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Full Length Research Paper

Pharmacological Assessment of Pain Relief from *Datura metel* Seed Extract

N. N. Wannang[1], H. C. Ndukwe[2]* and C. Nnabuife[2]

[1]Department of Pharmacology, Faculty of Pharmaceutical Sciences, University of Jos, Nigeria.
[2]Department of Clinical Pharmacy, Faculty of Pharmaceutical Sciences, University of Jos, Nigeria.

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This work was carried out to investigate the analgesic activity of dried seed of *Datura metel* Linn. A concentrated aqueous extract was obtained, mimicking conditions used in traditional treatment setting, which includes dissolving the extract in water. As in this part of the world, experiments were carried out with the aqueous extract for its peripheral and central antinociceptive potentials on acetic acid- induced writhing and radiant heat tail- flick models in rats, respectively. There was sensation of pain by the rats administered with the extract in the two test models used, after 60 min and above of pretreatment with the seed extract of *D. metel*. Hence, the analgesic activity of *D. metel* seed extract was found not to be significant (*P*>0.05) on acetic acid induced model, as well as the radiant heat tail-flick model. The behavioural pattern of sedation and decreased appetite on administration of seed extract could be explained on the basis of the action of some receptors like μ- receptors in the CNS, which when stimulated have the intrinsic potential to reduce the distress or the affective component of pain without having any significant change in the intensity of the actual sensation.

Key words: *Datura metel*, seed extract, analgesic, antinociceptive.

INTRODUCTION

Datura metel Linn. (Family; Solanaceae), Hausa name, zakami; Ogoni name, jegemi. It is an annual herb that grows four to five feet tall. The flowers are violet on the outside but whitish on the inside. The fruit is a spiny capsule of 1.25 inches in diameter. The seeds have the highest alkaloid content compared to the flowers, stem, immature fruits and leaves (Anozie, 1986). The fruits and seeds have several uses; the spiny fruit is used to card cotton. The calyx base is used in rubbing teeth. A drink made from the seeds is given as intoxicant to Fulani youths (Nigeria) to incite them into the “Sharo contest” or ordeal of manhood (personal communication). Youths in some parts of Plateau State, Nigeria, who use it to perform rigorous work, have claimed that the water extract of the seeds alleviate pain. Seeds along with other substances are used as a remedy for the symptoms of madness based on homeopathic principle, and decoc-tion of seeds is said to be useful in eye diseases (Anozie, 1986). The seeds also constitute the potential source for hyoscine (Anozie, 1986). It has been postulated that *D. metel* seeds extract can be helpful for pain relief, asthma and other illnesses, provided it is used by someone expe-rienced and skilled in the use of medicinal plants (Kermi et al., 2000). The seed extract is also used in the treat-ment of wounds, tooth decay and leprosy since it con-tains hyoscine (Aslam, 1996). *D. metel* Linn. is an herbal medicine, used in parts of Africa, including Nigeria (Anozie, 1986).

Traditional medicine is defined as the sum total of the knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures, whether explicable or not used in maintenance of health as well as in the prevention, diagnoses, improvement or treatment of physical and mental illness (WHO, 2004). Pain is generated when mechanical, thermal, chemical or electrical stimuli exceed a certain threshold value (pain threshold) which triggers the release of pain mediators from the effected tissue. The generation, transmission and central transformation of pain impulses is called noci-ception (Mutschler, 1995). Pain could be somatic or vis-ceral pain. Somatic pain can be further classified as sur-face (superficial) pain, which is generated in the skin, and

*Corresponding author. E-mail: chuksemail@yahoo.com.

also as deep pain that involves muscle, joints, bones and connective tissues. Nerve impulses from the skin nociceptors are transmitted via myelinated A fibers (primary pain) and unmyelinated C fibers (secondary pain) to the spinal cord. Pain receptors in the skeletal muscles and joints are also innervated with A and C fibers. The transmission of pain stimuli from visceral region takes place mainly via C fibers (Mutschler, 1995).

