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Research Article

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Biochemical composition, nutritional analysis and antioxidant activity of *Buchanania lanzan* Spreng fruits

Madhuri Suryawanshi, Vilas Patil, Varsha Jadhav (Rathod)*

Department of Botany, Shivaji University, Kolhapur- 416004, Maharashtra, India

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***Corresponding Author:**
Varsha Jadhav (Rathod)*
E-mail: suvidnyasuryawanshi@gmail.com, vdj_botany@unishivaji.ac.in

ABSTRACT

Buchanania lanzan Spreng belongs to the family Anacardiaceae. The primary focus of this study was to examine the phytochemical, proximate, antioxidant properties and GC-MS evaluation of unripe and ripen fruit of *B. lanzan* Spreng. The phytochemical studies showed that alkaloids, phenols, flavones, saponins, coumarins, glycosides and tannins are present in both ripen and unripe fruits. The proximate evaluation confirmed that crude fat (14.5%) and protein (6.37±0.69 g/100g) are high in ripening fruit. In unripe fruit crude fat (11.3%) and protein (4.11%) is less percent. The carotenoid (5.58 ± 0.5 mg/100g) and catalase (0.226±0.074 mg/100g) activity is higher in unripe fruit. The total polyphenol (6.4±0.8 mg/100g) and peroxidase (0.362±0.017 mg/100g) the content shows greater activity in ripen fruit. In DPPH and FRAP highest activity showed in methanol extract of ripening and unripe fruit than the other solvent. GC-MS evaluation showed many bioactive compounds present in unripe and ripen fruit. It is concluded that nutritional and bioactive ability is high in ripen and unripe fruits of *B. lanzan*. The fruits of *B. lanzan* are a good source of nutrition and medicinally important.

KEYWORDS: Phytochemical, proximate, antioxidants, GC-MS analysis, ripe, unripe fruit, *Buchanania lanzan*.

INTRODUCTION

The *B. lanzan* Spreng is a well-known forest plant. It belongs to the family Anacardiaceae. It is commonly known as 'Chironji or Char' (Banerjee & Bandyopadhyay, 2015). This plant is wild and mostly found in the tropical deciduous forests, northern, western and central India (Siddiqui *et al*., 2016). The plant *B. lanzan* was first reported by Francis Hamilton, (1798) (Sharma, 2012). This tree is commonly known as the 'Almondette tree' in English (Rai *et al*., 2015). The tree is evergreen and moderate sized. The flowering starts in the month of November. The fruits mature in 4 to 5 months. Fruit becomes reddish black after ripening (Kumar *et al*., 2012). The charoli seeds are lentil-sized, somewhat smoothed and have an almond like flavor and are eaten in crude or roasted form. All parts of this plant root, leaves, gum, bark and fruit have different medicinal properties (Khatoon *et al*., 2015). The seeds contain oil and protein. The seeds or kernels are nutritional and tasteful. The kernels of fruits are used as an ointment in skin diseases (Sharma, 2012). The oil extracted from Kernels is applied to skin diseases and is also used to remove spots and blemishes from the face. This plant is determined to possess cardio tonic, astringent and antioxidant activity (Mehta *et al*., 2011). In that plant many bioactive compounds are present which shows multiple biological effects such as antioxidant activity (Vyavaharkar & Mangaonkar, 2016). Plant seeds are used for tonic and expectorant. This plant is mostly used for traditional purposes (Sushma *et al*., 2013). The protective efficiency of this plant is depending on the Reactive Oxygen Species and availability of antioxidants (Mehta *et al*., 2009). The pulp of the fruit was not used yet. Therefore only the pulp of ripening and unripe fruit was used in phytochemicals, proximate, antioxidant and GC-MS analysis.

MATERIAL AND METHODS

Sample Collection and Extract Preparation

Buchanania lanzan Spreng fruits were collected from Bahirewadi village at Kolhapur District Figure 1. The collection was carried out during fruiting periods in the month of March 2016 to June 2018. The plants were identified with the help of available literature (flora) (Voucher No. MVS 002) (Yadav & Sardesai, 2002). The fresh fruits were washed completely until no other material remained. They were blotted when the moisture was completely absorbed, air dried and weighted to obtained fresh weight. Then the plants were put in paper envelope envelop and dried in the oven at 40^0 C until a constant weight was obtained. After complete drying

