Phytochemical Screening and Elemental Analysis of Aqueous and Methanolic Extracts of *Datura innoxia* Seeds and Leaves

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Research Article

Abstract

The present study is aimed to screen the phytochemicals analysis and elements content of *Datura innoxia* seeds and leaves. The aqueous and methanol extracts were carried out by using the maceration method and soxhlet apparatus, respectively. Results of the study of Phytochemical screening revealed the presence of a high concentration of alkaloids, flavonoids, tannins, steroids and triterpines, and low concentration of saponin and coummarins. The elements in the leaves and seeds (K, Ca, S, Si, Cl, Fe, Al, P, Mg, Ti, Mn, Zn, Sr, Cu, V, Br, and Zr) were determined by energy-dispersive X-ray fluorescence (EDXRF) spectroscopy. K content was the highest in seeds (5.469 ± 0.021%), Ca and S the highest in leaves (2.461 ± 0.019 %, 1.254 ± 0.022 %, respectively). The elements Ti, Mn, Sr, V, Br, and Zr were detected in the leaves with range concentration 0.062-0.002 %. The elements Si, Cl, Fe, Al, P, Mg, and Zn concentration in seeds varied from 0.002 to 0.942% and in leaves varied from 0.014 to 0.346%. The concentration of these elements did not exceed the standard of dangerous toxic levels.

Keywords: *Datura innoxia*, Extraction, Phytochemical screening, Elemental analysis

1. Introduction

A large proportion of the world's population depends on medicinal plants as home remedies and nutritional supplements. These plants also act as a raw material for the pharmaceutical industries for the production of various medicines. According to a survey conducted by the World Health Organization (WHO), 80% of the world's population depends on traditional methods of health care [1]. Plants contain pharmacologically active compounds such as alkaloids, flavonoids, glycosides, and many other important organic compounds. Metallic ions also play a very key role in the proper functioning of the human body; hence, these are integral components of plants [2, 3]. The human body needs a variety of elements for the proper functioning of all body parts. *Datura innoxia* is one such herb that contains essential and traces elements which are important for proper functioning and growth of the human
body. The deficiency of these elements causes a wide range of abnormalities and metabolic disorders. Determination of metals in medicinal plants is done to establish their purity, safety, and efficiency. There is no general guideline for the permissible level of the elements in the medicinal herb, except only for cadmium (0.3 mg/kg); arsenic (1 mg/kg), and lead (10 mg/kg). The ability of these metals to affect the pharmacological activity of herbs is the most obvious reason to study the amount of these elements in plants. X-ray fluorescence is a rapid and accurate analyzing method involving minimal sample preparation and provides multi-element determination [4]. Mineral composition of plants, spices, herbs, essential oils, legumes, nuts, yogurts, and vegetables has already been studied. In medicinally important plants and herbs, the content of mineral is already reported by [5, 6, 7]. Metallic mineral elements in a large number of medicinal plants were collected from Europe and the Mediterranean region and were studied by [8]. The mineral composition of medicinal plants from Sudan was studied by [9]. In Indian medicinal herbs, minerals were studied by [10, 11] and elemental analysis was carried out in some of the important medicinal herbs from India [12].

2. Material and methods

2.1 Plant samples (seeds and Leaves) were collection: Datura innoxia (seeds and Leaves) (Figures: 1 A, B, and C) were collected from El-Obeid City, North Kordofan State, Sudan, October, (2016). The plant leaves and seeds were cleaned, shade-dried, and ground by a mechanical grinder. Extraction by petroleum ether and methanol and water was carried out according to the method described by [13]. Their aqueous and methanolic extracts were characterized using GC-MS and EDXRF techniques. In addition to chemical tests for the identification of chemical compounds present in these samples.

2.2 Phytochemical screening of seeds and leaves: The phytochemicals of the plant samples were estimated following the procedure adopted by screening for the active constituents was carried out using the methods described by [14, 15, 16].

2.3 Test for tannins: 0.5 g of each extract was washed three times with petroleum ether, dissolved in 10 ml hot saline solution, and divided into two test tubes. To one tube 3 drops of ferric chloride reagent were added and to the other one 3 drops of gelatin, salts reagent were added. The occurrence of a blackish-blue color in the first test tube and turbidity in the second one denotes the presence of tannins.

