WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.453
Volume 14, Issue 18, 918-934. Research Article ISSN 2277–7105

ANTI-INFLAMMATORY POTENTIAL OF A TOTAL AQUEOUS EXTRACT OF THE STEM BARK OF *SACOGLOTTIS GABONENSIS* BAILLE URBAN (HUMIRIACEAE) IN *WISTAR* RAT

Ousmane Nagalo*[1], Djè Kouamé Wenceslas Kouame[2], Behiblo N'Guessan Bah Konan[1], Mama Kone[3]

[1]Assistant, Training and Research of Unit Science and Technology, Alassane Ouattara University, 01 BO box V18 Bouaké, Côte d'Ivoire.

[2]Assistant, Training and Research of Unit Engineering, Agronomy, Forestry and Environment, Polytechnic University of Man, BO box 20 Man, Côte d'Ivoire.

[3]Titular Professor, Training and Research Unit of Natural Sciences, Laboratory of Physiology, Pharmacology and Pharmacopoeia, Nangui Abrogoua University, 02 BO box 801 Abidjan 02, Côte d 'Ivoire.

Article Received on
29 July 2025,

Revised on 19 August 2025,
Accepted on 09 Sept. 2025

DOI: 10.20959/wjpr202518-38326

***Corresponding Author**
Ousmane Nagalo
Assistant, Training and Research of Unit Science and Technology, Alassane Ouattara University, 01 BO box V18 Bouaké, Côte d'Ivoire.

ABSTRACT

Sacoglottis gabonensis, a medicinal plant belonging to the Humiriaceae family, is used for the treatment of Buruli ulcer in Côte d'Ivoire. It has been the subject of several pharmacological and toxicological studies. The objective of this study is to verify the acute anti-inflammatory effect of the total aqueous extract of the stem bark *Sacoglottis gabonensis* (TAESg) in *Wistar* rat. For this purpose, 36 rats were divided into six homogeneous groups of six rats. Group 1, negative control, received distilled water; group 2, positive control, received aspirin® at a dose of 100 mg/kg bw; groups 3, 4 and 5 received TAESg at respective doses of 3.5; 17.5; 35 and 350 mg/kg bw for preventive anti-inflammatory activity. One hour after oral administration of TAESg, each rat received by injection under the plantar pad of the right hind paw 0.1 mL of fresh egg albumin or 0.1 mL of the 1% carrageenan solution depending on the test carried out. For curative anti-inflammatory activity, one hour before after administration of the different substances orally, each rat received, by

injection under the plantar pad of the right hind paw, either 0.1 mL of 1% carrageenan solution; either 0.1 mL of fresh egg albumin. In order to assess the evolution of the plantar edema caused by this injection, a measurement of the right hind paw of all rats was carried out 1 hour; 2 hours; 3 hours; 4 and 5 hours after injection. This study showed that TAESg at different doses significantly reduced the edema induced by fresh egg albumin and carrageenan during the preventive and curative studies in this experiment. Ultimately, TAESg has acute preventive and curative anti-inflammatory activity. However, more in-depth studies of this extract must be carried out on the analgesic and antipyretic power.

KEYWORDS: *Sacoglottis gabonensis*, Buruli ulcer, anti-inflammatory activity, rat.

INTRODUCTION

Buruli ulcer (BU) is a chronic necrotizing infection of the skin and soft tissues caused by *Mycobacterium ulcerans* (*M. ulcerans*). It is the third mycobacterial disease that most affects immunocompetent humans, after leprosy and tuberculosis, with a high occurrence in humid areas, in endemic regions.[1; 2] Côte d'Ivoire is one of the most endemic countries with more than 2000 new cases per year.[3] Faced with the scale of this disease, the Ivorian authorities set up a National Program for the Fight against Buruli Ulcer (PNLUB), which counted in 2007, 25,617 cumulative cases from 1978 to 2006.[4] Furthermore, the WHO reported nearly 30,000 cases in Côte d'Ivoire in 2008.[5]

However, the medical and surgical care efforts for the patient, led by the Ivorian State, remain insufficient.[6] Currently, there is no effective long-term vaccine against BU.[7] However, the treatment of BU is by antibiotic therapy regardless of the stage of the disease for 4 to 8 weeks, which leads to healing of early lesions, stabilization of the disease or regression of the lesions allowing less damaging surgical excision.[8;9] Many side effects of this antibiotic therapy have been identified, especially in children, including liver, kidney, hearing damage and limb muscle atrophy.[10] In order to reduce the side effects linked to antibiotics, mortality and the cost of treatment, numerous scientific works have been carried out on the ethnobotanical level. These investigations revealed a medicinal plant including *Sacoglottis gabonensis* (*S. gabonensis*) belonging to the Humiriaceae family, used in the treatment of BU in Côte d'Ivoire.[11] *S. gabonensis* has been the subject of several pharmacological and toxicological studies. Ethnobotanically, the treatment of BU with *S. gabonensis* consists of using a decoction of the stem bark of the plant as a drink and local application for a period of six months depending on the patient's condition.[11] In addition, the aqueous extract of the

stem bark of this plant had an inhibitory effect on the growth of different strains of *M. ulcerans*.[12] Furthermore, acute toxicity tests carried out in mice showed that total aqueous extract of the stem bark *Sacoglottis gabonensis* (TAESg) has an LD_{50} greater than 5000 mg/kg p. c. The subacute oral and cutaneous toxicity tests, the subchronic oral toxicity test showed that TAESg was nontoxic at the practitioner's therapeutic dose on the various biological parameters studied.[13;14] Other studies have shown that TAESg has healing activity and hemostatic potential.[15; 16] Continuing the work, the objective of the present work is to evaluate the acute anti-inflammatory effect of TAESg in rats. Specifically, the aim will be to evaluate the preventive and curative acute anti-inflammatory effect of carrageenan and egg white.

