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Analgesic and anti-Inflammatory activity of *Tradescantia fluminensis* leaves extract

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ABSTRACT

Objective: The present study sought to evaluate the anti-inflammatory and analgesic activities of ethanolic extract from *Tradescantia fluminensis* leaves. **Methods:** The crude leaf extract of *T. fluminensis* was investigated for anti-inflammatory and analgesic activities in Wistar Albino rats and mice respectively. The anti-inflammatory activity was investigated using egg albumin induced oedema model while acetic acid and formalin-induced paw licking models were used to evaluate the analgesic activity. **Results:** The extract showed a significant ($P<0.05$) dose-dependent inhibition of inflammation and pain compared to the control group. **Conclusion:** The leaf extract possesses anti-inflammatory and analgesic activities. The activities could be attributed to phytochemicals present in the plant.

Keywords: *Tradescantia fluminensis*, Analgesic activity, Anti-inflammatory activity.

INTRODUCTION

Inflammation is a protective response of living tissue to various substances and organism, including chemicals and microorganisms. Pain, heat and redness are among the common signs of inflammation.[1] Although drugs used for the management of pain and inflammation are easily accessible and affordable, most of them have been found to have numerous side effects.[2] Medicinal plants have been found to offer a potent alternative for managing pain and inflammation without any adverse effects. Herbal medicines have been used for centuries with some positive results.[3] The use of herbal medicine to manage various health conditions has increasingly received global attention and thus becoming an area of interest for researchers worldwide.[4,5] *T. fluminensis*, commonly known as wandering Jew, is traditionally used for wound healing in Turkey.[6] Folk literature also claims that the plant leaves are used to relive pain. However, there is currently no study conducted to provide scientific evidence of its analgesic activity. The present study was therefore conducted to evaluate the analgesic and anti-inflammatory activity of *Tradescantia fluminensis* leaves extract.

MATERIAL AND METHOD

Plant collection and extract preparation

The leaves of *Tradescantia fluminensis* were collected from Niboye, Kichukiro district of Rwanda. The plant was authenticated at the Department of Medical laboratory sciences in Mount Kenya University Rwanda. The leaves were washed to remove dirt and shade-dried for two week. The dried leaves were reduced to coarse powder and then soaked into 80% ethanol for 24 hours. The extract was filtered using Whatman No.1 filter paper and then placed on a water bath set at 60^0C to evaporate all the ethanol.

Experimental Animals

Wistar Albino rats (140-300g) and mice (15-25g) of both sexes were obtained from the school of Health sciences, Mount Kenya University, Rwanda. The animals were kept in standard environmental condition of 25.0±2°C temperature, 55±10% relative humidity and 12 hour light/12 hour dark cycle).

Phytochemical screening

The phytochemical screening for alkaloids, flavonoids, steroids, saponins, phenols, phlobatannins and tannins was carried out on the plant extract using procedures described by [7,8].

Statistical Analysis

The collected data was analyzed using one-way analysis of Variance (ANOVA) test followed by Tukey post hoc test for multiple comparisons. The results of the analysis were expressed as mean ± S.E.M. Difference between means with $p<0.05$ were considered statistically significant.

Analgesic activity

Acetic acid-induced writhing response in Mice

Induction of writhing in mice as a response to pain sensation caused by acetic acid was done following a slight modification of the procedure described by [9]. Five hours fasted mice were injected with 0.2 ml of 5% acetic acid solution intraperitoneally 1 hour after oral administration of the extracts. Group I received normal saline orally, Group II received 10mg/kg of Diclofenac sodium (standard drug), Group III and IV received 150 mg/kg and 300 mg/kg of plant extract respectively. Five minutes after the administration of acetic acid were allowed for the acetic acid to take effect. The number of writhing was then counted for each mouse for 10 min. A significant reduction of writhing ($P<0.05$) compared with the control group was considered as evidence for analgesia.

Percentage inhibition of writhing was calculated using the following formula;

$$\% \text{ Inhibition} = (MWc - MWt) \times 100 / MWc$$

Where: - MWc = Mean number of writhing in the control group, MWt = Mean number of writhing in treated group.

Formalin induced paw licking in rats

The formalin-induced hind-paw licking was carried out following the procedure described by [10]. Twenty microlitre of formalin was injected into the planter part of the right hind paw of the rats 30 minutes after treatments administration. The number of times that the rats licked the injected paws were counted for 10 minutes and recorded as indicative of pain.[11]

Anti-inflammatory activity

Egg albumin induced paw edema model described by [12] was adopted in evaluation of anti-inflammatory activity of *T. fluminensis* extract. Adult Wistar albino rats of either sex weighing between 140 g – 300 g were divided into four groups with six rats per group. Group 1 served as a control, and received normal saline. Group II was the positive control and received 10 mg/kg of diclofenac sodium. Groups III and IV received 150 mg/kg and 300 mg/kg of the extract respectively. Thirty minutes after the administration of the various agents, egg albumin was administered for the induction of oedema. Paw thickness was measured immediately after injection with egg albumin and then at 1 hour interval for 3 hours using a vernier caliper. Inflammation was indicated by significant ($P<0.05$) increase in paw thickness. The paw thickness of the groups treated with the extract and that of the group treated with diclofenac sodium (standard drug) was compared with the negative control group. Significant reduction of the paw thickness (expressed as mean ± S.E.M) among the treated groups compared to the control group was used to indicate oedema inhibition (anti-inflammatory activity).

RESULTS

Phytochemical Screening

The phytochemical screening of the leaf extract of *Tradescantia fluminensis* revealed that the plant possess various phytochemicals as shown in table 1.