2.4 Test for sterols and terterpines: 0.5 g of each extract was washed three times with petroleum ether and dissolved in 10 ml of chloroform. To 5 ml of the solution, 0.5 ml acetic anhydride was added followed by 3 drops of conc. Sulphuric acid at the bottom of the test tube. At the contact zone of the two liquids, a
gradual appearance of green to blue color was taken as evidence of the presence of sterols and pink to purple color for the presence of teriterpines in the sample.

2.5 Test for alkaloids:
0.5 g of each extract was heated with 10 ml of 2N HCl in a water bath, stirred for about 10 minutes, cooled, filtered, and divided into two test tubes. To one test tube, few drops of Mayer’s reagent were added while to the other tube a few drops of Valser’s reagent were added. Slight turbidity or heavy precipitate in either of the two test tubes was taken as presumptive evidence for the presence of alkaloids.

2.6 Tests for flavonoids:
0.5 g of each extract was washed three times with petroleum ether, dissolved in 30 ml of 80% ethanol. The filtrate was divided into three test tubes and used for the following tests:
a. To 5 ml of the filtrate in a test tube 1ml of 1%, aluminum chloride solution was added. The appearance of a yellow color indicated the presence of Flavonoids.
b. To 5 ml of the filtrate in a test tube 1ml of 1%, a potassium hydroxide solution was added. The appearance of a yellow color indicated the presence of Flavonoids.
c. To 5 ml of the filtrate in a test tube 1ml of 10% lead, acetate solution was added. The appearance of a yellow color indicated the presence of Flavonoids.

2.7 Test for saponins:
0.5 g of each extract was placed in a clean test tube. 10 ml of distilled water was added, vigorously shaken for about 30 seconds. The tube was then allowed to stand and observed for the formation of foam, which persisted for at least an hour, was taken as evidence for the presence of saponins.

2.8 Test for coumramins:
0.5 g of each extract dissolved in 10 ml distilled water in a test tube. A filter paper is attached to the test tube to be saturated with the vapor after a spot of 0.5N KOH is put on it. Then the filter paper was inspected under UV light. The absorption of UV light by the spot indicated the presence of coumramins.

2.9 Test for anthraquinone glycoside:
0.5 g of each of the three extracts was boiled with 10 ml of 0.5N KOH containing 1 ml of 3% hydrogen peroxide solution. The mixture was extracted by shaking with 10 ml of benzene. To 5 ml of the benzene solution, 3 ml of 10% ammonium hydroxide solution were added and the two layers were allowed to separate. The appearance of pink or red color in the lower layer indicated the presence of anthraquinones.

2.10 Test for cyanogenic glycoside:
0.5 g of each extract was placed in Erlenmeyer flask and sufficient distilled water was added to moisten the sample, followed by 1ml of chloroform. A piece of freshly prepared sodium picrate paper was carefully inserted between a split crock which was used to stopper the flask, a change in the color of the sodium picrate paper from yellow to various shades of red was taken as an indication of the presence of cyanogenic glycoside [16].

2.11 Determination of elements in seeds and leaves using EDXRFS:
Three grams of each of the dried samples were ground into fine powder by a mechanical grinder. The powder sample of each plant part was then prepared and pressed into a thick
pellet. The samples were analyzed by an energy-dispersive X-ray fluorescence (EDXRFS) spectrometer. This equipment runs under PCEDX pro software. The elements were analyzed according to the Shimadzu set condition.

2.12 GC-MS of methanolic and aqueous extracts:
0.1 g of each extract was dissolved in 1 ml of analytical grade methanol (99.8%), shook well by using a centrifuge for 3 minutes; 1µl of it was taken for GC-MS injector.

3. Result and Discussion
The yield percentage of leaves and seeds extracts by methanol and water were shown in tables 1 and 2. The results in the tables showed a high yield percentage of leaves than seeds in methanol and aqueous extracts. This means that leaves have more polar compounds than seeds. The small difference in yield percentage may be attributed to the high concentration of methanol which had been used in our extraction. Deep green crude extract color is similar to relevant literature [17, 18].

| Table 1: Yield percentage of methanol extract: |
|-----------------------------------------------|
| Sample          | Weight of sample | Weight of extract | Yield %  |
| Seeds           | 600 g            | 42.882g           | 7.147    |

| Table 2: Yield percentage of aqueous extract: |
|-----------------------------------------------|
| Sample          | Weight of sample | Weight of extract | Yield %  |
| Seeds           | 600 g            | 15.84g            | 2.64     |