MATERIAL AND METHODS

Plant material

It is made up of the stem bark of *Sacoglottis gabonensis* (Baille) Urban (Humiriaceae). These barks were harvested in Ingrakon in the Alépé region, a town located approximately 45 km from the Abidjan district. A sample was identified in accordance with that kept at the National Floristic Center (CNF) under number 1154 of June 16, 1965.

Animal material

The experiments are carried out on male and female albino rats of the *Rattus norvegicus* species of *Wistar* strain. They all come from the animal facility of the Physiology, Pharmacology and Pharmacopoeia Laboratory of Nangui Abrogoua University (UNA). They are 3 to 4 months old and their body weight varied between 120 to 160 g. They were housed in plastic cages with a stainless steel lid and provided with feeding bottles. A layer of wood shavings was placed at the bottom of the cages to constitute bedding. The animals are subjected to a temperature of 22 ± 2 °C with a photoperiod of 12 hours. The rats are fed daily with pellets from the company IVOGRAIN® and tap water continuously in feeding bottles. The experimental protocol and animal handling procedures are carried out according to good laboratory practices.[17]

Technical equipment

The technical laboratory equipment consisted of RETSH SM 100 electric grinder (Haan, Germany), electronic balance (Denver Instrument S-234, Germany), graduated cylinder, Erlenmeyer flask, conical flask, hydrophilic cotton, Whattman n°1 filter paper, brand oven

(Selecta, Spain), magnetic stirrer (Ovan MCG05E, Europe), digital micrometer (caliper, HARDENED, France) and Stopwatch.

Chemical substances and pharmacodynamics

The chemical and pharmacodynamic substances used were aspirin® (CYPHARM, Côte d'Ivoire), fresh egg albumin and carrageenan.

METHODS

Preparation of the TAESg

The fresh harvested bark is crushed into small pieces then dried in the laboratory on the bench at a temperature of 25°C for four weeks. The dried bark is reduced to a fine powder using the Retsch SM 100 grinder. The preparation of the total aqueous extract is done according to the preparation method described by **Kouassi**.[14] Four hundred grams (400 g) of powder from the stem bark of *S. gabonensis* are dissolved in two liters (2L) of distilled water and the whole is brought to a boil for 30 minutes. After cooling, the decoction is filtered, first through cotton wool, then through Wattman nº1 paper. The filtrates are dried in an oven at 50°C for 48 hours. A brown-colored dry powder which is TAESg is obtained. This powder, which will be used to prepare the different concentrations of TAESg, is stored in the refrigerator at -5°C until the days of handling.

Evaluation of acute anti-inflammatory activity (fresh egg albumin and carrageenan)

The method used for this test is that described by **Kouamé *et al***.[18] Thirty-six rats divided into six homogeneous groups of six rats were used for each test. The rats were fasted 16 hours before the experiment. First, the thickness of the right hind leg of each rat was measured using a caliper, thus constituting the initial thickness (**Et_0**). The different oral treatments are as follows:

- Group 1 : negative control received distilled water at a rate of 10 mL/kg bw.
- Group 2 : positive control received aspirin® at a dose of 100 mg/kg bw.
- Groups 3 : 4; 5 and 6: received TAESg at respective doses of 3.5; 17.5; 35 and 350 mg/kg bw

Preventive anti-inflammatory activity

One hour after oral administration of TAESg, each rat received by injection under the plantar pad of the right hind paw 0.1 mL of fresh egg albumin or 0.1 mL of the 1% carrageenan solution depending on the test performed. In order to assess the evolution of the plantar

edema caused by this injection, a measurement of the right hind paw of all rats was carried out 1 hour; 2 hours; 3 hours; 4 and 5 hours after injection.

These values represented the thickness of the tab at the given time t (**Et**). The values obtained made it possible to calculate the percentage increase in the circumference of the rat's paw (**% AUG**) according to the formula used in the work of **Kouamé *et al***.[18] A photograph was taken during the induction of acute inflammation with fresh egg albumin and with carrageenan at T_0, 1 hour and 5 hours.

$$\mathbf{AUG\ (\%)} = \frac{\mathbf{Et - Eto}}{\mathbf{Eto}} \times \mathbf{100}$$

AUG (%) = percentage increase

Et = thickness of the leg at time t

Et_0 = thickness E_0 of the initial leg

This determined percentage increase was used to calculate the percentage of edema inhibition (**% INH**) which makes it possible to evaluate the anti-inflammatory activity.

