Phytochemical Investigation and Pharmacological Screening of Ipomoea Batatas for Antiinflammation Activity

Bhoompalli Vishnukanth[1], Sarat Chandra V Miriyala[2], A. Srinivasa Rao[3]
[1]*Department of Pharmacology, Bhaskar Pharmacy College, Moinabad, R.R. District, Telangana, India, 500075*
[2]*Research Assistant, Department of Pharmacology, Bhaskar Pharmacy College, Hyderabad*
[3]*Professor and Principal, Bhaskar Pharmacy College, Moinabad, R.R. District, Telangana, India, 500075*

Abstract—**The present study aimed to evaluate the anti-inflammatory and antioxidant potential of Ipomoea batatas using various experimental models of inflammation in Wistar rats. Acute and chronic inflammation was induced using carrageenan, dextran, formaldehyde, and serotonin, and the effects of oral administration of Ipomoea batatas extract at low (200 mg/kg) and high (500 mg/kg) doses were compared with the standard anti-inflammatory drug diclofenac (10 mg/kg). Paw edema was measured at specific time points, and biochemical parameters including malondialdehyde (MDA), reduced glutathione (GSH), superoxide dismutase (SOD), and catalase (CAT) were estimated to assess oxidative stress and antioxidant activity. The results demonstrated a significant, dose-dependent reduction in paw edema in all models, with the high dose of Ipomoea batatas producing effects comparable to diclofenac. Biochemical analyses revealed decreased MDA levels and increased GSH, SOD, and CAT activities, indicating enhanced antioxidant defense and reduced lipid peroxidation.**

Index Terms—**Ipomoea batatas, Anti-inflammatory activity, Paw edema, Oxidative stress**

I. INTRODUCTION

Plants are one of the important sources of medicine. The application of plants as medicine dates back to prehistoric period. Several indigenous drugs used in modern medicine have figured in ancient manuscripts such as Rigved, the Bible, and Quran. Over six thousand years ago, the ancient Chinese were the first to use the natural vegetation as medicine. In India, the Ayurvedic system of medicine has been in use for over three thousand years. Hippocrates, the 'Father of Medicine' was the first to give a scientific explanation of diseases. Indian systems of medicine include Ayurveda, Siddha, Unani, Tibetan and Naturopathy. Herbal therapy provides rational means for the treatment of many internal diseases which are considered to be obstinate and incurable in other systems of medicine. It aims at both the prevention and cure of diseases.

II. HISTORY OF HERBAL DRUGS

Thousand years ago many natural drugs were identified for combating human ailments either by instinct or intuition or trial and error methods. The earliest mention of medicinal use of plants has been used found in 'Rig Veda', which was written between 4000 and 1600 B.C. In the "Atharva Veda", we find the more varied use of drugs. It is the “Ayurveda “which is considered as an “Upa Veda " that definite properties of drugs and their uses have been given in great detail. "Charka samhita" is another earliest treatise on "Ayurveda" (600 BC), which lists a total of 341 plant produce for use health management. "Sushruta Samhita" also dealt with plants related to medicine. Dhanvantari and Nagarjuna were the well known person with an intimate knowledge of the characteristics of medicinal plants. Rauwolfia, which has acquired world wide popularity, finds mention in ancient Hindu scriptures as well as in the monumental work of charaka. The plant was mentioned as usefull antidote for snake bites and insect stings.[1]

Their effectiveness, easy availability, low cost, and comparatively being devoid of serious toxic effect (time tested) popularized herbal remedies. Medicinal plants have their values due to the presence of chemical constituents, commonly known as secondary metabolites present in various plant tissues. These substances are alkaloids, glycosides, essential and fatty oils, resins, gums, mucilage, tannins etc. of large use. These active principles may be present in the organs of the plant, viz-roots, seeds, leaves, bark, wood etc..[2]

Popularity of herbal medicine over allopathic medicine is because of the following reasons: -

- Low cost of medicine
- Relatively free from side effects
- Cures the root cause and remove it
- Cures for many obstinate diseases
- Easy availability[3]

III. SCOPE OF HERBAL MEDICINES

Several civilizations across the globe have herbs in different forms. Before the advent of modern medicine herbs were used in the form of powders, pastes, tablets, galenicals like tinctures, infusion, decoction, oils saturated with herbs, oils, poultice etc. Herbs have been used in India in Ayurveda, Sidda, Unani systems of medicine, collectively known as indigenous system of medicine. The modernized method of formulating herbal medicines has yielded a new system of herbal medicine, popularly known as phytomedicine. The Ayurvedic medicines can be classified as like Charaksamhita, Sushrutsamhita, Bharat Bheshaj Ratnakar etc. and Ayurvedic proprietary medicine.

In developed countries, particularly in the United States of America, the herbal formulations are included in the list of food supplements and are considered as alternative or complementary system of medicines. Several clinical trials on herbal extract have been undertaken to prove their safety and efficacy using protocols acceptable to the modern medicines. Many developed countries have realized the usefulness of herbs as a sourse of starting material (lead compounds) in the process of drug discovery. The chances of getting new drugs from herbs are more than getting anew drugs from synthetic source because of availability of literature on plant activity. Many biomarkers have been isolated and identified.

