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ANTIINFLAMMATORY AND ANALGESIC ACTIVITIES OF *FICUS THONNINGII* AND *PSEUDOCEDRELA KOTSCHYI* EXTRACTS

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Abstract

Anti-inflammatory and analgesic studies were conducted on rats and mice using ethanolic extracts of the leaves of *Ficus thonningii* and stem bark of *Pseudocedrela kotschyi* using egg white induce inflammation, hot plate and writhing tests method. The ethanolic extracts of both plants inhibited egg-albumin induced edema, pain induced by hot plate and acetic acid induced writhing. *Ficus thonningii* and *Pseudocedrela kotschyi* significantly alter the stay time of the rats on hot plate with *Pseudocedrela kotschyi* showing a higher activity. Both plants extracts show analgesic activity in the acetic acid induced writhing (chemical method) with *Pseudocedrela kotschyi* showing a higher activity. Intraperitoneal LD₅₀ were 7g/kg and 1.5g/kg for *Ficus thonningii* and *Pseudocedrela kotschyi* respectively and preliminary phytochemical screening revealed the presence of glycosides, flavonoids, tannins and alkaloids in both extracts. These results suggest that these plants possess analgesic and anti-inflammatory properties for which they are used by traditional healers.

Keywords: Medicinal plants; Anti-inflammatory; Analgesic; Writhing test.

INTRODUCTION

Ficus thonningii Blume (Moraceae) is used as medicinal plant in Northern and southern Nigeria. It is found in Nigeria, Sierra Leone, Togo, Liberia and Ivory Coast. In Northern Nigeria it is called che'diya (Hausa), Southern Nigeria it is called yorodun. In the natural state it commences as an epiphyte and it is generally propagated by stake which grow rapidly. *Ficus thonningii* is a sacred or emblematic tree amongst several tribes in northern Nigeria. The Chawai (a tribe in Zaria, Nigeria) before a hunt set the bush on fire by the ritual method of drilling two pieces of che'diya stick, (Dalziel, J. M. 1936). The bark in decoction or infusion is used for sore throat and colds. In northern Nigeria, it is

used to cure pain associated with fever and for treating wounds.

Pseudocedrela kotschyi Harm (Meliaceae) is used in Northern Nigeria for rheumatism and general body pain by traditional healers. In Northern Nigeria it is called tonas and in Southern Nigeria it is called emi-gbegbi. The woody part of the plant is used in furniture and drum making (especially talking drums), mortars and bowls, barrels and canoes are also made from it (Dalziel, J. M. 1936). *Pseudocedrela kotschyi* root and leaves are used medicinally. In French Sudan Chevalier states the leaves are boiled and rubbed on the skin for the treatment of smallpox. The bark is bitter and exudes a dark-colored gum. In Togo, it is given as infusions for gastrointestinal, febrile

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and rheumatic conditions, and a decoction is used as a wash for body ulcers. In Northern Nigeria it is used as an occasional ingredient in arrow poison. In this study, the anti-inflammatory and analgesic activities of these plants have been studied using different methods.

MATERIALS AND METHODS

Materials. *Ficus thonningii* and *Pseudocedrela kotschy* leaves and stem bark respectively were collected from Babale, Jos, Plateau State, Nigeria in April and May 2002. They were authenticated by a taxonomist of the federal college of forestry, Jos; Specimen of the herbarium was deposited in the federal college of forestry, Jos.

100g of air dried and powdered leaves of *Ficus thonningii* and stem bark of *Pseudocedrela kotschy* respectively were Soxhlet extracted with water for 72 hours. The resultant extracts were vaporized and the resultant residue refrigerated at -4°C until use. The yields were 12.31g (12.31%) and 38.78g (38.79%) for *Ficus thonningii* and *Pseudocedrela kotschy* respectively of the solid residue. 100% Acetic acid (B.D.H chemicals, England), Egg-albumin (from local market), vernier caliper, hot plate, stock of the extract and distilled water were used for the experiment.

