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Nutritional Composition of *Buchnania Lanzan* Seeds Collected From Candidate plus Trees

Research Article

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Abstract

The study was carried out to evaluate the nutrition contents of *Buchanania lanzan* (Chironji) seeds obtained from thirteen candidate plus trees (CPTs) and analyzed for its nutritional composition. It was observed that total carbohydrate content ranged from 3.30g/100g (MPC-11) to 30.83g/100g (MPC-9), fatty oil and the content ranged from 39.7% (MPC-14) to 56.2% (MPC-8), ash content in defatted seeds ranged from 5.4% (MPC-11) to 32% (MPC-3), ascorbic acid content ranged from 9.3 mg/100g (MPC-2, 3, 7, 11, 12) to 17.6 mg/100g (MPC-10), phenol content was 339.6 mg/100g being found in MPC-14 and lowest content of 98.27 mg/100g was observed in MPC-9 and tannin content ranged from 56.60 mg/100g (MPC-9) to 577.3 mg/100g (MPC-8). Trace elements zinc content ranged from 1.31 ppm (MPC-12) to 2.12 ppm (MPC-10), Manganese content ranged from 0.44 ppm (MPC-14) to 0.98 ppm (MPC-2), Copper content ranged from 0.37 ppm to 1.28 ppm and Iron content ranged from 3.26 ppm (MPC-11) to 19 ppm (MPC-2). Based on the results obtained from the study, it can be concluded that the seeds of *B. lanzan* provide good opportunities to develop value added products, dietary supplements and phytotherapeutic compounds. MPC-8 was found to be the best source in respect of oil, carbohydrates and tannin content followed by MPC-10 and MPC-2 for ascorbic acid and trace minerals..

Keywords: Nutrition; Phytochemicals; Trace elements; Chironji seeds

Introduction

Buchnania lanzan Spreng commonly known as achar, char or chironji is an important multipurpose tree species belonging to the family Anacardiaceae. It is a moderate sized tree with a straight trunk, and useful for clothing dry hills. It is commonly found growing in association with *Shorea robusta*, *Anogeissus latifolia* and other deciduous trees in mixed deciduous forests. The tree grows on a variety of soil and attains a height up to 15m to 20m and girth up to 1.25m. The pulp of the fruit is edible. The seed after drying is used commonly in the preparation of sweets. It is also suitable as an agro forestry tree species and plays important role in the rural and tribal economy [1-3]. Rural people, particularly the indigenous collect the fruits to earn their livelihood and the species is recognized as a major income earning species of Eastern and Central India. The dried seeds are sold at one thousand two hundred rupees per kilogram. However, due to heavy biotic pressure, poor germination, slow growth of the species and lack of knowledge of its nursery and propagation techniques, plantations are not commonly raised either by forest department or by private tree growers. Therefore, the species is getting depleted fast from forest and non forest areas. At present the plant is grouped as an underexploited and non-nationalized minor forest produce. It is free for collection, as a result of which the local inhabitants, traders and greedy merchants destroy the branches/whole trees during collection of its fruits without bothering about the health of the tree. This has led to the destruction of chironji plants in the forests. There is an urgent need to develop a technology for easy multiplication and regeneration of chironji, and to popularize its importance among local inhabitants/tribals.

Chironji originated in the Indian sub-continent [4]. The species is found naturally occurring in the tropical deciduous forests of north, western and central India mostly in the state of Madhya Pradesh, Bihar, Orissa, Andhra Pradesh, Chhattisgarh, Jharkhand, Gujrat, Rajastan and Maharashtra. It is commonly found in dry deciduous forests up to an altitude of 1200 meters, and in sub-Himalayan tracts up to 900m. In central India, it is commonly associated with teak, sal in mixed forests.