There is fundamental difference between the indigenous system of medicine and modern medicine. The modern medicine makes use of single ingredient whereas the indigenous system of medicine believes that different constituents of herbs have synergistic effect. It has been shown that mode of action differs when effect of isolation biomarkers is compared with the total extracts.[4-9]

IV. MATERIAL AND METHODS

Collection and Identification of Plant Material

The fresh Ipomoea batatas are collected and identified was purchased from local market Pradesh, India, and authenticated by Dr. K. Madhava Chetty, Assistant Professor, Department of Botany, S.V University, Tirupati.

Preparation of the Extract

The Collected plant was wasted, air dried at room temp 7-14 days. were pulverized with the help of electric grinder the powder was further Sieved to get a fine powder and Stored in air tight Container. The powder was extracted using Soxhlet apparatus.

Extraction procedure

Coarsely powdered Ipomoea batatas were used for extraction with Ethanol by using Soxhlet method for 6-8 hours. 50g of dried powder was weighed and 500mL of solvent Ethanol is used for the extraction. The extracts were evaporated by using a rotary evaporator and dried at room temperature. The obtained crude extracts were weighed and stored at $4^{o}C$ for further analysis.

Experimental design

Group I Normal control

Group II Negative control

Group III Standard diclofenac 10 mg/kg

Group IV Ipomoea batatas extract (low dose 200 mg/kg)

Group V Ipomoea batatas extract (high dose 500 mg/kg)

Parameters

carrageenan-induced paw edema [10]

In the carrageenan-induced paw edema procedure, healthy Wistar rats or Swiss albino mice are divided into groups and acclimatized under standard laboratory conditions. The animals are fasted overnight before the experiment, with free access to water. Each group receives its respective treatment orally-either the vehicle, standard drug (diclofenac), or Ipomoea batatas extract at different doses. One hour after treatment, inflammation is induced by injecting 0.1 mL of 1% carrageenan solution into the sub-plantar region of the right hind paw. Paw volume is measured before and at 1, 2, 3, and 4 hours after injection using a plethysmometer or vernier caliper. The increase in paw volume is recorded and the percentage inhibition of edema is calculated using the standard formula. Behavioral changes such as pain and reduced activity are also noted. At the end of the experiment, animals are sacrificed as per ethical guidelines, and the inflamed paw may be collected for further histopathological analysis. The study is conducted following CPCSEA guidelines with prior approval from the Institutional Animal Ethics Committee, ensuring humane handling and minimizing animal distress throughout the process.

Dextran-induced paw edema [11]

In the dextran-induced paw edema procedure, healthy Wistar rats or Swiss albino mice are divided into groups and acclimatized for several days under standard laboratory conditions, with free access to food and water. Animals are fasted overnight before the experiment but provided water. Each group is treated orally with either a vehicle, standard anti-inflammatory drug (such as chlorpheniramine or diclofenac), or Ipomoea batatas extract at different doses. One hour after administration, acute inflammation is induced by injecting 0.1 mL of 1% dextran solution into the sub-plantar region of the right hind paw. Dextran causes edema primarily through the release of histamine and serotonin, leading to increased vascular permeability and swelling. Paw volume is measured before injection and at intervals of 30 minutes, 1 hour, 2 hours, and up to 4 hours after injection using a Plethysmometer or vernier caliper. The increase in paw volume is recorded and the percentage inhibition of edema is calculated using the standard formula. Behavioral changes such as pain, reduced mobility, and grooming are also observed. At the end of the experiment, animals are humanely sacrificed, and tissue samples may be collected for histological or biochemical analysis if necessary. The procedure is conducted following CPCSEA guidelines, with prior approval from the Institutional Animal Ethics Committee to ensure ethical treatment and minimal distress to the animals throughout the study.

Formaldehyde-induced paw edema [12]

In the formaldehyde-induced paw edema procedure, healthy Wistar rats or Swiss albino mice are divided into groups and acclimatized under standard laboratory conditions with free access to food and water. Animals are fasted overnight prior to the experiment while allowing water ad libitum. Each group receives its respective treatment orally-either vehicle, standard drug (such as diclofenac or indomethacin), or Ipomoea batatas extract at specified doses-once daily throughout the experiment. On the first day, inflammation is induced by injecting 0.1 mL of 2% formaldehyde solution into the sub-plantar region of the right hind paw using a fine needle. This causes chronic inflammation characterized by edema, pain, and tissue damage over several days. Paw volume is measured before the injection and on subsequent days (typically days 1, 3, 5, and 7) using a plethysmometer or vernier caliper. The increase in paw volume is recorded, and the percentage inhibition of edema is calculated by comparing treated groups with the control group. Behavioral observations such as pain response, reduced mobility, and grooming are also noted. At the end of the study, animals are humanely sacrificed, and tissue samples from the paw may be collected for histopathological examination to assess inflammatory changes. The procedure is conducted in compliance with CPCSEA guidelines, and prior approval is obtained from the Institutional Animal Ethics Committee to ensure ethical handling and minimal distress to the animals throughout the study.

