turmeric with heavy metals in the last decades has been raised, hence it is important for consumers to aware their hazardous effects on human health. The present study was designed to investigate the physiochemical characteristics (pH, conductivity, total dissolved solid) and level of macro elements and trace metals in the various sample of commercially available Turmeric powder. Recent research has focused on curcuminoids, the specific compounds in turmeric including curcumin which give turmeric its orange-yellow color.

Materials and Methods

Determination of physiochemical properties

A known amount (1.00g) of turmeric powder from each sample was dissolved in 100ml distilled water and heterogeneous mixture was obtained (Satishkumar *et al*., 2015). The pH and conductance were determined by using instruments (Jenway 3510PM, UK) (Jenway 4510CM, UK).

Determination of total dissolved solid was carried out by taking 1g of sample dissolved in 100ml of distilled water. Filtered the solution by means of whatt man filter paper, than dried in oven at 100 ^{o}C and weighed. The moisture content was determined by taking a small amount (1.00g) of samples in cleaned standard vials and kept in oven 100± 5^{o}C for 2 hour, placed in desiccators until the room temperature achieved and weighed. The same process was repeated until the constant weight obtained. The percentage of moisture can be calculated as follow,

% of moisture= (loss in weight in sample/weight of wet sample) x100

Dry Ashing

In the dry ashing method water and other volatile materials are vaporized while organic substances are oxidized in the presence of the oxygen in air to CO_2, H_2O and N_2. Minerals which have low volatility can be digested using dry ashing method because even at high temperature they are not volatilized (Yeshajahu, 1994). The percentage of ash in samples was determined by muffle furnace method (AOAC, 1995).Take known amount (10.00gm) of sample in porcelain crucible. Charred on low flame then high flame and then kept in furnace at 550 ^{o}C for 2 hr, Ash content was obtained. Further ash content was utilized for the determination of metal content by digestion of ash content in 2M HNO_3.

Preparation of sample solution for metal content determination

Dissolved sample (Ash) in 2M HNO_3 and transferred to 250ml volumetric flask, made the volume up to mark with distilled water and tagged as stock of sample solution.

Determination of Ca & Mg by complexometric titration

First for Ca^{2+} analysis, fill the burette with standard EDTA. Take (10mL sample solution), 40mL of distilled water 1kg KOH solution, one pinch of calcon indicator were added and then titrate until color turn from red to blue. For Mg^{2+}, an appropriate volume of sample solution (approx. 10mL) was taken in 250ml conical flask, excess amount of distilled water, 0.25gm of hydroxyl ammonium chloride, appropriate buffer solution of pH= 10, one drop of indicator EBT were added, appeared pink color solution and titrated directly with the standard EDTA solution, now added 0.25g NaF in conical flask again titrated with standard EDTA solution color should be remain same. Then again titrated with standard solution of Mn^{+2} blue color become changes in to pink and evaluated the end point.(Jeffery *et al*., 1989)

Determination of iron by spectrophotometer

Dissolved (0.7022g) ammonium iron (II) sulphate in 100ml distilled water, and 5mL of 1:5 H_2SO_4. Aliquots (3mL, 6mL, 9mL, 12mL and 15mL) of standard solution of Fe^{2+} were taken in 50ml volumetric flask separately, then added 5mL KSN and 3ml HNO_3 to each aliquots and made the volume up to the mark with distilled water and coded.

Appropriate volume of sample solution was taken in 50ml volumetric flask, and then added 5mL KCN and 3mL HNO_3 then made the volume up to the mark with distilled water. Absorbance was noted at 480nm by using spectrophotometer and calibration curve was drawn between absorbance and standard aliquots concentration of Fe^{2+} and finally concentration of iron in samples was determined.((Jeffery *et al*., 1989)

