

Phytochemical composition of *Datura stramonium* Ethanol leaf and seed extracts: A Comparative Study.

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### ABSTRACT

The study of natural products has given rise to the discovery of a variety of useful drugs for effective management of several diseases. Phytochemical constituents of plants are fingered to be biologically active compounds responsible for different activities such as analgesic, anti-inflammatory, antioxidant, antimicrobial, antifungal and anticancer. Thus, assessment of phytochemical constituents of plants is of utmost importance in medicine. There is however paucity of information on the comparative assessment of leaves and seeds of *Datura stramonium* (*D. stramonium*). Therefore, the present study was carried out to compare the phytochemical constituents of *D. stramonium* leaves and seeds. Ethanol was used for the extraction using standard method. Phytochemical screening was performed using various quantitative methods. The ratio of leaves versus seeds of phytochemical quantitative analysis was as follows: saponins (65.25: 34.25 mg/g), alkaloids (32.10: 71.28 mg/g), flavonoids (44.24: 30.12 mg/g), terpenoids (32.68:30.20 mg/g), tannins (31.25:26.62), respectively. This implies that saponins were dominant compounds followed by flavonoids and terpenoids in leaves while alkaloids were the dominant phytochemical in seeds. Based on our results, it is concluded that leaf and seed extracts of *D. stramonium* have varying concentrations of phytochemicals with the seed having higher concentration of alkaloids justifying why the seed is more toxic than the leaves while leaf extract had highest concentration of saponins and flavonoids giving credence to the antioxidant property of the leaves. Good quantity of various phytochemicals in this plant justifies its traditional use in the treatment of various diseases.

**Keywords:** Phytochemicals, *Datura stramonium*, Comparative study, Natural products, biologically active compounds.

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### INTRODUCTION

The study of natural products has led to the discovery of a variety of useful drugs for the treatment of several diseases and hence has gained good accolade in effective health care delivery [1]. Herbal remedies have been used for decades. Recently, the active compounds in herbs have been identified and some have been extracted and purified. Some of the active compounds include phytochemicals which are substances that play crucial role in defense system against numerous

diseases and stress condition [2,3]. Phytochemicals have been popular due to their several physiological capacities ranging from antioxidant [4-6], antidiabetic [7-11], antiarthritic [5], anti-inflammatory [12], antimicrobial [13], anticholesterolemic [14], anti-cancer [15], insecticidal, antifungal, anti-constipative [16]. Thus, phytochemical constituents are responsible for medicinal values of plants.

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*Datura stramonium* (*D. stramonium*) popularly known as thorn apple or Jimson weed has gained popularity in folklore medicine due to its potent pharmacological activity. The presence of different secondary metabolites has been reported previously in its leaf extracts [17]. Tropane alkaloids such as scopolamine, hyoscyamine, and atropine are found in *D. stramonium* seeds and flowers. Not minding the numerous applications of this plant, reports of its toxicity are well-documented in animals [18,19]. Its abuse can cause hallucination and deaths in animals due to its high level of alkaloids [20].

The determination of the phytochemical constituents of plant extracts is essential in order to understand the mechanism of action of acclaimed pharmacological

properties of plants and possible side effects. Thus, reports of phytochemical studies of plants abound [21-25]. *D. stramonium* is widely distributed in Nigeria and both the seeds and leaves are known for its folk medicine including the treatment of various diseases. However, information on the comparative phytochemical concentration of leaves and seeds is scarce. So, this study was aimed at determining and comparing the phytochemical constituents of the leaves and seeds of *D. stramonium* using ethanol as solvent of extraction. Information from this study will be very helpful for the formulation of new and better drugs. Thus, this study addresses on phytochemical analysis of leaves and seeds extracts of *D. stramonium*.

#### MATERIALS

All chemicals and reagents used were of analytical grade. Properly identified fresh leaves and seeds of fully grown *D. stramonium* were harvested from Ezi Okoro compound, Amaozara Ozizza community, in Afikpo North Local

Government Area of Ebonyi State, in April 2022. Some of the identified plant parts were stored in the Herbarium of Applied Biology Department, Ebonyi State University, Abakaliki, Nigeria (Voucher number: EBSU-H-397).

#### METHODS

##### Preparation of the Crude Ethanol leaf Extract of *D. stramonium*

Ethanol was used for extraction using Abdullahi and Mainul, [26] method. Properly identified fresh leaves and seeds of *D. stramonium* were washed and shade dried under room temperature and later converted into powder form using a grinder. Exactly 400g of each sample was

soaked in 2000 ml of 98% ethanol for 72 hours at room temperature with intermittent rocking. After 72 hours, the soaked sample was filtered using white sieve cloth. Thereafter, the filtrate was heated until the solvents were completely evaporated.