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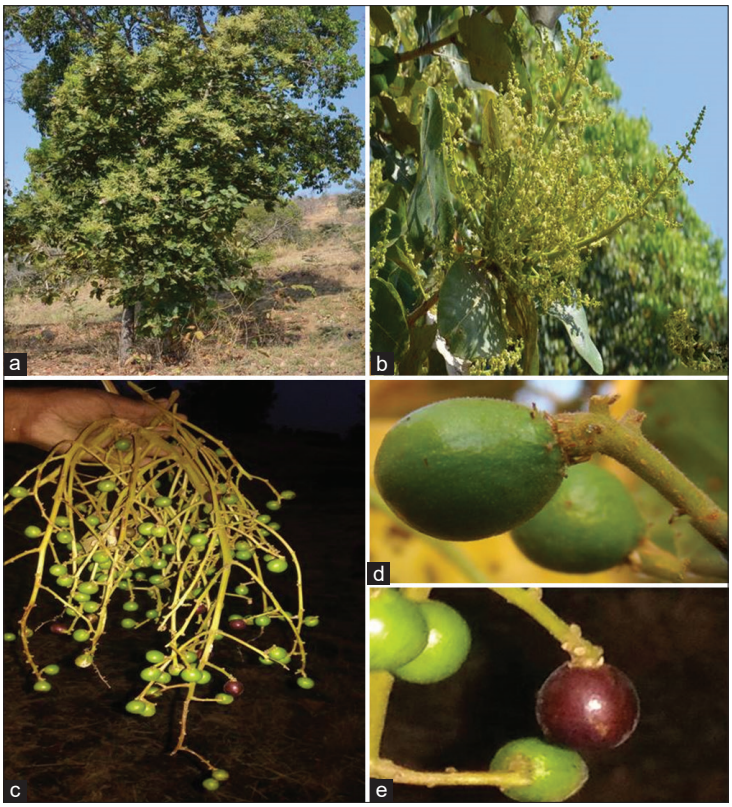

Figure 1: The photo plate showing a- Habit, b- Flowering twig, c- Fruiting twig d- Ripen fruit e- Unripen fruit

the sample was ground to a fine powder by using an electric grinder and used for the analysis.

Preliminary Phytochemical Analysis

The powder of the plant material was used for physicochemical determination. Successive extractive was carried out by a Soxhlet extraction method using six different solvents petroleum ether, aqueous, chloroform, acetone, alcohol and methanol. Fluorescence investigation of the powder of *B. lanzan* in different chemical reagents was performed under visible light, short wavelength (245 nm) and long wavelength (265). The percentage yield of extract, preliminary phytochemical tests of the extract was performed using specific reagent by different methods of (Kokate *et al.*, 1995; Kokate, 2002; Khandewal, 2005; Raman, 2006; Tripathi *et al.*, 2016).

PROXIMATE ANALYSIS

Dry Matter and Moisture

The dry matter of a sample is the amount of material left after all water has been removed. The AOAC (1990) method was used to determine the substance's dry matter and moisture content. Bowls were cleaned with soap, washed with water, and left in the oven overnight at 60 °C. The plates were then removed from the oven and placed in a desiccator to cool. 2 g of sample were burned in plates at 600 °C overnight. The following formula was used to calculate the dry matter and moisture. Dry matter (%) = Weight of dish + Weight of dried sample)- Weight of dish/Weight of sample before drying x 100; Moisture content (%) = (Weight of fresh sample - Weight of dry sample)/Weight of fresh sample x 100

Total Ash

The AOAC (1990) technique was used to determine the ash content. For one hour, the crucible was placed in a muffle furnace at 600 °C. It was immediately transferred from the furnace to a desiccator, cooled to room temperature, and measured to minimize water absorption. 2g of dry powdered sample was placed in the crucible of a muffle furnace and heated to 600 °C for six hours. The crucible was placed in a desiccator after cooling to normal temperature. To avoid moisture absorption, the crucible was relocated as soon as possible. The following formula was used to calculate the ash percent. Ash (%) = Weight of Ash/Weight of Sample x 100

Crude Fiber

Sadasivam and Manikam (1992) developed a method for calculating plant crude fibre content. To remove fat content, 2g of dry material were treated with petroleum ether. The powdered plant was dried and taken for further examination. This two-gram dry powder was heated for 30 minutes in 200 ml of 0.255 N H_2SO_4 and bumping chips. The solution was then filtered through muslin cloth and rinsed with hot water until it was acid-free. The residue was then treated with 200 ml of 0.313 N NaOH and boiled for 30 minutes. After being filtered again through muslin cloth, it was rinsed with 25 ml boiling 1.25

percent H_2SO_4, three 50 ml amounts of water, and 25 ml alcohol. Removed the leftovers and placed them in an ashing plate that had been pre-weighed (W1 g). After that, it was set ablaze for 30 minutes at 600°C. It was reweighed after chilling in the desiccator (W3 g). The crude fiber proportion was calculated using the formula, Crude fiber content (%) = Loss in weight on ignition (W2 -W1) - (W3 -W1)/Weight of sample x 100