$$\mathbf{INH\ (\%)} = \frac{\mathbf{\%\ AUG\ control\ -\ \%\ AUG\ treated}}{\mathbf{\%\ AUG\ control}} \times \mathbf{100}$$

Curative anti-inflammatory activity

One hour before after administration of the different substances orally, each rat received, by injection under the plantar pad of the right hind paw, either 0.1 mL of 1% carrageenan solution; either 0.1 mL of fresh egg albumin. The evolution of the edema of the right hind leg was measured as previously 1 hour; 2 hours; 3 hours; 4 hours and 5 hours later, by the digital micrometer. The values determined made it possible to calculate the percentage reduction in the thickness of the rat's paw (**% reduction**) in order to assess the importance of the treatment on edema according to the formula used in the work of **Kouamé *et al***.[18]

$$\mathbf{\%\ reduction} = \frac{\mathbf{A - B}}{\mathbf{A}}\ \mathbf{X\ 100}$$

A : measurement of the thickness of the edema of the negative control group.

B : measurement of the thickness of the edema 1 hour; 2 hours; 3 hours; 4 and 5 hours after treatment.

Statistical analysis

The data are analyzed using Graph Pad Prism 8.0.1 software (San Diego, CA, USA). The results obtained are expressed as a mean followed by the standard error of the mean (M ± SEM). Statistical significance is determined by the ANOVA 1 analysis of variance followed by the Turkey test. These tests will give us the degree of significance for $p < 0.05$. In the presentation of results, symbols (*, **, ***, ****/ $^{\#}$, $^{\#\#}$, $^{\#\#\#}$, $^{\#\#\#\#}$) will indicate significant decreases and increases compared to controls.

RESULTS

Preventive effect of TAESg on edema induced in rats by carrageenan (1%)

The average paw thickness of rats was between 2.42 ± 0.05 and 2.56 ± 0.05 mm before induction of edema by carrageenan (Table 1). After the injection of carrageenan into the right hind paw, the average thickness of the paw of control rats underwent a very highly significant increase ranging from 2.55 ± 0.03 mm (before injection of carrageenan) to 5.32 ± 0.21 mm (3 hours after injection of carrageenan) and decreased non-significantly to 4.60 ± 0.17 mm (5 hours after injection of carrageenan) (Fig. 1, A). In rats treated with TAESg at doses 3.5; 17.5; 35 and 350 mg/kg bw, the average thickness of the edema decreased significantly ($p < 0.001$) and respectively from 2.47 ± 0.03 to 4.18 ± 0.16 mm ; from 2.51 ± 0.07 to 3.90 ± 0.27 mm ; from 2.56 ± 0.05 to 4.19 ± 0.20 mm and from 2.42 ± 0.05 to 3.61 ± 0.05 mm after 3 hours of carrageenan injection (Fig. 1, B).

Table 1: Preventive effect of TAESg on edema induced in rats by carrageenan injection.

Treatment and doses (mg/kg bw)	Average paw thickness (mm) before carrageenan injection	Average paw thickness (mm) after carrageenan injection / percentage of edema inhibition (%) in parentheses				
		1 h	2 h	3 h	4 h	5 h
Distilled water edema control (mL/kg bw)	2.55 ± 0.03	4.82 ± 0.13	5.30 ± 0.29	5.32 ± 0.21	4.90 ± 0.21	4.60 ± 0.17
Aspirin® 100	2.49 ± 0.04	3.58 ± 0.06*** (51.98)	3.63 ± 0.14*** (58.54)	3.86 ± 0.06*** (50.54)	3.34 ± 0.07*** (63.82)	3.04 ± 0.10*** (73.17)
TAESg 3.5	2.47 ± 0.03	3.59 ± 0.13*** (51.54)	3.90 ± 0.16*** (48.37)	4.18 ± 0.16*** (38.98)	4.10 ± 0.16*** (31.48)	3.93 ± 0.09** (29.75)
TAESg 17.5	2.51 ± 0.07	3.14 ± 0.18*** (72.24)	3.67 ± 0.15*** (57.40)	3.90 ± 0.27*** (49.81)	3.71 ± 0.11*** (48.93)	3.37 ± 0.15*** (58.04)
TAESg 35	2.56 ± 0.05	3.38 ± 0.04*** (63.87)	3.62 ± 0.09*** (61.01)	4.19 ± 0.20*** (41.15)	3.67 ± 0.11*** (52.73)	3.39 ± 0.13*** (59.51)
TAESg 350	2.42 ± 0.05	3.51 ± 0.11*** (51.98)	3.82 ± 0.14*** (48.73)	3.61 ± 0.05*** (57.03)	3.21 ± 0.08*** (66.38)	3.06 ± 0.08*** (68.78)

*The values are in the form of M±ESM. n = 6 rats/group. The comparisons are made between the edema control group treated with distilled water and the aspirin® and TAESg groups on the one hand and between the aspirin® group and the TAESg batches on the other hand. *: indicates significant decreases and #: indicates significant increases; h: hour; mm: milimeter; %: percentage.*