3.1 Phytochemicals Detection of the Active Components in *Datura innoxia* Leaves Powder and Extract
Active components in *Datura innoxia* plant leaves powder, and in its methanolic extract, and their method of detection were listed in table 3. The chemical analysis by GC-MS of *Datura innoxia* seeds and leaves (aqueous and methanol) extracts and biological specimens revealed the presence of important pharmacological bioactive compounds mainly tropane alkaloids which are toxic at high concentrations, fatty acids, phenyls, phenylpropanoids, amino acids, amides, terpenoids, esters, ketones, coummarins, quinones, and flavonoids. The aqueous and methanol extracts of seeds and leaves have a similar effect to the experimental rats because they all contain main alkaloidal compounds (atropine, Hyoscyamine, Tropacocaine, scopoline, Apoatropin) which have a toxic effect. The results showed a high concentration of alkaloids, flavonoids, and triterpenes in methanol seed extract. Aqueous seed extract showed a high concentration of alkaloids. Methanol leaves extract showed a high concentration of tannins and steroids. Alkaloids used as parasympatholytics have critical pharmaceutical applications in small doses, for instance, they are used in making muscle relaxants, painkillers, tranquilizers, and psychotropic drugs [19]. Flavonoids used to enhance the renal excretion, treatment of senile cerebral insufficiency, treatment of problems of memoryless, used as effects including antibacterial, anti-viral, anti-oxidant, anti-cancer, and anti-inflammatory [20]. Tannins traditionally used as agents for converting animal hides to leather is one manifestation of the most obvious activity of the tannins, their ability to precipitate proteins, alkaloids, and gelatin, tannins are water-soluble phenolic compounds have molecular weights 300-500. Steroids and triterpenes are not detected in aqueous extracts. Cyanogenic and anthraquinone groups not detected in both aqueous and methanolic extracts, this corresponding to the results of [21] who recorded that the phytochemical screening of the plant *Datura innoxia* showed that the leaves and seeds had alkaloids, atropine, hyoscyamine,
scopolamine, flavonoids, essential oils, tannins, and saponins. Alkaloid, phenol, and tannins were seemed to be found in a high level in the crude extract [22] reported that nearly all of the identified components of the plant which are known by their activity against microorganisms are aromatic or saturated organic compounds, they are most often obtained through ethanol or methanol extraction. The presence of alkaloids, phenol, steroids, resins, saponins, flavonoids, tannins, and glycosides in *Datura innoxia* 95% ethanolic extract were confirmed by finding of Uma Reddy [23].

| Sample                      | Saponin | Cumarin | Alkaloids | Flavonoids | Tannins | Steroids | Triterpenes | Anthraquinones | Cyanogenic |
|-----------------------------|---------|---------|-----------|------------|---------|----------|-------------|----------------|------------|
| Aqueous Leaves Extract      | ++      | +       | ++        | ++         | ++      | -        | -           | -              | -          |
| Aqueous Seeds Extract       | +       | +       | +++       | +          | +       | -        | -           | -              | -          |
| Methanol Leaves Extract     | ++      | +       | ++        | +++        | +++     | ++       | -           | -              | -          |
| Methanol Seeds Extract      | +       | +       | +++       | +++        | ++      | +        | +++         | -              | -          |

Key:
- [+++] means a high presence of the chemical group.
- [++] means the medium presence of the chemical group.
- [+] means a low presence of the chemical group.
- [-] means a negative result of the chemical group.

3.2 Determination of Elements in *Datura innoxia* Seeds and Leaves using EDXRF technique

The concentrations of the elements analyzed using EDXRF are shown in table 4.