IV. Crude fat

Sadasivam and Manikam (1992) method was used to determine the crude fat content. In a thimble, 2 g of dry material were placed in the soxhlet apparatus. After placing the dry pre-weighed solvent flasks ('a' g) beneath the device and providing the required amount of petroleum ether, the condenser was connected. The sample was extracted for 16 hours at a temperature that resulted in 2-3 drips of condensation every hour. After the thimble was removed, the ether was kept in the instrument. A hot water bath was used to evaporate the excess ether in the solvent flask. It was then cooled before being weighed ('b' g). The following formula was used to calculate crude fat. Crude fat content (%) = (b - a)/Weight of sample×100

ANTIOXIDANT ANALYSIS

Total Polyphenols

The Folin and Denis (1915) method was used to determine the polyphenols. 0.5g of fresh plant material was pulverized in a mechanical mixer with a pinch of magnesium carbonate and extracted in 30 ml of 80 %acetone at 0 to 4^0C in the dark. After that, the remnant was wiped adequately 2-3 times with 80 percent acetone. The ultimate volume of the generated filtrate was boosted to 100ml by using 80 % acetone. Then, to generate a volume of 35ml, 2ml of plant extract was mixed with 10 ml of 20% Na_2Co_3 and purified water. Then 2ml of Folin and Denis reagent was added to the mixture (100g sodium tungstate and 20g phosphomolybdenic acid were dissolved in roughly 800 ml distilled water, 50 ml of 85 % phosphoric acid was added, and the mixture was refluxed for 2-5 hours). Finally, dilute the mixture to 50 ml with purified water. After the colour was generated, the absorbance was measured at 660 nm with a UV-VIS double beam spectrophotometer. A standard tannic acid solution was used to construct the standard polyphenol curve.

Catalase

A significantly modified Sadasivam and Manickam (1992) method was used to evaluate catalase activity. 500 mg fresh plant matter was homogenized in 10 ml 0.1 M phosphate buffer (pH-7.0). After that, the extract was filtered through 4 levels of muslin fabric (moistened with phosphate buffer). The filtrate was then centrifuged for 10 minutes at 10,000 rpm at 0 to 4^0 C. The enzymes were then extracted from the supernatant. In the assay mixture, add 3 mL H_2O_2 phosphate buffer. Then, using a UV-VIS double beam spectrophotometer, 0.2 ml enzyme was mixed right away, and the change in optical density was monitored at 240 nm per minute.

Peroxidase

Peroxidase activity was determined using the Maehly technique (1954). The enzyme was recovered by dissolving 0.5g of fresh plant material in 10 ml of 0.1 M phosphate buffer (pH- 7.0). After filtering through four layers of muslin cloth soaked in phosphate buffer, the filtrate was centrifuged at 10,000 rpm for 10 minutes at 0 to 4^0C. The enzymes were then extracted from the supernatant. In the enzyme assay, 2 ml phosphate buffer (pH-7.0), 1 ml 20 mm guaiacol, and 0.5 ml enzyme were utilized. The reaction was then started by adding 0.1 ml of 20 mm H_2O_2. Using a dual beam UV-VIS spectrophotometer and regular stirring of the reaction liquid with a glass rod, the change in optical density due to guaiacol oxidation was recorded per minute at 470 nm. The activity of the enzyme is then calculated as O. D. $min^{-1}mg^{-1}$ protein. Ripen and unripened fruit powder was used for DPPH and FRAP assay. The extract was prepared in different solvents such as methanol, alcohol and aqueous. For both assays plant extract was prepared in mg/ml.