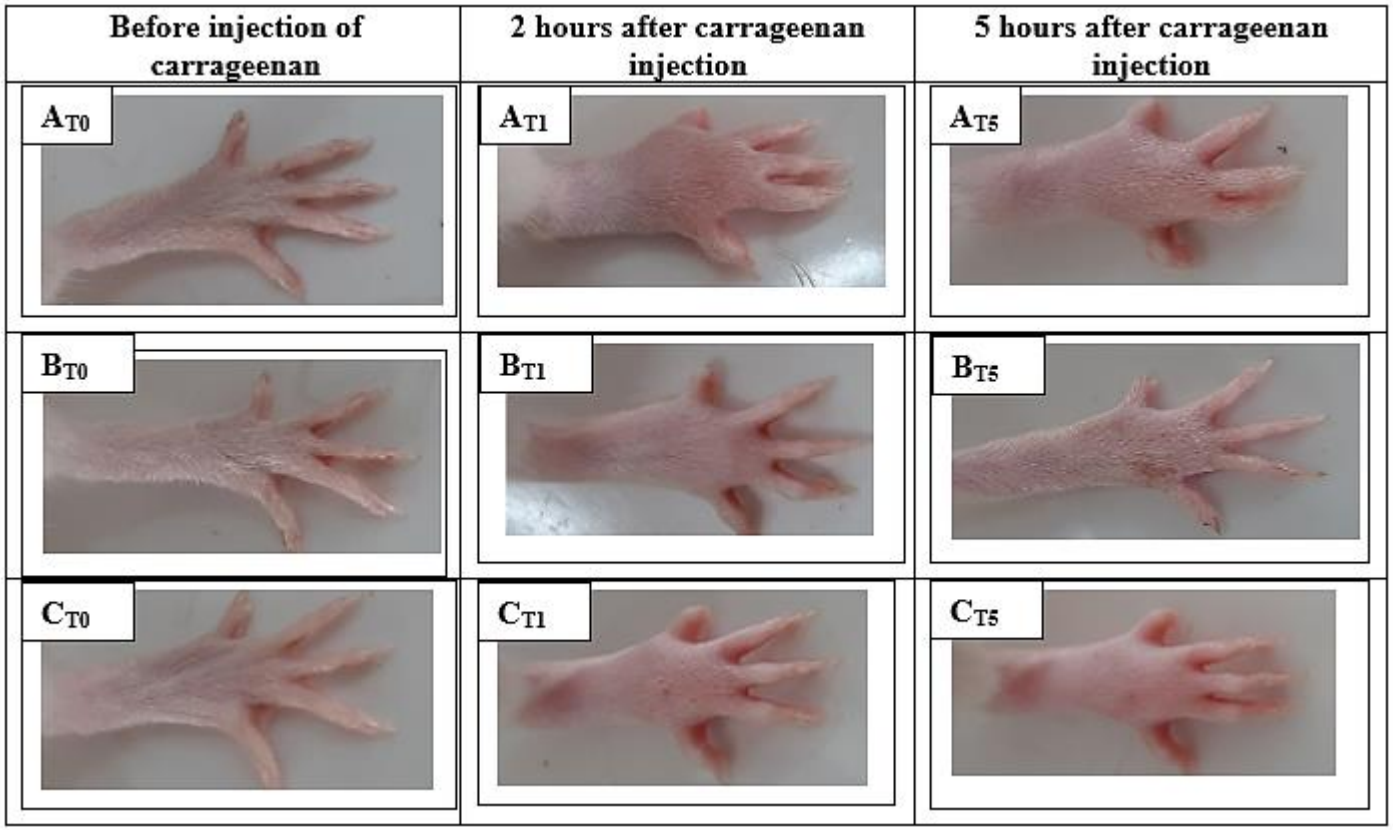

Fig. 1: Photographs of the right hind legs of rats before and after fresh egg albumin injection in rats

***A** : Distilled water (control), **B** : TAESg 350 mg/kg bw, **C** : Aspirine® 100 mg/kg bw.*

This reduction at the 3rd hour corresponds respectively to inhibition percentages of 38.98 %; 49.81 %; 41.15 %; 57.03 % compared to the edema control. At the 5th hour, the average thickness of the legs reached 3.93 ± 0.09 mm (29.75 %) (TAESg 3.5 mg/kg bw); 3.37 ± 0.15 mm (58.04 %) (TAESg 17.5 mg/kg bw); 3.39 ± 0.13 mm (59.51 %) (TAESg 35 mg/kg bw) and 3.06±0.08 mm (68.78 %) (TAESg 350 mg/kg bw). Aspirin®

resulted in significant inhibitions of edema by 51.98 % at the 1st hour; 50.54 % at the 3rd hour and 73.17 % at the 5th hour compared to the edema control (Fig. 1). These inhibitions of edema with TAESg are similar to those of aspirin® at the 1st, 2nd and 5th hour (Table 1).