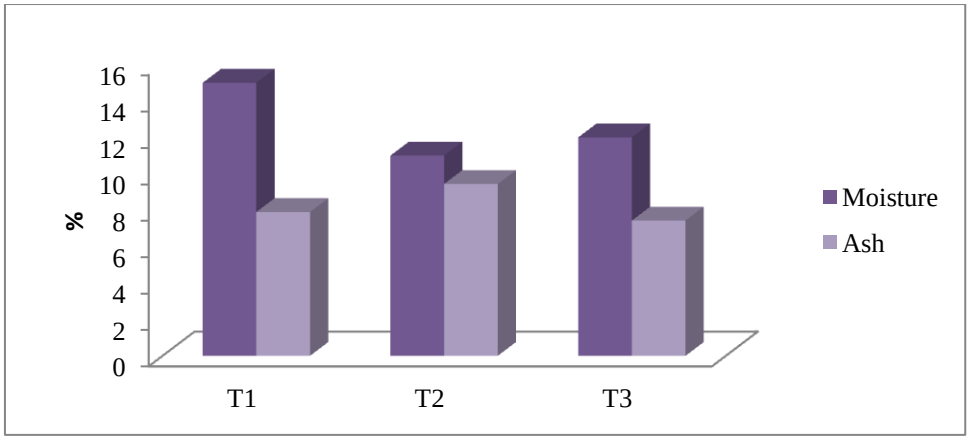

Fig.1 shows percentage of Moisture and Ash in Turmeric Sample

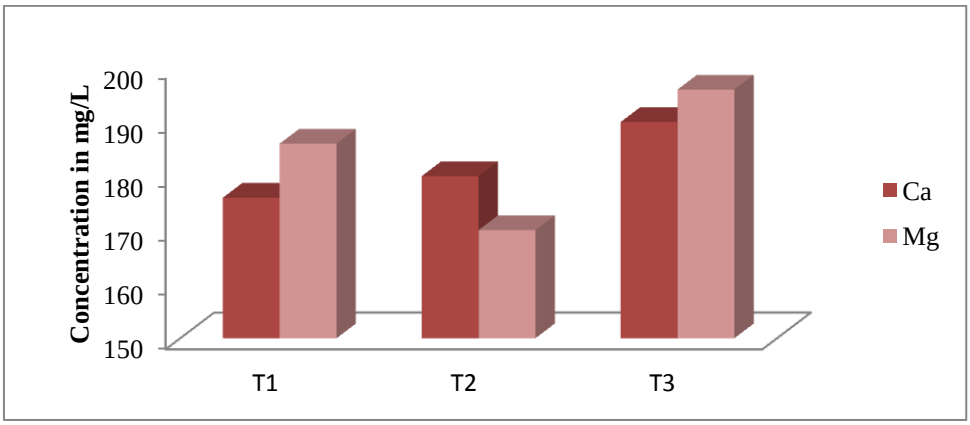

Fig. 2 shows concentration of Macro elements in Turmeric Sample

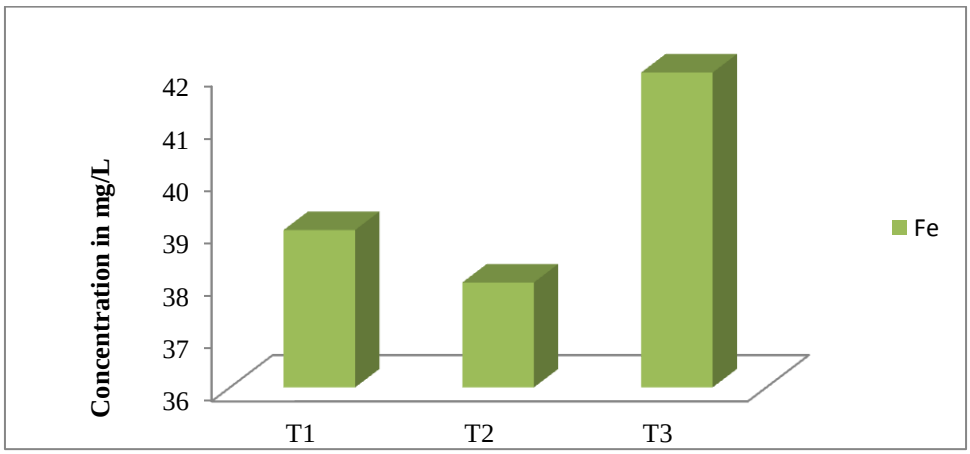

Fig. 3 concentration of Fe^{2+} in Turmeric Sample

Results and discussions

Present research shows that the pH of turmeric samples is found to be acidic (Table 1) and results are within the reported study Etudaiye *et al.,* (2015). The pH of the sample depends on the maturity of the plant, soil type, harvesting conditions and freshness of the sample (Shadaksharaswamy *etal*.,2011) Range of conductivity was noted as 5016µS/cm to 742µS/cm.. Conductivity does not have direct impact on human health. It is determined for several purposes such as determination of mineralization rate such as potassium, calcium, and sodium (Rahmanian *et al.,* 2015)**.**

The observed level of total dissolved solid in different three samples was found to be 2% (Table. 1).Total dissolved solid contains electrolyte and salt of metals, solid contents of food stuffs are associated to their food values, and better the solid content of the food greater is its nutritional value (Ikegw and Ekwer, 2009).

Moisture percentage indicates presence of water in sample. Moisture results have been found (Figure 1) within the reported work by Ikpeama andEkwer (2014).

Table 1: Physiochemical properties of Turmeric samples.