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The bark is dark gray or black, regularly divided into small rectangular plates, somewhat resembling a crocodile hide and is reddish inside. *Buchanania lanzan* is also a multipurpose tree. The wood is used in making boxes and cheap furniture. It has been reported to be suitable for match industry. It is used as a fuel, fodder especially for buffaloes, alternative host for Kusmi lac insect, and oil for cosmetics and soaps. Its oil is also used as edible oil by tribals. The seeds contain oil and protein. Seeds/ kernel of *Buchanania lanzan* are nutritional, palatable and used as a substitute of almonds in confectionery. They yield a fatty oil known as "Chironji oil" and substituted for olive and "Almond oils", both in confectionery and indigenous medicines used for glandular swellings of neck. The kernels, which have a flavor somewhat between that of pistachio and almonds, are eaten raw or roasted and are commonly used in the preparation of milk-based sweet meal and puddings. Fruits are laxative and used to relieve thirst, burning of the body and fever. Kernels of fruits are used as ointment in skin diseases. Thus, keeping in view nutritional composition of *Buchnania lanzan* seeds at initial level, the present study was undertaken.

Materials and methods

Collection and preparation of samples

B. lanzan fruits from thirteen candidate plus trees (CPTs) were collected from Amarwada, Tamia and Batkakhapa ranges of Chhindwara district of Madhya Pradesh (Figure 1). The fruits were rubbed and washed to remove the outer pulp and then dried in the shade for seven days. The dried seeds were dehulled by cracking along the margins with a piece of pebble to obtain the brown oval-shaped kernels. The kernels were dried at 60°C for six hours to 5% moisture level. The kernels from each CPTs were packed in separate cellophane bags and stored in refrigerator until used for various analysis.

Laboratory analysis

In the analytical laboratory of the Forest Research Centre for Skill Development, Chhindwara, Madhya Pradesh nutritional composition of *B. lanzan* seeds was analyzed using the standard procedures of the Association of Official Analytical Chemists (AOAC, 1990). The kernels of *B. lanzan* were analyzed to determine the carbohydrate, ash, oil, ascorbic acid, phenol, tannin and trace elements contents. Determination of carbohydrate content in the sample was estimated by Anthrone method [5,6]. The percentage of ash content of the sample was determined according to Association of Official Analytical Chemists (AOAC) method, (1970). The Oil content in the seeds was estimated according to the method described by Sadasivam and Manickam [6]. Ascorbic acid content was estimated by the titrimetric method of Aberg (1958). Trace elements were estimated by Association of Official Analytical Chemists (AOAC) method, 1970. Tannin content in the sample was estimated according to the method of Schanderi (1970). Total phenol content in the sample was estimated by Folin-Ciocalteau reagent [7,8]. The data collected were subjected to the analysis of variance (ANNOVA) and critical difference (CD) were calculated by computer programme SX Statistic PC DOS version 2.0, copyright @ 1985, 1987, NH analytical software.

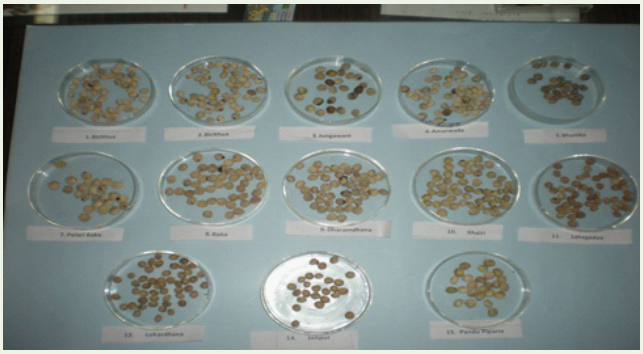

Figure 1: *B. lanzan* seeds collected from different candidate plus tree.