Preventive effect of TAESg on edema induced by fresh egg albumin in rats

The anti-inflammatory effect of TAESg on edema induced in rats by fresh egg albumin is recorded in Table 2. Before the injection of fresh egg albumin, the average thickness of the paws of the rats varied non-significantly from 2.55 ± 0.11 to 2.62 ± 0.05 mm. One hour after the injection of fresh egg albumin, the average thickness of the paw of edema control rats underwent a very highly significant increase, from 2.62 ± 0.05 to 6.71 ± 0.18 mm and decreased non-significantly to 5.09 ± 0.08 mm, 5 hours after the injection of fresh egg albumin. In rats treated with TAESg at doses 3.5; 17.5; 35 and 350 mg/kg bw, the average thickness of the edema decreased significantly ($p < 0.001$) and reached 5.29 ± 0.27 mm (40.74 %) respectively ; 5.04 ± 0.18mm (46.40 %) ; 4.33 ± 0.18 mm (61.22 %) and 4.00 ± 0.12 mm (68.41 %) 1 hour after injection of fresh egg albumin. At the 5th hour, this average thickness increases to 3.32 ± 0.11 mm (69.63 %) (TAESg 3.5 mg/kg bw) ; 3.25 ± 0.08 mm (72.87 %) (TAESg 17.5 mg/kg bw); 3.23 ± 0.11 mm (72.46 %) (TAESg 35 mg/kg bw) and 3.17 ± 0.10 mm (74.89 %) (TAESg 350 mg/kg bw).

Table 2: Preventive effect of TAESg on edema induced in rats by injection of fresh egg albumin.

Treatment and doses (mg/kg bw)	Average paw thickness (mm) before egg white injection	Average paw thickness (mm) after egg white injection/percentage of edema inhibition (%) in parentheses				
		1 h	2 h	3 h	4 h	5 h
Distilled water edema control (mL/kg bw)	2.62 ± 0.05	6.71 ± 0.18	6.60 ± 0.10	6.05 ± 0.08	5.59 ± 0.15	5.09 ± 0.08
Aspirin® 100	2.58 ± 0.10	4.88 ± 0.17*** (49.89)	4.80 ± 0.13*** (44.22)	4.47 ± 0.12*** (44.89)	3.80 ± 0.12*** (58.92)	3.29 ± 0.11*** (71.25)
TAESg 3.5	2.57 ± 0.06	5.29 ± 0.27*** (40.74)	4.64 ± 0.23*** (47.98)	3.96 ± 0.22*** (59.47)	3.83 ± 0.26*** (57.57)	3.32 ± 0.11*** (69.63)
TAESg 17.5	2.58 ± 0.04	5.04 ± 0.18*** (46.40)	4.71 ± 0.25*** (46.48)	4.01 ± 0.24*** (58.30)	3.59 ± 0.15*** (65.99)	3.25 ± 0.08*** (72.87)

TAESg 35	2.55 ± 0.11	4.33 ± 0.18*** (61,22)	4.43 ± 0.09*** (52.76)	3.87 ± 0.16*** (61.51)	3.36 ± 0.09*** (72.72)	3.23 ± 0.11*** (72.46)
TAESg 350	2.55 ± 0.04	4.00 ± 0.12*** (68.41)	4.05 ± 0.16*** (62.31)	4.01 ± 0.11*** (57.43)	3.31 ± 0.14*** (74.41)	3.17 ± 0.10*** (74.89)

*The values are in the form of M±ESM. n = 6 rats/group. The comparisons are made between the edema control group treated with distilled water and the aspirin® and TAESg groups on the one hand and between the aspirin® group and the TAESg groups on the other hand. *: indicates significant decreases and #: indicates significant increases; h: hour; mm: milimeter; %: percentage.*

Curative effect of TAESg on carrageenan-induced edema in rats

Before carrageenan injection, the average thickness of the rats' paw varied between 2.46 ± 0.04 and 2.63 ± 0.04 mm (Table 3). One hour after carrageenan injection, the average paw thickness of rats increased significantly ranging from 4.36 ± 0.14 to 4.81 ± 0.32 mm. In control rats, the average paw thickness increased from 5.25 ± 0.30 mm (1st hour) to 4.05 ± 0.28 mm (5th hour). On the other hand, in rats treated with TAESg at doses 3.5; 17.5; 35 and 350 mg/kg bw, the average thickness of the edema decreased significantly ($p < 0.001$) and increased to 4.42 ± 0.28 mm (15.81 %), 3.94 ± 0.06 mm (24.95 %), 3.89 ± 0.13 mm (25.90 %) and 3.76 ± 0.30 mm (28.38 %) 1 hour after carrageenan injection. At the 5th hour, the average thickness of the paw edema reached 3.31 ± 0.20 mm (18.27 %) (TAESg 3.5 mg/kg bw), 3.23 ± 0.08 mm (20.24 %) (TAESg 17.5 mg/kg bw), 3.21 ± 0.06 mm (20.74 %) (TAESg 35 mg/kg bw), 2.96 ± 0.13 mm (26.91 %) (TAESg 350 mg/kg bw). Aspirin® resulted in significant reductions in edema from 4.36 ± 0.14 mm to 3.76 ± 0.13 mm corresponding to 28.38 % (1st hour) and with a maximum inhibition percentage of 26.81 % at 4th hour compared to control.

