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Chemical composition of the seeds of Datura innoxia

Kendeson Anawuese Christiana[1], Iloka Gabriel Sunday[2], Bulama Joshua Samaila[1] and Dashak Albert Dayil[2].

[1]Department of Chemical Sciences, Federal University Kashere, P.M.B 0182, Gombe, Nigeria. [2]Department of Chemistry, University of Jos, P.M.B 2084, Jos, Nigeria.
Correspondence Author: kendesonac@yahoo.com

Abstract

The elemental analysis carried out on the seeds of the plant *Datura innoxia* showed the presence of phosphorus, nitrogen and chlorine. The moisture content was determined and found to be 6.61% ± 0.16. The ash content was 3.08% ± 0.13. The total carbohydrate and reducing sugar contents were determined and found to be 25.07% ± 0.88 and 21.69% ± 1.11 respectively. The lignin content was found to be 5.58% ± 0.16 while the crude fibre content was determined to be 42.42% ± 0.02. The percentage crude protein was found to be 8.64% ± 0.05, and the nitrogen content was determined to be 1.52% ±0.01. The non-polar and polar fat contents were found to be 18.24% ± 0.33 and 23.51% ± 0.25 respectively. The mineral composition of the *Datura innoxia* was determined and found to contain Ca, Mg, K, Na, Cu, Zn, Mn, Fe, Ni, Cd and Pb. The K, Mg and Ca contents were found to be 3450, 2500, and 2000 mg/100g respectively. Fe and Na were found to be 800 and 230mg/100g respectively. The Mn and Zn values were 50 and 37.50 mg/100g respectively. The concentrations of Cd and Cu were determined to be 2.50 mg/100g each. The seeds were found to contain 6.25 mg/100g of Pb. The Amino acid results showed that the seeds possess both essential and non essential amino acids. Some of the amino acids such as Glutamic acid, Aspartic acid Arginine, Leucine, Phenylalanine were present in appreciable quantity while Cystine and Methionine are present in very low quantity. The presence of these elements could be responsible for its sedation and hypnotic effect associated with the use of *Datura innoxia.*

Keywords: Chemical composition, *Datura innoxia*, Elemental and proximate analyses.

INTRODUCTION

Plants have in their arsenal an amazing array of thousands of chemicals noxious or toxic to bacteria, fungi, insects, herbivores, and even humans. Fortunately, this chemical diversity also includes many compounds that are beneficial to humans: vitamins, nutrients, antioxidants, anticarcinogens, and many other compounds with medicinal value [1].

Most plant species in the world are not edible due largely to the toxins they produce which evolve from the development of a defense mechanism generated by these plants to fight off predators.Toxin concentrations in a plant can vary tremendously and can be dramatically affected by environmental stress on the plant (drought, heat/cold, mineral deficiencies, etc) and disease. Different varieties of the same plant species can also have different levels of toxins and nutritional value [2].

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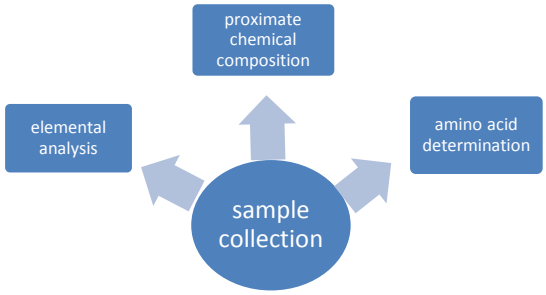
Datura innoxia belongs to the family solanaceae, which is known for its importance as a source of drugs in medicine and pharmacology [3].It is also listed as one of the poisonous house plants [4] as well as a sedative. In Nigeria, *Datura innoxia* has been reported as one the latest narcotic drug of abuse in Benue State [5].

Various species of *Datura* are known and widely employed for their medicinal and toxic properties that are based upon more than 30 alkaloids. Owing to their funnel form, fragrant nocturnal blooms, species such as *Datura innoxia, Datura metel, Datura stramonium* and *Datura wrightii* are cultivated as ornamental plants [6]. In China, it is known as "Yangjinhua" and used for the treatment of asthma, convulsions, pain, and rheumatism [7]. Ingestion of *Datura* manifests as a classic anticholinergic syndrome comprising central and peripheral signs and symptoms. Central toxic effects include confusion, agitation, anxiety, hallucinations, seizures and coma [8].

PROPOSED METHODOLOGY



Sample Collection

The plant sample of fresh seeds of *Datura innoxia* was collected from Kwande and Doemak District of Qua'anpan L.G.As of Plateau state and indentified in the Federal College of Forestry, Jos, Nigeria. The buds were cut open and the seeds dried and grounded to fine powder.

Elemental analysis

Sodium fusion test was carried out to determine the elemental composition of the sample using the method of Criddle and Ellis 1980 [9].

Determination of proximate composition of *Datura innoxia* seeds

Determination of proximate composition of *Datura innoxia* seeds were done using the methods described by AOAC 1995 [10].

Determination of amino acid composition of *Datura innoxia* seeds

Determination of amino acid composition of *Datura innoxia* seeds was done using the methods described by Spackman *et al.,* 1958 [11].

EXPERIMENTAL RESULTS

The elemental analysis of *Datura innoxia* seeds was carried out and this revealed that Nitrogen, Phosphorus and Chlorine were present. Bromine, Flourine and Iodine were not detected in the seeds.

