



Phytochemical Profiling and Nutraceu- tical Benefits of Methanol Leaf Extracts from *Datura alba ness*

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Species of the *Datura* plant have demonstrated significant pharmacological benefits in combating various diseases over the past decade. However, little information is available on *Datura alba ness* (DAN), and no studies have yet reported its proximate composition or characterized its phytochemical components. This study aims to investigate the nutritional, phytochemical and bioactive properties of *Datura alba ness*.

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Materials and Methods: Fresh leaves of *Datura alba ness* were collected from Abua Odua local government area of Rivers State, Nigeria and properly identified and authenticated. The fresh leaves were subjected to proximate analysis using standard protocols while the dried leaves were extracted using methanol by the method of cold maceration to obtain methanolic extract of *Datura alba ness* (MEDAN). The MEDAN was further subjected to phytochemical screening to obtain the various phytochemicals and Gas chromatography and mass spectrometry (GC-MS) analysis for detailed identification and characterization of the various bioactive compounds.

Results: Proximate analysis of fresh leaves of DAN showed the presence of moisture (60.4%), crude protein (21.9%), carbohydrate (7.6%), crude fibre (4.77%), ash (4.17%) and fat (1.19%) while the phytochemical screening revealed the presence of flavonoids (49.14%), alkaloids (19.16%), tannins 1(12.19%), saponins (11.72%), phenols (5.33%), cardiac glycosides (1.91%), oxalates (0.43%) and phytates (0.43%). Also, the GC-MS analysis of MEDAN identified twenty-nine (29) active compounds with four (4) observed as the most abundant (with area concentration >10%). They include Bis (2-ethylhexyl) phthalate (15.97%), 13-hexyloxacyclotridec-10-en-2-one (14.26%), n-hexadecanoic acid (12.87%) and Gamma.-Sitosterol (10.77%).

Conclusion: The identification of various nutrients, compounds, and bioactive substances through proximate, phytochemical, and GC-MS analysis of fresh leaves and methanol extract of *Datura alba ness* highlights its potential as a supplement and therapeutic agent. These findings suggest that *Datura alba ness* contains numerous bioactive compounds that may offer effective treatments for conditions related to oxidative stress, nervous system disorders, tissue damage, inflammation, and bacterial infections.

Keywords: *Datura alba ness*; proximate; phytochemical; GC-MS; bioactive compound.

1. INTRODUCTION

Traditional medicine originated from the natural resources of the environment, which communities adopted out of necessity to survive diseases and remained the primary healthcare system until the emergence of modern medicine [1,2]. Phytopharmaceuticals are natural or formulated herbal remedies that derive their effectiveness from one or more plant-based compounds, commonly known as phytochemicals [3,4]. Natural compounds from plants have attracted considerable attention due to their therapeutic potential against several disease conditions [5,6]. Due to their availability, affordability, and minimal side effects, nearly half of the world's population relies on herbal products for their primary healthcare needs [7]. A key focus in the study of plant-derived products is the identification and characterization of the biologically active compounds they contain, which paves the way for further pharmacological, biological, and scientific research [8]. Although, the potential potency and efficacy of some of these products have been documented; however, further studies are needed to effectively screen, identify, and characterize their various bioactive ingredients [7].

The *Datura* genus is typically described as consisting of annual or perennial herbs or shrubs with glandular or sometimes simple hairs that

belong to the Solanaceae family. The leaves are petiolate, with a simple blade that is either sinuate or entirely toothed. Solitary flowers are found in the inflorescences, located in branch forks or leaf axils. In general, the plants lack bracts, peduncles, and bracteoles. The large, usually actinomorphic flowers often have stout pedicels. The long, cylindrical or tubular calyx is circumscissile near the base, while the funnel-shaped, elongated corolla has cuspidate lobes [9,10]. The seeds are dark, flat, and kidney-shaped, while the fruits resemble walnuts, covered in spines, earning them the name "thorn apple". They are also commonly known as Jimsonweed or the Devil's trumpet [10,11].

Datura has been widely used in traditional medicine. It is a curious twist of nature that a plant which is primarily known for its toxic effects also has medicinal applications. It has been used as an anaesthetic for setting bones, as well as for treating bruises, wounds, and skin ulcers. They have also been employed in the treatment of neurological disorders, cardiovascular conditions, fevers, catarrh, pain, diarrhoea, and respiratory issues [9-12]. *Datura alba ness* (DAN) is one of the most common species found in Nigeria. Commonly referred to as *Zakami* while the Ogoni and Ndokwa tribes call it *Jegemi* and *Gegemu* respectively. Although several other *Datura* species have been scientifically characterized, there is a lack of data on the

phytochemical profiling and nutraceutical properties of *Datura alba* Ness. Therefore, this study aims to fill that knowledge gap by providing a comprehensive analysis of the nutritional and phytochemical aspects of *Datura alba* ness, a common species found in Nigeria.

