Evaluation of Anti-Inflammatory and Analgesic Property of Methanolic Extract of Momordica Dioica in Wistar Rat Model

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Abstract
Background: Since current medications frequently cause potentially serious side effects, countless individuals continued to have pain and inflammation despite the accessibility of treatments. Ancient practitioners have used a variety of herbal remedies with analgesic and anti-inflammatory properties extensively. Momordica Dioica is one of them, but no experimental research has been done in support of this traditional use. Objectives: The purpose of the research was to assess the analgesic and anti-inflammatory properties of methanolic Momordica Dioica fruit extracts. Methods: Dryed by air according to OECD guideline the version eighteen, the fruit of Momordica Dioica is extracted with the solvent methanol as well as an acute oral toxicity study was done for the methanol-based extract of Momordica Dioica. The Active Constituent responsible for the Activity was confirmed by HPTLC method. The hot plate method was employed to assess the analgesic efficacy of centrally mediated analgesia. The ability to reduce inflammation was assessed using a carrageenan-induced paw oedema test. Results: Momordica dioica's methanolic extract inhibits the ceiling result during activity. The Methanolic Extract of Momordica Dioica (MEMD) extract demonstrated a significant (p 0.0001) analgesic effect in the hot plate method at doses of 100mg/kg and in all combinations with standard. Maximum anti-inflammatory effects were seen in carrageenan-induced paw edema starting 2-4 hours after induction, and all tested doses of the extract significantly inhibited the carrageenan-induced inflammation (p 0.0001, p 0.001). The presence of a pentacyclic terpenoid i.e Ursolic acid present in the extract had potential analgesic and anti-inflammatory activity which supports the traditional claim. Keywords: Momordica Dioica, anti-inflammatory, analgesic, rat, carrageenan, HPTLC, ursolic acid

Background
As a form of natural remedies, plants for medicinal use, and their own secondary metabolites are increasingly utilised for healthcare purposes of disease. Various substances are present in the herbal plants with potent phytoconstituents. Since a few decades ago, there has been a demand for nutraceutical formulations, and there has been a desire to guarantee the effectiveness, and the safety of herbal medicines. Chromatographic technology is a key tool for qualitative and quantitative analysis, and one tool for maintaining the reliability is the evaluation of phytochemicals. (1)
Utilization steroids and non-steroidal anti-inflammatory drugs (NSAIDs), such as azathioprine, is one of the treatment options for these inflammatory disorders. All of these medications have a variety of side effects that limit their continued use and muddle treatment options (2–5). In order to treat inflammatory disorders, discovering non-toxic, safe anti-inflammatory medications made from plants is a necessity. (6)

The condition of pain is getting worse everywhere. Globally, According to estimates, 10% adult individuals who experience some form of pain are provided with a fresh diagnosis for persistent pain on an annual basis. (7,8) More than 80% of patients visit doctors because of pain, which is typically a transient issue that is instantly forgotten. Tragically, some people's pain does not go away; instead, it persists and causes them to endure intermittent suffering. (9) Regardless of the cause of the tissue damage—bacteria, trauma, chemicals, heat, or any other event—a number of compounds are released by the damaged tissues, which dramatically alter the nearby, unaffected tissues. The inflammation refers to the entire collection of these tissue alterations. (10)