##### Quantitative Determination of Phytochemical Compositions in Ethanol Leaf and seeds extracts of *D. stramonium*

Quantities of flavonoids, alkaloids, steroids and glycosides were determined using Harbone method [27] while saponins and terpenoids contents were

quantified using the method of Sofowora [28]. Tannins concentration was determined with Trease and Evans method [29].

##### Statistical Analysis

Data were expressed as mean  $\pm$  standard deviation (SD). Mean values were properly determined and compared using one-way analysis of variance (ANOVA) followed by

Turkey's post hoc test; significance was accepted at  $p < 0.05$ . All statistical analysis was carried out using Graph Pad Prism version 5.00 for Windows.

#### RESULTS

##### Quantitative phytochemical composition of the leaves and seeds of *D. stramonium*.

The ratio of leaves versus seeds of phytochemical quantitative analysis is as follows: saponins (65.25: 34.25 mg/g), alkaloids (32.10: 71.28 mg/g), flavonoids (44.24: 30.12 mg/g), terpenoids

(32.68:30.20 mg/g), tannins (31.25:26.62), respectively. This implies that saponins were dominant compounds followed by flavonoids and terpenoids in leaves while alkaloids were the dominant

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phytochemical in seeds. More so, there were significant difference ( $p < 0.05$ ) in saponins, flavonoids, alkaloids and steroids contents in leaves and seeds.

However, there were no significant ( $p > 0.05$ ) difference in terpenoid, steroids and glycoside compositions in the leaves and seeds of *D. stramonium* (Figure 1).

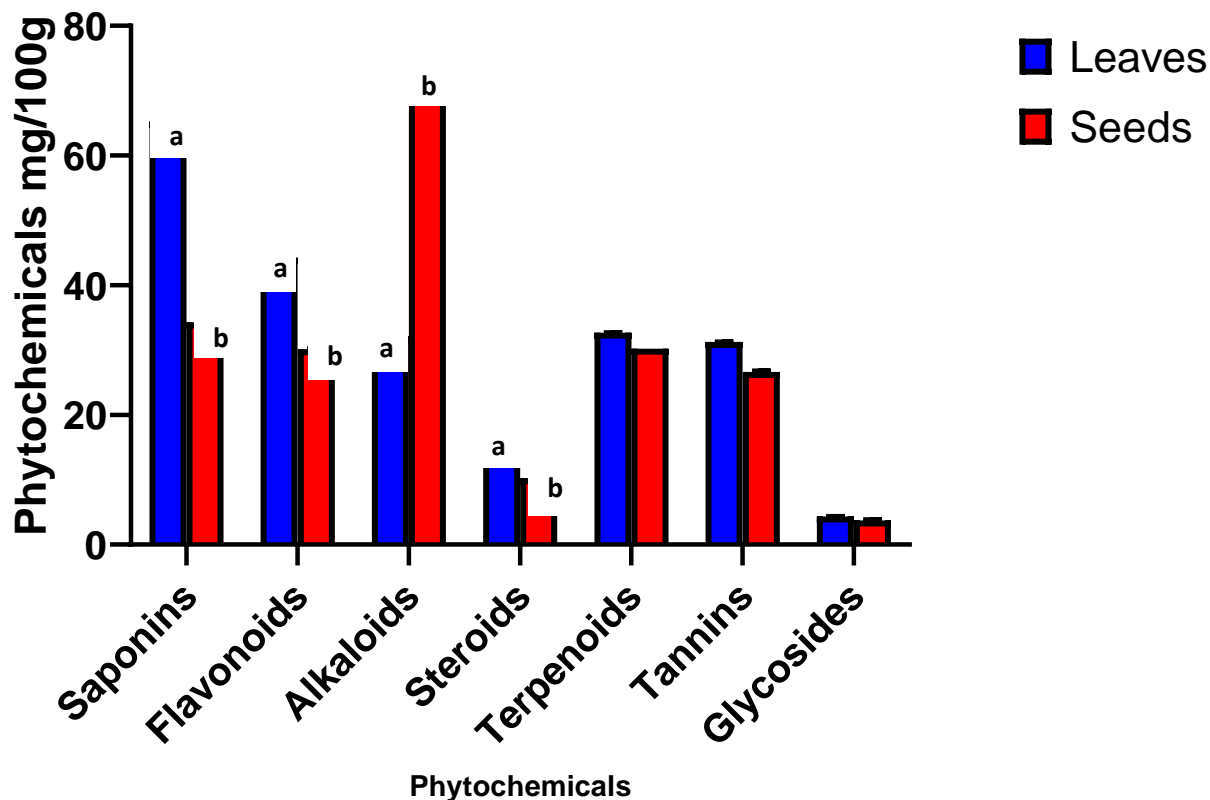


Figure 1: Comparative quantitative phytochemical composition of ethanol leaf and seeds extracts of *D. stramonium* expressed in mg/100g.