2. MATERIALS AND METHODS

2.1 Collection, Identification and Preparation of Plant Material

Fresh leaves of *Datura alba* ness were gathered from a garden in the Abua/Odua Local Government Area of Rivers State, Nigeria. The plant was identified and authenticated by a taxonomist from the Department of Plant Science and Biotechnology at the University of Port Harcourt, receiving the voucher number UPH/295.

2.2 Proximate Analysis of Plant Material

Fresh leaves *Datura alba* ness were used for the proximate analysis following standard protocols. Moisture content, crude protein, crude fibre, fat, ash, carbohydrate and energy value were as per the Association of Official Analytical Chemists (AOAC) method [13,14].

Moisture Content: To determine moisture content, fresh leaf samples of DAN were weighed in Petri dishes and then dried in an oven at 105°C for 24 hours. The percentage of weight loss was calculated as the moisture content.

Ash Content: To determine the ash content, leaf samples of DAN were dried in an oven to remove moisture and then weighed. They were then placed in a muffle furnace at 500–600°C for 4 to 6 hours until all organic matter was burned off, leaving only the ash. After cooling in a desiccator, they were weighed with the ash, and ash content was calculated as a percentage of the sample's original weight.

Crude Fibre Content: This was determined using a dried sample of DAN. About 10g of dried DAN was boiled 1.25% H₂SO₄ for 30 minutes to remove soluble components. The remaining residue was then filtered and washed in warm distilled water to remove the acid. The resultant residue was then boiled in 1.25% NaOH for 30 minutes and then filtered and washed in warm water to remove the base. The residue was then dried in an oven at 105°C and weighed. The dried residue was then burned in a furnace at

550°C to remove any remaining organic matter. The fibre content was determined by subtracting the ash weight from the fibre residue.

Nitrogen Content: Here, the Kjeldahl method was used. About 10g of DAN was placed in a Kjeldahl flask and concentrated H₂SO₄ and copper sulfate were added as catalysts. The mixture was heated, converting the organic nitrogen in the sample to ammonium sulfate. The solution was then cooled and NaOH added to neutralize the H₂SO₄ which converts ammonium ions into ammonia gas. The ammonia is then distilled and absorbed in a boric acid solution. The ammonia-boric acid solution was titrated with H₂SO₄ until the endpoint was reached. The nitrogen content was calculated based on the amount of titrant used, and the protein content was determined by multiplying the nitrogen content by a conversion factor (typically 6.25 for plant samples).

Lipid Content: This was done using the Soxhlet extraction method. Dried leaf samples of DAN were placed in an oven at 105°C to remove moisture. About 10g of moisture-free sample of DAN was placed in a Soxhlet extractor with petroleum ether added to the extraction flask. The apparatus was heated to reflux the solvent after dissolving and extracting lipids from the sample. The solution was evaporated to remove the solvent, leaving only the lipids. The resultant lipids were weighed and calculated as the percentage of crude lipids.

Carbohydrate Content: This was determined using the 'estimation by difference' method, where the sum of the moisture, ash, protein, and lipid contents is subtracted from one hundred (100).

2.3 Preparation and Extraction of Plant Material

The fresh leaves of *Datura alba* ness were washed, and air dried at room temperature for two (2) weeks to obtain crispy dry leaves which were ground into coarse particles. Extraction of the leaves was done by cold maceration according to previously described procedures [15,16]. About 400 g of coarsely ground particles of *Datura alba* ness 400g were soaked in 2000 ml of methanol and allowed to stand for 72hrs with intermittent stirring. The macerated mixture was then filtered using filter paper. The filtrate was dried in a water bath at a

temperature of 50°C to obtain the methanol extract of *Datura alba* ness (MEDAN).

2.4 Qualitative Phytochemical Analysis

Qualitative screening and detection of MEDAN were carried out to identify various phytoconstituents following the standard protocols outlined by Trease and Evans [17].

Alkaloids: Mayer's test was used to detect alkaloids in MEDAN. In this process, 2 ml of the extract was combined with 1 ml of Mayer's reagent. The appearance of a pale-yellow precipitate confirmed the presence of alkaloids.

Flavonoids: The Lead acetate test was used to detect the presence of flavonoids. A few drops of Lead acetate solution to MEDAN. The formation of a yellow precipitate indicated the presence of flavonoids.

Tannin/Polyphenol: The MEDAN was diluted and 3-4 drops of 10% FeCl₃ were added. A blue colour indicated the presence of gallic tannins, while a green colour signified catechol tannins.

Saponins: About 2 g of the MEDAN were boiled in 20 ml of distilled water. Then, 10 ml of the filtrate was mixed with 5 ml of distilled water and shaken vigorously. The formation of froth indicated the presence of saponins.

Glycosides: The Molisch's Reagent Test was used to detect glycosides. Approximately 5 ml of Molisch's reagent was added to 1 g of the extract, followed by the addition of concentrated H₂SO₄. The appearance of a violet colour indicated the presence of glycosides.

