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Original Article

Functional And Nutraceutical Characterization Of Cinnamon

Maryam Shahzadi[1], Bahisht Rizwan[1], Tabussam Tufail[1], Shahnai Basharat[1], Sanober Shehzadi[2]

[1]University Institute of Diet and Nutritional Sciences, The University of Lahore, Pakistan
[2]University Institute of University Institute of Physical Therapy, The University of Lahore, Pakistan
Tabussam.tufail@dnsc.uol.edu.pk

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***Corresponding Author:**
Dr. Tabussam Tufail
University Institute of Diet and Nutritional Sciences, The University of Lahore, Pakistan
Tabussam.tufail@dnsc.uol.edu.pk

ABSTRACT

Cinnamon has been using as a fragrant plant and spice. Cinnamon is a member of family Lauraceae. Cinnamon has been used as a traditional medicine to reduce blood glucose level in diabetes and to control Blood pressure, Tumor Growth, Parkinson's and Alzheimer's diseases. Cinnamon nutritional composition revealedthat it contained a significant value of mineral, vitamins, and the main bioactive component is cinnamaldehyde. Cinnamon caloric content was determined as ofcarbohydrate (CHO), protein, fat, fiber, moisture and ash. Cinnamon contained the uppermost amount of carbohydrate(53.37%) in T1 and the lowermost amount of ash (1.25%) in T3. The mineral content of macro-elements and micro-elements were determined fromchromium (Cr), manganese (Mn), iron (Fe), zinc (Zn), magnesium (Mg), phosphorus (P), calcium (Ca), potassium (K) and sodium (Na). The content of minerals in Cinnamon contained the highest amount of potassium (135.2) in T1 and the lowest sodium in T2. The content of vitaminsin Cinnamon contained the fat-solubleand water-soluble vitamins A, K, E, D, β-caroteneand C, B12, B9, B6, B3, B2, B1were determined. Amongst the vitamins, cinnamon contained the uppermostvalue ofβ-carotene (112) and the lowermostvalue of vitamin B6 (0.158). Bioactive compounds of Cinnamon were determined cinnamaldehyde, cinnamyl acetate, β-caryophyllene and coumarin. Among the bioactive compounds in Cinnamon contained the uppermostvalue of cinnamaldehyde (64.56). The antioxidant capacity of cinnamon bark extract was (49 µg/mL). Conclusively,cinnamon is enriched with nutritional values. So, it can be used in the treatment of various disease.

INTRODUCTION

Cinnamon is commonly known as "Dalcini" [1].The cinnamon name comes from a Greek word meaning sweet wood [2]. Cinnamon is a member of the family Lauraceae. Cinnamon bark has been used as a spice and as a sweet as well as savory aroma from antiquity. Botanical name Cinnamomum is derived as of the Hebrew as well as Arabic words amomon, meaning spice plant. Worldwide, there are about 250 species of the Lauraceae family of Cinnamomum; however, only a small number of varieties of Cinnamomum are grown for commercial purposes. Among them,four varieties commonly used as spices include Cinnamon Verum, Cinnamon Cassia, Cinnamon burmanni Blume, as well asCinnamon loureiroi[3]. Cinnamon is growing as of 20 to 30 feet;the leaves are dark green at the top and light green at the bottom. The fruit is dark, pulpy, and fragrant. The flower is small and in yellow colour [4]. Worldwide, Cinnamon is produced at about 27,000-35,000 tons annually. It is a hardy plant that is grown mainly in different climates at a good temperature of between 20 and 30º C between 1250 and 2500 mm with dried seeds and crop dispersal [5]. Cinnamaldehyde, is a major bioactive component of Cinnamon, is primarily responsible for providing flavor, aroma as well as flavor in food [6].It also provides defense in contradiction of microbial infections, oxidative stress and other chronic diseases [7].It can be added to the diet in the form of whole or ground material ingredients or as extracts or oils found in cinnamon leaves or bark [8] There are several ways of use for Cinnamon in a kitchen, and cinnamon can be

