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Anti - Nociceptive Potentials of Methanol Extract of *Cassia Alata* in Experimental Animals

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ABSTRACT

Cassia alata has been used as an agent for wound healing, anti-bacteria and pain in African traditional medicine. In this study, we aim to investigate the anti- nociceptive properties of *Cassia alata* to scientifically justify this folkloric claim. Thermal (tail flick test) and chemical (acetic acid induced writhing test) models of nociception were employed, animals were divided into five groups (n=5), the control group was treated with 1 mL/kg of distilled water, reference group received Tramadol 50 mg/kg, while the test groups received graded doses (125,250 and 500 mg/kg) plant extract. The extract produced dose dependent inhibition of the acetic acid in the chemical test. In the thermal test, the extract also dose dependently increased the withdrawal latency as compared to the control. This study showed that the methanol extract of *Casia alata* leaf produced anti-nociception in models of chemical and thermal pain which justifies its folkloric claim for the treatment of pain.

Keywords: *Cassia alata*, Tail flick, Acetic acid, Anti-nociceptive, Tramadol.

INTRODUCTION

In recent decades, the use of medicinal plants for therapeutic purposes has gained recognition [1]. In the developing countries of Africa most people rely on the use of herbal medicine for managing different ailments [2]. More so, in Africa traditional medicine, the use of medicinal plants has long been considered effective, affordable and reliable means of health care delivery, [3]. Plants represent the origin of modern pharmacotherapy and a good number of modern drugs have been isolated from plants [4].

One of the definitions of pain is the effect that is generated in consciousness by the arrival of nerve impulses produced by noxious stimuli in the brain [5]. The brain sometimes interprets it as suffering that arises from the perception of a painful stimuli. The Association for the Study of Pain (IASP) has given a broader and more inclusive definition of pain as an unpleasant, sensory and emotional experience associated with actual or potential tissue damage [6]. Pain is a common symptom in many disease conditions and it often affects the quality of life of an individual.

The plant *Cassia alata* has its origin from Argentina [7]. Its other common aliases are *Senna alata*, Candle Brush, Candlestick, and others [8]. *C. alata* is widely known as “ketepeng china” in Indonesia and it is a common herbs plant used in most of South Asia for treatment of various diseases. It is also used for its medicinal purpose in some European Countries like France [9]. The root of *C. alata* is effective in treatment of rheumatism and has laxative properties [10]. In India, the seeds and leaves has shown high potency for treatment of eczema as well as a potent fungicide [11]. Stomach pain during pregnancy has been reduced by *C. alata*. it has also been used for headaches and paralysis. Some countries have used extracts of *C. alata* in their practice of local herbal medicine to treat a variety of skin diseases [12].

However, despite the ethnomedicinal benefits of *Casia alata* leaf, there are few reports on its antinociceptive activities. Therefore, in order to establish a scientific basis for this folkloric claim, this study was designed to study the anti-nociceptive properties and the possible mechanism of action of the methanol leaf extract of *Casia alata*.

MATERIALS AND METHODS

Plant Materials

The leaves of *Cassia alata linn* was collected at Egume, Dekina Local Government Area, Kogi state. Identification and authentication of the plant was done in the Herbarium of the Biological Science Department of Kogi State University, Anyigba by Mr. Sule F.E and was compared with voucher specimen number 717.

Experimental Animals

Wister rats of both sexes weighing 110-150g respectively were acquired from the laboratory animal department of the Faculty of Veterinary Medicine, University of Nigeria, Nsukka and were used as the experimental animals. The animals were given free access to standard feed and water *ad libitum*. The animals were housed in clean cages having beddings of sawdust that was replaced with fresh beddings every three days. The study was undertaken in accordance to the ethical guidelines on laboratory animal use and care policy, which was in compliance with Kogi State University Research Policy.

Chemicals

Methanol, normal saline, distilled water, acetic acid. Reagents used were obtained from the Department of Biochemistry, Kogi State University, Anyigba. All the reagents were of analytical standard grade.

Preparation of *Cassia Alata* Plant Extract

Freshly collected *Cassia Alata* leaves were air-dried for two weeks and the size was reduced using mortar and pestle. The extraction method was by cold maceration using absolute methanol. Erlenmeyer flask was used to collect 100g of the powder and then 500ml of the solvent was added to the flask and kept for 48 hours with occasional agitation before being filtered. Evaporation to dryness of the extract was done using an evaporator under reduced pressure and controlled temperature (40-60°C). The resultant evaporated extract was stored in a leveled airtight container in the refrigerator for future use.

Anti-nociceptive activity

Acetic Acid Induced Writhing in Mice

Acetic acid induced writhing method as described by [13] was adopted for the study of analgesic activity in this experiment. Thirty (30) Wister albino rats of both sexes were grouped into five classes. Classes 1 and 2 were treated as negative control (distilled water 1ml/kg) and positive control (Tramadol 50 mg/kg). classes 3, 4, and 5 were treated with extract doses of 500 mg/kg, 250 mg/kg, and 125 mg/kg. All administrations were given orally. At Sixty minutes of treatment, the experimental animals were administered 0.6% acetic acid (10 ml/kg) intra-peritoneally to induce pain. 5minutes after acetic acid administration, the animals were observed and number of writhes by each animal was counted for 15minute.