Steroids: Steroids were detected by adding a few drops of acetic anhydride to the MEDAN extract. A colour change from violet to blue to green indicated the presence of steroids.

2.5 Quantitative Phytochemical Analysis

The quantitative chemical evaluation was carried out to detect the amount of the various phytochemicals following standard protocols by Harborne, J.B [18].

Flavonoids: About 100 g of MEDAN was with aluminium chloride solution and ethanol which produced a yellow-colored complex with flavonoids. The absorbance was measured at 420 nm using a spectrophotometer. The

concentration was calculated using a standard curve of quercetin.

Alkaloids: The MEDAN was treated with bromocresol green, which forms a yellow-coloured complex with alkaloids. The absorbance was measured at 470 nm and a standard curve based on a known alkaloid standard (quinine) was used to determine the concentration.

Tannins: The extract was mixed with Folin-Denis reagent, which reacts with tannins to yield a blue colour. The absorbance was measured at 760 nm and a standard curve based on tannic acid was used to determine the concentration.

Saponins: The extract was reacted with Vanillin and Sulfuric acid to form a red colour. The absorbance was measured at 560 nm and a standard curve based on digitonin was used to determine the concentration.

Phenols: The extract was mixed with Folin-Ciocalteu reagent to produce a blue colour. The absorbance was measured at 760 nm and a standard curve based on gallic acid was used to determine the concentration.

Cardiac Glycosides: The extract was hydrolyzed with concentrated H₂SO₄ to release aglycones, which are then reacted with acetic anhydride to yield coloured complexes, mostly reddish-brown or blue. The absorbance was measured at 620 nm and a standard curve based on digoxin was used to determine the concentration.

Oxalates: The extract was added to calcium chloride solution to precipitate calcium oxalate and then filtered to collect the precipitate (calcium oxalate). The calcium oxalate was dissolved in concentrated sulfuric acid and then allowed to cool at room temperature. The dissolved oxalate solution was now titrated with a standard potassium permanganate solution until a permanent pink which indicated the endpoint. The volume of potassium permanganate used for the titration was noted and used in the calculation of the amount of oxalate.

Phytates: The extract was added to Wade's reagent (ferric chloride-sulfuric acid) to form a coloured complex with phytates. The absorbance was read at 500 nm and a standard curve based on sodium phytate was used to determine the concentration.

2.6 Chemical Characterization Gas Chromatography-Mass Separation (GC-MS)

The phytochemicals in MEDAN were characterized using a GC-MS QP2010 Plus (Shimadzu, Japan). Identification of the phytochemicals in the sample was performed with a QP2010 gas chromatography system equipped with a Thermal Desorption System (TD 20) linked to Mass Spectroscopy (Shimadzu, Japan). The ionization voltage was set to 70 eV. Gas chromatography was conducted in temperature programming mode using a Restek column (0.25 mm, 60 m, XTI-5). The initial column temperature was set at 80°C for 1 minute, then increased linearly at 70°C per minute to 220°C, held for 3 minutes, followed by a linear increase of 10°C per minute to 290°C for 10 minutes. The injection port temperature was maintained at 290°C, and the GC-MS interface was also kept at 290°C. The sample was introduced through an all-glass injector operating in split mode, with a helium carrier gas flow rate of 1.2 mL per minute.

Compounds were identified by comparing their retention times and fragmentation patterns with the mass spectra obtained from the GC-MS. The identity of the active components in the extract

was verified by comparing their retention indices, peak area percentages, and mass spectral fragmentation patterns against data stored in the National Institute of Standards and Technology (NIST) digital library to confirm the names, molecular weights, formulas, structures, and bioactivities of the compounds.

3. RESULTS

Table 1 presents the results of the proximate analysis of fresh *Datura alba nesa* leaves. The data reveal that the leaves contain 60.4% moisture. Protein (21.9%) and carbohydrates (7.60%) are identified as the most and second most abundant nutritional components, respectively, while fats (4.17%) are the least abundant dietary component.

Table 2 presents the qualitative and quantitative analysis of the phytoconstituents in the methanol extract of fresh *Datura alba nesa* leaves. The data indicate that the extract contains a significant amount of valuable phytoconstituents. Flavonoids were found to have the highest concentration (12.62 mg/100 g, 49.14%), followed by alkaloids (4.92 mg/100 g, 19.16%). Oxalates and phytates had the lowest concentrations, at 0.11 mg/100 g and 0.03 mg/100 g, respectively.