It serves as an essential mechanism for re-establishing tissue homeostasis as well as starting the human body's process of recovery. (11) It stems mainly from a complicated connection for sensory, emotional, and behavioural factors which manifests as struggling and is inherently unpleasant along with hurting, soreness, avoiding motor reflexes, and modifications in autonomic output. Due to the personal character of pain, it can differ from individual individuals as well as among the same individual. (12) Acute inflammation remains a prompt reaction to a harmful agent. Fluid and plasma protein exudation as well as a build-up of primarily neutrophilic leukocytes are its defining features. It produces a minimally advantageous effect, particularly when dealing with infectious obstacles, and instead aggravates infections. (12,13). The term "chronic inflammation" refers to an ongoing process of inflammatory mediators that lasts for a period of time and involves both active inflammation as well as is attempting to repair damaged tissue. Utilising therapy may (for a while) have the advantage of being more profoundly reducing pain and inflammation instead of non-drug treatments, but that advantage is frequently outweighed by the risks of unfavourable side effects. It should therefore be adjusted separately based on efficacy as well as any potential drawbacks or negative effects. (14). These common medications has a number of potentially serious side effects that are mostly linked to prolonged use, including kidney failure, Increased chance for cardiovascular disease, hematologic (platelet inhibition resulting from hindering thromboxane synthesis), as well as digestive problems. Heart failure and cardiovascular disease have been connected with the intake of NSAIDs. (15,16). A mild-to-moderate pain reliever, acetaminophen is closely regulated as a result of the Food and Drug Administration's ("FDA") potential for unappealing skin reactions, severe liver damage from harming herself, and a increase in INR when taken in combination with warfarin medication. (17)

When it comes to the medications that are often advised for several inflammation-related and immunological situations, such as asthma, is steroid medications. (18). Since medication with corticosteroid affects endogenous corticosteroid production as well as possesses a known as hormones' initial interaction occurs with the corticosteroid receptors, resulting in an inhibitory impact upon the endocrine development axis in the body it is important to closely monitor its use because of its many side effects. It also reduces inflammation and the immune response inside the cell even when it is gone from in blood circulation (19). According to the World Health Organisation, 80% of individuals in nations that are developing, use conventional healthcare, and that both conventional and alternative therapies are broadly used and in high demand globally. (20) Chemicals found in plants are a plentiful natural source and could act as a foundation to develop novel medications. (21). A cucurbitaceous, evergreen climbing creeper, Momordica dioica (also referred to as kakrol or spiny gourd)). It has a wide geographic distribution in Bangladesh and India and is indigenous to Asia. Over thousands of years, it has been used as a vegetable with significant nutritional value as well as a preventive and curative agent for a variety of diseases. (22). Momordica dioica is a herb in the Cucurbitaceae family that climbs dioeciously. There are numerous phytoconstituents in it. Momordica dioica contains small amounts of alkaloids, steroids, triterpenes, flavonoids, glycosides, saponin, and flavonoids (1). Despite of having its roots in the Indo-Malayan region, this genus now grows in South Asia, Polynesia, Tropical Africa, Bangladesh, Sri Lanka, Myanmar, China, and Japan. (23) Ursolic acid, a pentacyclic terpenoid is used medicinally in a in a number of forms. ursolic acid, Normal locations for a secondary plant metabolite include the fruit skin, stem bark, or leaves being part of extracts of plants utilised within traditional health care, this compound has been used for Despite having been known to have health-improving qualities for generations. Researchers have lately turned to this source of knowledge gathered over
generations in order to naturally occurring biologically active substances.(24) Aside from its many other medicinal benefits, UA has anti-inflammatory properties as well as a protective effect on the liver, brain, kidneys, and lungs. (28-29-30). Expanding investigations into plants with medicinal properties that are claimed to be effective in the management of both inflammation and pain is therefore urgently needed. Traditional practitioners have used a variety of advantageous plants having analgesic and anti-inflammatory properties for quite a while (25). The vast majority of these medicinal plants, however, have not yet undergone adequate testing. The traditional claim that momordica dioica has analgesic and anti-inflammatory properties has not being backed through many scientific studies. In this study, the starting point for the conventional application of Momordica dioica for discomfort and/or inflammation was established. Additionally, in order to gain understanding of the type of phytochemical (Active) substance used, this study attempted to pinpoint the components that generate their soothing and anti-inflammatory properties. The results of the present research can additionally serve as a starting point for additional research and the determination of the specific substances responsible for both the analgesic and anti-inflammatory benefits associated with the plant.