Tail Flick Test

The experiment was carried out by assessing the tail withdrawal time from hot water. Animal grouping was same as the acetic acid induced writhing test. The rats were pretreated 60 minutes before the experiment. About 3-5cm of the tail of each mice was dipped into a water bath with warm water temperature maintained at between 50-55ºC. The time taken for the mouse to flick its tail known as withdrawal latency was recorded for all the mice using a stopwatch at 30 minutes after treatment.

Statistical Analysis

Results were expressed as mean ± standard error of mean and presented in graphs. Data analysis was done using one-way analysis of variance (ANOVA) followed by Newman- Keuls *post hoc* test. Results were considered significant at $p < 0.05$.

RESULTS

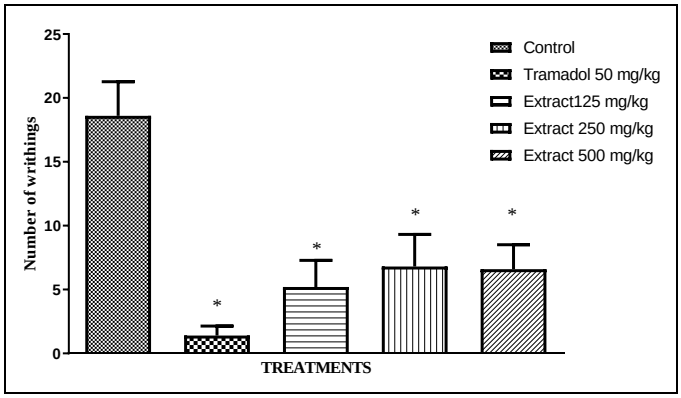

Figure 1: Effects of graded doses of methanol extract of *cassia alata on number of writhings in acetic acid induced abdominal constriction*. *p<0.05 compared to vehicle treated control (One-way ANOVA and then, by Newman- keuls *post-hoc* test).

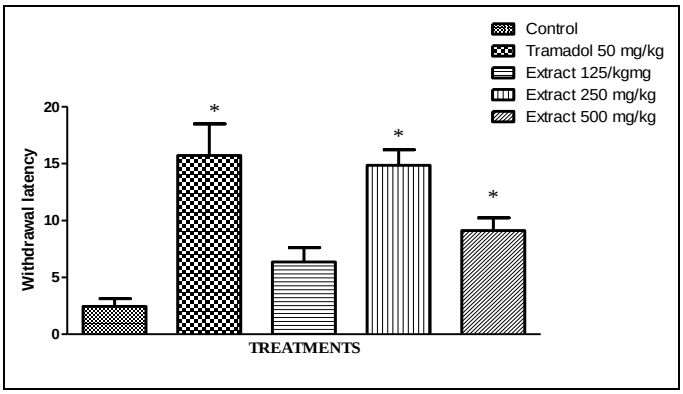

Figure 2: Effects of graded doses of methanol extract of *Cassia alata* on tail flick latencies in mice. *p<0.05 compared to vehicle treated control (One-way ANOVA followed by Newman- keuls *post-hoc* test).

Effects of Methanol Extract of *Cassia Alata* on Acetic Acid-induced Writhing Test.

Figure 1 shows that the plant extract (125, 250 and 500 mg/kg) gave a significant ($p<0.05$) reduction in writhing movements caused by acetic acid. The reference drug Tramadol 50 mg/kg also produced significant reduction in writhing movements caused by acetic acid.

Effects of Methanol Extract of *Cassia Alata* on Tail-flick Latency.

Figure 2 shows the effects of graded doses of the methanol extract of *cassia alata* on tail flick latency(s). The extract (250 and 500 mg/kg) tested showed significant ($p<0.05$) increase in the tail flick latency(s), the extract (125 mg/kg) was not significant compared with the control (distilled water). The efficacy of the 500 mg/kg of the extract was comparable to the reference group (Tramadol 50 mg/kg).

DISCUSSION

This experiment was undertaken to investigate the anti-nociceptive effects of the methanol extract of *Casia alata* leaf

In this present study chemical and thermal model of nociception were employed, for the thermal model the tail flick test was used. Meanwhile, for the chemical model the acetic-acid induced writhing's was used.

In testing new agents for their analgesic potential, the acetic acid induced writhing is usually employed [14]. The abdominal constrictions observed in this model of nociception is as a result of the chemical substance acetic acid which cause the release of inflammatory mediators like serotonin, bradykinin, substance P, prostaglandin and serotonin. These mediators activate primary afferent nociceptors [15]. There was inhibition of this abdominal constrictions in animals treated with the extract as compared with the control, suggesting that the extract possibly prevents the release of inflammatory mediators.

Pain sensitivity is usually assessed by the tail flick test. In this test the ability of the agent tested to increase withdrawal latency when the tail is immersed in a water bath containing water of 55ºC indicates that the agent has analgesic potentials [16]. Increased in withdrawal latency observed with anti-nociceptive agents is as a result of the activation of the periaqueductal gray matter (PAG) to produce endogenous peptides that goes to the spinal cord to prevent transmission of pain impulses in the dorsal horn, thereby preventing nociceptor activation [17]. The ability of the ethanol leaf extract of *Casia alata* to prevent the increase in withdrawal latency in this model of nociception may indicate that the extract exhibits its anti-nociceptive activity through central mechanisms.

CONCLUSION

Collectively the extract was found to possess considerable analgesic properties at doses tested centrally and peripherally. This in part validates the claim for the traditional use of the plant for wound healing.

Conflict of interest

The authors declare no conflict of interests

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