Table 1. Proximate analysis of fresh leaves of *Datura alba nesa*

S/N	Constituents	Content (%)
1.	Crude fibre	4.77±0.01
2.	Fat	1.19 ± 0.01
3.	Ash	4.17 ± 0.01
4.	Carbohydrate	7.60 ± 0.01
5.	Moisture content	60.4 ± 0.01
6.	Crude protein	21.9 ± 0.01

Table 2. Qualitative and quantitative phytoconstituents of methanol extract of *Datura alba nesa*

Phytochemical Constituent	Qualitative	Quantitative (mg/100 g)	Quantitative (%)
Flavonoids	+++	12.62 ± 0.01	49.14
Alkaloids	+++	4.92 ± 0.02	19.16
Tannins	+++	3.13 ± 0.02	12.19
Saponins	++	3.01 ± 0.01	11.72
Phenols	++	1.37 ± 0.01	5.33
Cardiac glycosides	+	0.49 ± 0.02	1.91
Oxalates	+	0.11 ± 0.11	0.43
Phytates	+	0.03± 0.01	0.12

+ present
 ++ moderately present
 +++ highly present

Table 3. The Gas Chromatographic-Mass Separation (GS-MS) spectral analysis of methanol extract of *Datura alba ness*

Peak number	Retention time	Area time	Area %	Name of compound
1	10.737	8328159	3.65	Hydrocinnamic acid
2	12.275	755279	0.33	beta-Phenylethyl butyrate
3	17.867	3075029	1.35	1-Tetradecanol
4	19.101	29367983	12.87	n-Hexadecanoic acid
5	20.391	2957377	1.30	9,12,15-Octadecatrien-1-ol
6	20.492	3684843	1.61	13-Hexyloxacyclotridec-10-en-2-one
7	21.190	816331	0.36	Methyl stearate
8	21.278	9140328	4.00	9,12-Octadecadienoic acid
9	21.350	13824365	6.06	7-Hexadecenal
10	21.611	2081058	0.91	Octadecanoic acid
11	22.045	1947820	0.85	Tetracosane
12	22.209	9660346	4.23	Dodecanoic acid, 1,2,3-propanetriylest
13	22.941	2437672	1.07	cis-11-Tetradecen-1-ol
14	23.359	5424929	2.38	Ricinoleic acid
15	24.036	1512491	0.66	Tetracosane
16	25.202	36461427	15.97	Bis(2-ethylhexyl)phthalate
17	25.264	7109481	3.11	Stigmasterol
18	26.329	4768528	2.09	9-Tetradecenal, (Z)-
19	26.470	2986245	1.31	Linoleic acid ethyl ester
20	26.536	3831073	1.68	Dotriacontane
21	26.748	24577804	10.77	Gamma.-Sitosterol
22	27.001	4965656	2.18	Cholest-5-en-3-ol, 24-propylidene-(3.
23	27.395	2128723	0.93	Squalene
24	27.633	996996	0.44	1-Monooleoylglycerol
25	28.003	32551778	14.26	13-Hexyloxacyclotridec-10-en-2-one
26	28.090	6254316	2.74	9,19-Cyclolanost-24-en-3-ol
27	28.367	2383390	1.04	Delta.-Tocopherol
28	28.731	1641813	0.72	Tetrapentacontane
29	29.204	2590497	1.13	Gamma.-Tocopherol

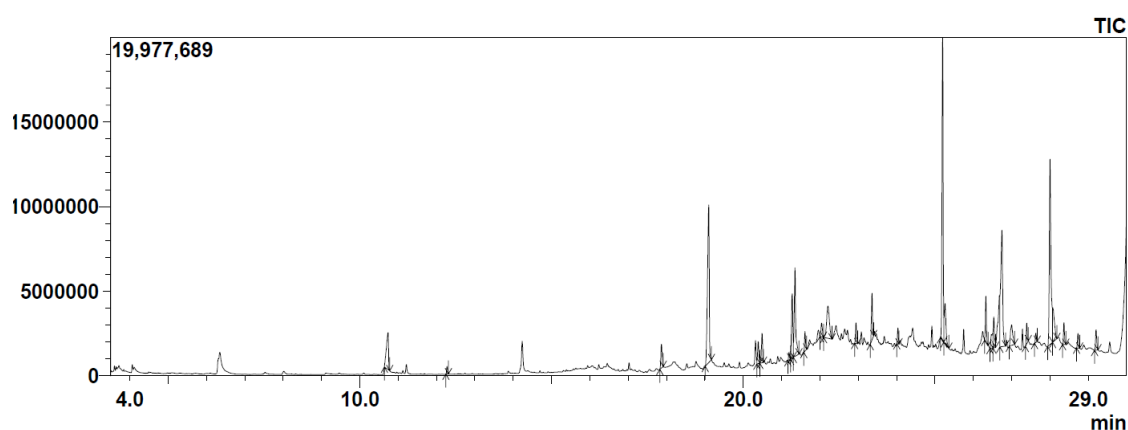
**Fig. 1. Total ionic chromatogram (TIC) analysis of methanol leaf extract of *Datura alba ness* extract**

Table 3 lists the biomolecular compounds identified in the methanol leaf extract of *Datura alba ness*, with a total of twenty-nine compounds detected. The five most abundant compounds are Bis(2-ethylhexyl) phthalate (15.97%), 13-Hexyloxacyclotridec-10-en-2-one (14.26%), n-

Hexadecanoic acid (12.87%), γ -Sitosterol (10.77%), and 7-Hexadecenal (6.06%).