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utilized to make perfumes, incenseas well as pharmaceuticals [9]. Antioxidant, antimicrobial, antitumor and anti-inflammatory and other spice properties have been reported in several studies. Cinnamon-based products bioactive content is nowenticinga great attention, both by consumers and industry. The diversity of plant chemicals, plant extracts and essential oils are responsible for many biological functions and possible uses [10]. Cinnamon, delivertrace elements, fiber, protein, vitamins, C, B, A, minerals, phosphorus, sodium,iron, potassium, calcium, as well as chemical compounds that are acknowledged to promote health facilities and prevent disease [11]. The study aimed to identify the Cinnamon chemical composition as well as mineral profile to assess its nutritionalvalue,in human health it plays a prominent role as the spice, so aimed to findthe nutritional composition of cinnamon. It is a very useful herb. Considering cinnamon as a common herb but it has many health benefits. Many different diseases can treat through the use of cinnamon. Spice Cinnamon is responsible for biological functions and possible uses.

METHODS

Collection of sample: A sample ofCinnamon was procured from local market of Lahore Cinnamon bark was taken and ground into a powder using a grinding machine.

Chemical analysis: After delivering the samples to the same size, Cinnamon was investigatedfor its chemical composition, i.e., crude protein, crude fat, crude fibre, moisture and ash was quantified consistent with its relevant procedures [12].The nitrogen-free extract (NFE) i.e., carbohydrates (CHO) wasquantified by the method of difference and performed in Lab 102, University Institute of Diet & Nutritional Sciences, The University of Lahore.

Moisture Content: A sample was collected of Cinnamon, and it was analyzed for its moisture content using hot air oven (Memmet Germany) at a temperature of 105±5°C as stated bymethod No. 44-I5A [13].

Protein Content: Samples should be taken, and the content of protein in the cinnamon sample was obtained by usingmethod of Kjeldahl's according to method No 46-10 [14].

Fat Content: The fat content was observed, and a sample was taken for the determination of fat content.The instrument that was used is the Soxhlet apparatus according to method No. 30-25 [15].

Fibre Content: The cinnamon sample was taken for crude fibre analysis by adopting the procedure mentioned in method No. 32-10 [16].

Ash Content: Ash content was observed with the use of muffle furnace through heating to constant weight at a temperature of 550 C as mentioned in method No. 08-0 [17].

Nitrogen Free Extract (NFE): The nitrogen-free extract (NFE) was quantified by deducting the %ages of total ash, crude protein, crude fat, crude fibre and moisture from 100.

Mineral Content: Mineral content of macro-minerals Magnesium (M), Potassium (K), Phosphorus (P), Calcium (Ca), Sodium (Na), micro-minerals Manganese (M), chromium (Cr), Zinc (Zn), Iron (Fe) of Cinnamon was assessed with the use of atomic absorption spectrophotometer (Perken Elmer) by adopting the procedure given in AOAC (1990) [18].

Vitamin Content

Water-soluble vitamins : Water-soluble vitamin for example vitamin B9 (niacin), vitamin B6 (pyridoxine), vitamin B2 (riboflavin), vitamin B1 (thiamin) were obtained using the method of high-pressure liquid chromatography (HPLC) and Application Note: 1994 of DionexVydacas stated by Finglas and Foulks (1984) and Kamman, Wanthesen, and Labuza (1980) [19,20].

Fat-soluble vitamins: Fat-soluble vitamins for example vitamin E, A were obtained using method of high-pressure liquid chromatography (HPLC) according to Manz and Philipp (1981) [21].

Bioactive compounds: Cinnamaldehyde, cinnamyl acetate, β-caryophyllene and coumarin were determined.Using a method of gas chromatographic-mass spectrophotometric (GC-MS) aimed at the extraction as well as analysis for components of spice Cinnamon [22].

Total Antioxidant Capacity Test: Total antioxidant capacity test (Blois, 1958) was performed using diphenyl2-picrylhidrazyl (DPPH) and vitamin C as the comparative standard.Using a spectrophotometer, the total antioxidant capacity test was determined [23].

Statistical Analysis: Data attained from each parameter was subjected to statistically analyzed using SPSS 25-version.