Result and discussion

Collection and chemical analyses of seeds from thirteen candidate plus trees (CPTs) of *B. lanzan* has shown its potential nutritional significance. The results of the study pertaining to the nutritional parameters of *Buchanania lanzan* seeds are presented in Table 1 and 2. The perusal of data reveals that the total carbohydrate content ranged from 3.30g/100g (MPC-11) to 30.83g/100g (MPC-9) respectively as tabulated in Table 1. The mean value of carbohydrate obtained in the present study was 12.81% which is in agreement with the value (12.96%) reported earlier by Khatoon *et al.* (7). There were seven groups in which the means were not significantly different from one another. Seeds contain moderate amounts of carbohydrates which is generally available as instant energy source. Seeds were found to contain rich source of fatty oil and the content ranged from 39.7% (MPC-14) to 56.2% (MPC-8) respectively (Table 1). Amongst the thirteen CPTs analyzed for fatty oil content, there were five groups in which the means were not significantly different from one another. Khatoon *et al.* (2015) reported 38% of fatty oil in *B. lanzan* seeds, while Dwivedi *et al.* (2012) reported 59% of fatty oil content. *B. lanzan* seeds harvested in the 2nd week of May have been reported to contain maximum values of (61.66%) of oil (11). Oil is used to treat skin diseases, remove spots and blemishes from the face. Seeds are also medicinally valuable; contribute in ayurvedic and unani medicine as a nervine tonic, anticough and antileprotic (5). Ash content in defatted seeds ranged from 5.4% (MPC-11) to 32% (MPC-3) and results are presented in Table 1. There were eight groups in which the means were not significantly different from one another. Khatoon *et al.* (2015) reported 2.20% of ash in *B. lanzan* seeds. The ash values obtained in the present study varies with those reported earlier by various workers. Ash content represents the total mineral content in foods. They play an important role from a physicochemical, technological and nutritional point of view. Ascorbic acid (vitamin - C) content was estimated in seeds of all thirteen CPTs of *B. lanzan* and results are depicted in Table 1. The ascorbic acid content ranged from 9.3 mg/100g (MPC-2, 3, 7, 11, 12) to 17.6 mg/100g (MPC-10). There were three groups in which the means were not significantly different from one another. Dwivedi *et al.* (2012) have reported 5.0 mg of ascorbic acid in *B. lanzan* seeds [4].

The phytochemical analysis revealed the presence of phenolics and tannins in seeds of *B. lanzan.* Phytochemicals, mainly phenolics are considered to be the important bioactive compounds. Multiple biological effects of phenolics are related to its antioxidant activity. These are responsible for a wide range of physiological effects such as

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Table 1: Nutritional composition of *Buchanania lanzan* seeds.

CPT No.	Total carbohydrates (g/100g)	Oil (%)	Total Ash (%)	Ascorbic acid (mg/100g)	Phenols (mg/100g)	Tannins (mg/100g)
MPC 1	9.60	51.7	11.0	13.95	237.9	305.6
MPC 2	10.50	46.5	26.9	9.30	251.7	498.1
MPC 3	9.60	49.2	32.0	9.30	196.5	532.0
MPC 4	14.60	43.0	22.4	13.95	124.1	362.2
MPC 5	20.0	55.75	7.2	13.95	187.9	350.9
MPC 7	15.6	52.9	23.0	9.30	141.3	396.2
MPC 8	11.66	56.2	21.3	13.95	265.5	577.3
MPC 9	30.83	48.5	17.3	13.95	98.27	56.6
MPC 10	13.1	54.3	9.1	17.6	181.0	147.1
MPC 11	3.30	46.1	5.4	9.30	158.6	181.1
MPC 12	7.8	52.9	8.4	9.30	124.1	158.4
MPC 14	8.83	39.7	8.7	13.95	339.6	305.6
MPC 15	11.16	55.0	14.2	13.95	293.1	67.92
SE ±	2.2946	2.2244	1.4243	1.4243	13.213	1.7824
CD (0.05)	4.7166	4.5722	2.9276	2.9276	27.159	3.6639

Values are means of triplicate samples. Tannins are expressed as catechol equivalents

Table 2: Trace Mineral Composition of *Buchanania lanzan* Seeds.