Fig 1 displays the total ion chromatogram analysis of the methanol leaf extract of *Datura alba ness*. The analysis shows that the extract

reaches its peak height of 19,977,689 between 25 and 26 minutes."

4. DISCUSSION

Medicinal plants serve as a crucial source of novel herbal medicines, with the global demand for herbal drugs increasing significantly in recent decades [5]. The World Health Organization estimates that 80% of the global population relies on herbal and folk medicines as sources of therapeutic agents and active chemical constituents, fueling the rapid growth of related healthcare sciences [19]. Numerous active phytochemicals—such as terpenoids, tannins, alkaloids, phenols, flavonoids, steroids, glycosides, and volatile oils—have been extracted from medicinal plants, including their crude extracts and essential oils. These secondary metabolites have been linked to the treatment of both curable and incurable diseases [9,20]. The present study provides a comprehensive analysis of the nutritional and phytochemical properties of *Datura alba* Ness, a common species of *Datura* found in Nigeria.

Proximate analysis of fresh leaves of DAN revealed the presence of moisture (60.4%), crude protein (21.9%), carbohydrate (7.6%), crude fibre (4.77%), ash (4.17%) and fat (1.19%) with protein and carbohydrates being the most abundant dietary components (Table 1). Leaves are among the most abundant and affordable sources of protein. The nutritional quality of protein depends on the balance of essential amino acids, which humans cannot produce and therefore must obtain through their diet [21]. The present study reveals that DAN is a good source of protein. This is higher than what was observed for *Datura metel* [22] and *Datura stramonium* leaves [23]. Carbohydrates form a major class of naturally occurring organic compounds that are essential for the maintenance and sustenance of life in both plants and animals, while also serving as key raw materials for various industries [23]. Data from the study suggests that DAN is equally a good source of carbohydrates, providing lower carbohydrate content when compared with *Datura stramonium* leaves [23]. Also, DAN was shown here as a good source of dietary fibre although it had lower fibre content compared to *Datura stramonium* leaves [23]. Dietary fibres are the indigestible parts of plant-based foods, primarily found in fruits, leaves, vegetables, and grains. Unlike other carbohydrates, they cannot be broken down by the body's digestive enzymes. Instead, they pass through the

digestive system relatively intact, providing several health benefits such as reduced body weight and reduced risk of cardiovascular diseases [24,25]. The study also showed that *Datura alba* Ness (DAN) is a good source of ash (4.17%), indicating the presence of various mineral elements in the leaves. Additionally, the high moisture content (60.4%) suggests that it could accelerate the growth of microorganisms, potentially shortening the shelf life of stored fresh leaf samples [26]. The low-fat content (1.19%) might imply that the leaves are less palatable as dietary fats are known to enhance the taste of food by absorbing and retaining flavour.

The result of phytochemical analysis shows that DAN contains large quantities of flavonoids, alkaloids, tannins, saponins and phenols with small quantities of cardiac glycosides, oxalates and phytates (Table 2). The variety of phytochemicals in DAN grants it multiple pharmacological properties. The study shows that flavonoids (49.14%) were the most abundant phytochemical, constituting half of the active constituent of the leaf. Flavonoids are one of the most diverse and widespread groups of natural compounds. The presence of hydroxyl groups grants them scavenging properties and plays a crucial role in preventing lipid peroxidation [27,28]. They have been reported to exhibit anti-inflammatory effects, and hypoglycemic properties, and may reduce glucagon levels, enhancing glucose utilization and lowering blood glucose, while also stimulating insulin release from the pancreas [29]. Extracts from seeds and leaves of other *Datura* species have been demonstrated to contain a significant quantity of flavonoids [30] with potent antidiabetic, hypoglycaemic and anti-inflammatory activities [30-33]. Alkaloids were the second most abundant phytochemical found in MEDAN (14.92%). Alkaloids are natural compounds containing heterocyclic nitrogen atoms, historically used in the preparation of spices, medicines, and poisons [28,34]. They exhibit a range of pharmacological effects, including anti-inflammatory, antibacterial, antimutagenic, analgesic, local anaesthetic, hypnotic, psychotropic, and antitumor activities, among others [35,36]. Extracts from the seed and leaves of other *Datura* species have been demonstrated to exhibit analgesic, antibacterial and psychotropic activities [37-39]. Saponins (12.19%) and tannins (11.72%) which were found in almost equal concentration are also important phytoconstituents which have been shown to possess potent anti-microbial,

hypocholesterolemic and anti-diabetic properties [40,41]. Extracts from the seed and leaves of other *Datura* species have been demonstrated to exhibit potent anti-microbial and hypocholesterolemic activities [30,31,42]. The low concentrations of cardiac glycosides (1.91%), oxalates (0.43%) and phytates (0.12%) in the MEDAN show that it is less likely to be toxic as these phytochemicals are known to be toxic at high concentrations [43,44]. However, some extracts from seeds and leaves of other *Datura* species have been shown to exhibit toxicity [10,45,46].