RESULTS

This study was conducted to attained the nutritional amount of spice Cinnamon found locally, commonly called *Darchini*. Determination of the proximate analysis of spice Cinnamon was done by using standard procedures then presented in Table1.

Treatments	Moisture %	Protein %	Fat %	CHO %	Fiber %	Ash %
T1	6.4	4.51	3.55	53.37	24.48	2.25
T2	5.9	4.01	3.05	52.87	23.98	1.75
T3	5.4	3.51	2.55	52.37	23.48	1.25

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Table 1. Proximate Analysis of Cinnamon

Results of Table 1 revealed that proximate analysis of Cinnamon include content of moisture, protein, fat, carbohydrate,fiber and ash range were 6.4%, 4.51%, 3.55%, 53.37%, 24.48%, 2.25%.In T2, the content of moisture, protein, fat, nitrogen-free extract, i.e.,carbohydrate, fiber and ash range, were 5.9%, 4.01%, 3.05%, 52.87%, 23.98%,1.75%. Whereas in T3, thecontent of moisture, protein, fat, nitrogen-free extract, i.e.,carbohydrate, fiber and ash range, were 5.4%, 5.25%, 2.55%, 52.37%, 23.48%, 1.25%respectively. The results obtained revealed that spice Cinnamon contain high content of carbohydrate. The content of protein and fat was lower as compared to carbohydrate. Correspondingly, another study by Gul Set al.,(2009)found in Cinnamon, the content ofmoisture, protein, fat, carbohydrates, fiber and ash were range as5.1%, 3.5%, 4.0%, 52%, 33.0, 2.4% and respectively.

Mineral Content: Determination of mineral content of spice cinnamon was done by using the standard procedures then presented in Table 2.

	Microminerals				Macrominerals				
Treatments	Iron	Zinc	Chromium	Manganese	Calcium	Magnesium	Potassium	Sodium	Phosphorus
T1	7.5	3.1	0.9	20.6	84.3	86	135.2	0.5	42.9
T2	7.0	2.6	0.4	20.1	83.8	85.5	134.7	0	42.4
T3	6.5	2.1	-0.1	19.6	83.3	85	133.7	-0.5	41.9

Table 2: Mineralscontent of Cinnamon

The table 2 showed that the cinnamon containsiron, zinc, chromium, manganese, calcium, magnesium, potassium, sodium and phosphorus the mineral contents range were 7.5, 3.1, 0.9, 20.6, 84.3, 86, 135.2, 0.5, 42.9 in T1 and iron, zinc, chromium, manganese, calcium, magnesium, potassium, sodium and phosphorus the mineral contents range were 7.0, 2.6, 0.4, 20.1, 83.8, 85.5, 134.7, 0 and 42.4 mg/g in T2. Whereas iron, zinc, chromium, manganese, calcium, magnesium, potassium, sodium and phosphorus, the mineral contents ranges were 6.5, 2.1, -0.1, 19.6, 83.3, 85, 133.7, -0.5 and 41.9, respectively. Mineral'scontent of spice Cinnamon include the uppermostvalue for potassium whereas the lowermostvalue for sodium. In contrast, iron, calcium and phosphorus content are lesser than the statedvalues by Al-Numair et al., (2007); they found that cinnamon contain mineral content iron, zinc, calcium, magnesium, potassium, sodium, and phosphorus were

Fat -soluble vitamins	
β-carotene	112µg
Vitamin A	9.33µg
Vitamin D	7.1 0µg
Vitamin E	2.32 mg
Vitamin K	10.98 µg
Water -soluble vitamins	
Vitamin C	5.22mg
Vitamin B9	6.0µg
Vitamin B6	0.158mg
Vitamin B3	1.33mg
Vitamin B2	7.5mg
Vitamin B1	6.05mg

Table 3: Vitamins Content of Cinnamon

Thistable showed that Cinnamon contains**β-carotene,** Vitamin A, D, E, K, C, B9, B6, B3, B2, B1 were range as 112 µg, 9.33 µg, 7.10µg, 2.32mg, 10.98µg, 5.22mg, 6.0µg, 0.158mg, 1.33mg, 7.5mg and 6.05mg.Among the vitamins, cinnamon contained the uppermostvalue of β-carotene and the lowermostvalue of vitamin B6. A study conducted by Khalisyaseen (2021), who found Cinnamon contain vitamin A, E, D, K, B1, B2, then vitamin C were range as 9.184µg, 7.948µg, 6.128mg, 11.348µg, 5.888mg, 6.620µg and 5.152mg correspondingly.

