

PHYTOCHEMICAL ANALYSIS AND ANALGESIC ACTIVITY OF METHANOL ROOT EXTRACT OF DATURA METEL USING ALBINO RATS

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Abstract: For several years plants have been a source of potential drug substance which has been a resurgence of interest to researchers for natural materials as an alternative for the treatment and management of many diseases. *Datura metel* is a member of the family Solanaceae, shrub-like annual herb known as devil's trumpet. Pain is a devastating health problems commonly treated with traditional medicinal plants in many part of the world most especially in Africa, because of the high cost of some drugs; some have turn to consuming of plants materials to reach their desire. The roots of *Datura metel* have been used as pain resistant during traditional marriage rights, as such; its analgesic effect needs to be investigated for its claim. The root of *Datura metel* was extracted by cool maceration using methanol. Phytochemicals were screened using laboratory methods. The phytochemical screening of methanolic root extract revealed the presence of bioactive constituents such as alkaloids, flavonoids, tannins, saponins, terpenoids, phenols and steroids while glycoside and anthraquinones were absent. Thirty albino rats were used to assess the analgesic activity of *Datura metel* and were divided into six groups of 5 rats each. The extract was potent at all doses as well as the standard drug when compared with negative control. From the results obtained, it can be concluded that methanol root extract of *Datura metel* could be used as a pain reliever in traditional medicine. This validates its analgesic and is recommended for use in analgesic formulations.

Keywords: medicinal, plant, *Datura*, root, pain, analgesic, rats and methanol.

1. INTRODUCTION

Over the past years, there has been a resurgence of interest in the research of natural materials as a source of potential drug substance [16]. Plants have great potential for the treatment and management of some diseases and have been used world wild for the treatment of several diseased conditions. The medicinal importance of plants lies in their bioactive phytochemical constituents that produce definite physiological actions in the human and other animals body [1]. Medicinal herbs have their value as medicament based simply on a traditional folk use that has been perpetuated for generations. With the increase in the use of herbal medicines a thorough scientific investigation of these plants is of importance, based on the need to validate their myths usage [3]. Pain is a disabling accompaniment of many medical conditions and pain control is one of the most important therapeutic priorities [18]. Analgesics are drugs used to treat or reduce pain.

Description of *Datura metel*

Datura metel is a shrub-like annual herb known as devil's trumpet. *Datura metel* grows in the wild in all the warmer regions of the world, its indigenous names in Nigeria include: Igbo –Myaramuo; Hausa – babanjubji; Yoruba – Apikan [13]. In some parts of Nigeria, especially the north, *Datura metel* is found growing as a weed in abandoned farmlands, dumpsites and sometime cultivated. *Datura* comprises of more than 10 species the common ones include, *Datura Metel*, *Datura Alba*, and *Datura Stramonium*.

2. MATERIALS AND METHODS

Sample Collection

Datura metel plant was collected from Aliero metropolis in a polythene bag and taken to the Department of Plant Science and Biotechnology of Kebbi State University of Science and Technology, Aliero (KSUSTA) for identification. The plant was identified by Prof. Dharmendra Singh with voucher number 282.

Sample Preparation

The plant root was sort-out and rinsed with water to remove soil particles. The root was cut into small pieces and dried under shade in natural condition for three weeks. After complete drying, the root was pounded into fine powder using mortar and pestle, then sieved and stored in a sealed container.

Experimental Animal

Thirty (30) adult albino rats of both sexes were used for this study. They were obtained from Usman Danfodio University, Sokoto. The rats were housed in ventilated plastic cages. They were allowed to acclimatize for 7 days with free access to commercial rat feed and water.

Extraction Technique

The Methanol extract was prepared by soaking 100 grams of the sample in 400ml of 99.8% methanol for 72 days, then the soaked sample was filtered using Whatman No.1 filter paper, the filtrate was evaporated in an oven at 40°C.

Analgesic Screening

The investigation of analgesic activity of *Datura metel* methanol extract was conducted on adult albino rats of both sexes with weight between 120-210g. The rats were randomly assigned into six groups of five rats each designated as group 1, 2, 3, 4, 5 and 6.

Analgesic Activity

The analgesic activity was determined by measuring drug-induced changes in the sensitivity of the pre-screened rats to heat stress, using a hot plate at temperatures of 55°C, applied to their tails. The animals were pre-treated 60 minutes before subjecting them to heat stress as follows: Group 1 serve as the negative control which were given water, Group 2 serve as the positive control which were treated with standard drug (ibuprofen 400mg) while Group 3 to 6 serve as the treated groups and were administered with different doses of the extract; 100mg/kg, 200mg/kg, 400mg/kg and 800mg/kg respectively. The distance between the heat source (hot plate) and the tail skin was 1 cm and the cut-off reaction time fixed at 20s to avoid tissue damage. The time taken for rats to react to the external stimuli introduced was measured for each group that was set up for the experiment.

3. RESULTS AND DISCUSSION

3.1 Results

Table 1: Qualitative Phytochemical Compositions of Methanol Root Extract of *Datura Metel*.

Phytochemicals	Results
Alkaloids	+
Tannins	+
Saponins	+
Phenols	+
Glycosides	-
Flavonoids	+
Steroids	+
Terpenoids	+
Anthraquinones	-

Key; + = Present - = absent

Analgesic Activity

The analgesic activity of methanol root extract of *Datura metel* was effective at all doses of the extract as well as positive control when compared with the negative control.