Materials and Methods

Resources and Procedures used.

Vernier caliper, Hot Plate (Nishant Enterprises, India), Electronic Balance (Shimadzu Scientific, India)

Drugs and Chemicals Used

CMC, Methanol 99.5% pure (Loba Chemie pvt.ltd), Diclofenac, I-Carrageenan (Irish moss – himedia laboratories pvt. Ltd) In the course of the research, purified water was used.

Plant Material Collection, Identification, and Preparation

The M. dioica fruits included in the present research were obtained locally between the months of June and July 2022. The fruits were sieved, crushed, and chopped before drying under the sun. As a result, 1627.10 g as a whole M. dioica extract (MEMD) were obtained to exhaustion over the course of three days using a liter of ninety percent methanol (1L) percolated at room temperature during the process. Preparation of methanolic extract was shown in fig no.1.

The amount produced of crude extracts can be estimated as percentage by using the formula below: (26)

\[
\text{Yield (\%)} = \left( \frac{\text{Dry weight of extract} - \text{Dry weight of plant material}}{\text{Dry weight of plant material}} \right) \times 100
\]

Experimental Animals

61 Wistar Rats weighing 250-280 gm, age 4-6 weeks Male and female in 1:1 ratio were obtained from Crystal Biological Solutions, Pune and kept in environments with a cycle of light and dark lasting 12
hours, which is allowed for the consumption of anything as well as water at a room temperature (252 °C). prior to starting the research, they were given a full week to get used to the research environment. All of the animals that were used in the current research were treated in accordance with the generally accepted, worldwide regulations for using animals. The Institutional Animal Ethics Committee at the Dr. D. Y. Patil Institute of Pharmaceutical Sciences and Research in Pimpri, Pune, Maharashtra, properly approved the research protocol (DYPIPSRIAECEsept2022-23 P-8). (Registration no 198/PO/Re/S/2000/CPCSEA) (27)

**Experimental Design**

**Table 1: Animal Grouping with Treatment Groups**

<table>
<thead>
<tr>
<th>Group</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>Normal Control (0.5ml Saline p.o)</td>
</tr>
<tr>
<td>Group 2</td>
<td>Disease Control (Carrageenan 1% (0.1ml) sub – planter route)</td>
</tr>
<tr>
<td>Group 3</td>
<td>Carrageenan 1% (0.1ml s.p) + Diclofenac (50mg/kg)</td>
</tr>
<tr>
<td>Group 4</td>
<td>Carrageenan 1% (0.1ml s.p) + MeEMD 100 mg/kg p.o</td>
</tr>
<tr>
<td>Group 5</td>
<td>Carrageenan 1% (1ml s.p) + MeEMD 200 mg/kg</td>
</tr>
<tr>
<td>Group 6</td>
<td>Carrageenan 1% (0.1ml s.p) + MeEMD 400 mg/kg p.o</td>
</tr>
<tr>
<td>Group 7</td>
<td>Carrageenan 1% (0.1ml s.p) + Diclofenac (50mg/kg) + MeEMD 100 mg/kg p.o</td>
</tr>
<tr>
<td>Group 8</td>
<td>Carrageenan 1% (0.1ml s.p) + Diclofenac (50mg/kg) + MeEMD (200 mg/kg p.o)</td>
</tr>
<tr>
<td>Group 9</td>
<td>Carrageenan 1% (0.1ml s.p) + Diclofenac (50mg/kg) + MeEMD (400 mg/kg p.o)</td>
</tr>
</tbody>
</table>

**Acute Toxicity Test**

Using OECD guidelines, An evaluation for acute toxicity was carried out within the 2000mg/kg one dose of raw leaf as well as root extracts. There was a 2000 mg/kg maximum dosage were administered to one were fasting mouse on the very initial day, and four additional rats were treated Within a specific order based on the results of the initial animal. For the first 4 hours of the entire period of 24 hours, The animals had been closely monitored for toxic effects like fatigue, crippling weakness a shaking sensation, vomiting, and decreased appetite on an as-needed basis. After that, they were monitored every day for a period of fourteen days to check for any fatality. (27)