PH	Conductivity µs cm^{-1}	Total dissolved solid %	Moisture	Ash
6.760	738	2	15.500±1.273	7.940 ±0.085
5.823	516	2	11.450±0.071	9.445 ±0.346
6.420	742	2	12.720±0.000	7.435±0.2621

Table 2: Concentration of metals in mg per 100gram

Ca	Mg	Fe
176.00 ±22.63	186.00±8.49	39.453 ±0.552
180.00 ±28.28	170.00±14.14	38.084 ±0.084
190.00 ±14.14	196.00±5.66	42.577 ±42.577

Ash content of turmeric shows that turmeric will contain reasonable amount of mineral and result was found within the range of some reported range. (Ikpeama *et al*., 2014). Nisar *et al*., (2015) However, there are variations in reported values of ash in turmeric powder that reflect the fact that influence of several factors like environmental and geographical factors**.**

Range of concentration of calcium was noted 176 mg/100g – 190mg/100g. The concentrations of magnesium in three different samples of Turmeric were found to be, 186.00mg/100g inT_1, 170.00mg/100g in T_2, and 196.00mg/100g in T3 in table 2. .The observed range of mean concentration of iron was noted 39.453mg/100g, 38.084453mg/100g and 42.577mg/100. It was observed that metal content are within RDI (Recommended Daily Intake) values.(Millikan, 2012)The results were also statistically analyzed using analysis of t-test. Results indicate that concentration of Ca, Mg ($P < 0.05$) there was no significant difference were determined among the different sample, however level of Fe ($p > 0.05$) there was significant difference in all turmeric sample

Conclusion

The results of physiochemical parameters, showed that the locally available Turmeric samples are pure and have good shelf life. The current study disclosed that Turmeric powder enhances the nutrition of foods as it has suitable level of ash and contain valuable level of Ca, Mg and Fe.It can be concluded that the majority of widely used turmeric brands are permissible limit of macro and micro minerals.

References

AOAC, (1996), Official Methods of chemica Analysis, (16th Edn.), VoII.Association of Officil

Ahamefula, I., Onwuka, G.I. and Chibuzo, N. (2014). Nutritional Composition of Turmeric (*Curcuma longa)* and its Antimicrobial Properties. *Int. J. Sci. Eng. Res.* 5(10):1085-1089.

Etudaiye, H., Adinoyi, U., Chukwuma, S. and Adeyemi, O. (2015). Possible short term storage effect on some chemical properties of locally processed turmeric powder in South-eastern Nigeria. *Asian J. Plant Sci. Res.* 5(7):6-12.

Ikegwa, O.J. and Ekwer, F.C. (2009). Thermal and physical properties of some tropical fruit and their juice in Nigeria. *J. F. technol*. 7: 38-42.

Jeffery,G.J., Jamandham, B. and Dennay, R.C. (1989). Vogel text book of quantitative analysis. Addiswesleylonyman, New York 5th edition. page.309-311,690,691.

Kapoor, L.D. (2000). Handbook of Ayurvedic Medicinal Plants. USA: CRC Press, Boca Raton 1-12.

Louay, L. (2014). Medicinal and pharmacological properties of Turmeric *(Curcuma longa):* A review. *Int J Pharm Biomed Sci.* 5(1):17-23.

Millikan, M. (2012). Nutritional metal in foods by AAS (8). School of engineering science, Fohes and ISI Victoria University Australia, pp. 143-165.

Nadadur, S.S., Srirama, K. and Mudipalli, A. (2008). Iron transport and homeostasis mechanisms: Their role in health and disease. *Indian j Med Res*, pp. 533- 544

Nasri, H., Sahinfard, N., Rafieian, M., Rafieian, S., Shirzad, M. and Rafieian-kopaei, M. (2014). Turmeric: A spice with multifunctional medicinal properties. *J Herb Med Plarmacol.* 3(1): 5-8.

Pal, S.T., Choudhuri, S., Chattopadhyay, A., Bhattacharya, G.K., Datta, T. and Das, G.S. (2001). Mechanisms of curcumin-induced apoptosis of Ehrlich's ascites carcinoma cells. *Biochem. Biophys. Res. Commun.* 2; 288(3): 658-65..

Rahmanian, N., Ali, S.H., Homoyoonfard, M., Ali, N.J., Rehan, M., Sadaf, Y. and Nizami, A.S. (2015). Analysis of physiochemical parameters to evaluate the Drinking Water Quality in the state of Perak, Malaysia. *J. Chem.* Article ID 716125, 10 pages http://dx.doi.org/10.1155/2015/716125

Randhawa, M.A. (2008). Black seed, Nigella sativa, deserves more attention. J. Ayub Med. Coll, Abbott bad, 20: 1 -2.

Ravindran, P.N., Babu N.K. and Sivaraman, K. (2007). The golden spice of life Turmeric: The Genu+s Curcuma. USA: CRC Press, Boca Raton: 1-14.

Shadaksharaswamy,M. ‹Manay N.S.(2011). Food, facts and principles, New Age international publisher. New Age International, 3rd Edition,.. pp. 520

WHO(1998).Vitamin and mineral requirements in human nutrition, 2nd edition. pp. 59-272.

Vyas, K. (2015). The Cure is in the Roots: Turmeric. *J Nutr Disorders Ther*. 5: 16

Yeshajahu, P and Melon,C.E (1994). Food Analysis Theory and Practical, 3rd edition,.1-30