DPPH Radical Scavenging Activity

1, 1- Diphenyl-2- Picrylhydrazyl (DPPH) was used for the free radical scavenging activity of the extract by using method

Table 1: Powder behavior of fruit powder

Number	Reagent	Colour / behavior	Inference
1	Powder as such	Orange brown	_____
2	Powder + 5% FeCl3	Dark green	Tannin present
3	Powder + Picric acid	Saffron yellow	Alkaloids present
4	Powder + 5% iodine	Apple green	Starch present
5	Powder + 40% NaOH + Lead acetate	Chocolate Brown	Cysteine present
6	Powder+conc. HNO3+Ammonia	Orange yellow	Xanthoprotein
8	Powder + 5%KOH	Rose wood red	Glycosides

Table 2: Fluorescence study of powder with different chemical reagent in visible and U. V. Light of fruit powder

Sr. No.	Powder with chemical reagent	Visible light	Short wavelength (254)	Long wavelength (365)
1	Powder as such	Olive green	Pear green	Black
2	Powder + D.W.	Olive green	Pear green	Slate grey
3	Powder+ 1N NaOH in D. W.	Umber brown	Hunter green	Black
4	Powder + 1N NaOH in Alcohol	Brown	Hickory brown	Black
5	Powder +10% HCl	Granola yellow	Forest green	Slate grey
6	Powder + conc. HCl	Moss green	Forest green	Slate grey
7	Powder + conc. HNO_3	Olive green	Emerald green	Slate grey
8	Powder + conc. H_2SO_4	Chocolate brown	Hunter green	Black
9	Powder + Acetone	Moss green	Forest green	Slate grey
10	Powder +5%KOH	Chocolate brown	Hunter green	Black
11	Powder +5% iodine	Moss green	Hunter green	Black
12	Powder +5% $FeCl_3$	Army green	Forest green	Black

Wang *et al.* (1998). For DPPH assay 500 µl of plant extract was added in 2.5 ml methanol solution of DPPH (24 µg/ml DPPH). The reaction mixture was well agitated and kept in 30 minute. Control prepared in 0.5 ml methanol and 2.5 ml DPPH. Standard was used as ascorbic acid. The absorbance was read at 516 nm a U. V. Visible Spectrophotometer

Ferric Reducing Antioxidant Power Assay

0.1 ml plant extract add in 2.9 ml FRAP (Ferric reducing antioxidant power) reagent. FRAP reagent was freshly prepared by combining TPTZ solution: $FeCl_3$ solution: acetate buffer in 1:1:10. After reaction mixture incubates for 15 minute at 37^0C. Method is described by Benzie& Strain *et al.*, (1996). The results were expressed as ascorbic acid equivalent to antioxidant capacity.

GC-MS Analysis

The extraction was prepared in methanol by using the Soxhlet apparatus. The temperature was not enormously the boiling point of the respective solvent. The obtained extracts were filtered through Whatman No.-1 filter paper then concentrated by using an evaporator and the residual extracts were stored in the refrigerator at 4o C in small and air tight amber colour glass bottles. The GC-MS analysis was done using GCMS- TQ8050- Shimadzu (Japan). It has equipped with SH-Rxi-5 sil MS fused silica capillary column (0.25mm diameter and 0.25 mm thickness). Injection mode- split, Flow control mode – Pressure, Pressure- 75.2 kPa, linear velocity-41.4 cm/sec, Purge flow-3.0 ml/min and Spilt ratio-(1.0). Helium gas (99.9%) was used as a carrier gas at constant flow rate. Identification of components is read on mass spectrum of GC-MS by using National Institute of Standard and Techniques NIST-08 LIB and WILEY-O8. Gas Chromatography-Mass Spectrometry (GC-MS) analysis was carried out by using the method of Hema *et al.*, (2010).

Table 3: Extractive values of fruit powder

Extract	Colour	%Yield
Petroleum ether	Chocolate Brown	5.65
Aqueous	Chocolate Brown	50
Chloroform	Chocolate Brown	2.5
Acetone	Lemon Yellow	9
Alcohol	Chocolate Brown	41
Methanol	Chocolate Brown	10

Table 4: Preliminary phytochemical screening of fruit powder

Sr. No.	Content	Petroleum ether	Methanol	Chloroform	Acetone	Alcohol	Aqueous
1	Phenols	+++	++	---	++	+++	+++
2	Flavones	---	+	---	+	++	+++
3	Tannins	+	+++	+	++	+++	+++
4	Coumarins	+	---	++	---	+++	---
5	Saponin	+	+	---	+	++	++
6	Alkaloids	+	---	++	+++	+++	+++
7	Glycosides	+	++	+++	---	---	---

