NIPES

Journal of Science and Technology Research

Journal homepage: www.nipesjournals.org.ng

Anti-Inflammatory and Anti-Nociceptive Properties of Aqueous Leaves Extract of *Ipomoea Batatas* (lam). On Experimental Animals

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Article Info

Ipomea batatas; anti-inflammatory; anti-nociceptive, pentazocin, aspirin

Received 15 January 2020
Revised 21 January 2020
Accepted 22 January 2020
Available online 02 March 2020

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Abstract

Ipomoea batatas is sub-tropical and tropical region plant being implicated in the treatment of several diseases as reported ethnomedicinally. Leaves aqueous extract of I. batatas was evaluated for the potential of anti-inflammatory and anti-nociceptive properties of Wistar rats and mice. These autonomous studies, involving two phases of the study of which twenty-five rats and mice were randomly divided into groups of five (n=5). The studies involved formalin induced anti-inflammatory effect in rats exhibiting edema on left hind sub-planter paw. Acetic acid and hot plate induced pain in mice were evaluated via peripheral and central acting anti-nociceptive property of Ipomoea batatas plant extract. The extract was orally given across the treated groups at graded doses: 50, 100 and 200 mg/kg with aspirin and pentazocin as reference drug control whereas untreated control was given water. The results gotten showed a significant reduction ($p<0.05$) in the paw volume of the plant extract with anti-inflammatory property was observed at 120, 180 and 240 minutes. From the anti-nociceptive activity, a significant inhibitory effect ($p<0.05$) across the treated groups with formalin and hot plate induced pain in mice. This research study hence authenticates the folklore benefits of I. batatas leaves in treating inflammation and nociceptives.

1. Introduction

Inflammation is known to be a widespread causative factor that propels the irritation of broad diversified disease conditions such as: arthritis, cardiovascular and asthma disease which signify severe health complications. Inflammatory disorders is treated presently using non-steroidal and steroidal anti-inflammatory agents to exercise their potency via blocking the metabolism involving arachidonic acid using lipoxygenase and cyclooxygenase enzyme trails [1]. Non-steroidal and steroidal anti-inflammatory agents used anti-inflammatory substance known to show certain toxicity activities. Owing to this action, isolated compounds having less toxicological latent is required [2]. Accordingly, explore for plant natural products with defensive effects and displaying least side effects basically attracting the ultimate anticipate for humans.

Ipomoea batatas (L.) Lam. is in the family Convolvulaceae, usually there are largely dicotyledons prone to two embryonic seed [3]. It is known to be a perennial crop that creeps, sometimes semi-erect, having basis from Central and South America. It is a source of power nutrients possessing wide range of to damage *oxidation and free* harmful to cells and tissue. More so, it aid to *perfect heart functions* [4]. *Ipomoea batatas* displayed an extensive folklore uses like; anti-fertility, anti-

carcinogenesis, *anti-inflammatory, anti-mutagenity,* anti-hemorrhagic, regulates *stable blood sugar and* anti-diabetes [5]. Suggestions are made that mucilage can promote its antioxidant effects against peroxyl and hydroxyl radicals [6].

2. Methodology

2.1 Collection of Plant Material

Sweet potatoes leaves (*Ipomoea batatas*) were collected from Bolorunduro village Akure, Ondo State, Nigeria and was identified and authenticated by Dr. O. Timothy of the Department of Plant Biology and Biotechnology, University of Benin, Edo State, Nigeria.

2.2 Preparation of Plant Material

Leaves were rinsed in clean water and air dried for 7 days, afterwards oven dry at 40 ^{0}C for 24 hours. Crunchy leaves were pulverized via electrical mechanical engine. Powdered leaves sample was stored in an air-tight container further use

2.3 Experimental animals

Albino and Swiss rats and mice of both sexes, weighed between 180-250 g and 25-31g being acquired from Pharmacology animal house, University of Benin, Benin City. They were placed in conducive steel cages and allowed access to rat chow and water. They were acclimatizing for 14 days. Animals were held in accordance to standard protocols to the use of laboratory animals with ethical approval number FLS/17/101.

2.4 Qualitative phytochemical Screening

The presence of alkaloids, flavonoids, tannins, saponins, cardiac glycoside, and phenols content of the plant were determined by the methods described by [7, 8, 9]

2.5 Acetic acid induced nociception in rats

The study carried out involved Swiss mice by utilizing the model by [2]. The mice were randomly split into groups of six with 5 per group. Group I was negative control received water only; group II received reference drug, (20 mg/kg pentazocine), and groups III, IV and V orally received 50, 100 and 200 mg/kg of *Ipomea batatas* extract. An hour thereafter, 0.1 ml of 6% acetic acid was intraperitoneally injected. Nociceptive activities were determined via writhing reflex.

