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Counteract Inflammatory Properties of the Purified Ethanolic Extract of *Acrostichum aureum* (Linn.) Leaf

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Abstract

Inflammation plays a crucial role in the improvement of chronic diseases such as cancer, heart failure, pulmonary embolism, diabetes, arthritis, and headache, stroke all of which provide significant treatment challenges. The counteracting inflammatory impact of cleaned ethanolic crude selection of Acrostichum aureum leaf was investigated. The extract demonstrated considerable counteract inflammatory efficacy in the carrageenan-induced oedema impact in rats, with a decrease in paw volume of 65.90 % (P0.01), equivalent to that generated by the standard drug indomethacin (66.66 %) after 24 hours at a dose of 400 mg/kg body mass. The findings point to purified ethanolic crude extract of Acrostichum aurum's leaf having counteract inflammatory properties, justifying its use in folklore medicines.

Key words: Carrageenan-induced oedema, *Acrostichum aureum*, Indomethacin Anti-inflammatory, Methanolic extract.

1. Introduction

Acrostichum aureum is an Acrostichum species that grows in the Nigerial (A. aureum) Linn. It is an evergreen shrub found in Sri Lanka, Bangladesh, India, China, the Brazil, Japan, Australia, and Taiwan, primarily in mangrove forests and along the coast. Pterosterone, 2-butanone, kaempferol, ponasterone, and quercetin are found in the plant's ethanolic extract [6]. Boils, Rheumatism, and sores, were traditionally treated with the roots. To halt bleeding, apply leaves. saponins, steroids, fronds and glycosides, are all found in the plant, and they're utilized to treat stomach and pain issues. The Acrostichum aureum leaves methanolic extract was found to provide selective cytotoxicity against various cancer cell lines [10].

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Acrostichum uaream is also useful for preventing diseases that cause difficulty breathing. Sinus discomfort, which creates a severe headache, as well as pain in the nose and throat infection, which causes a painful throat, are among these ailments. It is effective in reducing chest pain. It is effective in curing cancer by eliminating cancer cells in the breast, stomach, and colon since it has cytotoxic qualities. A. uareum is beneficial in treating urination disorders such as clouding urination, which is common in women. It is an antidote that aids in the removal of the effects of snake venom in the event of a snake bite.

Due to undesirable adverse effects like stomach ulcers induced by non-steroidal anti-inflammatory medicines, anti-inflammatory medications have not been utilized efficiently in all patients (NSAIDs). As a result, new medications without these adverse effects are being sought all around the world. Pharmaceuticals produced from plant utilized in conventional treatments for the treatment of pain, inflammatory, and fever illnesses have gotten a lot of attention during this process since they are have limited adverse effects and inexpensive [3]. The goal of this investigation was to evaluate the activity of counteract inflammatory of purified ethanolic extract of Acrostichum aureum leaf in order to offer scientific evidence of the alleged ethnopharmacological effects.

2. Materials and Method

Plant material Collection: The Acrostichum aureum (Linn.) plants were gathered from the botanical garden of University of Lagos, Lagos State, Nigeria in April 2021.

Ethanolic extract preparation: The leafs components of the plant were collected and removed all unwanted items with purified water and dried at room temperature before being dried in an electric oven at 70^{o}C. The heated leafs were process into powdery form using a suitable grinder. Thereafter, grinded powder of Acrostichum aureum (Linn.) leaf was protected in an airtight carton in a dry, cool and dark environment. In a clean, flat-bottomed glass bottle, accurately weighed 500 grams of powdered material were drenched in 2.0 liters of 90% ethyl alcohol. The container and its quantities were locked and preserved for 6 days, with some shaking and stirring in between. A chunk of clean, white cotton substance was then used to coarsely screen the entire combination. With whatman filter paper, the filtrate was removed from the mixture and concentrated with a rotary evaporator at a bath temperature of not more than 45 ^{o}C.

Test for various chemical groups: Saponins, tannins, flavonoids, steroids, gums, reducing sugars, as well as alkaloids were all detected in the crude ethanol leaf extract of A. uerem [1]. A 10 % (w/v) purified ethanol leaf extract solution was used in each experiment.

3. Test for counteract inflammatory properties

Test Animals & Drugs: In vivo counteract inflammatory testing was performed on male albino Wistar rats weighing between 180 - 207 g. They were kept in a regular setting at Federal Polytechnic Ilaro animal house where they were fed once in every 24 hours with Trusty Chunks and clean water in cleaned plastic cage. The study's standard medication was Indomethacin.