serotonin-induced paw edema [13]

In the serotonin-induced paw edema procedure, healthy Wistar rats or Swiss albino mice are acclimatized under standard laboratory conditions with access to food and water. The animals are fasted overnight before the experiment, with water allowed ad libitum. They are then divided into groups and treated with either a vehicle, standard anti-inflammatory drug (such as cyproheptadine or diclofenac), or Ipomoea batatas extract at different doses. One hour after oral treatment, acute inflammation is induced by injecting 0.1 mL of 1% serotonin solution into the sub-plantar region of the right hind paw using a fine needle. Serotonin (5-hydroxytryptamine) causes edema by increasing vascular permeability and promoting inflammatory mediator release, leading to swelling and pain. Paw volume is measured before injection and at intervals of 30 minutes, 1 hour, and up to 3 or 4 hours after injection using a plethysmometer or vernier caliper. The increase in paw volume is recorded, and the percentage inhibition of edema is calculated by comparing the treated groups with the negative control. Behavioral signs such as pain, discomfort, and reduced movement are also observed. At the end of the experiment, animals are humanely sacrificed in compliance with ethical guidelines, and paw tissues may be collected for histopathological or biochemical analysis. The study is conducted following CPCSEA guidelines, with approval from the Institutional Animal Ethics Committee to ensure proper animal care and minimal distress.

Estimation of malondialdehyde (MDA) [14]

The estimation of malondialdehyde (MDA), a marker of lipid peroxidation, is commonly performed using the thiobarbituric acid reactive substances (TBARS) method. In this procedure, tissue samples such as paw or liver are homogenized in ice-cold phosphate buffer to prepare a 10% w/v homogenate. The homogenate is mixed with trichloroacetic acid (TCA) to precipitate proteins and centrifuged to obtain a clear supernatant. An equal volume of thiobarbituric acid (TBA) solution is added to the supernatant, and the mixture is heated in a boiling water bath for 15–20 minutes to allow the formation of a pink MDA-TBA adduct. After cooling, the absorbance of the colored complex is measured at 532 nm using a spectrophotometer, and MDA concentration is calculated from a standard curve or expressed per mg of protein in the homogenate. All steps are carried out under cold conditions to minimize further lipid peroxidation, and blanks are included to correct for background absorbance.

Estimation of reduced glutathione (GSH) [15]

The estimation of reduced glutathione (GSH) is performed to assess the antioxidant status of tissues and is commonly carried out using Ellman's reagent (DTNB). In this procedure, tissue samples such as paw or liver are homogenized in ice-cold phosphate buffer to prepare a 10% w/v homogenate, which is then deproteinized by adding 5% trichloroacetic acid (TCA) and centrifuged to obtain a clear supernatant. An equal volume of DTNB is added to the supernatant, where it reacts with the free sulfhydryl groups of GSH to form a yellow-colored 5-thio-2-nitrobenzoic acid (TNB) complex. The absorbance of this complex is measured at 412 nm using a spectrophotometer, and the GSH concentration is calculated from a standard curve prepared with known concentrations of GSH. The results are expressed as μmol of GSH per mg of protein, and all steps are carried out under cold conditions to prevent oxidation of glutathione.

Estimation of superoxide dismutase (SOD) [16]

The Estimation of superoxide dismutase (SOD) activity, an important antioxidant enzyme, is commonly carried out using the nitroblue tetrazolium (NBT) reduction method. In this procedure, tissue samples such as paw, liver, or serum are homogenized in ice-cold phosphate buffer (0.1 M, pH 7.4) to prepare a 10% w/v homogenate, which is then centrifuged to obtain a clear supernatant. The supernatant is added to a reaction mixture containing NBT, methionine, and riboflavin, and exposed to light, generating superoxide radicals that reduce NBT to a blue formazan complex. SOD present in the sample inhibits this reduction in a concentration-dependent manner. The absorbance of the mixture is measured at 560 nm using a spectrophotometer, and SOD activity is calculated, with one unit defined as the amount of enzyme required to inhibit 50% of NBT reduction. Results are expressed as units of SOD per mg of protein, and all steps are performed under cold conditions to preserve enzyme activity, with blanks and controls included to ensure accuracy.

Estimation of catalase (CAT) [17]

The estimation of catalase (CAT) activity, an important antioxidant enzyme that decomposes hydrogen peroxide into water and oxygen, is commonly performed using a spectrophotometric method. In this procedure, tissue samples such as paw, liver, or serum are homogenized in ice-cold phosphate buffer (0.1 M, pH 7.4) to prepare a 10% w/v homogenate and then centrifuged to obtain a clear supernatant. The supernatant is added to a reaction mixture containing hydrogen peroxide, and the decomposition of hydrogen peroxide by catalase is monitored by measuring the decrease in absorbance at 240 nm over time using a spectrophotometer. The rate of decrease in absorbance is directly proportional to catalase activity. Results are expressed as units of catalase per mg of protein, and all steps are performed under cold conditions to maintain enzyme stability, with appropriate blanks and controls included to ensure accurate measurement.