| Elements | Seeds | Leaves |
|----------|-------|--------|
|          | % ±SD | % ±SD  |
| K        | 5.469±0.021 | 0.570±0.003 |
| Ca       | 0.037±0.001  | 2.461±0.019  |
| S        | 0.037±0.002  | 1.254±0.022  |
| Si       | 0.942±0.015  | 0.051±0.001  |
| Cl       | 0.647±0.011  | 0.078±0.002  |
| Fe       | 0.008±0.000  | 0.346±0.003  |
| Al       | 0.012±0.005  | 0.226±0.008  |
| P        | 0.08±0.001   | 0.08±0.007   |
| Mg       | 0.012±0.007  | 0.068±0.015  |
| Ti       | 0.000±0.000  | 0.062±0.003  |
| Mn       | 0.000±0.000  | 0.035±0.001  |
| Zn       | 0.002±0.000  | 0.014±0.000  |
| Sr       | 0.000±0.000  | 0.011±0.001  |
| Cu       | 0.001±0.000  | 0.008±0.001  |
| V        | 0.000±0.000  | 0.005±0.002  |
| Br       | 0.000±0.000  | 0.005±0.000  |
| Zr       | 0.000±0.000  | 0.002±0.001  |

*Datura innoxia* seeds and leaves have been studied to determine the essential and trace elements content and their correlation with the toxicity of the plant. The energy-dispersive X-ray fluorescence (EDXRF) spectroscopy has been used for the determination of the elements. The
analytical method allows the determination of 17 elements (K, Ca, S, Si, Cl, Fe, Al, P, Mg, Ti, Mn, Zn, Sr, Cu, V, Br, and Zr). Among the considered elements, K content was the highest in seeds (5.469 ± 0.021 w/w %), Ca the highest in leaves (2.461 ± 0.019 w/w%), and S has the highest content in leaves (1.254 ± 0.022 w/w%). The elements Ti, Mn, Sr, V, Br, and Zr were not detected in the plant seeds but detected in the plant leaves with range concentration between 0.062-0.002 w/w%. The range of elemental concentration of the elements Si, Cl, Fe, Al, P, Mg, and Zn in seeds varied from 0.002 to 0.942 w/w% in leaves varied from 0.014 to 0.346 w/w%. The concentrations of these elements did not exceed the standard dangerous toxic levels. Some of these elements are of vital importance for human metabolism and some are well known for curing diseases [24].

3.3 Chemical compounds of methanol extract of Datura innoxia seeds
The study of the chemical composition of methanol extract of Datura innoxia seeds using GC-MS analysis showed the presence of 20 compounds. The chemical compounds with their retention time (RT), chemical formula, and molecular weight are presented in table 5. They are as alkaloid compounds (scopolamine, atropine, tropine, 3-tropanone, pseudoecegonine methyl ester, apoaatropin, hyoscyamine, tropacocaine, tiglypseudotropin, homatropine, aziridine,1-methyl), fatty acids, esters (oleic acid, azelaic acid, acetic acid bromo-, 2-methylpyrazine-5-carboxylic acid, benzoicacid,3,5-dichloro-, 8-aza-8-methylbicyclo (3,2,1)oct-3-ylester) and and 8-azabicyclo(3,2,1)octane-3,6-diol,acetate (ester) and amines (benzonitril, 2-amino).

Table 5: Chemical compounds of methanol extract of Datura innoxia seeds

| Compound name                      | Formula  | M.wt   | Base ions | RT   |
|------------------------------------|----------|--------|-----------|------|
| Scopolamine.                       | C₁₇H₂₅NO₄ | 303    | 108-138   | 15.48|
| Aziridine,1-methyl.                | C₃H₅N    | 57     | 42-55     | 6.08 |
| Tropinone.                         | C₆H₁₀NO  | 139    | 42-96     | 15.48|
| 3-Tropanone.                       | C₆H₁₀NO  | 139    | 96-82     | 4.93 |
| Propanamide.                       | C₃H₇NO   | 73     | 44-73     | 3.56 |
| Methyl vinyl carbinol.             | C₄H₉O    | 72     | 43-57     | 3.56 |
| Pseudoecegonine methyl ester.      | C₁₀H₁₇NO₃| 199    | 96-199    | 4.93 |
| Atropine.                          | C₁₇H₂₅NO₃| 289    | 124-82    | 14.383|
| Apoaatropin.                       | C₁₇H₂₅NO₂| 271    | 124-271   | 14.384|
| Hyoscyamine.                       | C₁₇H₂₅NO₃| 289    | 124-289   | 14.377|
| Tropacocaine.                      | C₁₅H₁₉NO₂| 245    | 124-82    | 14.381|
| 8-Azabicyclo(3,2,1)octane-3,6-diol,acetate (ester). | C₁₂H₁₇NO₄ | 241 | 94-154 | 15.48|
| Tigloidine.                        | C₁₃H₁₂NO₂| 223    | 124-82    | 14.37|
| Homatropine.                       | C₁₆H₁₂NO₃| 275    | 124-275   | 14.36|
| Benzonitril,2-amino-               | C₆H₁₂N₂  | 118    | 91-118    | 7.73 |
| Oleic acid.                        | C₁₈H₃₄O₂  | 282   | 111-83    | 7.43 |
| Azelaic acid.                      | C₉H₁₆O₄  | 188    | 11-152    | 7.433|
| Acetic acid,bromo-.                | C₃H₆Bro₂  | 138    | 43-94     | 14.37|
| 2-methylpyrazine carboxylic acid.  | C₄H₇N₂O₂ | 138    | 138-94    | 15.47|
| Benzoic acid, 3,5-dichloro-, 8-aza-8-methylbicyclo(3,2,1)oct-3-ylerster. | C₁₅H₁₇Cl₂NO₂ | 313 | 124-82 | 14.38|