Table 1: Phytochemical Analysis

Photochemical component	Status
Alkaloids	++
Flavanoids	++
Tannins	+++
Phenols	+++
Saponins	-
Steroids	-
Phlobatannins	-

Acetic acid-induced writhing test

Table 2 shows that ethanolic extract of *T. fluminensis* at a dose of 300 mg/kg significantly ($p<0.05$) inhibited the number of writhing in acetic acid induced writhing in mice. The positive drug (Diclofenac sodium 10 mg/kg) showed the highest percentage of inhibition (73%). A dose of 150 mg/kg of the extract showed no significant inhibition of acetic acid induced writhing.

Table 2: Effect of ethanolic extracts of *T. fluminensis* on acetic acid induced writhing in mice

Study Treatments	Dosages	Mean No. of writhes/ 10 mins	Inhibition (%)
Acetic Acid (Negative control)	1% v/v	9.20 ± 1.24	-
Ethanolic extract	150mg/kg	6.40±1.69	30.4
Ethanolic extract	300mg/kg	4.00±.707*****	56.5
Diclofenac Sodium (positive control)	20mg/kg	2.40±.678*****	73.0

Values are expressed as mean ± S.E.M. (n = 5mice), *p<0.05 Dunnet test as compared to control.

Table 3: Effect of ethanolic extracts of *T. fluminensis* on formalin induced paw licking in rats

Study Treatments	Dosages	Mean No. of writhes/ 10 mins	Inhibition (%)
Formalin (Negative control)	5% v/v	8.60±2.135	-
Ethanolic extract	150mg/kg	6.33±2.272	26.3
Ethanolic extract	300mg/kg	3.40±.748*****	60.4
Diclofenac Sodium (positive control)	10mg/kg	1.98±.245*****	77.1

Values are expressed as mean ± S.E.M. (n = 5mice), *p<0.05 Dunnet test as compared to control.

Table 4: Effect of *T. fluminensis* leaf extract on egg albumin induced oedema in rats

Treatments	Time interval in Hours		
	1 hour	2 hours	3 hours
Negative control	.65 ± .02	.64 ± .03	.66 ± .02
150 mg/kg	.59 ± .03	.47 ± .01*****	.46 ± .01*****
300 mg/kg	.46 ± .02*****	.45 ± .02*****	.46 ± .02*****
Diclofenac 10 mg/kg	.44 ± .01*****	.43 ± .02*****	.44 ± .01*****

Values are expressed as mean ± S.E.M. (n = 5 rat), *p<0.05

Formalin induced paw licking in rats

Table 3 indicates that a dose of 300 mg/kg of *T. fluminensis* extract significantly inhibited the number of paw licking in formalin induced paw licking in wistar albino rats.

Anti-inflammatory activity

Anti-inflammatory activity of the *T. fluminensis* leaves extracts was evaluated using egg albumin induced paw oedema in rat.

Administration of the extracts at a dose of 300 mg/kg and the standard drug diclofenac at 10 mg/kg produced statistically significant reduction in paw thickness (oedema inhibition) ($p < 0.05$) at 1, 2 and 3 hours after administration of egg albumen. The 150 mg/kg dose showed anti-inflammatory activity after second and third hours of egg albumin administration (Table 4).

Discussion

The study findings showed that ethanolic extract of *T. fluminensis* possess analgesic activity in the two analgesic models. The extract showed a significant inhibition of acetic acid-induced writhing and formalin-induced hind paw licking in mice and rat respectively. The inhibition is dose dependent with high doses of the extract showing a significant percentage of inhibition. Pain in acetic acid induced writhing in mice results from the production of localized inflammatory response due to release of pain mediators specifically arachidonic acid from tissue phospholipids via the cyclo-oxygenase (COX) pathway [13], and by production of prostaglandin [14,15]. Prostaglandin and arachidonic acid lead to inflammation and pain by increasing capillary permeability. Writhing inhibiting substances exhibit analgesic activity by inhibition of prostaglandin release.[16] This suggests that extracts from *T. fluminensis* block the release of prostaglandin hence inhibiting writhing.

The administration of 300 mg/Kg of the extract significantly (P<0.01) inhibited the licking response. Formalin injection into the rat hind paw results to spontaneous pain behaviors that includes licking of the injected paw.[17] Intense pain that starts almost immediately after formalin injection (early phase) is triggered by activation of C-fibres.[18] Besides inhibiting the production of prostaglandin, the findings suggest that the extract inhibited the activation of primary afferent fibers by formalin.

In the present study, the dose of 300 mg/kg of *T. fluminensis* and 10 mg/kg diclofenac sodium showed significant (P<0.05) inhibition of egg albumin induced oedema after 1, 2 and 3 hours of oedema induction. One hour after the oedema induction the 150 mg/kg of the extract showed no significant activity against oedema. However after the second and third hours the dose showed significant oedema inhibition compared to the control group. This implies that *T. fluminensis* possesses anti-inflammatory activity that is dose dependent. Similar to the diclofenac sodium, the extract could have elicited the anti-inflammatory activity by inhibiting either the release or action of serotonin or histamine. These are two inflammatory mediators that are released in response to injection with egg albumin.[19]

The analgesic and anti-inflammatory effects exhibited by the extracts could as well be attributed to other phytochemicals present in the plant leaves. Past studies have shown that phytochemicals including tannins and flavonoids possess analgesic and anti-inflammatory activities.[20-22] To better understand the mechanisms by which *T. fluminensis* phytochemicals act, further studies are warranted.

CONCLUSION

This study concludes that leaf extract of T. *fluminensis* possesses anti-inflammatory and analgesic activities. The active phytochemicals could therefore be extracted for development of new medication for the management of both pain and inflammation.

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