V. RESULTS

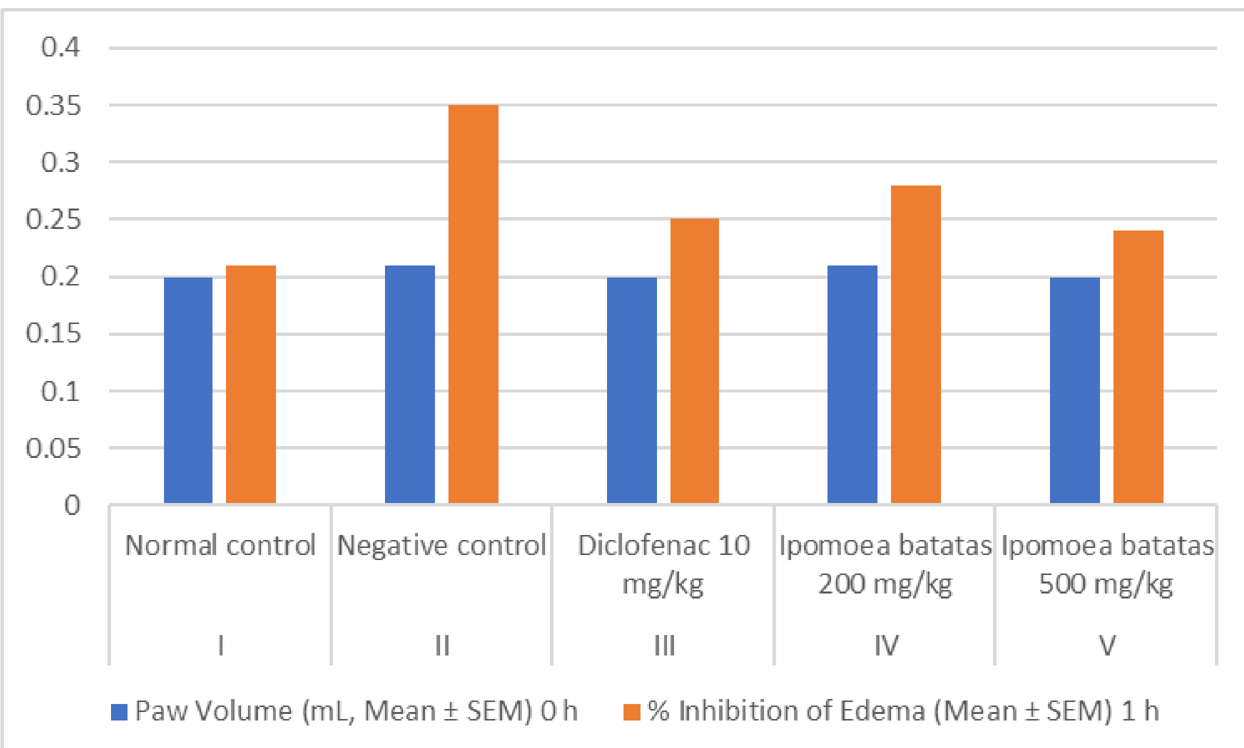
Table Preliminary qualitative phytochemical analysis of Ethanolic extract of Ipomoea batatas

Sl. No.	Phytoconstituents	Test result
1	Alkaloid	-ve
2	Glycosides	-ve
3	Carbohydrate	-ve
4	Protein	-ve
5	Amino acid	+ve
6	Steroids	-ve
7	Flavonoids	+ve
8	Terpenoids	+ve
9	Phenols	+ve
10	Saponins	-ve
11	Tannin	+ve