The values in the chart are the Mean  $\pm$  SD from triplicate readings ( $n=3$ ). Bars with no alphabets are significantly the same at

( $p > 0.05$ ) while bars with different alphabets are significantly different at ( $p < 0.05$ ).

#### DISCUSSION

The determination of the phytochemical constituents of plant extracts is essential so as to understand the mechanism of action of acclaimed pharmacological properties of medicinal plants. In this study, the results obtained from phytochemical analysis of ethanol leaf and seeds extracts *D. stramonium* revealed the presence of flavonoids, alkaloids, tannins, saponins, terpenoids, glycosides and steroids in varying amounts. The result of this study agrees with those of previous studies which reported the presence these phytochemicals in the leaf and seed extracts of *D. stramonium* [17,30]. From our result, saponins were present in

highest concentration followed by flavonoids and terpenoids in the leaf extract. Our result agrees with previous authors [31]. However, alkaloids were the most abundant phytochemicals in seeds. *D. stramonium* seeds have highest toxicity level than other parts of the plant [20, 32]. This may be accredited to the dense concentration of alkaloids in seeds of *D. stramonium*.

Saponins have anti-cancer properties [33]. Appreciable saponins contents of this plant may be responsible for their anti-tumor and anti-mutagenic properties and can reduce the risk of human cancer, by preventing the growth of cancer cells. Anti-hyperglycemic potential of saponins

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has also been reported [10, 34]. High saponins content of this plant justifies its traditional use in the management of cancer and diabetes mellitus [7]. Phytochemicals display their antimicrobial effect in different ways including inactivation of enzymes [17, 35]. For instance, plant rich in tannins have antibacterial potential due to their character that allows them to react with proteins forming stable water-soluble compounds leading to damage of cell membrane and subsequent death of the bacteria. Tannic acid is a naturally occurring plant phenol present in fruits and vegetables and used as an additive in medicinal product for human. It is extensively used in the treatment of burns, diarrhea and as a local astringent [36]. Plants with tannins are used for healing of wounds, varicose ulcers and burns [34].

In this study, flavonoid had the highest concentration in leaf extract of *D. stramonium*. According to Ayesha *et al.*, [37] and Raziq *et al.* [38], freshly growing parts of medicinal plants contain many flavonoid contents that start to disappear after plant reaches a certain stage of development. From our result, the high quantity of flavonoid in the leaf may be attributed to the freshly grown leaves that were utilized in this study. These flavonoids are mainly responsible for the antioxidant activity of medicinal plants

Both leaves and seeds of *D. stramonium* are good sources of phytochemicals. Most of the phytochemicals were in greater quantities in leaves than seeds except alkaloids that were found in larger quantities in seeds extract than leaf

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[4-6]. Other biological functions of flavonoids include protection against allergies, inflammation, ulcer, bacteria, viral and tumor [13, 34, 39, 40]. Thus, the acclaimed anti-inflammatory and antioxidant effects of *D. stramonium* may be attributed to its high flavonoids content. Steroids and triterpenoids possess anti-inflammatory, antimicrobial and analgesic properties and play a vital role in regulation of human hormones [41]. Pure alkaloids and their synthetic derivatives are used as an important medicinal agent due to their analgesic and anti-microbial properties [42, 43]. The dense alkaloids concentration in the seeds may justify the use of *D. stramonium* seeds in the treatment of pain, malaria and enteric fever in folk medicine. Glycosides aid in the inhibition of carbohydrate mediated tumor growth in man [44]. The cardiac glycosides can enhance the power of the heart beat without any increase in the amount of oxygen required by the heart muscle. Thus, cardiac glycosides increase the efficiency of the heart without stressing the heart muscles [45]. This justifies the use of *D. stramonium* seeds in the treatment of heart diseases in rural communities. Further, cyanogenic glycosides can enhance glucose and lipid metabolism, antioxidants status, improved capillary function in diabetic patients [46].

extracts. Good concentration of these phytochemicals makes *D. stramonium* leaves and seeds therapeutically very important and this justifies its use in ethnomedicine.

agencies in the public, commercial, or not for-profit sectors.

#### CONCLUSION

#### CONFLICT OF INTEREST

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