Animals: Albino mice of either sex (weighing 15- 25g) and albino rats of either sex (weighing 120-200g) were used. The animals were bred and housed under standard environmental conditions in the University of Jos Animal House, and fed with standard diet and water ad libitum.

Acute toxicity: The LD_{50} values of the extracts were determined in mice ip. as described by Lorke (1983).

Test for Anti-inflammatory Activity.

Increases in the rat hind paw linear circumference induced by subplantar injection of a phlogistic agent were used as the measure of acute inflammation (Winner et al 1962).

The phlogistic agent employed in this study was fresh egg-albumin. The animals were deprived of water and food during the experiment. Inflammation of the hind paw was induced by injecting 0.1ml of fresh egg-albumin into the sub plantar surface of the right hind paw. Edema was assessed in terms of the difference in zero time linear circumference at the injected paw and its circumference 1 hour, 2 hour, and 3 hours intervals after egg-albumin injection. (Hess and Mitong, 1972). For routine drug testing, the increase in paw circumference after administration of the phlogistic agent was adopted as a measure of effect. (Winner et al. 1962).

Ficus thonningii (500mg and 1000mg) or *Pseudocedrela kotschy* (300mg and 600mg) were administered ip. 30 min. prior to egg- white administration. Control rats received an equal volume of the vehicle. Increases in linear paw circumference were taken as an index of increase in paw volume, which is a measure of edema.

Test for analgesic activity

1. Writhing test in mice: Three groups of eight mice each were injected (ip.) with 0.1ml of 1% acetic acid. One group received vehicle and the other two groups received *Ficus thonningii* extract (500mg and 1000mg/kg ip.) 30 minutes prior to acetic acid. The numbers of writhing movement were counted for 15 minutes. Percentage inhibition of writhing movement was calculated. The above procedure was repeated for *Pseudocedrela kotschy* extract at doses of 300mg and 600mg/kg (ip.).

2. Hot plate test: Rats were kept on a hot plate maintained at a constant temperature of $55 \pm 1^{\circ}\text{C}$. The time taken for either paw licking or jumping was recorded, (Elizabeth et al, 1996). Rats were divided into three groups. While one group served as control and received the vehicle, the other groups received *Ficus thonningii* extract at doses of 500mg and 1000mg/kg (ip.) 30 minutes prior

to placement on the hot plate. The above procedure was repeated for *Pseudocedrela kotschyi* extract at doses of 300mg and 600mg/kg (ip.).

RESULTS AND DISCUSSION

Intra-peritoneal LD₅₀ were 7g/kg and 1.5g/kg for *Ficus thonningii* and *Pseudocedrela kotschyi* respectively.

Anti-inflammatory activity. Fresh egg-albumin caused an increase in the rat paw circumference in the control rats. Maximum swelling (edema) was about 120min. The extract showed good anti-inflammatory activity against acute inflammation. (Table 1 & 2). On the average, *Pseudocedrela kotschyi* extract exhibited more potency. Both extracts

suppressed the increase in the rat paw edema. The inhibition was significant ($p < 0.05$) 1h after the injection of phlogistic agent, *Pseudocedrela kotschyi* did not show significant inhibition at 300mg/kg. (Tables 1 & 2).

Analgesic activity.

Table 3 and 4 show the analgesic activity of the extracts. The results indicate that both extracts have analgesic activity.

Results are presented as means \pm SEM and differences were analyzed using Student's t-test and p values less than 0.05 were considered significant (Snedecor, and Cochran, 1967).

Table 1: Effect of extracts on paw circumference.