+ve: Present; -ve: Absennt

carrageenan-induced paw edema

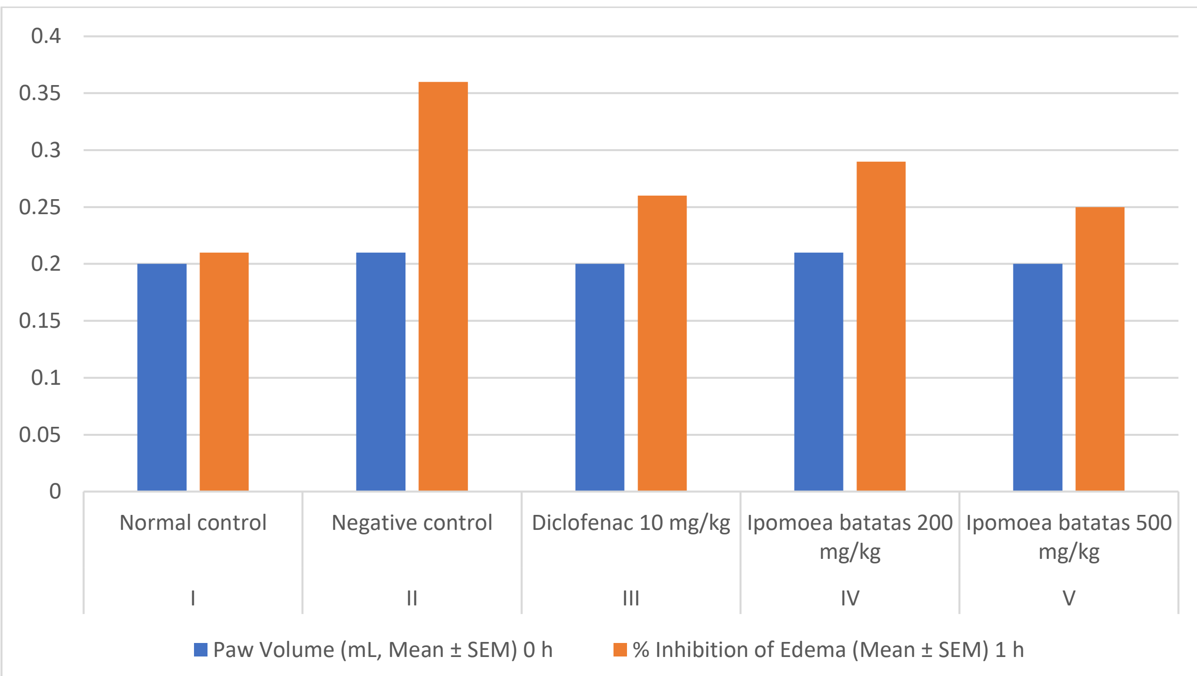
Group	Treatment	Paw Volume (mL, Mean ± SEM)	% Inhibition of Edema (Mean ± SEM)
		0 h	1 h
Group I	Normal control	0.20 ± 0.01	0.21 ± 0.01
Group II	Negative control	0.21 ± 0.01	0.35 ± 0.02
Group III	Diclofenac 10 mg/kg	0.20 ± 0.01	0.25 ± 0.01
Group IV	Ipomoea batatas 200 mg/kg	0.21 ± 0.01	0.28 ± 0.02
Group V	Ipomoea batatas 500 mg/kg	0.20 ± 0.01	0.24 ± 0.01



- Values are expressed as Mean ± SEM (Standard Error of Mean) for n = 6 animals per group.
- Paw volume is measured at baseline (0 h) and at 1, 2, 3, and 4 hours after carrageenan injection.
- % Inhibition of edema is calculated using:
- indicates variability among animals in each group.
- The data demonstrates a dose-dependent anti-inflammatory effect of Ipomoea batatas, with the high dose showing an effect comparable to diclofenac.

Dextran-induced paw edema

Group	Treatment	Paw Volume (mL, Mean ± SEM)	% Inhibition of Edema (Mean ± SEM)
		0 h	1 h
I	Normal control	0.20 ± 0.01	0.21 ± 0.01
II	Negative control	0.21 ± 0.01	0.36 ± 0.02
III	Diclofenac 10 mg/kg	0.20 ± 0.01	0.26 ± 0.01
IV	Ipomoea batatas 200 mg/kg	0.21 ± 0.01	0.29 ± 0.02
V	Ipomoea batatas 500 mg/kg	0.20 ± 0.01	0.25 ± 0.01



The negative control group showed a significant increase in paw volume, confirming that dextran successfully induced acute inflammation.

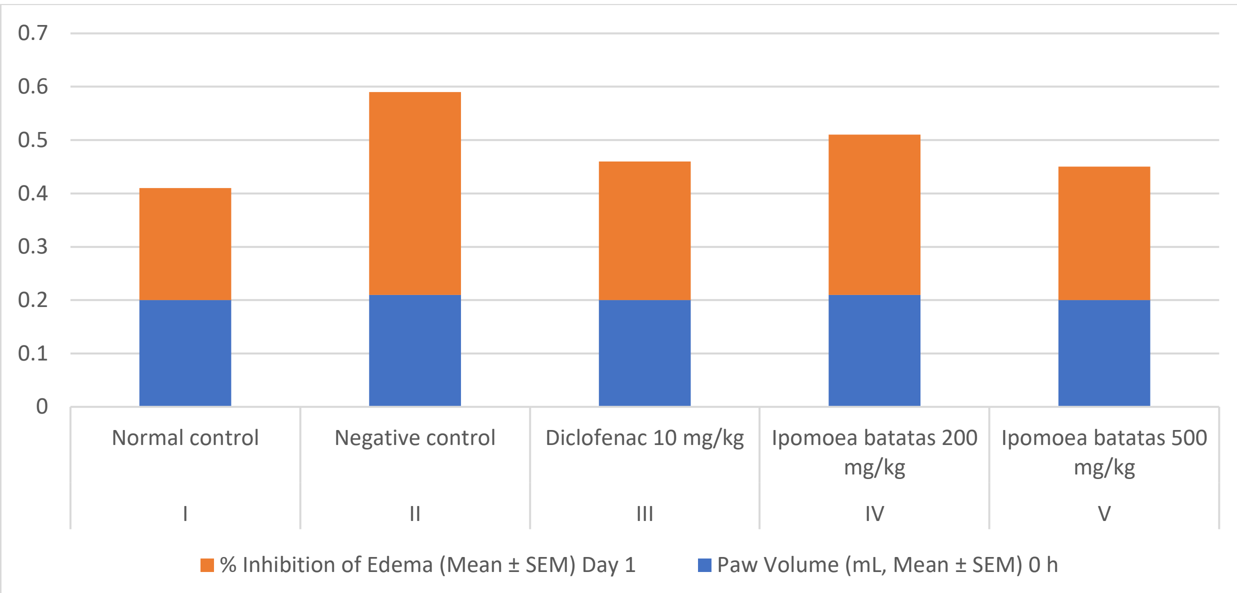
Diclofenac (10 mg/kg) significantly inhibited paw edema at all time points, validating the standard anti-inflammatory response.