**HPTLC Evaluation of active constituent for anti-inflammatory activity.**

The herb Momordica dioica is a member of the Cucurbitaceae family. There are numerous phytoconstituents in it. Ursolic acid is one of them and a pentacyclic terpenoid that is found in nature and has a number of therapeutic benefits. (1) The current study looked at ursolic acid's activities (UA). a secondary plant metabolite, for its anti-inflammatory properties in the Momordica Dioica plant. (28-29-30) This study created and validated a rapid, precise, exact, and particular HPTLC technique to measure ursolic acid from Momordica dioica herbal extract. Methodology for quick analysis of Ursolic acid determination. The High performance thin layer chromatography (HPTLC) were established and confirmed. On an aluminium HPTLC plate (60 F254) coated with precoated silica gel with formic acid, ethyl acetate, and toluene (7:3:0.1), chromatographic separation was accomplished. The detection process was carried out at 530 nm. (31-32-33)

**Induction of Acute Inflammation**

Acute paw edema was introduced by giving 0.1 ml of a 1% (w/v) carrageenan solution made in normal saline. 0.1 ml of a 0.9% NaCl solution with a 1% suspension of carrageenan was injected onto a right hind paw's sub-plantar tissue. One dose of the test substance was administered orally. (34)

**Animal Grouping and Dosing**

Nine groups of six rats each had been selected randomly from the total population of the rats. Oral gavage was used to administer each agent through the oral route. Animals were divided into nine groups, including three test combination groups using the standard (Diclofenac) listed in table 1 as well as normal control, disease control, standard, low dosage test, medium dosage, and high dosage test groups.

**Evaluation of Analgesic Activities of the Extract**
Hot Plate Method

The purpose of this procedure was to determine whether Momordica Dioica had any potential as a central analgesic. Each mouse was placed into a wide-open round chamber for the test, which had a metallic plate to be the floor and was kept at a constant temperature of 55 °C. The jumping and paw licking, two behavioural responses induced by this plate, are both thought to be supra-spinally merged responses and are able to be measured in terms of their quickness of response.

The animals had to be set on a hot plate along with a cut-off time of 15 seconds in order to avoid wounds on the animals' paws one hour adhering to the administration of the usual treatments, the vehicle, and three distinct quantities of the extract, as well as the reaction times of all of them were noted. The amount of period it made to lick its Paw or jump away the heated surface was used to assess reaction time. At 0, 30, 60, 90, and 120 minutes, the reaction times were recorded. (35)

Anti-Inflammatory Activity

Carrageenan-Induced Paw Edema

In search of new anti-inflammatory medications, carrageenan-induced oedema of the rat paw is frequently utilised as an effective model of inflammation. The carrageenan-induced rat paw edema method was done to assess the anti-inflammatory property of Momordica dioica methanolic extracts. Rats Wistar By using a method to induce paw oedema in rats, carrageenan's anti-inflammatory activity was quantified. The rats were divided into nine groups, each with six rats. A 0.1 ml injection of a 1% (w/v) carrageenan solution made with typical saline was used to cause acute paw edema. 0.1 ml of a 0.9% NaCl solution containing a was added an hour later. A 1% carrageenan suspension injection was given to the right hind paw, the subplantar tissue. For a period of 24 hours, the straight paw circumference will be determined hourly. Vernier callipers were used to measure the paw's circumference. Following the carrageenan procedure, measurements were conducted among 0 and 24 hours later. The anti-inflammatory effect was evaluated using the correlation between T, the thickness of the paw in the control group, and T0, the thickness of a paw in the test compound treated group. (34, 36)

\[
\%\text{inhibition of edema} = \frac{T - T_0}{T} \times 100
\]
Evaluated Parameters:

After research but prior to animal sacrifice blood was collected by ROP for biochemical estimation like Complete Blood Counta, C-Reactive protein and Immunological pro-inflammatory parametry Interlukin-1ß) and TNF were also evaluated using ELESA kit (krishgen biosystem). At the conclusion of the research, the animals were sacrificed, and the paw tissue was isolated from each group of animal histopathology to know the degree of inflammatory cell infiltration in the surrounding tissue of the paw. Also, Image J analysis was performed on histograms.