Bioactive compounds: Using gas chromatographic-mass spectrophotometric (GC-MS), Cinnamon bioactive contents were determined and presented in Table 4.

Bioactive compounds	
Cinnamaldehyde	64.56
Cinnamyl Acetate	1.11
β-caryophyllene	1.17
Coumarin	0.87

Table 4: Bioactive compounds of Cinnamon

The table showed that Cinnamon contain bioactive compounds cinnamaldehyde, cinnamyl acetate, β-caryophyllene, and coumarin was range as 64.56, 1.11, 1.17 and 0.87. Among the bioactive compounds, cinnamon contained the uppermostvalue of cinnamaldehyde as well as the lowermost value of coumarin. A study evaluated by Kimet al.(2015c), who assessed bioactive compounds in cinnamon cinnamaldehyde, cinnamyl acetate, β-caryophyllene, and coumarin were range as 64.49, 1.15, 1.10 and 0.9

Antioxidant capacity of Cinnamon: By using a spectrophotometer, the IC50 of cinnamon bark extract was obtained at 42,61 µg/mL and presented in Table 5.

Concentration of cinnamon bark extract (µg/ml)	Inhibition (%)	IC_{50} (µg/ml)
10	13,63	42,61
20	26,39	
30	38,81	
40	46,15	
50	57,51	
60	68,53	

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Table 5: Concentration, %inhibition, and IC50 of Cinnamon bark extract

DISCUSSION

In the total antioxidant capacity test, we used Diphenyl-2-Picrylhidrazyl (DPPH) with a 50 µg/mL concentration. The maximum wavelength and maximum absorbance were found and used to be the control absorbance. The extract of cinnamon bark with 10, 20, 30, 40, 50 and 60 µg/mL concentrationswere used in this test. Furthermore, as the comparative standard used the ascorbic acid (vitamin C) with 2, 4, 6, 8 and 10 µg/mL concentration. From each concentration, 0,5 mL was taken and reacted with 3,5 mL of DPPH. This result of reaction was obtained from the absorbance reading with Spectrophotometry Genesys 30 Vis. The IC50 of cinnamon bark extract and vitamin C were calculated and found. Data were collected from the results of the total antioxidant capacity test using the DPPH. Furthermore, GraphPad Prism V.0.9. was used in this experimental research. Data is shown in table 5. The IC50 value for ascorbic acid was 5.4 µg/mL, while the cinnamon bark extract was 42.61 µg/mL. Cinnamon bark extract has a powerful capacity, and so is the capacity for vitamin C. When compared with vitamin C, the antioxidant capacity of cinnamon bark extract is indeed weaker. However, according to Tasia et al (2014),Cinnamon itself, apart from being an antioxidant, can also act as an antidiabetic. In recent years the Cinnamon is the very commonly used spice. Cinnamon as a therapeutic herb have taken wide attention in the scientific community because of its natural bioactive components and various health benefits.Conceivably cinnamon usedin foods as aromatic plants or by means of natural antioxidants dietary source tomake better the food safety and quality of food. Cinnamon contains nutritive values of carbohydrates, protein, fat, fibre, moisture and ash. The mineral content of macroelements magnesium, sodium, potassium, phosphorus and microelements iron, zinc, chromium and manganese were determined.

CONCLUSION

Cinnamon spice includes vitamins A, K, E, D, C, B9, B6, B3, B2, B1. The bioactive compounds of spice cinnamon were cinnamaldehyde, cinnamyl acetate, β-caryophyllene and coumarin. Cinnamon has a very strong capacity for antioxidants.

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