Extract	Dose (mg/kg)	Average inflammation (Paw circumference) mm \pm SEM					
		1 h	Inh. (1 h)	2 h	Inh. (2 h)	3 h	Inh. (3 h)
<i>Ficus thonningii</i>	Control	3.40 \pm 0.50		4.22 \pm 0.61		3.78 \pm 0.42	
	500	2.32 \pm 0.13	1.08	1.87 \pm 0.15	2.35	1.33 \pm 0.21	2.45
	1000	1.93 \pm 0.18	1.47	1.42 \pm 0.13	2.80	0.93 \pm 0.31	2.85
<i>Pseudocedrela kotschyi</i>	Control	3.40 \pm 0.50		4.22 \pm 0.61		3.78 \pm 0.42	
	300	3.30 \pm 0.17	0.38	3.15 \pm 0.29	0.72	2.62 \pm 0.02	0.91
	600	1.93 \pm 0.12	1.47	1.30 \pm 0.09	2.92	1.31 \pm 0.08	2.47

Table 2: Percent inhibition of edema by extract.

Extract	Dose (mg/kg)	Time (h)		
		1 h	2 h	3 h
<i>Ficus thonningii</i>	500	32	56	65
	1000	43	66	75
<i>Pseudocedrela kotschyi</i>	300	11	17	24
	600	43	69	65

Table 3: Effect of ethanolic extracts of *Pseudocedrela kotschyi* and *Ficus thonningii* on acetic acid- induced writhing

Treatment	n	Dose (mg/kg, i.p)	Number of writhing	Inhibition (%)
Control	8	-	52.25 \pm 2.53	-
<i>F. thonningii</i>	8	500	15.00 \pm 1.29*	71.3
	8	1,000	5.50 \pm 1.55*	89.5
<i>P. kotschyi</i>	8	300	13.33 \pm 0.42 *	74.5
	8	600	4.00 \pm 0.58*	92.3

Values are mean \pm S. E. M., * $P < 0.05$ vs. control, student's t-test.

Table 4: Antinociceptive effects of ethanolic extracts of *Pseudocedrela kotschy* and *Ficus thonningii* in the hot-plate test

Treatment	n	Dose (mg/kg i.p)	Latency (S)
Control	8	-	1.50 ± 0.29
<i>F. thonningii</i>	6	500	6.50 ± 0.65
	8	1,000	6.75 ± 0.48
<i>P. kotschy</i>	8	300	3.52 ± 0.41
	6	600	9.33 ± 1.20

Acute toxicity studies in mice revealed that the intra-peritoneal LD₅₀ were 7g/kg and 1.5g/kg for *Ficus thonningii* and *Pseudocedrela kotschy* ethanol extracts respectively. The *Pseudocedrela kotschy* extract can be said to be slightly toxic in mice from the results above.

Extracts of *Pseudocedrela kotschy* and *Ficus thonningii* also demonstrated both anti-inflammatory and analgesic activities.

Ethanolic extracts of *Ficus thonningii* and *Pseudocedrela kotschy* leaves and stem bark respectively inhibited egg-albumin induced rat paw edema. Both extracts shows a dose and time-dependent inhibition of the egg white induced paw edema (table 1 and 2). At time interval of 1 hours both extracts produced significant inhibition ($p < 0.05$) of the egg-albumin induced edema.

Ethanolic extract *Ficus thonningii* leaves at doses of 500 and 1,000mg/kg (i.p) reduced acetic acid-induced writhing in mice (Table 4) with a percentage inhibition of 71.3% and 89.5% respectively. Both extracts exhibited significant analgesic activity when tested using the hot plate method.

Ethanolic *Pseudocedrela kotschy* stem bark, at dose of 300mg and 600mg/kg (i.p) produces a significant anti-nociception in both chemical and thermal tests (table 3 and 4). The percentage inhibitions of acetic acid-

induce writhing in mice at dose levels of 300 and 600 mg/kg are 74.5% and 92.3% respectively.

This may also explain the claim by the traditional healers that the plants have the potential to relief pain.

The present study revealed that the ethanolic extracts of *Ficus thonningii* and *Pseudocedrela kotschy* leaves and stem bark respectively have anti-inflammatory and analgesic activity in experimental animals. The overall results of this study confirm the traditional uses of these plants.

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