Statistical Analysis

- Graph pad prism is used for analysis
- All values are expressed as a Mean ± SEM, n = 6, vertical lines represent SEM
- All data are subjected to one way and two way ANOVA following by Tukey’s multiple comparison test.
- *p < 0.05, **p < 0.01, ***p < 0.001, ****p < 0.0001, NS: Non Significant
- Multiple comparison

1. Normal group are compared with Disease, standard and all test groups.
2. Disease control group is compared with normal, standard and all treatment groups.
3. Standard group are compared with all treatment groups

Results

Acute Toxicity

The rats used in the acute toxicity trial were continually observed for the first four hours, for the next twenty-four hours, followed by for the following fourteen days in order to ascertain whether or not there was any toxicity. The plant's LD50 was estimated to be above 2000 mg/kg because there were no overt signs of toxicity, noticeable behavioural changes, or fatality within 24 hours or within the following 14 days. Three dose levels were chosen as a consequence of the acute toxicity test. A high level (400 mg), which was twice as much as the median dose that were equal with the highest dosage attained during the acute toxicity trial, as only one-tenth10th of the dose that was low (50 fifty percent of the middle dose, or 100 mg). (27)

HPTLC evaluation of active constituent for anti-inflammatory activity:

Methodology/Conclusions/significance: For quick analysis of Ursolic acid determination, The High performance thin layer chromatography (HPTLC) was established and confirmed as shown in fig.no.2 with densitogram of ursolic acid On an aluminium HPTLC plate (60 F254) coated with precoated silica gel with formic acid, ethyl acetate, and toluene (7:3:0,1), chromatographic separation was accomplished and confirmed by TLC as shown in fig. No.3. The detection process was carried out at 530 nm. Ursolic acid's Rf value was discovered to be 0.795%. In the 400ng/band concentration range, linearity for ursolic acid was detected. The upper and lower bounds of quantification for ursolic acid were observed to be 0.04 ng/band and 0.14 ng/band, respectively. The mean % recovery of ursolic acid was (0.54). The method's specificity, robustness, linearity, precision, and accuracy have all been validated in compliance with ICH standards. The created method can be used to evaluate the regularity of ursolic acid in herbal extracts.(37-38). Pictorial presentation of HPTLC evaluation was shown in fig. no.4.
A 100 mg dose of the extract produced a statistically significant analgesic outcome (p 0.0001) at 120 min and 180 min in the hot plate method when compared to the negative control group and diclofenac 10 mg/kg produced an of significance analgesic impact at 60 and 12 min. Contrarily, at 60 and 60 minutes, respectively, 200mg and 400mg of the extract show less of a substantial analgesic impact (p 0.001) in comparison to the negative control group. The doses as shown in the graph did not significantly differ from one another when compared. While the combination group showed similar significant effect (p < 0.0001) as of Diclofenac i.e standard. Fig.no.5 shows effect of methanolic extract of momordica dioica on hot plate method.
Anti-Inflammatory Activity

Carrageenan-Induced Paw Edema

This study was conducted to evaluate the extract's ability to reduce inflammation during its acute stage. The extract's 100 mg dose has a significant analgesic effect (p 0.0001). In comparison to the negative control, all additionally an statistically significant inhibitory effect was seen when the standard medication was combined with dosages of the plant's extracts. (p 0.0001) on the average raise in paw volume beginning at 3 several hours. However, at 2 hours, the analgesic effects of 200 and 400 mg of the extract are of lesser significance (p 0.001) as shown in fig.no.6. and 7.