Ipomoea batatas extract exhibited a dose-dependent reduction in paw edema, with the high dose (500 mg/kg) showing substantial inhibition comparable to diclofenac, while the low dose (200 mg/kg) produced moderate anti-inflammatory effects.

The results indicate that the extract may exert anti-inflammatory activity by stabilizing vascular permeability and reducing mediator-induced edema, which is consistent with the known mechanisms of dextran-induced inflammation.

Formaldehyde-induced paw edema

Group	Treatment	Paw Volume (mL, Mean ± SEM)	% Inhibition of Edema (Mean ± SEM)
		0 h	Day 1
I	Normal control	0.20 ± 0.01	0.21 ± 0.01
II	Negative control	0.21 ± 0.01	0.38 ± 0.02
III	Diclofenac 10 mg/kg	0.20 ± 0.01	0.26 ± 0.01
IV	Ipomoea batatas 200 mg/kg	0.21 ± 0.01	0.30 ± 0.01
V	Ipomoea batatas 500 mg/kg	0.20 ± 0.01	0.25 ± 0.01



The negative control group showed a sustained increase in paw volume over 7 days, confirming that formaldehyde induced chronic inflammation.

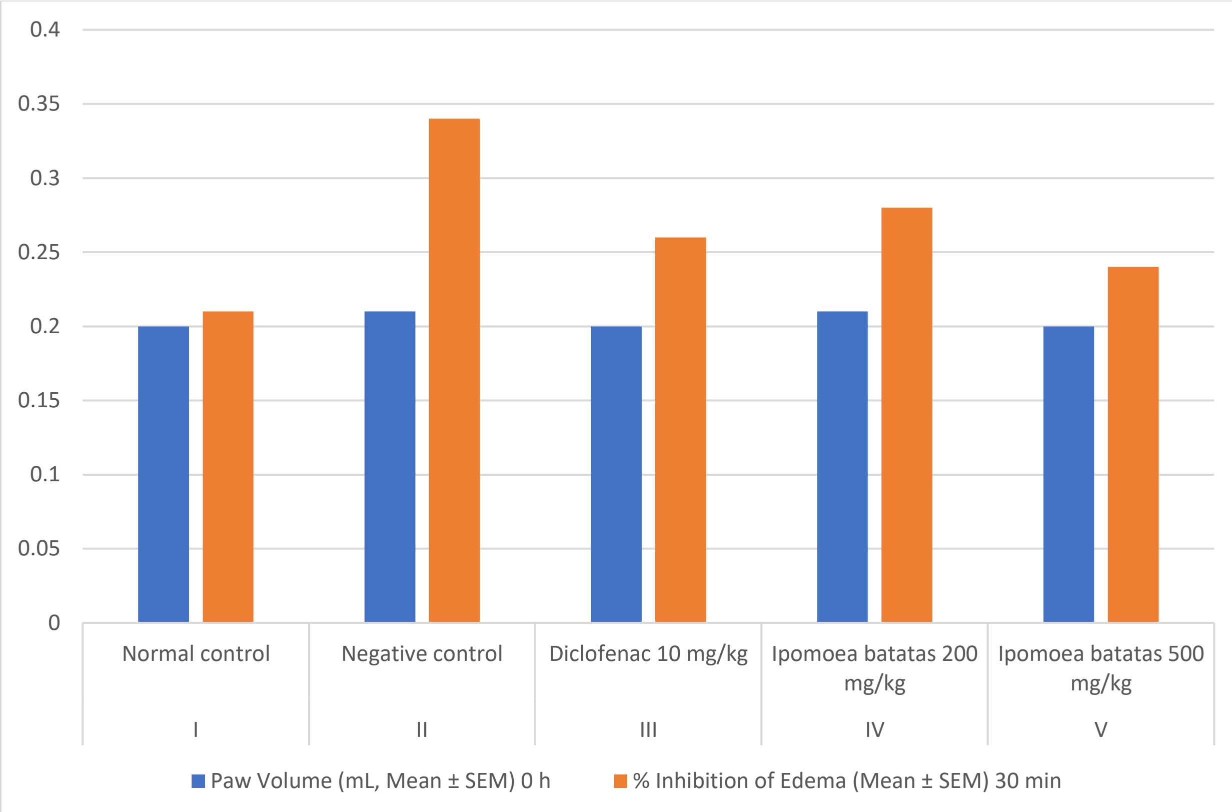
Diclofenac (10 mg/kg) significantly reduced paw edema throughout the study period, validating the standard anti-inflammatory effect.