Furthermore, the results from Gas chromatography and mass spectrometry (GC-MS) analysis of MEDAN identified twenty-nine (29) active compounds with four (4) identified as the most abundant (with area concentration >10%). These abundant compounds include Bis (2-ethylhexyl) phthalate (15.97%), 13-hexyloxacyclotridec-10-en-2-one (14.26%), n-hexadecanoic acid (12.87%) and Gamma-Sitosterol (10.77). Both long- and short-term exposure to Bis (2-ethylhexyl) phthalate is toxic to humans and animals [47-49]. However, 13-hexyloxacyclotridec-10-en-2-one is said to possess antimicrobial and anti-inflammatory effects and may protect against liver damage [50]. On the other hand, n-hexadecanoic acid acts as an antioxidant, helping to alleviate oxidative stress and protect cells from damage. Also, other studies suggest that studies suggest that n-hexadecanoic acid may have anti-inflammatory properties, potentially helping to manage conditions like rheumatoid arthritis and asthma [51,52]. Gamma-sitosterol can help lower cholesterol levels by competing with cholesterol for absorption in the intestines, potentially reducing the risk of heart disease. Also is said to possess anti-inflammatory properties while reducing the risk of cancer and boosting the immune system [53-55].

5. CONCLUSION

The presence of various nutrients, compounds, and bioactive substances identified through proximate, phytochemical, and GC-MS analysis of fresh leaves and methanol extract of *Datura alba* ness supports its potential use as a supplement and therapeutic agent. Based on these findings, it can be concluded that *Datura alba* ness contains several bioactive compounds that could serve as effective treatments for diseases related to oxidative stress, nervous

system disorders, tissue damage, inflammation, and bacterial infections.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that No generative artificial intelligence (AI) technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

The authors have declared that no competing interests exist.

REFERENCES

1. Adewunmi CO, Ojewole JAO. Editorial-Safety of traditional medicines, complementary and alternative medicines in Africa. African journal of traditional, complementary and alternative medicines. 2004;1(1):1-3.
2. Chinko BC, Dapper DV, Adienbo OM, Egwurugwu JN, Uchefuna RC. Biochemical Evaluation of the Effects of Hydromethanolic Extracts of *Dioscorea bulbifera* in Wistar Rats. IOSR Journal of Dental and Medical Sciences. 2016;5(9): 105-10.
3. Ugoeze KC, Oluigbo KE, Chinko BC. Phytomedicinal and Nutraceutical Benefits of the GC-FID Quantified Phytocomponents of the Aqueous Extract of *Azadirachta indica* leaves. Journal of Pharmacy and Pharmacology Research. 2020;4(4):149-63.
4. Bhusnure OG, Shinde MC, Vijayendra SS, Gholve SB, Giram PS, Birajdar MJ. Phytopharmaceuticals: An emerging platform for innovation and development of new drugs from botanicals. Journal of Drug Delivery and Therapeutics. 2019;9(3-s):1046-57.
5. Adienbo OM, Nwafor A, Ogbomade RS. Contraceptive efficacy of hydro-methanolic fruit extract of *Xylopia aethiopica* in male albino rats. Int J Adv Biol Biom Res. 2013;1(7):718-27.
6. Gbaranor KB, Tee PG, Agara HN, Victor PD, Alasia OM, David-Sarogoro N, et al. Phytochemical Analysis of Leaf Extract of *EnglerinaDrummomdii*Balle Ex Polhill & Wiens. Volume. 2021;10:128-34.