RESULTS AND DISCUSSION

Preliminary Phytochemical Analysis

The phytochemical investigation of fruit powder of *Buchanania lanzan* was done by utilizing diverse solvents for example chloroform, acetone, methanol, aqueous, petroleum ether and ethanol. In phytochemical evaluation some parameters were studied such as powder behavior, phytochemical screening, extractive values and fluorescence study. The fluorescent investigation is additionally valuable for some unrefined medications are assessed subjectively and it is an essential parameter of pharmacognostical evaluation (Gupta *et al.*, 2006; Kokoski *et al.*,1958). The powder behavior, fluorescence study, extractive values and preliminary phytochemical screenings are tabulated in Tables 1-4 respectively. The extractive values were helpful in determining the soluble nature of a particular constituent in a particular solvent. The extractive yield is higher in alcohol and aqueous when compare with different solvents. According to the Table 4 in alcoholic extraction of phenols, flavones, tannins, coumarins, saponins and alkaloids are present in high quantity. Glycosides are absent in acetone, alcohol and methanol. The extraction of leaves of *B. lanzan* was prepared in different solvents and observed- steroid, flavonoid, phenol, glycosides and tannins are present in different solvents (Niratker & Sailaja, 2014). In the present study the extractions of the pulp of *B. lanzan* show phenols, flavones, tannins, coumarins, saponins, alkaloids and glycosides. Phytochemical screening was useful to recognize the nature of the substance present in the various solvents (Pattnaik *et al.*, 2013). The preliminary phytochemical screening demonstrated the presences of phenols, flavones, tannins, coumarins, saponins, alkaloids and glycosides (Shoaib *et al.*, 2017). The preliminary phytochemical screening is basic for distinguishing proof of the distinctive phytoconstituents present in plant material (Koparde & Magdum, 2017). It is valuable in finding the bioactive compound and is additionally useful in the acknowledgment and valuation of bioactive compounds (Jain *et al.*, 2014).

Proximate Analysis

B. lanzan fruit analysis shows potential nutritional significance. The fruits are rich source of protein, fat and fiber. These are easily available as instant energy source. Moisture content of the natural products decides quality and stability (Khatoon *et al.*, 2015). The dry matter, moisture content, crude fat, ash, crude fiber and protein represent in Figure 2. The ash value gives an idea about the inorganic composition and other impurities (Tripathi *et al.*, 2016). The protein (6.37%) estimated is high in ripening fruit as compare with unripening fruit. Moisture content (76.4 %) determination is very important because it directly affects the nutritional contents of the fruits. The moisture is highest in unripen fruit and the dry matter is high in ripen fruit. The ash (7.4%) values are important for qualitative standards and also useful in determining the authenticity and purity of the sample (Daffodi *et al.*, 2015). The enlisted

underutilized fruits, B. *lanzan* is one of them and according to Pal *et al*. seeds of *B. lanzan* are a potential source of protein (19.0g), fat (59.1g) and fiber (3.8 g) (Pal *et al*., 2019). The earlier study (Provide citation) has determine the nutritional value of seeds but in pulp of ripen fruit by addition of some parameter shows that nutritional value is fat (14.5%), protein (6.37±0.69 g/100gs), fiber (4.5%), ash (7.4%), dry matter (55%) and moisture (76.4%).

Antioxidant Analysis

Carotenoid and total polyphenol recorded in Table 5. The total polyphenol is high in ripening fruit as compare to unripen fruit and carotenoid is high in unripe fruit than the ripe fruit. The estimations of catalase and peroxidase are depicted in Table 5. The peroxidase is higher in ripen fruit (362±0.017). Catalase is a sufficient amount in unripe fruit with a value (0.226±0.074). Antioxidant reduces the oxidative stress which is caused by free radical (Banerjee & Bandyopadhyay, 2015). The fruits are wealthy in carotenoid and antioxidants. These lessen the danger of cardiovascular ailments. In photosynthesis assumes carotenoids provide pivotal job to give photo protective function. The quality of fruit is given via carotenoid (Omayma *et al*., 2013). The carotenoid value is high in unripening fruit than in ripen fruit. The DPPH and FRAP value recorded in Table 6. Unripen

Table 5: Antioxidant analysis

Content	Unripen (mg/100g)	Ripen (mg/100g)
Catalase	0.226±0.074	0.0121±0.006
Peroxidase	0.210±0.0060	3.62±0.017
Carotenoid	5.58±0.5	4.1±0.4
Total polyphenol	4.6±0.39	6.4±0.39

Table 6: Antioxidant activity in DPPH and FRAP

Content	Solvent	Ripened	Unripened
DPPH (%)	Methanol	46.24 ± 096.	74.76 ± 1.90
	Ethanol	32.50 ± 0.97	61.29 ± 0.20
	Aqueous	26.99 ± 0.32	36.78 ± 0.23
FRAP(mg/100g	Methanol	168.31±1.96	172.95 ± 0.4
Ascorbic acid	Ethanol	156.83 ± 3.04	157.10 ± 0.98
equivalent)	Aqueous	97.81 ± 3.94	152.73 ±3.94