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Table 1: Proximate chemical composition of the seeds of *Datura innoxia*

Parameters	Result (%)
Ash Content	3.08 ± 0.13
Crude Fat (Ether)	18.24 ± 0.33
Crude Fat (MeOH/$CHCl_3$)	23.51 ± 0.25
Crude Fibre	42.42 ± 0.02
Crude Nitrogen	1.52 ± 0.01
Crude Protein	8.64 ± 0.05
Lignin Content	5.58 ± 0.16
Reducing Sugar	21.69 ± 1.11
Total carbohydrate	25.07 ± 0.88
Moisture content	6.61 ± 0.16

The result of the proximate chemical composition of the seeds shows moisture content which measures the amount of water in the plant to be 6.61%. According to NRC 1993 [12], moisture content of 5 - 20% (DM) is regarded as high. This indicates that the moisture content of the seed is high and shows that the fresh seeds contain high moisture. The result of this investigation is in variance with those obtained in literature [13]. This difference may be due to difference in plant species and environmental conditions.

The ash content was found to be 3.08%. The ash content which is termed “physiological” ash is a measure of the amount of the content of inorganic residue present in the seeds. This varies according to the type of soil [14].

The total carbohydrate content of the seeds sample was found to be 25.07%. This value is lower than the 31% reported for cotton seeds [15]. The reducing sugar content for the seeds was found to be 21.69%. The seeds were also found to contain 1.5% nitrogen and 8.64% protein respectively even though the seeds are not consumable.

The lipid content of the seeds was carried out and the result showed that the ether soluble extract i.e. non-polar lipid was 18.24% while the $CHCl_3$/CH_3OH soluble extract i.e. polar lipids was 23.51%. Polar lipids usually contain glucolipids, which are not soluble in ether.

The lignin content was determined and it showed the seeds contain 5.58%. Crude fibre, which measures the fibrous component (cellulose, hemicellulose and lignin) was found to be 42.42%, which is very high and may be due to the plant.

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Table 2: Mineral composition of the seeds of *Datura innoxia*

Element determined	Concentration in mg/100g dry sample
Ca	2000
Mg	2500
K	3450
Na	230
Cu	2.50
Zn	37.50
Mn	50.00
Fe	800
Ni	5.00
Cd	2.50
Pb	6.25

The mineral profile of the seeds shown in Table 2, revealed that the seeds contained the highest amount of K, followed by Mg, Ca, Fe. The least is Ni in mg/100g of sample dry weight. The presence of Cd and Pb could be the poisonous nature of the plant. According to Martin and Coughtrey, 1982 [16], metals are natural constituents of the environment and are found in varying levels in the soil, ground and surface waters. Some minerals are essential, required fornormal metabolism of organisms and various physiological processes, while others are non-essential and play no significant biological roles [17].

Table 3: Amino acid composition of the seeds of *Datura innoxia*

Amino acid determined	Concentration in g/100g Protein
Lysine	1.84
Histidine	0.92
Arginine	2.56
Aspartic acid	4.06
Threonine	1.02
Serine	1.70
Glutamic acid	4.37
Proline	1.85
Glycine	4.37
Alanine	2.10
Cystein	0.31
Valine	1.08
Methionine	0.47
Isoleucine	1.70

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Leucine	3.07
Norleucine	1.63
Tyrosine	0.93
Phenylalanine	3.15

The amino acid composition of *Datura innoxia* seeds was determined and is shown in Table 3. The result shows that it contains both essential and non essential amino acid. The essential amino acids are: Lysine, Threonine, Valine, Leucine, Isoleucine, Methionine, Phynlalanine and Trosine. While Histidine, Arginine, Aspartic acid Serine, Glutamic acid, Proline, Glycine, Norleucine, Cystein and Alanine are the non essential amino acid. Amino acids are the building blocks of proteins. Proline and Arginine are important as secondary metabolites of some plants which is also present in appreciable quantities in the seeds. These amino acids are precursors of a number of alkaloids. They are metabolically connected to Glutamic acid. Methionine is important as a methyl donor in plant biochemistry while Lysine is important in the alkaloid biosynthesis in plants.

CONCLUSION

This research reports the collection of *Datura innoxia* seeds and the probe into its elemental, mineral, proximate and amino acid composition. The seeds were collected, dried and ground into fine powder sequel to analyses.

Elemental analysis carried out revealed the presence of Nitrogen, Phosphorus and Nickel. Proximate chemical composition determination showed high contents for moisture and crude fibre at 6.61% and 5.58% respectively which could be attributed to soil climatic conditions. Potassium, Sodium and Calcium were found to be present in appreciable quantities of between 2000-3450 g/100g dry sample. The elements Lead and Cadmium are considered harmful and carcinogenic which could be why the plant is poisonous. On the other hand, amino acid determination indicated moderate concentrations for various essential and non essential amino acids between 0.31 – 4.37g/100g.

FUTURE SCOPE

Further studies will focus on the isolation, structural elucidation and biological activities of the seed extracts of *Datura innoxia.*

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AUTHOR'S PROFILE

Kendeson Anawuese Christiana has received her Bachelor of Science degree in Pure Chemistry and Master of Science degree in Applied Organic Chemistry from University of Jos in the years 2004 and 2012 respectively. Her area of interest lies in Natural Products Chemistry.

Iloka Gabriel Sunday has received his Bachelor of Science degree in Pure Chemistry from University of Jos in the year 2010 and his Masters of Science degree in Chemistry from University of Ilorin in the year 2015. His area of interest lies in Organic Synthesis of promising chemical compounds.

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Bulama Joshua Samaila has received his Bachelor of Science degree in Industrial Chemistry from University of Maiduguri in the year 2005 and his Masters of Science degree in Chemistry from University of Ilorin in the year 2012. His area of interest lies in Natural Products Chemistry.

Dashak Dayil Albert, has received his Ph.D in Carbohydrate Chemistry from University of Jos in the year 2005. His area of interest lies in Carbohydrate Chemistry.