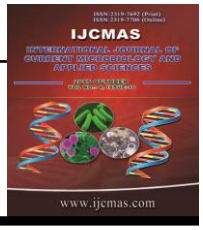
Int.J.Curr.Microbiol.App.Sci (2015) 4(10): 839-843

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 4 Number 10 (2015) pp. 839-843**
http://www.ijcmas.com



Original Research Article

Heavy Metal Deposition and Phytochemical Characterization of Curry Leaves (*Murraya koenigii*)

V.G. Vyas*, U.K. Kandoliya, S.I. Vidhani, H. J. Parmar, V.M. Bhalani, and B.A. Golakiya

Elemental Cell, Food Testing Laboratory, Department of Biotechnology, Junagadh Agricultural University, Junagadh, India
**Corresponding author*

Keywords

Murraya koenigii, Heavy metal, Phyto chemicals, Phenol

A B S T R A C T

Indian cooking basically contains a handful of herbs like Murraya koenigii which help to enhance the flavor of the dish. But there is more to the humble curry leaf than simply flavor. Leaves in present investigation contains major nutrient like N, P, K, S and Na were 2.95 %, 0.67 %, 0.34 %, 1.97 % and 0.88 percent respectively. On dry weight basis, it contains 18.49 % total protein, 4.81 % total fat and almost 68.66% total carbohydrate. The leaves also contains comparable amount of antioxidant like ascorbic acid, flavonoid and total phenol as well as linolenic acid, PUFA, which is very good for health.

Introduction

The curry tree (*Murraya koenigii*) is a tropical to sub-tropical tree in the family *Rutaceae*, which is native to India and Sri Lanka. Its leaves are used in many dishes in India and neighboring countries. Indian cooking basically contains a handful of herbs which help to enhance the flavor of the dish. Curry leaves is the common ingredients in Indian cooking added in the end to garnish the dishes. Often used in curries, the leaves are generally called by the name "curry leaves", though they are also translated as "sweet neem leaves" in most Indian languages (as opposed to ordinary neem leaves which are bitter). The leaves of *Murraya koenigii* are also used as an herb in Ayurvedic medicine. They are believed to also have an adjuvant action on non-insulin dependent diabetics (people with type- 2 diabetes). Curry leaves have a great impact as anti-carcinogenic action (Farhath. *et al.*, 2000). Curry leaves have properties that can help in lowering one's blood cholesterol levels (Jing-Tian Xie *et al,* 2006). Curry leaves is a staple in Indian dishes, commonly used as seasoning, this leaf adds a special flavour to every dish it is added to. But there is more to the humble curry leaf than simply flavor. Packed with carbohydrates, fiber, calcium, phosphorous, iron, magnesium, copper, minerals and vitamins like nicotinic acid and vitamin C, vitamin A, vitamin B, vitamin E, antioxidants, plant sterols, amino acids, glycosides and flavonoids, curry leaves help your heart function better,

fights infections and can enliven your hair and skin with vitality. Thus the present work is planned to evaluate nutritional composition and fill the niche areas which has to be systematically filled in research works related to *Murraya koenigii*.

Materials and Methods

The leaves of *Murraya koenigii* was collected from three different places of local market of Junagadh and treated as replication. The amount of reducing, total carbohydrates and true protein was estimated as per Nelson (1944), Anthrone reagent (Hedge & Hofreiter, 1962) and Folin-Phenol reagent (Lowry *et al.*, 1951) methods respectively. The phenol content in was determined by method of Malik and Singh (1980) using methanolic extract. Standard graph was prepared for quantification using gallic acid as a standard. Results of total phenol were expressed as mg of gallic acid equivalents per gm of fresh weight of sample. Total Ascorbic acid was quantified according to the method described by Omaye *et al.*, (1979). Total ascorbic acid was ex-pressed in mg per 100g leaves sample. Total Flavonoid was estimated using 1 ml of methanolic extract in which 0.5 ml of 2% w/v $AlCl_3$ in methanol and 0.5 ml potassium acetate (120 mM) were added and incubated at room temperature for 30 minutes. Absorbance was read at 415 nm. Quercetin was used as a standard and the results were expressed as mg of quercetin equivalents per gm of fresh weight sample Chanda and Dave (2009).

The dry leaves of *Murraya koenigii* was used for oil estimated following the method outline by AOAC., (2005). Oil was extracted from dry leaves by soxhlet extraction in hexane as solvent. The extracted oils were dried under reduce pressure in rotary evaporator to make free from solvent. Oils were stored at -20 ºC until prior to use for fatty acid profile. The nutritional data were expressed on dry weight basis.

Plant samples were analysed for N by micro-Kjeldahj using Automatic Digestion, Distillation System (Vap 50s Gerhardt), Total P by vanado molybdo phosphoric yellow color method using spectrometer method and K by mix acid (perchloric acid and nitric acid) digestion and flame photometry as described by Jackson (1973).