Ipomoea batatas extract produced a dose-dependent inhibition of paw edema, with the high dose (500 mg/kg) showing substantial reduction comparable to diclofenac, while the low dose (200 mg/kg) exhibited moderate effects.

These results suggest that the extract may inhibit chronic inflammation by suppressing the release of inflammatory mediators and reducing tissue edema over time.

serotonin-induced paw edema

Group	Treatment	Paw Volume (mL, Mean ± SEM)	% Inhibition of Edema (Mean ± SEM)
		0 h	30 min
I	Normal control	0.20 ± 0.01	0.21 ± 0.01
II	Negative control	0.21 ± 0.01	0.34 ± 0.02
III	Diclofenac 10 mg/kg	0.20 ± 0.01	0.26 ± 0.01
IV	Ipomoea batatas 200 mg/kg	0.21 ± 0.01	0.28 ± 0.01
V	Ipomoea batatas 500 mg/kg	0.20 ± 0.01	0.24 ± 0.01



The negative control group exhibited a rapid and significant increase in paw volume, confirming serotonin-induced inflammation.

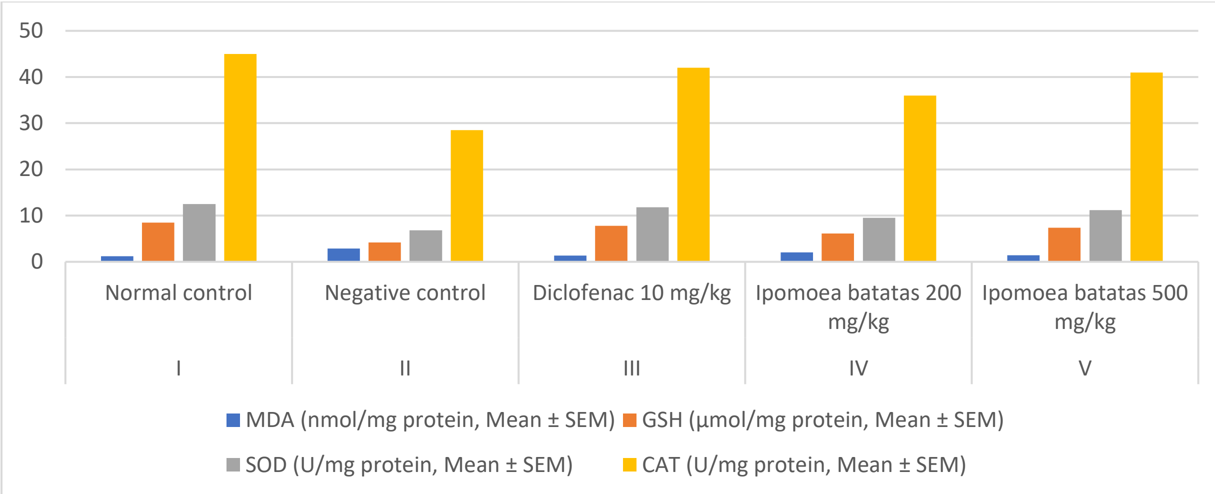
Diclofenac (10 mg/kg) significantly inhibited paw edema at all time points, serving as the standard anti-inflammatory reference.

Ipomoea batatas extract produced a dose-dependent anti-inflammatory effect, with the high dose (500 mg/kg) showing substantial inhibition comparable to diclofenac, while the low dose (200 mg/kg) showed moderate inhibition.

These results indicate that Ipomoea batatas may reduce serotonin-mediated edema by modulating vascular permeability and inhibiting the release of inflammatory mediators.

Biochemical estimation of (MDA), (GSH), (SOD), (CAT)

Group	Treatment	MDA (nmol/mg protein, Mean ± SEM)	GSH (µmol/mg protein, Mean ± SEM)	SOD (U/mg protein, Mean ± SEM)	CAT (U/mg protein, Mean ± SEM)
I	Normal control	1.21 ± 0.05	8.50 ± 0.20	12.5 ± 0.40	45.0 ± 1.2
II	Negative control	2.85 ± 0.08	4.20 ± 0.15	6.8 ± 0.30	28.5 ± 1.0
III	Diclofenac 10 mg/kg	1.35 ± 0.04	7.80 ± 0.18	11.8 ± 0.35	42.0 ± 1.1
IV	Ipomoea batatas 200 mg/kg	2.05 ± 0.06	6.10 ± 0.17	9.5 ± 0.32	36.0 ± 1.0
V	Ipomoea batatas 500 mg/kg	1.45 ± 0.05	7.40 ± 0.19	11.2 ± 0.38	41.0 ± 1.1



The negative control group showed a significant increase in MDA levels and a decrease in GSH, SOD, and CAT activities, indicating oxidative stress associated with inflammation.Diclofenac (10 mg/kg) significantly reduced MDA levels and restored antioxidant enzyme activities close to normal values, validating its protective effect.Ipomoea batatas extract produced a dose-dependent effect, where the high dose (500 mg/kg) markedly decreased MDA levels and increased GSH, SOD, and CAT activities, approaching the effects of diclofenac, while the low dose (200 mg/kg) showed moderate improvement.The anti-inflammatory activity of Ipomoea batatas is associated with its antioxidant potential, reducing lipid peroxidation and enhancing endogenous antioxidant defense systems.