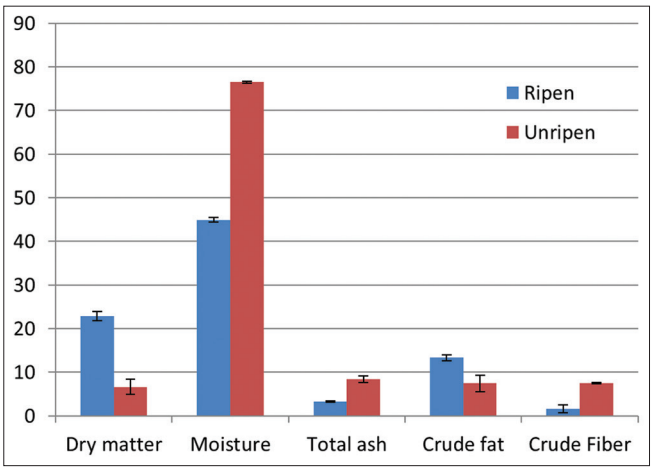

Figure 2: Proximate analysis of fruit powder

Table 7: Total numbers of bioactive compounds screening out in ripen and unripen fruit of *Buchanania lanzan* by using GC-MS analysis

S.N.	% Area of Peak	Name of the compound	Molecular Formula	Molecular Weight	Ripen	Unripen
1.	0.60	cis-2-Nonene	C9H18	126	Present	Absent
2.	6.28	Tridemorph	C19H39NO	297	Present	Absent
3.	14.11	4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl	C6H8O4	144	Present	Present
4.	0.99	4H-Pyran-4-one, 3,5-dihydroxy-2-methyl-	C6H6O4	142	Present	Absent
5.	1.05	5-Acetoxymethyl-2-furaldehyde	C8H8O4	168	Present	Absent
6.	47.80	5-Hydroxymethylfurfural	C6H6O3	126	Present	Present
7.	0.33	6-Acetyl-.beta.-d-mannose	C8H14O7	222	Present	Absent
8.	1.45	Pentanedioic acid, 2,2-dimethyl-, bis (1-methylpropyl) ester	C15H28O4	272	Present	Absent
9.	0.44	4-tert-Butylcyclohexyl methyl ethylphosphonate	C13H27O3	262	Present	Absent
10.	0.65	Tetradecanoic acid	C14H28O2	228	Present	Present
11.	0.78	Hexadecanoic acid, methyl ester	C17H34O2	270	Present	Present
12.	5.70	n-Hexadecanoic acid	C16H32O2	256	Present	Present
13.	0.21	Methyl 10-trans,12-cis-octadecadienoate	C19H34O2	294	Present	Absent
14.	0.95	9-Octadecenoic acid, methyl ester,(E)100	C19H36O2	296	Present	Present
15.	1.30	Methyl stearate	C19H38O2	298	Present	Absent
16.	3.20	9-Octadecenoic acid, (E)-	C18H34O2	282	Present	Absent
17.	5.51	Octadecanoic acid	C18H36O2	284	Present	Present
18.	0.72	Z)-3-(pentadec-8-en-1-yl)phenol	C21H34O	302	Present	Present
19.	0.32	Phenol, 3-pentadecyl	C21H36O	304	Present	Present
20.	1.59	1,8,11,14-Heptadecatetraene, (Z,Z,Z)	C17H28	232	Present	Absent
21.	1.62	(Z)-3-(Heptadec-10-en-1-yl)phenol	C23H38O	330	Present	Present
22.	1.58	3-((4Z,7Z)-Heptadeca-4,7-dien-1-yl)phenol	C23H36O	328	Present	Present
23.	0.07	1-Nonadecene	C19H38	266	Absent	Present
24.	0.08	Phthalic acid, butyl undecyl ester	C23H36O4	376	Absent	Present
25.	0.10	Methyl hexadec-9-enoate	C17H32O2	268	Absent	Present
26.	1.00	Linoleic acid ethyl ester	C20H36O2	308	Absent	Present
27.	9.53	Methyl 5,11,14,17-eicosatetraenoate	C21H34O2	318	Absent	Present
28.	2.58	3-Tridecylphenol	C19H32O	276	Absent	Present