3.4 Chemical compounds of methanol extract of Datura innoxia leaves
The chemical compounds identified in the methanol crude extract are listed in table 6. The analysis by GC-MS revealed 30 compounds. The total chemical constituents that were present in
methanol crude extract are as follows: Alkaloidal compounds (8-abicyclo(3.2.1)octane, 3-chloro-8-methyl, scopolamine, atropine, hyoscyamine, apoatropin, tropacocaine, tigloidine, benzoic acid, 3,5-dichloro-8-aza-8-methylbicyclo(3.2.1)oct-3-yl ester, d1-phenylephrine), phenol compounds (phenol, 3-(1,1-dimethyl), phenol, m-tert-butyl), coumarins compounds (4H-pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl), Pyranone, 4H-pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl, phosphorodiimidous fluoride tetra methyl, ketone compounds (4-Acetophenone, 4-methoxy, 2-hydroxy-5-methyl acetophenone, 3-methoxyacetophenone, 4-hydroxy-3-methylacetophenone, 4-hydroxy-2-methylacetophenone) and amines and amides compounds (2-hexanamine, 4-methyl (forthane), acetamide, 2-cyano, 4-H, 1,2,4-triazol-4-amine, acetamide, N-(aminocarbonyl)-2-chloroacetylurea, 1,2-Propanediamine, L-glutamine, alanine (2-aminopropanoic acid), aminopyrazine, (hexylamine, 1,5-dimethyl), and methyloxime.

Table 6: Chemical compounds of methanol extract of *Datura innoxia* leaves:

| Compound name                                      | Formula      | M. wt  | Base ions | RT   |
|---------------------------------------------------|--------------|--------|-----------|------|
| Alanine (Amino acid)                               | C₅H₁₂NO₂     | 84     | 40-84     | 8.60 |
| 8-Abicycle(3,2.1)octane, 3-chloro-8-methyl         | C₅H₁₂C₁N     | 159    | 124-44    | 14.38|
| Atropine.                                          | C₁₉H₂₅NO₃    | 289    | 124-67    | 14.380|
| Tropacocaine.                                      | C₁₉H₂₅NO₃    | 245    | 124-82    | 14.382|
| Benzoic acid, 3,5-dichloro-8-aza-8-bicycle         | C₁₉H₂₆C₃NO₂  | 313    | 124-94    | 14.384|
| 2-Hydroxy-5-methylacetophenone.                    | C₁₆H₁₂O₂      | 150    | 150-107   | 5.950 |
| Hyoscyamine.                                       | C₁₉H₂₅NO₃    | 289    | 124-82    | 13.26 |
| Apoatropin.                                        | C₁₉H₂₅NO₃    | 271    | 94-138    | 15.47 |
| 4-Hydroxy-3-methyl acetophenone.                   | C₁₉H₂₅O₂      | 150    | 135-77    | 5.951 |
| 4-Hydroxy-2-methylacetophenone.                    | C₁₉H₂₅O₂      | 150    | 135-121   | 5.953 |
| 4H-pyran-4-one, 2,3-3,5-dihydroxy-6-methyl.        | C₁₅H₁₂O₄      | 144    | 144-72    | 4.26  |
| Acetamide, N-(aminocarbonyl)-2-chloroacetylurea.    | C₁₅H₁₂N₂O₂    | 136    | 87-136    | 11.946|
| Scopolamine.                                       | C₁₅H₁₂NO₄    | 289    | 124-94    | 14.36 |
| Pyranone.                                          | C₁₅H₁₀O₄      | 144    | 73-101    | 4.25  |
| Phenylephrine.                                     | C₁₆H₁₀NO₂     | 167    | 162-146   | 11.952|
| L-Glutamine.                                       | C₁₆H₁₄NO₃     | 146    | 41-84     | 6.223 |
| Aminopyrazine.                                     | C₁₆H₁₂N₃      | 95     | 43-95     | 10.95 |
| 3-Methoxy Acetophenone.                            | C₁₀H₁₀O₄      | 150    | 77-135    | 5.948 |
| Hyoscyamine.                                       | C₁₀H₁₀NO₃     | 289    | 124-82    | 13.26 |
| Phenol, 3-(1,1-dimethyl)                           | C₁₀H₆O       | 150    | 135-150   | 5.949 |
| 1,2-Propanediamine.                               | C₁₀H₁₄N₂      | 74     | 44-71     | 13.48 |
| Tigloidine.                                        | C₁₀H₂₅NO₂     | 223    | 82-124    | 14.38 |