7. Saronee F, Amah-Tariah FS, Chinko BC, Dapper DV. GC-MS and proximate analysis of the hydromethanol extract of *Craterispermum schweinfurthii* leaves. *South Asian Res. J. Nat. Prod.* 2023;6(2): 101-9.
8. Singh BP, Bangar SP, Alblooshi M, Ajayi FF, Mudgil P, Maqsood S. Plant-derived proteins as a sustainable source of bioactive peptides: recent research updates on emerging production methods, bioactivities, and potential application. *Critical reviews in food science and nutrition.* 2023;63(28):9539-60.
9. Ibrahim M, Siddique S, Rehman K, Husnain M, Hussain A, Akash MSH, Azam F. Comprehensive analysis of phytochemical constituents and ethnopharmacological investigation of genus *Datura*. *Critical Reviews™ in Eukaryotic Gene Expression.* 2018;28(3).
10. Sharma M, Dhaliwal I, Rana K, Delta AK, Kaushik P. Phytochemistry, pharmacology, and toxicology of *Datura* species—A review. *Antioxidants.* 2021;10(8):1291.
11. Priya KS, Gnanamani A, Radhakrishnan N, Babu M. Healing potential of *Datura alba* on burn wounds in albino rats. *Journal of ethnopharmacology.* 2002;83(3):193-9.
12. Satyavati GV, Raina MK, Sharma M. *Medicinal plants of India, vol 1, ICMR.* Delhi: Cambridge Printing Works. 1976:85-7.
13. de Vries MEJ, Duphar B. Association of Official Analytical Chemists Europe Regional Section. *Z Lebensm Unters Forsch.* 1990;190:F9-F12.
14. Nielsen SS. *Introduction to food analysis.* Nielsen's Food Analysis: Springer; 2024:3-14.
15. Nerlekar N, Patil P, Khot S, Kulkarni A, Dandge P, Berde A, et al. Cold maceration extraction of wild fruit *Terminalia bellirica* (Gaertn.) Roxb.: exploring its bioactives for biomedical applications. *Preparative Biochemistry & Biotechnology.* 2024:1-19.
16. Lezoul NEH, Belkadi M, Habibi F, Guillén F. Extraction processes with several solvents on total bioactive compounds in different organs of three medicinal plants. *Molecules.* 2020;25(20):4672.
17. Evans WC. *Trease and Evans' Pharmacognosy.* 16th ed. New York: Elsevier Health Sciences; 2009.
18. Harborne JB. *Phytochemical Methods:* Springer Dordrecht; 1984.
19. World Health Organization. *WHO traditional medicine strategy: 2014-2023:* World Health Organization; 2013.
20. Al-Jafari ASH, Hossain MA. Phytochemical studies of various polarities leave crude extracts of Omani *Datura metel* L. and evaluation of their antimicrobial potential. *J Coast Life Med.* 2015;3(3):214-9.
21. Aletor O, Oshodi AA, Ipinmoroti K. Chemical composition of common leafy vegetables and functional properties of their leaf protein concentrates. *Food chemistry.* 2002;78(1):63-8.
22. Aduloju EI, Ogunlade Y. Nutritive properties and phytochemical analysis of Thorn Apple "Gegemu" (*Datura metel*). *J. Nat. Sci. Res.* 2015;5(13):71-7.
23. Ibiom OFA, Kalu EN, Kanayochukwu LU, Akpo SO. Proximate and Phytochemical Analysis of the Fruits and Leaves of *Datura Stramonium* L, and the Effect of Fungi Associated with Foliar Blight on Them. *Austin J Biotechnol Bioeng.* 2017;4(1): 1073.
24. Patil MS, Bavaskar KR, Rane BR, Jain AS, Shirkhedkar A. *Introduction to Dietary Fibers.* Food Supplements and Dietary Fiber in Health and Disease: Apple Academic Press; 2023:3-47.
25. Dragan SR, Damian G, Pah AM, Hayta M, Kahraman K. *Dietary Fibers.* Handbook of Dietary Phytochemicals. 2019:1-34.
26. Aborisade AB, Adetutu A, Owoade AO. Phytochemical and proximate analysis of some medicinal leaves. *Clinical Medicine Research.* 2017;6(6):209-14.
27. Izu GO, Adeyi AO, Erukainure OL, Islam MS. Gamma-sitosterol-rich fraction from the methanolic extract of *Ficus exasperata* restores diabetes associated pathophysiological alterations in an alloxan-induced diabetic rats. *Biokemistri.* 2022;33(1):39-52.
28. Ugoeze KC, Amadi N, Okoronkwo NA, Abali SO, Oluigbo KE, Chinko BC. GC-FID guided Identification and Quantification of detectable Phytochemicals in selected Commercial Chamomile Herbal Tea. *International Journal of Applied Biology and Pharmaceutical Technology.* 2023; 14(1):1-11.
29. Shehadeh MB, Suaifan GA, Abu-Odeh AM. Plants secondary metabolites as blood glucose-lowering molecules. *Molecules.* 2021;26(14):4333.
30. Anju Dhiman AD, Ratan Lal RL, Meenu Bhan MB, Bindu Dhiman BD, Ashima