Carrageenan-injecting oedema test: In this analysis, the Lanhers procedure was used Lanhers et al., 1991 [4]. Oedema was evoked by vaccinating 0.05 ml of 1 percent carrageenan into the right hind foot sub plantar area of each rat. In this investigation, four different factions were used. The extract was given orally to the test groups at 200 and 400 mg/kg body strength, whereas the unfavorable restraint group received 1 ml purified water and the favorable restraint group collected 8 mg/kg body strength of indomethacin 30 minutes before the carrageenan vaccination. After the medication, the paw quantity was assessed utilizing a micrometer screw gauge at 0, 1, 2, 4, 6, 8 and 24 hours and ethanol root extract of A. aureum were administered. The extract's percentage inhibition of inflammatory impact was estimated using the formula below.

$$\% \text{ inhibition of inflammation} = [(Bc-Bt)/Bc] \times 100$$

In the equation above, Bc is the control group's average degree of inflammation and Bt is the test group's average degree of inflammation.

4. Results and discussion

Test for chemical group: Table 1 show the presence of reducing sugars, tannins, gums, flavonoids and saponins in which all were detected in the ethanolic extract of A. aureum, according to the results of various chemical analysis.

Table 1. Outcomes of various group tests of purified ethanolic extract of A. aureum leaf.

Flavonoid	+
Alkaloid	-
Tannin	+
Steroid	-

Gum	+
Saponin	+
Reducing Sugar	+

Where + indicate presence and - indicate absence

Test for counteract inflammatory activity: Table 2 show the counteract inflammatory properties of purified A. aureum ethanolic extract. A maximal oedema paw quantity of 1.72 ± 0.09 mm was found in the control rats after 8 hours of carrageenan administration in the carrageenan-induced oedema test. At 2, 4, 6, 8 and 24 hours, the percentage inhibition of oedema paw quantity by the extract at 400 mg/kg body weight was statistically substantial when described in relation to indomethacin-treated mice. When compared to indomethacin, the 400 mg/kg body weight reduced paw volume by 65.90% after 24 hours (66.66 %).

The synthesis or discharge of mediators at the damaged site is involved in acute inflammation. Prostaglandins, particularly the leucotrienes, E series, bradykinins, serotonin and histamine are among these mediators, and they all contribute to fever and pain [11]. As a result, preventing these mediators from reaching the wounded location or having their pharmacological impact should reduce fever, discomfort and inflammation [9].

Natural products' anti-edematous effectiveness is typically evaluated using carrageenan-induced paw oedema as an in vivo standard of inflammation [5]. In the rat paw, carrageenan has been found to create a range of mediators, with the first phase being correlated to discharge of histamine and the second phase being linked to the production of prostaglandins [7]. Oedema caused by carrageenan is usually linked to the early exudative phase of inflammation, which is one of the most crucial methods in inflammatory disease [8]. The counteract inflammatory effect of a 450 mg/kg dose of purified A. aureum ethanolic extract was 65.90 %, which was comparable to indomethacin (66.66 %), a well-known prostaglandin inhibitor. As a result, the ability of this extract to disrupt the cyclooxygenase pathway may be responsible for its counteract inflammatory activities [2].

Table 2. Effect of purified ethanol extract of A. aureum leaf and indomethacin on carrageenan-induced oedema paw volume in male Wistar rats.

Treatment Groups	Doses (mg/kg body weight)	Right Hind Paw Volume (mm)					
		1h	2h	4h	6h	8h	24h
Control	0	1.01 ± 0.09*	1.30 ± 0.06*	1.49 ± 0.08*	1.69 ± 0.05*	1.72 ± 0.09*	1.32 ± 0.07*
Positive Control (Indomethacin)	10	0.49 ± 0.06* (51.48)	0.61 ±0.06** (52.30)	0.70 ±0.05* (53.02)	0.59 ±0.06** (65.08)	0.58 ±0.04** (66.27)	0.43 ± 0.08* (66.66)
Extract	200	0.99 ± 0.08* (1.98)	1.08 ± 0.06* (16.92)	1.14 ± 0.05* (23.48)	1.23 ± 0.07* (27.22)	1.17 ± 0.04* (31.97)	0.81 ± 0.09* (38.64)
Extract	400	0.54 ± 0.04*	0.65 ± 0.03*	0.74 ± 0.09**	0.62 ± 0.07**	0.59 ± 0.08*	0.45 ± 0.06**

(46.53) (50.00) (50.33) (63.31) (65.69) (65.90)

Values in brackets denote percentage inhibition of the oedema paw volume.
Values are expressed as mean±SD; *P < 0.05; **P < 0.01 vs. control; n = 5.

5. Conclusion

Finally, the counteract inflammatory action of purified ethanolic crude extract of Acrostichum aureum leaf can be inferred. However, more research is needed to determine the active principles that are responsible for this activity.

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