Curative effect of TAESg on fresh egg albumin-induced edema in rats

Before albumin injection, the average paw thickness of all rats ranged from 2.56 ± 0.07 to 2.64 ± 0.08 mm (Table 4). One hour after the injection of fresh egg albumin, the average paw thickness of rats significantly increased ($p<0.001$) from 6.34 ± 0.18 to 6.79 ± 0.28 mm. After the different treatments, in control rats, the average thickness of the paw increased from 6.79 ± 0.28 mm to 6.13 ± 0.25 (1st hour) and reached 4.85 ± 0.26 mm (5th hour). In rats treated with TAESg at doses 3.5; 17.5; 35 and 350 mg/kg bw, the average thickness of the edema decreased significantly ($p < 0.01$) and increased to 5.47 ± 0.16 mm (10.76 %), 5.46 ± 0.16 mm (10.92 %), 5.26 ± 0.58 mm (14.19 %) and 5.22 ± 0.30 mm, respectively. (14.84 %) 1 hour after treatment with TAESg. Five hours after treatment with TAESg, the average thickness of the edema reached 3.39 ± 0.09 mm (30.10 %) (TAESg 3.5 mg/kg bw), 3.33 ± 0.22 mm (31.34 %) (TAESg 17.5 mg/kg bw), 3.28 ± 0.08 mm (32.37 %) (TAESg 35 mg/kg bw) and 3.27±0.10 mm (32.58 %) (TAESg 350 mg/kg bw). Aspirin® resulted in significant reductions in edema from 6.64 ± 0.27 mm to 5.17 ± 0.38 mm corresponding to 15.66 % (1st hour) and with a maximum inhibition percentage of 34.43 % at the 5th hour compared to the control.

Table 3: Curative effect of TAESg on edema induced in rats by the injection of carrageenan (1%)

Treatment and doses (mg/kg bw)	Average paw thickness (mm) before carrageenan injection	Average paw thickness (mm) after carrageenan injection	Average paw thickness (mm) after carrageenan injection/percentage of edema inhibition (%) in parentheses				
			1 h	2 h	3 h	4 h	5 h
Distilled water edema control (mL/kg bw)	2.63 ± 0.04	4.81 ± 0.32$^{###}$	5.25 ± 0.30	5.23 ± 0.22	4.67 ± 0.16	4.40 ± 0.26	4.05±0.28
Aspirin® 100	2.50 ± 0.03	4.36 ± 0.14$^{###}$	3.76 ± 0.13*** (28.38)	3.84 ± 0.15*** (26,58)	3.48 ± 0.11*** (25.48)	3.22 ± 0.16*** (26.81)	2.98 ± 0.13*** (26.42)
TAESg 3.5	2.47 ± 0.05	4.52 ± 0.35$^{###}$	4.42 ± 0.28 (15.81)	4.11 ± 0.20** (21.41)	3.89 ± 0.25** (16.70)	3.68 ± 0.28* (16.36)	3.31 ± 0.20* (18.27)
TAESg 17.5	2.48 ± 0.06	4.56 ± 0.13$^{###}$	3.94 ± 0.06** (24.95)	3.88 ± 0.17*** (25.81)	3.58 ± 0.11*** (23.34)	3.44 ± 0.08** (21.81)	3.23 ± 0.08** (20.24)
TAESg 35	2.47 ± 0.04	4.54 ± 0.16$^{###}$	3.89 ± 0.13*** (25.90)	3.61 ± 0.21*** (30.97)	3.56 ± 0.08*** (23.77)	3.32 ± 0.09** (24.54)	3.21 ± 0.06** (20.74)
TAESg 350	2.46 ± 0.04	4.67 ± 0.21$^{###}$	3.76 ± 0.30*** (28.38)	3.50 ± 0.22*** (33.08)	3.45 ± 0.18*** (26.12)	3.09 ± 0.13*** (29.77)	2.96 ± 0.13*** (26.91)

*The values are in the form of M±ESM. n = 6 rats/group. The comparisons are made between the edema control group treated with distilled water and the aspirin® and TAESg groups on the one hand and between the aspirin® batch and the TAESg groups on the other hand. *: indicates significant decreases and #: indicates significant increases; h: hour; mm: milimeter; %: percentage.*

Table 4: Curative effect of TAESg on edema induced in rats by injection of fresh egg albumin.

Treatment and doses (mg/kg bw)	Average paw thickness (mm) before egg white injection	Average paw thickness (mm) after egg white injection	Average paw thickness (mm) after egg white injection/percentage of edema inhibition (%) in parentheses				
			1 h	2 h	3 h	4 h	5 h
Distilled water edema control (mL/kg bw)	2.61 ± 0.02	6.79 ± 0.28$^{###}$	6.13 ± 0.25	5.80 ± 0.26	5.46 ± 0.20	5.17 ± 0.21	4.85 ± 0.26
Aspirin® 100	2.56 ± 0.07	6.64 ± 0.27$^{###}$	5.17 ± 0.38** (15.66)	4.40 ± 0.14** (24.14)	4.20 ± 0.11*** (23.07)	3.50 ± 0.10*** (32.30)	3.18 ± 0.04*** (34.43)
TAESg 3.5	2.60 ± 0.12	6.72 ± 0.28$^{###}$	5.47 ± 0.16* (10.76)	4.70 ± 0.08* (18.96)	4.46 ± 0.29** (18.31)	3.83 ± 0.09*** (25.91)	3.39 ± 0.09*** (30.10)
TAESg 17.5	2.64 ± 0.08	6.58 ± 0.11$^{###}$	5.46 ± 0.16* (10.92)	4.63 ± 0.12** (20.17)	4.36 ± 0.17*** (20.14)	3.73 ± 0.26*** (27.85)	3.33 ± 0.22*** (31.34)
TAESg 35	2.58 ± 0.09	6.34 ± 0.18$^{###}$	5.26 ± 0.58* (14.19)	4.61 ± 0.46** (20.51)	4.22 ± 0.05*** (22.71)	3.64 ± 0.05*** (29.59)	3.28 ± 0.08*** (32.37)
TAESg 350	2.70 ± 0.09	6.66 ± 0.12$^{###}$	5.22 ± 0.30** (14.84)	4.36 ± 0.13*** (24.83)	4.20 ± 0.09*** (23.07)	3.60 ± 0.08*** (30.36)	3.27 ± 0.10*** (32.58)