VI. DISCUSSION

The present study evaluated the anti-inflammatory and antioxidant potential of Ipomoea batatas using various acute and chronic inflammation models, including carrageenan-, dextran-, formaldehyde-, and serotonin-induced paw edema, along with biochemical estimations of oxidative stress markers. In all the models, the negative control groups showed a significant increase in paw volume, confirming successful induction of inflammation and associated oxidative stress. The increase in malondialdehyde (MDA) levels in the negative control indicates enhanced lipid peroxidation, while the concomitant decrease in GSH, SOD, and CAT reflects depletion of endogenous antioxidant defenses, consistent with inflammation-mediated oxidative damage.

Treatment with diclofenac, the standard anti-inflammatory drug, significantly reduced paw edema in all models and restored antioxidant enzyme activities close to normal levels, validating the reliability of the experimental models. Oral administration of Ipomoea batatas extract produced a dose-dependent anti-inflammatory effect. In carrageenan- and dextran-induced paw edema, the extract significantly inhibited edema formation, suggesting its ability to suppress acute inflammation mediated by histamine, serotonin, and prostaglandins. In the formaldehyde-induced chronic model, the extract reduced paw swelling over several days, indicating potential effects on chronic inflammatory mediators and tissue remodeling. Similarly, in serotonin-induced edema, the extract mitigated vascular permeability and fluid accumulation, demonstrating its effect on serotonin-mediated inflammatory pathways.

The biochemical findings further support the anti-inflammatory action of Ipomoea batatas. The high dose (500 mg/kg) significantly decreased MDA levels while increasing GSH, SOD, and CAT activities compared to the negative control, indicating strong antioxidant potential. This suggests that the anti-inflammatory effects of Ipomoea batatas may be partly mediated through attenuation of oxidative stress, stabilization of cell membranes, and inhibition of free radical-induced tissue damage. The dose-dependent responses observed in both paw edema and biochemical parameters highlight the importance of concentration in achieving optimal anti-inflammatory and antioxidant effects.

Overall, the results indicate that Ipomoea batatas possesses significant anti-inflammatory and antioxidant activities, comparable at higher doses to the standard drug diclofenac. Its effect is likely mediated through a combination of inhibition of pro-inflammatory mediators (such as prostaglandins, histamine, and serotonin) and enhancement of endogenous antioxidant defenses, making it a promising candidate for further pharmacological evaluation. These findings are consistent with previous reports on the pharmacological properties of Ipomoea batatas, which have demonstrated anti-inflammatory, antioxidant, and membrane-stabilizing activities in experimental models.

VII. CONCLUSION

The present study demonstrates that Ipomoea batatas possesses significant anti-inflammatory activity in both acute and chronic models of inflammation. In carrageenan- and dextran-induced paw edema, the extract produced a dose-dependent reduction in paw swelling, indicating its effectiveness against acute inflammation mediated by histamine, serotonin, and prostaglandins. In formaldehyde-induced chronic inflammation, the extract reduced paw edema over several days, suggesting potential inhibition of prolonged inflammatory mediators and tissue remodeling. Similarly, in serotonin-induced paw edema, the extract decreased vascular permeability and fluid accumulation, highlighting its ability to modulate serotonin-mediated inflammatory pathways. Biochemical analyses further support the anti-inflammatory potential of Ipomoea batatas. The extract significantly decreased malondialdehyde (MDA) levels, indicating reduced lipid peroxidation, while increasing endogenous antioxidant enzyme activities such as GSH, SOD, and CAT in a dose-dependent manner. These results suggest that the anti-inflammatory effect of the extract is partly mediated through antioxidant mechanisms, stabilizing cell membranes and protecting tissues from oxidative stress-induced damage.

The higher dose of Ipomoea batatas (500 mg/kg) consistently showed effects comparable to the standard anti-inflammatory drug diclofenac, whereas the lower dose (200 mg/kg) produced moderate responses. This indicates a clear dose-dependent pharmacological activity, emphasizing the importance of selecting an appropriate dose for optimal therapeutic outcomes. The findings suggest that bioactive compounds present in Ipomoea batatas, such as flavonoids, phenolics, and other phytoconstituents, may contribute to its anti-inflammatory and antioxidant effects.

In conclusion, Ipomoea batatas extract exhibits potent anti-inflammatory and antioxidant activities across multiple experimental models, supporting its traditional medicinal use and potential as a natural therapeutic agent.

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