CPT No	Zinc (Zn) ppm	Manganese (Mn) (ppm)	Copper (Cu) (ppm)	Iron (Fe) (ppm)
MPC1	1.89	0.74	1.28	5.68
MPC 2	1.96	0.98	0.74	19.0
MPC 3	1.59	0.60	0.70	4.21
MPC 4	1.60	0.65	0.62	4.08
MPC 5	1.38	0.55	0.88	3.74
MPC 7	1.47	0.62	0.37	10.9
MPC 8	1.41	0.75	0.91	5.65
MPC 9	1.75	0.65	1.12	4.59
MPC 10	2.12	0.75	1.11	4.86
MPC 11	1.72	0.63	0.58	3.26
MPC 12	1.31	0.57	0.82	3.46
MPC 14	1.34	0.44	0.74	3.87
MPC 15	1.92	0.87	1.27	4.71
SE ±	0.0143	0.0169	0.0190	0.1026
CD(0.05)	0.0294	0.0348	0.0392	0.2110

Values are means of triplicate samples

anti-allergenic, anti-atherogenic, anti-inflammatory, anti-microbial, anti-oxidant, cardioprotective and vaso-dilatory effects [9]. Polyphenolics are considered to function as antioxidants by various mechanisms like donating electrons, free radical scavenging by H-donation. Hence analyses were performed to find out the potential of *B. lanzan* seeds as a candidate for nutraceutical significance. The highest phenol content was 339.6 mg/100g being found in MPC-14 and lowest content of 98.27 mg/100g was observed in MPC-9 respectively as depicted in Table 1. There were eight groups in which the means were not significantly different from one another. Tannins (commonly referred to as tannic acid) are water soluble polyphenols that are present in many plant foods. The anti-carcinogenic and anti-mutagenic potential of tannins may be related to antioxidative property which is important in protecting cellular oxidative damage including lipid peroxidation. The generation of superoxide radicals was reported to be inhibited by tannins and related compounds. The anti-microbial activities of tannins are well documented. The growth of many fungi, yeast, bacteria and viruses are inhibited by tannins. In the present study, the tannin content in *B. lanzan* seed samples analyzed ranged from 56.60 mg/100g (MPC-9) to 577.3 mg/100g (MPC-8) respectively. There were twelve groups in which the means were not significantly different from one another. Khatoon *et al.* (2015) reported the tannin content of 0.00425 microgram tannic acid per milligram of sample. The tannin content of the samples analyzed in the present study are in accordance to the work reported by earlier workers.

The trace mineral composition viz. zinc, manganese, copper and iron were analyzed in *B. lanzan* seeds and results are depicted in Table 2. In the present study, zinc content ranged from 1.31 ppm (MPC-12) to 2.12 ppm (MPC-10). Khatoon *et al.* (2015) has reported 3.32mg/100g zinc in *B. lanzan* seeds. Zinc is needed for a healthy immune system and protects liver from chemical damage. Manganese was also analyzed in all the thirteen CPTs of *B. lanzan* and the content ranged from 0.44 ppm (MPC-14) to 0.98 ppm (MPC-2) respectively (Table 2). Khatoon *et al.* (2015) has reported 1.6 mg/100g manganese in *B. lanzan* seeds. Manganese promotes growth, development and cell function. It is needed for bone growth, protein and fat metabolism, healthy nerves and blood sugar regulation and a healthy immune system. Copper content was also analyzed and the content ranged from 0.37 ppm to 1.28 ppm as depicted in Table 2. Khatoon *et al.* (2015) have reported 1.15 mg/100g copper in *B. lanzan* seeds. Copper is involved in respiratory and red blood cell function. It is needed for healthy nerves and bone development. Iron content was also analyzed in all thirteen CPTs and the content ranged from 3.26 ppm (MPC-11) to 19 ppm (MPC-2). Khatoon *et al.* (2015) have reported 4.8 mg/100g iron in *B. lanzan* seeds. There were nine groups in copper and iron in which the means were not significantly different from one another. Iron is necessary for formation of hemoglobin that carries oxygen in the blood. It is needed for energy production and a healthy immune system [10-14].

Conclusion

Based on the results obtained from the study, it can be concluded that the seeds of *B. lanzan* provide good opportunities to develop

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value added products, dietary supplements and phytotherapeutic compounds. MPC-8 was found to be the best source in respect of oil, carbohydrates and tannin content followed by MPC-10 and MPC-2 for ascorbic acid and trace minerals.

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