*The values are in the form of M±ESM. n = 6 rats/group. The comparisons are made between the edema control group treated with distilled water and the aspirin® and TAESg groups on the one hand and between the aspirin® group and the TAESg groups on the other hand. *: indicates significant decreases and #: indicates significant increases; h: hour; mm: milimeter; %: percentage.*

DISCUSSION

Inflammation is a defense reaction of the body to various attacks which can be of physical, chemical, biological or infectious origin causing an immune response. It results in a set of local and peripheral cellular and molecular reactions triggered from a focus in order to limit damage.[19] This involves prevention followed by repair necessary for the return of tissue function.[20]

Thus, for anti-inflammatory activity, TAESg at doses of 3.5; 17.5; 35 and 350 mg/kg bw significantly reduced edema induced by fresh egg albumin and carrageenan during preventive and curative studies in this experiment. The injection of these agents caused a maximum increase in the thickness of the paw of rats from the 1st hour for egg white albumin and at the 3rd hour for carrageenan. Indeed, the phlogogenic agent carrageenan of chemical origin causes a weak involvement of histamine or serotonin in the first phase and a strong involvement of kinins and prostaglandins in the second phase around 3 hours.[21] Thus, for anti-inflammatory activity, TAESg at doses of 3.5; 17.5; 35 and 350 mg/kg bw significantly reduced edema induced by fresh egg albumin and carrageenan during preventive and curative studies in this experiment. The injection of these agents caused a maximum increase in the thickness of the paw of rats from the 1st hour for egg white albumin and at the 3rd hour for carrageenan. Indeed, the phlogogenic agent carrageenan of chemical origin causes a weak involvement of histamine or serotonin in the first phase and a strong involvement of kinins and prostaglandins in the second phase around 3 hours.[21]

Albumin is a phlogogenic agent of biological origin, which leads in a first phase to the secretion of histamine and serotonin promoting vasodilation, plasma transudation and edema. In a second phase which extends beyond the 3rd hour, uses bradykinin as a mediator which increases vascular permeability before the biosynthesis of prostaglandins associated with leukocyte migration in the inflamed area.[22] TAESg reduced edema induced by fresh egg albumin. This suggests that TAESg could act on the release of histamine, serotonin and bradykinin. These results are similar to those of **Kouamé *et al***.[18] These authors showed that the aqueous extract of *Justicia flava* reduced the edema induced by fresh egg albumin by 61 % during the preventive study and by 29.62 % during the curative study compared to the control. Similarly, **Marref *et al.*** revealed that methanolic extract of *Gladiolus segetum* at 500 mg/kg bw inhibited egg-albumin edema by 52.67 % after 5 hour of experiment.[23]

CONCLUSION

At the end of this study, oral administration of the total aqueous extract of the stem bark of *Sacoglottis gabonensis* reduced the edema induced by fresh egg albumin and carrageenan. The extract has acute anti-inflammatory activity confirming its action during the inflammatory phase during the wound healing process.

However, more in-depth studies of this extract must be carried out on the analgesic and antipyretic power.

REFERENCES

1. Hotez PJ, Kamath A. Neglected tropical diseases in sub-saharan africa: review of their prevalence, distribution, and disease burden. PLoS Neglected Tropical Diseases, 2009; 3(8): 1-10.
2. Sopoh G, Asiedu K. Buruli ulcer in sub-saharan Africa. PLoS Neglected Tropical Diseases, Switzerland, Springer International, 2016; 15-43.
3. Zingue D, Bouam A, Tian RBD, Drancourt M. Buruli ulcer, a prototype for ecosystem-related infection, caused by *Mycobacterium ulcerans*. Clinical Microbiology Reviews, 2018; 31(1): 1-52.
4. PNLUB. Plan stratégique national de lutte contre l'ulcère de Buruli en Côte d'Ivoire 2007-2011. Programme National de Lutte contre l'Ulcère de Buruli, 2007; 69.
5. OMS. Réunion annuelle de l'initiative mondiale contre l'ulcère de Buruli. Organisation Mondiale de la Santé, Genève, Suisse, 2009; 161.
6. Adjet AA, Kouame D, Fokou G. Phytothérapie et lutte contre l'ulcère de Buruli dans le district sanitaire de Yamoussoukro (Côte d'Ivoire) : identification, description, fonction symbolique des plantes et recettes utilisées. Médecine et Santé Tropicale, 2016; 26: 408–413.
7. Huygen K, Adjei O, Affolabi D, Bretzel G, Demangel C, Fleischer B. Buruli ulcer disease: prospects for a vaccine. Medical Microbiology and Immunology, 2009; 198(2): 69-77.
8. Chauty A, Ardant MF, Adeye A, Euverte H, Guédénon A, Johnson C, Aubry J, Nuermberger E, Grosset J. Promising clinical efficacy of streptomycin-rifampin combination for treatment of Buruli ulcer (*Mycobacterium ulcerans* Disease). Antimicrobial Agents and Chemotherapy, 2007; 51(11): 4029-4035.
9. Aubry P, Gaüzère B. Ulcère de Buruli. Médecine Tropicale, 2015; 1-6.