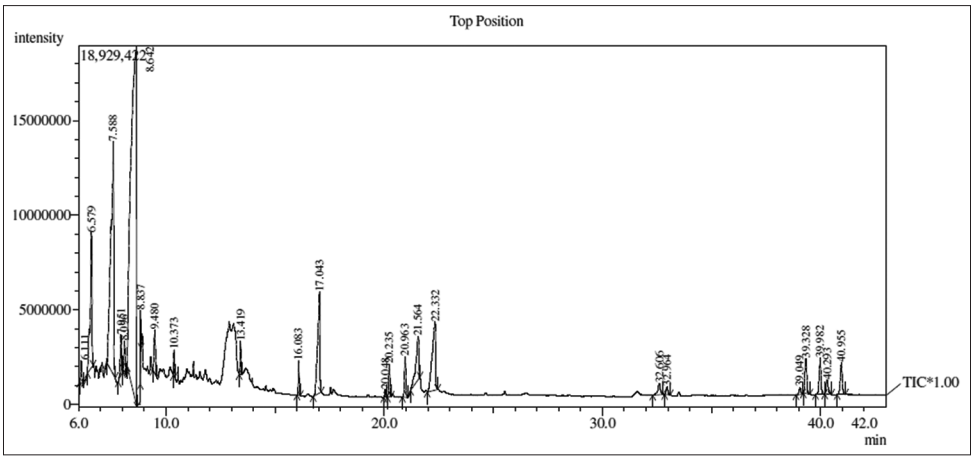

Figure 3: GC-MS chromatogram of methanol extract of ripe fruits of *Buchanania*

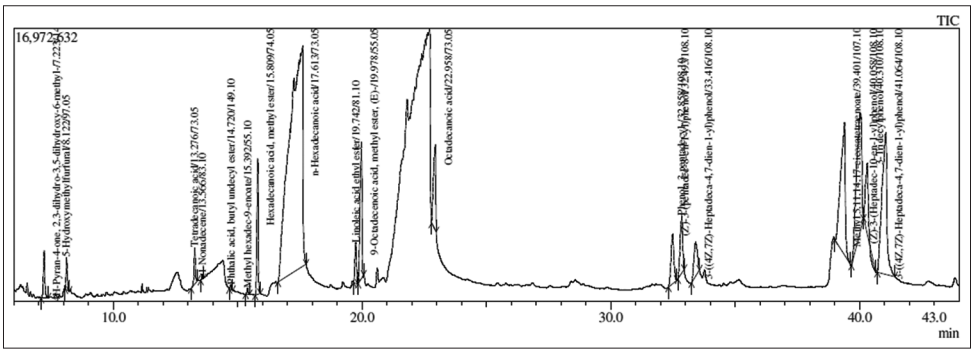

Figure 4: GC-MS chromatogram of methanol extract of unripe fruits of *Buchanania lanzan*

fruit show highest activity than the ripen fruit. Plant extract was prepared in three different solvents such as methanol, alcohol and aqueous. As compare to other solvent in methanol extract of unripe and ripe fruit show more activity (74.76 ± 1.90 and 46.24 ± 0.96). In DPPH highest percentage inhibition was observed in methanol extract of unripe fruit and ripe fruit. But as compare to ripe and unripe fruit activity is highest in unripe fruit. In plant extract having antioxidant molecules they scavenge the radical against DPPH, color change purple to yellow and decrease the absorbance (Vyavaharkar & Mangaonkar, 2016). In DPPH methanol bark extract shows good scavenging activity (Siddiqui *et al*., 2014). Vyavaharkar and Mangaonkar were observed DPPH activity in alcoholic extract of B. lanzan seeds. They reported that in 500 µl alcoholic seed extract percentage inhibition is 20 % but in 500 µl alcoholic extract of pulp fruit percentage inhibition is 61.29%. The pulped fruit showed the best DPPH activity than the seeds of the plant (Vyavaharkar & Mangaonkar, 2015). In DPPH assay black gum extract shows percentage inhibition is 67.58% (Siddiqui *et al*., 2016). In unripe pulp fruit of *B. lanzan* shows the highest percentage inhibition 74.76% than the black gum extract of *B. lanzan*. In FRAP assay highest activity showed in methanol extract compare to other solvents in both ripen and unripe fruit.