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3.5 Chemical compounds of aqueous extract of *Datura innoxia* seeds:
The chemical compounds identified in the aqueous crude extract are listed in Table 7. The aqueous crude extract was analyzed by using GC-MS leading to the identification of 24 different compounds. These compounds are as follows: Alkaloidal compounds (scopolamine, atropine, tropine, 3-tropanone, pseudoecgonine methyl ester, apoatropin, hyoscyamine, tropacocaine, tiglipseudotropin, tiglipseudotropine (tigloidine), homatropine, 8-azabicyclo[3,2,1]octane, 3-chloro-8-methyl, benzoyl ecgonine, and benzoic acid, 3,5-dichloro-8-aza-8-methyl[3,2,1]oct-3-ylester, 3,3-dimethyl piperidine, 2-Piperidinone, 1-methyl), amides compounds (3-nitrobenzylbromide, creatine (glycine,N-(aminoiminomethyl)-N-methyl), fatty acids and esters (n-butyric acid, 2-ethylhexylester, hexylisobutyl carbonate (carbonicacid) hexylisobutylester, butanoic acid, octylester, 3-hydroxy-4-methoxybenzoic acid (isovanillic acid), uric acid and vanillic acid, ketone compounds (glaceto phenone), coumarin compounds (2,4-dihydroxy-2,5-dimethyl-3(2H)-furan-3-one, 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl, terpenoidal compounds (limonene oxide trans) and carbohydrates (sucrose).