Table 2: Analgesic Activity of Methanol Root Extract of *Datura Metel*

Dose Administration(mg/kg)	Analgesic Activity(s)
Water (5ml/kg)	6.59±0.23 ^a
Ibuprofen (400mg/kg)	14.21±0.21 ^d
MREDM (100mg/kg)	11.47±0.47 ^b
MREDM (200mg/kg)	12.70±0.38 ^c
MREDM (400mg/kg)	14.36±0.33 ^d
MREDM (800mg/kg)	15.83±0.55 ^e

Values are presented as mean ± standard error of mean (n = 5 per group). Values having the same superscript in the same column are not significantly different ($P < 0.05$) analysed by one-way ANOVA followed by Duncan's multiple comparison test. MREDM= methanol root extract of *Datura metel*.

3.2: Discussion

Phytochemical analysis

Phytochemicals are biologically active, naturally occurring chemical compounds found in plants, which provide health benefits for humans as medicinal ingredients and nutrients [9]. They protect plants from disease and damage, and also contribute to the plant's colour, aroma and flavor. The phytochemical screening of methanol root extract of *Datura metel* revealed the presence of some secondary metabolites; Alkaloids, tannins, saponins, phenols, flavonoids, steroids and terpenoids while anthraquinones and glycosides were absent. These correspond to the preliminary phytochemical investigation performed on methanolic and hydroalcoholic extract of *Datura metel* which revealed the presence of alkaloids, tannins, cardiac glycosides, flavonoids, and phenols, while, phytochemical analysis of *Datura stramonium* showed that it contained alkaloids, saponins, tannins, steroids, flavonoids, phenols and glycosides [6]. Plants with a medicinal value play a vital part in healing and curing human diseases because of the biochemical constituents, known as phytochemicals. Phenols being secondary metabolites play important role as defense compounds. Phenolic exhibit several properties beneficial to humans and its antioxidant properties are important in determining their role as protecting agents against free radical-mediated disease processes [4]. Flavonoids have been reported to exert multiple biological properties including anti-microbial, cytotoxic, anti-inflammatory and anti-tumor activities; but the best-described property of almost every group of flavonoids is the capacity to act as powerful antioxidants [17]. Alkaloids have pharmacological applications as anesthetics and central nervous system stimulants [8]. Alkaloids have many pharmacological activities including anti-hypertensive effects (many indole alkaloids), anti-arrhythmic effect (quinidine, sparteine), anti-malarial activity (quinine), and anti-cancer actions (dimericindoles, vincristine, vinblastine) [5]. Tannin-rich plant extracts have been widely used for the treatment of gastric ulcer disease [14].

Analgesic Activity

Pain has been officially defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage [19]. Analgesics are drugs used to treat or reduce pain and the classical analgesic drugs notably opiates and non-steroidal anti-inflammatory drugs have their origin in natural products but many synthetic compounds that act by the same mechanism have been developed and are associated with serious adverse effects such as ulceration, gastrointestinal bleeding, additive potential, respiratory distress, drowsiness, nausea etc. [2]. Ibuprofen is a propionic acid derivative and nonsteroidal anti-inflammatory drug (NSAID) used to reduce mild to moderate pain, inflammation, fever and it has antipyretic effects [7]. Ibuprofen works by blocking an enzyme that makes prostaglandin which results in lower levels of prostaglandins in the body.

The tail flick method using hot plate model was selected to evaluate the central analgesic potential of the extract because of its sensitivity to strong analgesics, limited tissue damage with a cut-off time of 20sec sec, which is usually applied to

limit the amount of time the mouse spends on the hot plate. However this method makes use of higher brain function and is seen as supraspinal [10].

Phytoconstituents like alkaloids, flavonoids, steroids, and tannin isolated from medicinal plants have been reported to possess significant analgesic and anti-inflammatory activities [11]. Alkaloids and flavonoids are well known for their ability to inhibit pain perception [12]. The present study demonstrates that methanol root extract of *Datura metel* acts as a potent analgesic agent. The analgesic activity of MREDM may be due to the presence of secondary metabolites such as alkaloids, flavonoids, phenols, saponins, steroids and tannins. The analgesic activity of MREDM was effective at all doses of the extract, which is significant and increased in a dose dependent manner. The increase in analgesic activity with increasing doses of MREDM might be due to an increase in the concentration of phytoconstituents that possess analgesic activity with the maximum dose. Phytochemicals have been found to have overlapping functions which may include antioxidant effect, stimulation of immune system and modulation of hormone metabolism [15]. The analgesic activity of MREDM may be due to its ability to activate opioid receptors in the central nervous system.

4. CONCLUSION

The present study showed that methanol root extract of *Datura metel* (MREDM) contains secondary metabolites such as flavonoids, alkaloids and phenols which possess analgesic activity. The analgesic activity of the extract was potent as the standard drug (ibuprofen) and its analgesic activity was dose dependent. From the results obtained, it can be concluded that methanol root extract of *Datura metel* could be used as a pain reliever in traditional medicine. This validates its analgesic and is recommended for use in analgesic formulations.

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