Figure 5: Effect of methanolic extract of momordica dioica on hot plate method

Figure 6: Effect of methanolic extract of momordica dioica on carrageenan induced paw thickness.
Evaluation Of Anti-Inflammatory And Analgesic Property Of Methanolic Extract Of Momordica Dioica In Wistar Rat Model.

Figure 7: Percentage inhibition of methanolic extract of momordica dioica on carrageenan induced paw thickness.

C-reactive protein

C-reactive protein is a homopentameric acute-phase inflammatory protein. (CRP) demonstrates increased expression under inflammatory conditions. When the human body is inflamed, the level of CRP increases. One of the acute phase reactants, a class of proteins that increase in response to inflammation. Some inflammatory proteins known as cytokines cause a rise in the concentrations of acute phase the reactants.

The extract's 100 mg dosage had a significance analgesic result (p 0.0001) The levels of CRP were lower in all other doses of the plant extract, i.e. Test group with standard drug, which demonstrated a inhibiting impact that is of statistical significance (p 0.0001). On the other hand, the resulting extract at 200 mg and 400 mg have a less significant effect on lowering the levels (p 0.001) as shown in fig.no.8

Figure 8: Effect of methanolic extract of momordica dioica on c-reactive protein

Complete Blood Count

The evaluation was conducted to check the Pro-Inflammatory parameters A reliable biomarker of inflammation is thought to be white blood cells (WBCs). A number serious medical conditions are linked to elevated WBCs and pro-inflammatory cytokines. White blood cells are a vital and necessary part of your immune system. Since they are produced in your bone marrow, they defend your body
against diseases and infections. However, if you have a high white blood cell count, you probably have an infection or an inflammatory condition. (39-43)

The extract's 100 mg dosage had a significance of analgesic effect (p 0.0001) A statistically significant inhibitory impact was seen in the test group using the reference medication. (p 0.0001) with a decreased WBC cell count for all other doses of the plant the extract. Contrarily, 200 mg and 400 mg level of the extract have a less significant effect on reducing the levels (p 0.001) as shown in fig.no.9.

**Figure 9:** Effect of methanolic extract of momordica dioica on complete blood count(wbc)

The analysis were done to make sure the pro-inflammatory parameters were within range. The extract's 100 mg dosage had a significance analgesic action (p 0.0001) Through lower levels of Interleukin 1 (fig.no.11) and TNF(fig. no.10) all additional dosage of the plant extract, i.e. Test group with standard(reference) drug, had a inhibitory effect having statistically significant (p 0.0001). Contrarily, 200 mg and 400 mg level of the extract have a less significant effect on reducing the levels (p 0.001).

**Figure 10:** TNF α

**Figure 11:** IL-1β

**Effect of methanolic extract of momordica dioica on pro-inflammatory parameters**

**Histopathology and Image J analysis**

The following Table representing the each group of animal histopathology to know the severity of infiltration of Inflammatory cells of the paw tissue. Also, Image J analysis was performed on histograms with their cell count.
<table>
<thead>
<tr>
<th>Groups</th>
<th>Histopathological Images</th>
<th>Image J analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>A] Normal Control</td>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /> Cell Count -190</td>
</tr>
<tr>
<td>B] Disease Control</td>
<td><img src="image3.png" alt="Image" /></td>
<td><img src="image4.png" alt="Image" /> Cell Count -85</td>
</tr>
<tr>
<td>C] Standard</td>
<td><img src="image5.png" alt="Image" /></td>
<td><img src="image6.png" alt="Image" /> Cell Count -228</td>
</tr>
<tr>
<td>D] MEMD100</td>
<td><img src="image7.png" alt="Image" /></td>
<td><img src="image8.png" alt="Image" /> Cell Count -177</td>
</tr>
<tr>
<td>E] MEMD 200</td>
<td><img src="image9.png" alt="Image" /></td>
<td><img src="image10.png" alt="Image" /> Cell Count -165</td>
</tr>
</tbody>
</table>