Fatty acid profile of *Murraya koenigii* leaves oil

The fatty acids profiles were determined by GC-MS. Fatty acid methyl esters were prepared using BF3 methanolic solution and extracted with hexane (Viorica *et al.*,2012). GC-MS analyses were performed as per method described by Viorica *et al.*(2012) with some modification. GC-MS analyses were performed by Food Testing Laboratories using a Shimdzu model QP2010 quadruple mass spectrometer detector. The GC column was a DB-5, 30m, 0.25µ m capillary. The initial column temperature was 60°C. The temperature program was 12ºC per minute with one minute hold time when rich at 150ºC. A final temperature was 240°C per minutes with hold time at five minutes and the mass spectrometer detector analyses. The ion source temp was 230 ºC. Interface temp was 240ºC and the solvent cut time was 2 minutes. For the identification of the compounds the mass spectra of the samples were compared with those Mass Spectral Library as well as the fatty acids composition was quantified using appropriate standards.

Results and Discussion

The major nutrient content of curry leaves

viz., N, P, K, S and Na were 2.95 %, 0.67 %, 0.34 %, 1.97 % and 0.88 percent respectively (Table 1) The proximate contents of total protein, total fat, and total carbohydrate were 18.49, 4.81, and 68.66 percent respectively. Leaves also contains total phenol (3.21 mg/g), ascorbic acid (23.41 mg/100g) and total flavonoid (17.38 mg/g) which were associated with higher antioxidant capacity. The results indicate that vegetables containing high phenolic may provide a source of dietary antioxidants. The phenolic compounds may contribute directly to the antioxidant action; therefore, it is necessary to investigate total phenolic content (Kandoliya *et al.*,2015). The heavy metal contents Cadmium (Cd), Chromium (Cr), Lead (Pb), Arsenic (As) and Mercury (Hg) were 0.01 ppm., 2.24 ppm 0.50 ppm 6.42 ppm and 1.08 ppm. Trace element were analysed by ICP - MS. Out of these heavy element Cd and Pb were below described limit, the content of Cr, As, and Hg was beyond the prescribed limit (Table.2). As per Internationnal Standard prescribed limit of Cd, Cr, Pb,As and Hg were 1.5 ppm, 1 ppm, 6 ppm, 1.4 ppm and 0.5 ppm (Awasthi. 2000). Food chain contamination by heavy metals has become a burning issue in recent years because of their potential accumulation in biosystems through contaminated water, soil and irrigation water. In fixed oil, fatty acid profiling of 10 fatty acids was done on GCMS (Table 3, Fig.1) among them as per GCMS chromatogram, methyl ester of linolenic acid was maximum (1545 ppm) followed by Oleic acid contributing 276.03 ppm. The lowest amount of fatty acid was noted for linoleic acid (14.53 ppm). Linolenic acid is a PUFA, omega-6 fatty acid, which is very good for health.

Over all, leaves of *Murraya koenigii* is a comparable good quality having number of valued fatty acids which is medicinally important.

Table.1 Nutritional composition of curry leaves

Parameter	**Concentration***	**Micro-nutrient**	**Concentration (ppm.)**
Total Protein	18.49±1.42 %	Mn	39.85±2.86
Total Fat/oil	4.81± 0.03 %	Zn	18.32±1.32
Total Carbohydrate	68.66±2.59 %	Cu	11.61±0.62
Reducing Sugar	3.58±0.14 %	Mo	2.06±0.11
Total phenol	3.21±0.09 mg/g	Ni	5.86±0.35
Ascorbic acid	23.41 ±0.76 mg/100g	Li	0.20±0.07
Total Flavanoid	17.38± 0.58 mg/g	Al	Trace
Total N	2.95±0.15	Mg	Trace
Total P	0.67±0.04		
Total K	0.34±0.02		
Total S	1.97±0.09		
Total Na	0.88±0.03		

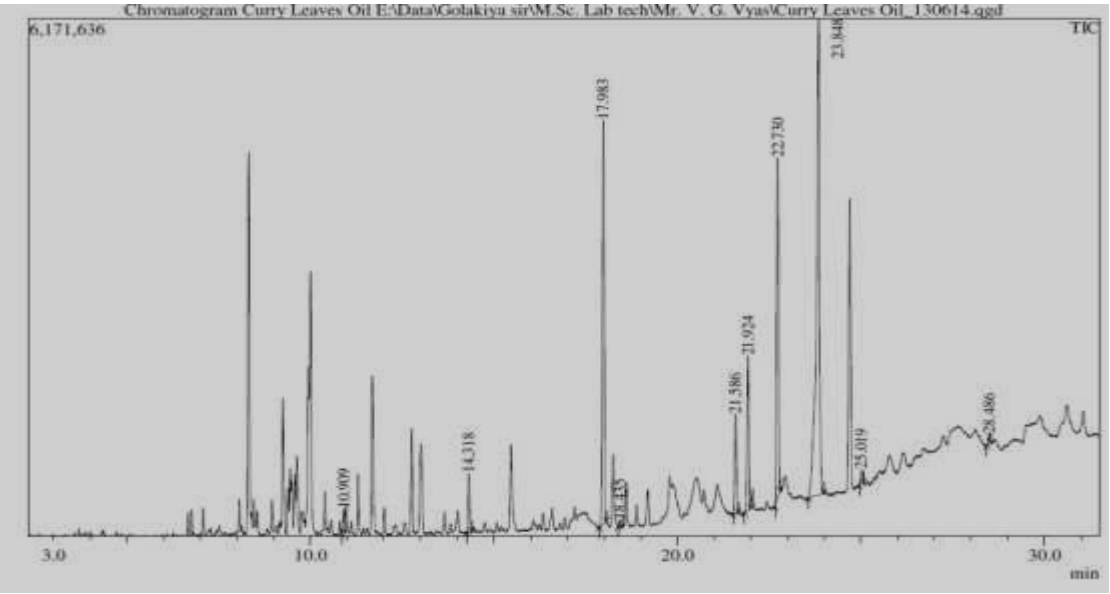
Table.2 Heavy metal contamination detected in curry leaves