The work is aimed at investigating the analgesic activity of the aqueous seed extract of *D. metel* as claimed by traditional medicine practitioners. Hot plate induced pain explored the nociceptors (free nerve endings) in the skin of the rats used in the experiment. On the other hand, acetic acid induced pain explored the nociceptors, muscles and connective tissues, as the case may be (Mutschler, 1995).

MATERIALS AND METHODS

Collection of plant material

The *D. metel* plant was collected from the wild in Jos, Plateau State, Nigeria and was identified by Professor C.O. Akwueshi, of the Botany Department, University of Jos, Nigeria.

Extraction of plant material

The seeds were obtained from the fruits that were dried under shade for 14 days to ease the shedding of the seeds. The aqueous extract was prepared by dissolving 800 mg of the coarse powder in 200 ml of distilled water (4 mg/ml) over a 72 h period at room temperature. A percentage yield of 15.79% was obtained after extraction and evaporation to dryness at room temperature. The dried extract was then concentrated appropriately using distilled water. The extract was filtered and the residue was air-dried and weighed. The weight of the extract in aqueous solution was obtained.

Experimental animals

The investigation of analgesic activity of the extract was conducted on albino rats (Wistar strain) weighing between 100-150 g. They were purchased from the Animal Research House of the University of Jos, Plateau State, Nigeria. The animals were kept in metal cages at room temperature under condition of natural light and dark schedule and supplied food and water *ad libitum*. To keep the hydration rate constant, the food and water were withdrawn 12 h before the experiment.

Administration

All drugs were administered intraperitneally.

Nociceptive activity screening

The *in-vivo* antinociceptive activity of the crude extract was studied by acetic acid induced writhing method (Whittle, 1964). The inhibition of writhing in rats by the seed extract in 30 min was com-pared against inhibition of writhing by a standard analgesic (pentazocin).

Analgesic screening

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 50-58°C, applied to their tails (D'Amour, 1941) . The distance between the heat source (hot plate) and the tail skin was 1.5 cm and the cut-off reaction time was fixed at 10 s to avoid tissue damage. The time taken for rats to react to the external stimuli introduced was measured and a mean reaction time was obtained for each group that was set up for the experi-ment. Pentazocin (1 mg/kg) was used as the standard analgesic for comparing the tail-flick latencies of crude extracts. Tail-flick latency after 60 min of the drug (extract) administration was considered to be optimum. Hot water-induced method was also used at similar temperatures with the hot- plate method in order to resolve for any differences, especially that there was no analgesiometer at the time this experiment was carried out.

Phytochemical screening

The tests for tannins, phlobatanins, cardiac glycosides, carbohydrates and flavonoids, anthraquinones, saponins and cyanogenetic glycosides were carried out using procedures described by Trease and Evans (1996).

RESULTS

Results from Table 1 reveal the mean reaction time of extract slightly increases as the dose of the extract increases. The mean reaction time of the extract at the highest dose level of 300 mg/kg is below the mean reaction time of the negative control and also far below the mean reaction time of the positive control.

Table 2 reveals that the mean reaction time of the extract at the three different dose levels is about the same. However, these recorded observations are below the mean reaction time of the negative control (normal saline), and far below the mean reaction time of the positive control (pentazocin 1 mg/kg)

As seen in Table 3, the mean writhes of the rat decreases as the dose of the extract increases from 100-300 mg/kg. The mean reaction time at the highest dose of 300 mg/kg of the extract is about the same mean count with that of the negative control (normal saline). Both groups produced higher counts in writhes compared to pentazocin treated group.

Table 4 shows the phytochemical constituents of the seeds of *D. metel*. The seed was found to contain tan-nins, phlobatanins, cardiac glycosides, carbohydrates and flavonoids. However, anthraquinones and cyano-genetic glycosides were absent. Similarly, saponins and anthraquinones were absent.