10. Houngbédji GM, Bouchard P, Frenette. *Mycobacterium ulcerans*, infections cause progressive muscle atrophy and dysfunction and mycolactone impairs satellite cell proliferation. American Journal of Physiology-Regulatory, Integrative and Comparative Physiology, 2011; 300(3): 724-732.
11. Vangah OM, Kroa E, Zai LP. Recensement des tradipraticiens de santé, des pratiques, des pathologies et des plantes médicinales de Côte d'Ivoire. TV : Région des Lacs : départements de Toumodi, Yamoussoukro, Tiébissou et la sous-préfecture de Didiévi. Rapport Technique OMS-CI., 2000; 40.
12. Koné M, Vangah-Manda OM, Kouakou H, Yapo AP, Bléyéré NM, Datté YJ. Influence de *Sacoglottis gabonensis* (Baille) Urban et de *Okoubaka aubrevillei*. Normand et Pellegrin sur la croissance in vitro de *Mycobacterium ulcerans*. Médecine Afrique Noire, 2007; 54(11): 549-554.
13. Koné M., Bléyéré N.M., Yapo AP, Vangah MO, Ehile EE. Evaluation de la toxicité d'un extrait aqueux de *Sacoglottis gabonnensis* (Baille) Urban (Humiriaceae) chez les rongeurs, une plante utilisée dans le traitement de l'ulcère de Buruli en Côte d'Ivoire. International Journal of Biological and chemical Sciences, 2009; 3(6): 1286-1296.
14. Kouassi KB. Etude subchronique chez le rat Wistar albinos de l'extrait total aqueux des écorces de tige de *Sacoglottis gabonensis* (Baille) Urban (Humiriaceae) plante utilisée dans le traitement de l'ulcère de Buruli en Côte d'Ivoire. Thèse de Doctorat, Université Nangui Abrogoua, Côte d'Ivoire., 2018; 146.
15. Nagalo O, Koné M, Oussou NJ-B, Yapo AP. Healing activity of a total aqueous extract of *Scoglottis gabonensis* (Baille) Urban on induced wounds in Wistar rat. European Journal of Biomedical and Pharmaceutical Sciences, 2022; 9(5): 328-337.
16. Nagalo O, Koné M, Oussou NJ-B, Yapo AP. Hemostatic potential of total aqueous extract of *Sacoglottis gabonensis* (Baille) Urban (Humuriaceae) stam bark in Wistar rats pretreated with warfarin. Journal of Cellular and Molécular Physiology, 2022; 4(1): 211-219.
17. OCDE. Série sur les principes de bonnes pratiques de laboratoire et vérification du respect de ces principes. ENV/MC/CHEM, 1998; (98), (17): 22-23.
18. Kouamé DKW, Oussou NJ-B, Kouakou KL, Yapo AP. Analgesic and antipyretic effet of an aqueous extract of *Justicia flava* (FORSK) VAHL (Acanthaceae) in mice.World Journal of Pharmaceutical Research, 2021; 10(14): 1-15.

19. Viladomiu M, Hontecillas R, Bassaganya-riera J. Modulation of inflammation and immunity by dietary conjugated linoleic acid. European Journal of Pharmacology, 2016; 785: 87-95.
20. Raymondjean M. Les mécanismes de l'inflammation périphérique. Revue Francophone des Laboratoires, 2007; 389: 21-28.
21. Di Rosa M, Giroud JP, Willoughby DA. Studies of mediators of the acute inflammatory response induced in rtas in different sites by carrageenan and turpentine. The Journal of Pathology, 1971; 104(1): 15-29.
22. Barung EN, Dumanauw JM, Duri MF, Kalonio DE. Egg white-induced inflammation models : A study of edema profile and histological change of rat's paw. Journal of Advanced Pharmaceutical Technology and Research, 2021; 12(2): 109-112.
23. Mbaoji FN, Onwuka AM, Onu S, Peter IE, Nweze JA, Okonta LE. Evaluation of methanol-dichloromethane extract of *Stemonocoleus micranthus* (Fabaceae) stem bark for anti-inflammatory and immunomodulatory activities. Evidence-Based Complementary and Alternative Medecine, 2020; 6: 1-10.
24. Marref SE, Benkiki N, Melakhessou MA, Bouzidi S. Acute toxicity, anti-ulcer and anti-inflammatory effects of methanol extract of *Gladiolus segetum* in rat. Pharmacognosy Journal, 2018; 10(4): 758-762.