- Hooda AH. Plebeian assessment of antimicrobial and in vitro antioxidant zest of *Datura fastuosa* L. seeds. 2012.
31. Shobha G, Soumya C, Moses SKaV. Phytochemical profile, antibacterial and antidiabetic effects of crude aqueous leaf extract of *Datura stramonium*. *Pharmacophore*. 2014;5(2-2014):273-8.
 32. Murthy BK, Nammi S, Kota M, Rao RK, Rao NK, Annapurna A. Evaluation of hypoglycemic and antihyperglycemic effects of *Datura metel* (Linn.) seeds in normal and alloxan-induced diabetic rats. *Journal of ethnopharmacology*. 2004;91(1): 95-8.
 33. Sonika G, Manubala R, Deepak J. Comparative studies on anti-inflammatory activity of *Coriandrum sativum*, *Datura stramonium* and *Azadirachta indica*. *Asian J Exp Biol Sci*. 2010;1(1):151-4.
 34. Yang L, Stöckigt J. Trends for diverse production strategies of plant medicinal alkaloids. *Natural product reports*. 2010; 27(10):1469-79.
 35. Bhambhani S, Kondhare KR, Giri AP. Diversity in chemical structures and biological properties of plant alkaloids. *Molecules*. 2021;26(11):3374.
 36. Czapski GA, Szypuła W, Kudlik M, Wileńska B, Kania M, Danikiewicz W, Adamczyk A. Assessment of antioxidative activity of alkaloids from *Huperzia selago* and *Diphysastrum complanatum* using in vitro systems. *Folia Neuropathologica*. 2014;52(4):394-406.
 37. Abena AA, Miguel LM, Mouanga A, Ouamba JM, Sianard DF, Thiebolt MH, et al. Neuropsychopharmacological effects of leaves and seeds extracts of *Datura fastuosa*. 2004.
 38. Abena AA, Miguel LM, Mouanga A, Assah TH, Diatewa M. Evaluation of analgesic effect of *Datura fastuosa* leaves and seed extracts. *Fitoterapia*. 2003;74(5): 486-8.
 39. Khalili M, Atiabi M. Antinociceptive effects of oral and intraperitoneal administration of alcoholic *Datura stramonium* seeds extract in male rats. 2004.
 40. Sharma K, Kaur R, Kumar S, Saini RK, Sharma S, Pawde SV, Kumar V. Saponins: A concise review on food related aspects, applications and health implications. *Food Chemistry Advances*. 2023;2:100191.
 41. Gupta N, Gudipati T, Prasad G. Plant secondary metabolites of pharmacological significance in reference to diabetes mellitus: an update. *Int J Curr Microbiol App Sci*. 2018;7:3409-48.
 42. Tandon C, Mathur P, Sen M. Antibacterial compounds in different species of *Datura*: A review. *Academic Journal*. 2014;8(21): 2090-208.
 43. López-Moreno M, Garcés-Rimón M, Miguel M. Antinutrients: Lectins, goitrogens, phytates and oxalates, friends or foe? *Journal of Functional Foods*. 2022;89:104938.
 44. Kaur N, Agarwal A, Sabharwal M, Jaiswal N. Natural Food Toxins as Anti-Nutritional Factors in Plants and Their Reduction Strategies. *Food Chemistry: The Role of Additives, Preservatives and Adulteration*. 2021:217-48.
 45. Krenzelok EP. Aspects of *Datura* poisoning and treatment. *Clinical Toxicology*. 2010; 48(2):104-10.
 46. Gaire BP, Subedi L. A review on the pharmacological and toxicological aspects of *Datura stramonium* L. *Journal of integrative medicine*. 2013;11(2):73-9.
 47. Rowdhwal SSS, Chen J. Toxic effects of di-2-ethylhexyl phthalate: An overview. *BioMed Research International*. 2018;2 018(1):1750368.
 48. Gray TB, Butterworth KR, Gaunt IF, Grasso P, Gangolli SD. Short-term toxicity study of di-(2-ethylhexyl) phthalate in rats. *Food and Cosmetics Toxicology*. 1977; 15(5):389-99.
 49. David RM, Moore MR, Finney DC, Guest D. Chronic toxicity of di (2-ethylhexyl) phthalate in mice. *Toxicological Sciences*. 2000;58(2):377-85.
 50. Selvarajan VS, Selvarajan R, Pandiyan J, Abia ALK. Unveiling the Potency and Harnessing the Antibacterial Activities of Plant Oils against Foodborne Pathogens. *Microbiology Research*. 2023;14(3):1291-300.
 51. Kavitha R, Uduman M. Identification of bioactive components and its biological activities of *Abelmoschus moschatus* flower extract-a GC-MS study. *IOSR J. Appl. Chem*. 2017;10(11):19-22.
 52. Aparna V, Dileep KV, Mandal PK, Karthe P, Sadasivan C, Haridas M. Anti-inflammatory property of n-hexadecanoic acid: Structural evidence and kinetic assessment. *Chemical Biology & Drug Design*. 2012;80(3):434-9.
 53. Nattagh-Eshtivani E, Barghchi H, Pahlavani N, Barati M, Amiri Y, Fadel A, et al. Biological and pharmacological effects

- and nutritional impact of phytosterols: A comprehensive review. *Phytotherapy Research*. 2022;36(1):299-322.
54. Trautwein EA, Demonty I. Phytosterols: natural compounds with established and emerging health benefits. *Oléagineux, Corps Gras, Lipides*. 2007;14(5):259-66.
55. Moreau RA, Nyström L, Whitaker BD, Winkler-Moser JK, Baer DJ, Gebauer SK, Hicks KB. Phytosterols and their derivatives: Structural diversity, distribution, metabolism, analysis, and health-promoting uses. *Progress in Lipid Research*. 2018;70:35-61.

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