DISCUSSION

The aqueous extract (100, 200 and 300 mg/kg) showed no significant analgesic activity in both radiant heat tail-flick model and the acetic acid induced writhing model. The abdominal constriction response induced by acetic acid is a sensitive procedure to establish peripherally act-

Table 1. Effect of the aqueous extract of *D. metel* on hot plate-induced pain in rats

Dose (mg/kg)	Mean Reaction Time (sec)	Percentage Inhibition (%)
100	2.34± 0.24	39.39
200	2.58 ±0.30	43.43
300	2.98 ±0.20	50.17
Normal saline (negative control)	3.30 ±0.45	55.55
Pentazocin (1 mg/kg) (positive control)	5.94 ±0.49	100.00

P>0.05 for treatment versus negative control.

Table 2. Effect of the aqueous extract of *D. metel* on hot water-induced pain in rats

Dose (mg/kg)	Mean Reaction Time (sec)	Percentage Inhibition (%)
100	2.92±0.40	49.15
200	2.88±0.37	48.48
300	2.90±0.25	48.82
Normal saline(negative control)	3.65±0.30	61.45
Pentazocin (1 mg/kg) (positive control)	5.95±0.42	100.00

P>0.05 for treatment versus negative control.

Table 3. Effect of the aqueous extract of *D. metel* on acetic acid-induced pain in rats

Dose (mg/kg)	Mean Reaction Time (sec)
100	15.7±2.8*
200	14.0±1.4*
300	12.0±0.7
Normal saline (negative control)	12.3±0.7
Pentazocin (1 mg/kg) (positive control)	5.3±1.4

**P*<0.05 for treatment versus negative control.

Table 4. Phytochemical screening of *D. metel* seeds

Constituents	Remark
Alkaloids	+++
Saponins	-
Tannins	++
Phlobatannins	++
Cardiac glycosides	++
Anthraquinones	-
Cyanogenetic	-
Flavonoids	++
Carbohydrates	++

Key: +++: present
++: slightly present
- : absent

acting analgesics. The response is thought to involve local peritoneal cells and mediated by the prostaglandin pathways (Ronaldo et al., 2000). In the tail-flick method, increase in stress tolerance capacity of the animals indicates the possible involvement of a higher center, thus, it is thought to involve central activity (Vogel, 1997).

In general, there was a perception of pain by the rats administered with the extract in the two test models used, after 60 min and above of pretreatment with the seed extract of *D. metel*. Hence, the analgesic activity of *D. metel* seed extract was found not to be significant on acetic acid induced model, as well as the radiant heat tail-flick model (*P*>0.05). From the study, the behavioural pattern of sedation and decrease appetite on adminis-tration of seed of the extract could be explained on the basis of the action of some receptors like μ-receptors in the CNS, which when stimulated have the intrinsic potential to reduce the distress or the effective compo-nent of pains without having any significant change in the intensity of the actual sensation (Rang and Dale, 1997).

This may be due to sensation of contentment, euphoria and well being due to action of such drugs that can stimulate such receptors in higher centers of the brain (Williams, 2000).

Phytochemical screening of *D. metel* seeds revealed the presence of alkaloids, tannins, cardiac glycosides, flavonoids and carbohydrates. Scopolamine (an alkaloid) content of the plant *D. metel* is higher than that of other *Datura* species. The analgesic and CNS depression of the plant is often attributed to the presence of this alkaloid (Tyler et al., 1990), but the observed effect in this study could be as a result of drying, which is reported that drying process accelerates the conversion of hyoscya-mine to atropine.

In conclusion, it may also be said from the study that traditional uses of aqueous extract of *D. metel* seed for the treatment of various types of pain conditions has got

no definite basis, as revealed from the experimental results. However, further investigations on other parameters are currently going on in our laboratory to ascertain if there are no other mechanisms, by which the affective component of pain is altered and if this produces an overall effect on the nociceptive property when used in treatment.

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