Heavy metal	Concentration (ppm.)
Cd	0.012±0.002
Cr,	2.243±0.023
Pb	0.502±0.015
As,	6.621±0.324
Hg	1.086±0.049

Table.3 Fatty acid profile from oil of curry leaves

Peak	R.Time	Curry Leaves (ppm)	Name
1	10.91	39.63	Lauric acid, methyl ester
2	14.32	114.73	Myristic acid, methyl ester
3	17.73	15.14	Palmitic acid, methyl ester
4	18.43	18.30	Palmitoleic acid, methyl ester
5	21.59	176.41	Stearic acid, methyl ester
6	21.92	276.03	Oleic acid, methyl ester
7	22.58	14.53	Linoleic acid, methyl ester
8	23.85	1545.51	Linolenic acid, methyl ester
9	25.02	51.89	Arachidic acid methyl ester
10	28.49	59.09	Behenic acid, methyl ester

Figure.1 Chromatogram of Curry leaves oil



Reference

Association of Official Analytical Chemists (AOAC) (2005). Official Methods of Analysis of AOAC International. 18th Edition. Maryland, USA: AOAC International.

Awasthi, S.K., 2000. Prevention of food Adulteration Act No. 37 of 1954. Central and State Rules as Amended for 1999, third ed. Ashoka Law House, New Delhi

Chanda, S., and Dave. R. (2009).In vitro models for antioxidant activity evaluation and some medicinal plants possessing antioxidant properties: An overview. *Afr. J. Microbiol. Res.*, **3**:981-996.

Farhath-Khanum, K.R.A., Sudarshana-Krishna, K.R., Viswanathan, K.R., and Santhanam, K. (2000). Anticarcinogenic effects of curry leaves in dimethylhydrazine treated rats. Plant Food and Human Nutrition 55: 347-355.

Hedge, J.E. and Hofreiter, B.T. (1962). In: Methods in Carbohydrate Chemistry. Vol.17, (Eds.,) Whistler, R.L. and BeMiller, J.N., Academic Press, New York, p. 420.

Jackson, M. L.(1973). 'Soil Chemical Analysis'. Prentice Hall of India Pvt Ltd, New Delhi.

Jing-Tian Xie, Wei-Tien Chang, Chong-Zhi Wang, Sangeeta R. Mehendale, Jing Li, Ramalingam Ambihaipahar, Umadevi Ambihaipahar, Harry H. Fong, Chun-Su Yuan (2006). Curry Leaf (Murraya koenigii Spreng.) Reduces Blood Cholesterol and Glucose Levels in ob/ob Mice. Am. J. Chin. Med. 34, 279.

U.K Kandoliya, N.P Bodar, V.K Bajaniya, N.V Bhadja, B.A Golakiya (2015). Determination of nutritional value and antioxidant from bulbs of different onion (Allium cepa) variety: A comparative study. *Int. J. Curr. Microbiol. App. Sci*, **4**(1):635-641.

Lowry, O.H., Rosenbrough, N.J., Farr, A.L. and Randall, R.J. (1951). Protein measurement with folin- phenol reagent. *J. Biol. Chem.*, 193, 265-275.

Malik, C. P. and Singh, M. B. (1980). In : Plant Enzymology and Histo-Enzymology. Kalyani Publications, New Delhi.

Nelson, N. (1944) A photometric adaptation of somogyi method for determination of glucose. J Boil chem. 135: 375-380

Omaye, S.T., Turnbull, J.D., and Saubelich, H.E., (1979) Selected Methods for the determination of Ascorbic Acid in Animal Cells, Tissues and Fluids," Methods in Enzymology. **62** (1): 3-10.

Viorica M.P, Alexandra G., Diana N. R., Delia D., Camelia M., Despina B. and Constantin M. (2012). Journal of Agroalimentary Processes and Technologies 2012, 18 (2), 136-140.