Discussion

The results of this study emphasise the ursolic acid (UA) from Momordica dioica's anti-inflammatory action. The study found a significant decrease in paw edema, CRP levels, white blood cell (WBC) counts, and pro-inflammatory cytokines TNF-α and IL-1, suggesting the possibility of using UA as an anti-inflammatory drug in therapeutic settings. These findings support an increasing number of research that shows medicinal plants like Momordica dioica have potent anti-inflammatory properties but nonsteroidal anti-inflammatory medications (NSAIDs) have more adverse consequences.
Ursolic acid, a pentacyclic terpenoid present in Momordica dioica, has undergone major studies for its anti-inflammatory properties. It has been shown to inhibiting pro-inflammatory enzymes, modulate immune responses, and attenuate pain signaling pathways. Therefore, an anti-inflammatory effects seen in the Momordica dioica'methanolic extract can be attributed to presence of UA. Additionally, the study focused on developed and validating a high-performance thin-layer chromatography (HPTLC) method for quantifying UA in the herbal extract. This method provides a reliable means of quantifying UA, ensuring quality control and facilitating further research on this secondary metabolite. The study's findings have important implications for the development of alternative and natural therapies for pain and inflammation. NSAIDs, while effective, are associated with various side effects, making medicinal plants like Momordica dioica appealing as safer alternatives for managing pain and inflammation. The observed reduction in paw edema, pain response, and CRP levels suggest the extract's ability to alleviate inflammation and associated pain. The normalization of WBC counts and TNF-α and IL-1β i.e pro-inflammatory cytokines further supports the extract's anti-inflammatory action by regulating the inflammatory response. Histopathological examination of the paw tissue revealed a reduced infiltration of inflammatory cells, indicating the extract's ability to suppress immune cell recruitment and infiltration. This suggests that the extract may help prevent tissue damage associated with excessive inflammation. The quantitative analysis done using Image J strengthens the validity of the observed effects by providing objective measurements of paw edema which has inflammatory cell infiltration. In conclusion, this study provides compelling evidence for the anti-inflammatory and analgesic properties of the fruit methanolic extract of Momordica dioica, primarily attributed to the presence of UA. The development of a reliable HPTLC method for UA quantification adds to the study's significance and offers a useful tool for future research and quality control. The potential therapeutic application of the extract in managing inflammation and pain warrants further investigation, including the identification and isolation of other active constituents in Momordica dioica. These discoveries add to the expanding body of knowledge having natural alternatives for pain and inflammation management, with the aim of developing safer and more effective therapies. Regenerate response

Conclusion:

In conclusion, The results of the current study offer strong proof that the analgesic and anti-inflammatory potential exist of the Momordica dioica’s methanolic extract. This study provides valuable insights into the anti-inflammatory properties of UA derived from Momordica dioica. The significant reduction in paw edema, CRP levels, WBC counts, and TNF-α and IL-1β i.e pro-inflammatory cytokines supports its potential as an effective anti-inflammatory action. The HPTLC method developed for UA quantification offers a reliable means of assessing its presence and concentration in Momordica dioica extracts. The use of medicinal plants, such as Momordica dioica, and their active constituents like UA, holds promise for the development of healthier and more potent treatments for pain and inflammation. Further research is warranted to elucidate the precise mechanisms of action of UA and explore its therapeutic potential in various inflammatory conditions

Declaration:
Ethical Approval: Animal studies were approved by the Institutional Animal Ethics Committee as per protocol no. (IAEC Reg. No. DYPIPSRIAEC/198/PO/Re/S/2000/CPCSEA).

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Conflict of interest: Author declared no conflict of interest

Available online at: https://jazindia.com
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