2.6 Formalin induced nociception in rats

The study carried out using Swiss mice via the model illustrated by [2]. Mice were randomly divided into five groups with 5 each. Group I received water only; group II received reference drug, (20 mg/kg indomethacine), and groups III, IV and V orally received 50, 100 and 200 mg/kg of *Ipomea batatas* extract. An hour thereafter, 0.1 ml of 10 % formaline was intraperitoneally injected. Nociceptive activities were evaluated via writhing reflex

2.7 Anti-inflammatory study

Wistar rats were divided into five groups of five rats each. Group I was pretreated with distilled water; group II received acetyl salicylic acid (aspirin at 100 mg/kg) as the positive control. Correspondingly, groups III, IV and V were administered orally with graded doses at 50, 100 and 200 mg/kg of *Ipomoea batatas* respectively. Paw edema was induced via injecting rats with 0.1 ml of freshly prepared carragenaan in the left hind paw an hour later of post drug administration. Edema volume was determined via using verneer Caliper with results taken at 1 hour intervals i.e.: 0, 1, 2, 3, 4 hours after carragenaan administration.

2.8 Statistical analysis

Data were presented as mean ± standard error of mean (SEM). Analysis of variance (ANOVA) and Dunnet's test were used for data determination; $p<0.05$ taken as statistical significant. The software package, Graph pad prism 7 used for the analysis.

3. Results and Discussion

Table 1 indicates the presence of various secondary metabolites in the preliminary screening of the leaf extract of *J. gossypifolia*.

Table 1: Qualitative phytochemical analysis of n-Hexane leaves extract of *Jatropha gossypifolia*

Samples/Phytochemicals	Leaves extract
Alkaloids	+ve
Flavonoids	+ve
Tannins	+ve
Saponnins	+ve
Cardiac glycosides	+ve
Phenols	+ve

+ ve indicates present and – ve indicates absent

Table 2: effect of *Ipomoea batatas* extract on acetic acid induced peripheral pain in mice *P-value>0.05, 0.01 n=5*

Groups	Dose (mg/kg)	Mean±SEM acetic acid	% inhibition
Control	DW	41.14±2.03	-
Pentazocine	20	11.02±1.22**	73.2
I. batatas extracts	50	21.48±2.60	47.8
I. batatas extracts	100	19.00±1.64*	53.8
I. batatas extracts	200	12.10±2.16**	70.6

The results obtained indicated that there was significant anti-nociceptive effect across the treated treated with 100 and 200 mg/kg bw when compared with control groups (Table 2). Conversely, the treated group with 50 mg/kg bw showed no significant inhibition ($p<0.05$) on writhing test

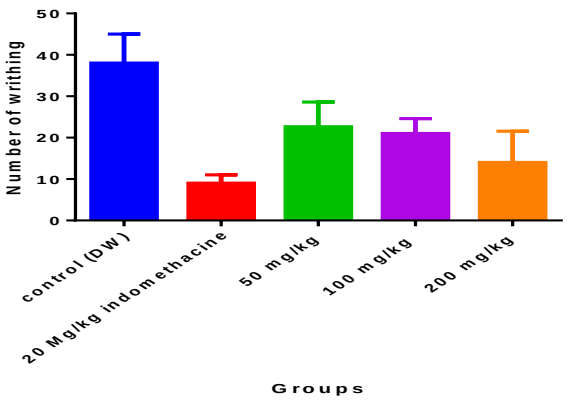

Figure 1: Effect of *Ipomoea batatas* extract on formalin induced pain in rat

The results obtained showed that there was no significant anti-inflammatory activity across the treated groups after an hour time frame except for the positive control when compared with control groups (Table 3). The treated groups at 50, 100 and 200 mg/kg bw of extract of *Ipomoea batatas* exhibited significant inhibition (p<0.05) on the volume of edema at 120, 180 and 240 minutes.

Table 3: effect of *Ipomoea batatas* extract on formalin induced inflammation on rat sub-plantar paw.

Groups	**Dose (mg/kg)**	**Mean±SEM 1hr**	**Mean±SEM 2hr**	**Mean±SEM 3hr**	**Mean±SEM 4hr**
Control	DW	5.53±**0.15**	5.77±**0.15**	5.50±**0.29**	5.27±**0.15**
Acetylsalicyclate	100	4.00±**0.23****	3.90±**0.06*****	3.90±**0.06****	3.50±**0.17*****
I. batatas extracts	50	5.50±**0.29**	4.50±**0.00****	3.90±**0.06****	3.67±**0.09*****
I. batatas extracts	100	5.50±**0.29**	4.50±**0.29****	4.27±**0.15****	3.80±**0.00*****
I. batatas extracts	200	5.00±**0.00**	4.77±**0.15***	4.20±**0.12****	3.90±**0.06*****