### Table 7: Chemical compounds of aqueous extract of *Datura innoxia* seeds:

| Compounds name                              | Formula     | M. Wt | Base ions     | RT     |
|---------------------------------------------|-------------|-------|---------------|--------|
| 4H-Pyran-4-one, 2,3-dihydro-3,5-dihydroxy-6-methyl. | C₆H₂O₄     | 144   | 144-101       | 4.253  |
| 2,4-Dihydroxy-3-methyl-3(2H)-furan-3-one.   | C₆H₆O₄     | 144   | 144-101       | 4.254  |
| Sucrose.                                    | C₁₂H₂₉O₁₁  | 342   | 163-85        | 6.82   |
| 3-Nitrobenzil bromide.                      | C₅H₆BrNO₂  | 215   | 215-90        | 7.08   |
| Uric acid.                                  | C₅H₄N₂O₃   | 168   | 168-125       | 8.082  |
| Vanillic acid.                              | C₆H₄O₣     | 168   | 168-125       | 8.084  |
| Glaceto phenone.                            | C₅H₄O₣     | 168   | 168-125       | 8.083  |
| 3-Hydroxy-4-methoxy benzoic acid.           | C₈H₈O₄     | 168   | 168-125       | 8.078  |
| 2-Piperidinone, 1-methyl-                    | C₇H₁₄NO    | 113   | 113-57        | 8.18   |
| Limonene oxide trans.                       | C₁₀H₁₆O    | 152   | 94-108        | 15.48  |
| 3,3-Dimethyl piperidine                     | C₇H₁₃N     | 113   | 113-84        | 8.17   |
| Butanoic acid, octylester.                  | C₁₂H₂₄O₈   | 200   | 112-71        | 8.254  |
| n-Butyric acid, 2-ethyl hexylester.         | C₁₂H₂₄O₈   | 200   | 112-71        | 8.252  |
| Atropine.                                   | C₁₇H₂₃NO₃  | 289   | 289-124       | 14.433 |
| Scopolamine                                 | C₁₇H₂₃NO₄  | 303   | 94-138        | 15.46  |
| Pyranone.                                   | C₁₂H₄O₄    | 144   | 101-73        | 4.253  |
| Hyoscyamine                                 | C₁₇H₂₅NO₃  | 289   | 289-124       | 14.434 |
| Tropacocaine.                               | C₁₅H₁₅NO₂  | 245   | 124-82        | 14.431 |
| Tigloidine.                                 | C₁₃H₂₅NO₂  | 223   | 124-82        | 14.435 |
| (Glycine,N-(aminoiminomethyl)-N-methyl)      | C₇H₃N₂O₂   | 131   | 113-84        | 8.184  |
| Benzoic acid, 3,5-dichloro-8-aza-8-methyl (3,2,1) oct-3-ylester. | C₁₅H₁₇Cl₂NO₂ | 313 | 82-128 | 14.392 |
| Benzoyl ecgonine.                           | C₁₆H₁₉NO₄  | 289   | 124-289       | 14.391 |
| 8-Azabicyclo[3,2,1] octane, 3-chloro-8-     | C₈H₁₄ClN   | 159   | 82-124        | 14.393 |
| Benzoyl ecgonine.                           | C₁₆H₁₉NO₄  | 289   | 124-289       | 14.385 |

3.6 Chemical compounds of aqueous extract of *Datura innoxia* leaves:
The chemical compounds identified in aqueous crude extract are shown in table 8. Analysis by GC-MS revealed 31 compounds. These are as follows: Alkaloidial compounds (scopolamine, atropine, tropine, 3-tropanone, pseudoeccgonine methylester, apoatropin, hyoscyamine, tropacocaine, tigly pseudo tropin, tigloidine, scopolamine, homatropine, 8-azabicyclo[3,2,1]octane, 3-chloro-8-methyl, 1H-1midazole, 1-acetyl, benzoyl eegonine, benzoic acid, 3,5-dichloro-8-aza-8-methyl[3,2,1]oct-3-ylester1, 3,3-dimethylpiperidine, 3-nitrobenzlbromide, 2-piperidinone, 1-methyl, 1,3-dimethyl, 3,4,5,6-tetrahydro-2(1H)-primidinone,