GC-MS analysis

The GC-MS chromatogram of ripen and unripe fruits of *Buchanania lanzan* in Figures 3 and 4 demonstrates the presence of twenty three and eighteen phytochemical compounds in ripen and unripe fruits respectively. The retention time, molecular formula, molecular weight, percentage area and name of the compounds are organized in Table 7. The major phytochemical compounds and their biological activities are depicted in Table 8. 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl, 5-Hydroxymethylfurfural, Tetradecanoic acid, Hexadecanoic acid, methyl ester, n-Hexadecanoic acid, 9-Octadecenoic acid, methyl ester, Octadecanoic acid, (Z)- 3-(pentadec-8-en-1-yl)phenol, (Z)- 3-(Heptadec-10-en-1-yl) phenol, 3-((4Z,7Z)- Heptadeca-4,7-dien-1-yl) phenol. These compounds were found in ripen and unripe fruits. The large percentage area of peak in ripen fruit is possessed by 5-Hydroxymethylfurfural (47.80 %) and in unripe fruit percentage area of peak is occupied by n-Hexadecanoic acid (46.44%). Li Wei *et al*., 2015 reported that in *Schisandra chinensis* biological activity of 5-Hydroxymethylfurfural is hepatoprotective and have antioxidant effects. In *Pistia stratiotes* n-Hexadecanoic acid shows that antioxidant, hypocholesterolemic, nematicide, anti-androgenic, hemolytic and flavors (Tyagi & Agarwal, 2017). Phthalic acid, butyl undecyl ester shows antimicrobial activity in plant *Cenchrus ciliaris* (Singariya *et al*., 2015). In *B. lanzan* more elevated amount of fatty acids are present such as Hexadecanoic acid, 9- Octadecanoic acid etc. (Bothara & Sing, 2011).

CONCLUSION

From the above results it is concluded that ripen and unripen fruit of *Buchanania lanzan* shows presence of the good amount of protein,

Table 8: Biological activity of compound identified in methanolic extract of ripe and Unripe fruits of *Buchanania lanzan*

S.N	Name of the compound	Biological activity
1.	Tridemorph	Fungicide (Srinivasulu and Rangaswamy, 2006)
2.	4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl	Antifungal activity (Teoh Yi P. *el al.*, 2011). Antimicrobial, Anti-inflammatory (Meenakshi and Kalavathy, 2015).
3.	5-Hydroxymethylfurfural	Hepatoprotective and antioxidant effects (Li Wei *et al.*, 2015).
4.	6-Acetyl-.beta.-d-mannose	Antimicrobial agents (Ezekwe and Chikezie , 2017)
5.	Tetradecanoic acid	Antioxidant, cancer preventive, hypercholesterolemic, nematicide, lubricant, cosmetic (Gomathi and Elango, 2015).
6.	Hexadecanoic acid, methyl ester	Antioxidant, hypocholesterolemic, nematicide, pesticide, Anti-androgenic, flavor, hemolytic and 5- Alpha reductase inhibitor (Sudha *el al.*, 2013).
7.	n-Hexadecanoic acid	Antioxidant, hypocholesterolemic, nematicide, Anti-androgenic, flavor, hemolytic (Tyagi and Agarwal, 2017).
8.	9-Octadecenoic acid, methyl ester, (E)100	Antioxidant, hypocholesterolemic, pesticide, Anti-androgenic, flavor, hemolytic, 5- Alpha reductase inhibitor (Rajeswari and Muthuirulappan, 2015).
9.	Methyl stearate	Antidiarrheal, cytotoxic, antiproliferative (Arora and Kumar, 2018).
10.	Octadecanoic acid	5- Alpha reductase inhibitor, hypocholesterolemic, suppository, cosmetic, lubricant, surfactant and softening agent, perfumery, propecic (Meenakshi and Kalavathy, 2015) Antifungal, Antitumor, Antibacterial (Arora *el al.*, 2017).
11.	Phenol, 3-pentadecyl	Antidiarrheal property (Udobre *et al.*, 2016).
12.	1-Nonadecene	Stronger radical scavenging effect (Marrufo *et al.*,2013).
13.	Phthalic acid, butyl undecyl ester	Antimicrobial activity (Singariya *et al.*, 2015).
14.	Methyl hexadec-9-enoate	Antialopecic, Anti-androgenic, Antifibrinolytic, Nematicide, Pesticide (Kumar *et al.*, 2012).

fat, ash and crude fiber. The fruits of *B.lanzan* is a better source of nutrition and antioxidant activity. The fluorescence study of the plant determine the quality and purity of plant material available in the market. The GC-MS analysis shows that 37 compounds present in fruits, which posseses various bioactive properties such as antimicrobial, anticancer, antidiarrheal, antiinflamatory etc. The preliminary phytochemical screening can be used to estimate the quality of the sample. Both the stages of fruits i. e. unripen and ripen are nutritionally and medicinally important.

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