P-value>0.05, 0.1, 0.01 n=5

Several studies showed inflammation and nociceptives related to disease of different clinical states such as vascular, cancer and arthritis disorder [10]. Also, various medicinal plants have the ability to ease nociceptive and inflammation associated with *in vivo* and *in vitro* methods. *Ipomoea batatas* is known as a medicinal plant frequently utilized traditionally to relief pain and some diseases. This study evaluates the property of *I. batatas* on inflammation with the consideration associated among anti-inflammatory and palliative activities. Extracted substances and pure compounds derived from plant medicine have been tested for possible capability to adapt to the term of pro-inflammatory signals and hence might perhaps acts as anti-inflammatory pilot agents. Subsequent phytochemicals have been implicated as anti-inflammatory substances such as; catechines, flavonoids, polyphenols, terpenes, quinines, alkaloids, etc [11]. The possible modes of action of anti-inflammatory property in phytochemicals have been recorded in literatures. The most vital ones include such via NF-kB stimulated inhibition and down-controlling inflammatory expression of enzyme signal like COX-2, MMP-9 and 5-LOX [12]. The result from the phytochemical screening of *I. batatas* as conducted by [13] showed that most plant has bio-active components such as flavonoids and tannins with possible interest of treating inflammation and nociceptives states. The animals prone to higher doses at 50, 100 and 200 mg/kg of the plant extract were presented with significantly inhibited carrageneen induced inflammation after 120, 180 and 240 minutes. Inhibition could have been instigated via the presence of certain bioactive component previously stated. During rheumatoid arthritis, flavonoids are implicated for the inhibition release of chemical substances via histamine whereas serotonin decreases its symptoms. These are assumed to be interceded via reduction of fibroblast proliferation, monocyte infiltration, inhibited TNF-α and blocked COX [14]. The possible mechanisms of action associated with anti-inflammatory latent of the extract perhaps mimicked the same prototype. This reports consent with the report by [10] on anti-inflammatory activity of *Xeromphis spinosa* plant extract in carrageenin-induced edema in rats which displayed significant result after 240 minutes of administration. Also, *Artemisia absinthium* methanolic extract showed significant anti-inflammatory property in mice, which exhibited prolonged anti-inflammatory reaction and it is recommended that it could be due to deferred plant extract absorption [2]. Pains are triggered by intraperitoneal injection to cause irritants into rats' cavity. The animals retort with dynamic writhing reflex. Formalin and acetic acid technique is typically measured by induction of chronic pain [15]. *Ipomoea batatas* significantly blocked the strong writhing reflex following various phases of the reaction to acetic acid and formalin induction. Graded doses at 50, 100 and 200 mg/kg body weight

of the extract significantly decreased pain when relatively comparable to positive control (20 mg/kg pentazocine). Result gotten concurred with the report of [16] involving the property of aqueous and ethanol cold maceration extracts of *Crocus sativus L.* being evaluated for its anti-nociceptive effect in mice. Analgesic study was mediated via writhing and unusual stretching. The extracts showed anti-nociceptive property against acetic acid and formalin induced writhing. In similar report, *Thymus vulgaris* hydro alcoholic extract exhibited a significant activity against nociceptive in three analgesic forms evaluated in mice: tail flick, hot plate and formalin tests. The animal dosed at 100 and 200 mg/kg of the extract were extra potent when compared with control group. Serotoninergic, cholinergic and opioid receptors were involved as potential mode of action of analgesic potentials of the plant [17]. Antinociceptive effect of *I. batatas* also have same prototype. The experimental animal gives two distinct pain behavioral parameters, involving different stimuli. First stage was instigated instantly prior to acetic acid and formalin injection ended between 0 – 5 minutes resultant to chemical activation of nociceptors. This probably can be owe to straight activity of nociceptors, experimentally obtainable data exhibited acetic acid and formalin principally trigger the effect of C-fibres and not A- afferents, this stage can be blocked via centrally substitute analgesics. Second stage was created at 15 - 30 minutes after acetic acid and formalin induction, most possibly relies on peripheral modes also centrally intercede one. The late stage of the second phase seems to be owing to inflammatory feedback partly mediated via prostaglandins and are concealed through peripheral agents includes steroids and NSAIDs also with centrally acting agents [18]. *I. batatas* activities were significant in second stages, signifying a procedure associated with inflammatory method [11].

4. Conclusion

This study showed *I. batatas* with certain level of inhibition against carrageneen induced inflammation in the last stage while exhibiting significant effect in acetic acid and formalin induced pain, validation of the florklore benefits of the plant. Flavonoids and several phytochemicals can be concerned in mediating several biological activities, mechanism of actions of the plant in instigating anti-nociception and anti-inflammation with the help of further study.

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