| Compound name                                      | Formula  | M.Wt  | Base ions  | RT  |
|---------------------------------------------------|----------|-------|------------|-----|
| d1-beta-phenyllylacid, (DL-alpha-Hydroxyhydro cinnamic acid). | C19H10O3 | 166   | 91-106     | 7.661 |
| n-Hexadecanoic acid.                              | C16H32O2 | 256   | 256-213    | 12.030 |
| 1,3-Dimethyl-3,4,5,6-tetrahydro-2(1H)-primidinone | C16H12N2O | 128   | 84-128     | 6.882 |
| 5-Aminovaleric acid.                              | C5H11NO2 | 117   | 30-98      | 3.461 |
| Azlaic acid.                                       | C7H14O4  | 188   | 60-171     | 7.400 |
| 9,12-Octadecadienoic Acid [Z,Z],methylester.      | C19H34O2 | 294   | 81-67      | 13.200 |
| 3-Methyladipicacid.                               | C9H12O4  | 160   | 114-142    | 7.050 |
| Hyoscyamine.                                       | C17H23NO3 | 289   | 124-289    | 13.294 |
| Atropine.                                         | C17H23NO3 | 289   | 124-289    | 13.923 |
| Benzoicacid,3,5- dichloro,8-aza-8-methyl.         | C15H17Cl2N | 313   | 94-124     | 14.54 |
| Scopolamine.                                       | C17H21NO4 | 303   | 94-138     | 15.541 |
| Scopolamine, TMS derivative.                      | C20H29NO  | 375   | 94-138     | 15.542 |
| 1H-1midazole,1-acetyl.                            | C10H14O2  | 110   | 68-129     | 6.491 |
| 5,6-dihydro-5-methyluracil.                       | C6H11N2O2 | 128   | 56-138     | 6.866 |
| 9,12-Octadecanoic acid [Z,Z].                     | C18H32O2  | 280   | 81-95      | 10.922 |
| 1,3-Dimethyl-3,4,5,6-tetrahydro-2(1H)-pyrididine  | C14H12N2O | 128   | 128-84     | 6.872 |
| Isocamphopinone.                                  | C10H16O  | 152   | 41-122     | 3.835 |
| Isovaleric acid, propyl ester.                    | C8H16O2  | 144   | 103-85     | 5.844 |
| Butanoic acid,3-hydroxy-3-methyl.                 | C10H18O3  | 118   | 103-85     | 5.843 |
| Valeric acid,3-methyl.                            | C8H12O2  | 116   | 87-60      | 3.611 |
| Aceticacid, phenyl.                               | C8H8O2   | 136   | 91-136     | 5.241 |
| Oleic acid.                                       | C18H34O2  | 282   | 282-82     | 7.402 |
| Azelaic acid.                                     | C9H16O4  | 188   | 111-83     | 7.400 |
| Tropacocaine.                                     | C13H19NO2 | 245   | 124-82     | 14.431 |
| Benzoyl eegonine.                                 | C15H11NO4 | 289   | 124-289    | 14.390 |
| 8-Azabicyclo (3,2,1)octane,3-chloro-8-methyl.     | C9H14CIN  | 159   | 82-124     | 14.392 |
| Apoatropin.                                       | C17H21NO2 | 271   | 94-124     | 14.381 |
| Homatropine.                                      | C16H21NO3 | 275   | 124-82     | 14.372 |
| 2-methylpyrazine-carboxylic acid.                 | C8H12N2O2 | 138   | 138-94     | 15.483 |
| Pyrroline,1-(2-methylpropenyl)                    | C8H12N   | 125   | 110-124    | 14.387 |
| 9,12-Octadecadienylchloride, [Z, Z].              | C18H31ClO | 298   | 81-95      | 10.921 |

Table 8: Chemical compounds of aqueous extract of Datura innoxia leaves:
benzoic acid, 3,5-dichloro, 8-aza-8-methyl), fatty acids and esters (2-methylpyrazine-5-carboxylic acid, azelaic acid, oleic acid, acetic acid, phenyl (benzeneacetic acid), valeric acid, 5-aminovaleric acid, 3-methyl-, 3-methyladipic acid, butanoic acid, 3-hydroxy-3-methyl-, isovaleric acid, propyl ester, 9,12-octadienoic acid(Z,Z), 9,12-octadeca dienyliclorkide,(Z,Z), 5,6-dihydro-5-methyluracil, 9,12-octadecadienoicacid(Z,Z), methylester, n-hexadecanoic acid (palmitic acid), d1-beta-phenylllic acid (d1-alpha-hydroxy hydrocinnamic acid), (isovanillic acid), hexanoic acid (13), dehydroacetic acid, vanillic acid), coumarin compounds (3-dimethyl-3,4,5,6-tetrahydro-2(1H)-pyridinone, pyrrolidine, 1-(2-methyl-1-propenyl). presence of ketone compounds (glilactopethene and isocamphophonipe), (and hydrocarbon compounds (1-fluorononone).

4. Conclusion
The phytochemical screening of the Datura innoxia revealed the presence of important pharmacological bioactive substances as well as medicinal and nutritional potentials in the leaves, and seeds such as saponin, coumarin, flavonoids, tannins, steroids, teriterpines, and alkaloids. The alkaloidal compounds are mainly toxic. The analysis of seeds and leaves showed the presence of Fe (0.346 w/w %), Al (0.226 w/w %), P (0.080 w/w %), Mg (0.068 w/w %), Ti (0.062 w/w %), Mn (0.035 w/w %), Zn (0.014 w/w %), Sr (0.011 w/w %), Cu (0.008 w/w %), V (0.005 w/w %), Br (0.005 w/w %), and Zr (0.002 w/w %). The K concentration was the highest in seeds (5.469 w/w %), Ca was rather high in leaves (2.461w/w%) and S was rather high in leaves (1.254 w/w%). These plants are important for pharmacological research and drug development, not only when bioactive phytocompounds are used directly as therapeutic agents, but also as starting materials for the synthesis of drugs or as models for pharmacologically active compounds [25].

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