African Journal of Pharmacy and Pharmacology Vol. 3(12). pp. 651-653, December, 2009
Available online http://www.academicjournals.org/ajpp
ISSN 1996-0816 © 2009 Academic Journals

Short Communication

Analgesic and anti-inflammatory activity of aqueous root extract of *Cassia sieberiana* D. C. (Caesalpiniaceae)

Guata Yoro Sy[1]*, Alioune Dior Fall[2], William Diatta[2], Malick Gueye[2], Khady Badji[2], Emmanuel Bassène[2] and Babacar Faye[1]

[1]Laboratoire de Pharmacologie, Faculté de Médecine, de Pharmacie et d'Odonto-Stomatologie, Université Cheikh Anta Diop de Dakar, BP 5005, Dakar-Sénégal.
[2]Laboratoire de Pharmacognosie et Botanique, Faculté de Médecine, de Pharmacie et d'Odonto-Stomatologie, Université Cheikh Anta Diop de Dakar, BP 5005, Dakar-Sénégal.

Accepted 19 November, 2009

The analgesic and anti-inflammatory activity of *Cassia sieberiana* roots were investigated. Analgesic activity had been investigated using acetic acid induced contortions in mice. The aqueous root extract of *C. sieberiana* at 300 mg/kg per os showed similar analgesic activity than 100 mg/kg of acetylsalicylic acid (20 ± 1.14 vs 26 ± 1.79 contortions) (ns, $p < 0.05$). In rat paw oedema model, *C. sieberiana* aqueous root extract significantly decreased carrageenan-induced oedema. These results showed that aqueous root extract of *C. sieberiana* possessed both analgesic and anti-inflammatory activities, which have justified their use in Senegal traditional medicine to treat pain and inflammation.

Key words: *Cassia sieberiana*, pain, inflammation, phytotherapy.

INTRODUCTION

Cassia sieberiana D.C. (Caesalpiniaceae) is a common tree in Senegal to Nigeria. It is also found in East Africa. The phytochemical analysis of the roots had shown the presence of flavonoids, anthracenic derivates and non hydrolysable tannins (Kerharo, 1974).

Previous studies showed that ethanolic root extract of *C. sieberiana* had an antiparasitic effect, myorelaxant and antispasmodic activity (Fall et al., 2005). It was also shown that *C. sieberiana* extracts had antimicrobial activity against *Neisseria gonorrhoeae, Herpes simplex virus* type I and African swine fever virus (Silva et al., 1997a, b).

In Senegal, the aqueous root extract of *C. sieberiana* was used in traditional medicine to treat pain and inflammation (Kerharo, 1974).

The objective of this study was to assess the analgesic and anti-inflammatory activity of *C. sieberiana* aqueous root extract, in experimental *in vivo* pain and inflammation models.

*Corresponding author. E-mail: guatayoro_sy@yahoo.fr. Tel: 00221 76 596 01 68.

EXPERIMENTAL

Plant material

Fresh roots of *C. sieberiana* were collected in January (2007) from Ziguinchor in Senegal. Botanical samples were identified at the Department of Botany and Pharmacognosy, Faculty of Medicine and Pharmacy, University of Dakar, where the voucher specimen (DPB-07-01) was deposited. The roots were sliced into small pieces and dried at room temperature for two weeks.

Extraction

The roots were powdered (150.0 g) and extracted with 2.0 L of distillated water as a decoction for 1 h and filtered. The extractive was concentrated *in vacuo* and a dried extract was obtained after one week in a desiccator, yielding (23.7 g, 15.8%) of extract.

Animals

Swiss albino mices weighting 20 - 30 g were used for the writhing test essay. The anti-inflammatory activity was done using male wistar rats weighting 160 - 170 g. The animals had free access to food and water. They were housed under standard environmental Conditions on a 12/12 h light/dark cycle.

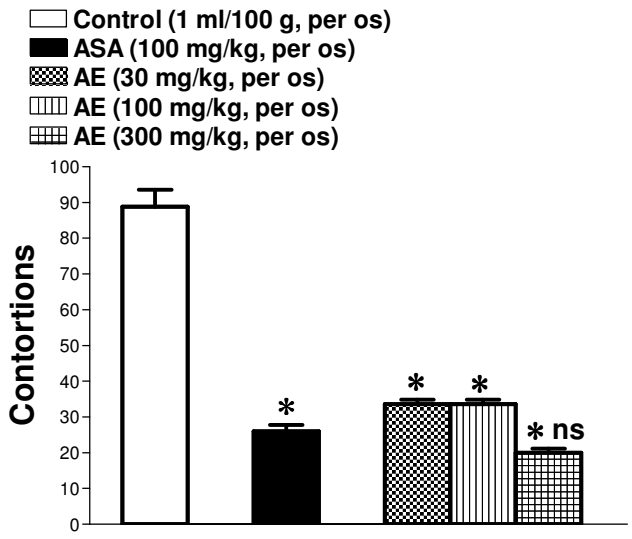

Figure 1. Effect of aqueous root extract of *Cassia sieberiana* on contortions induced with acetic acid 1% in mice. AE : aqueous extract, ASA : acetylsalicylic acid. ∗p < 0.05 vs control. ns: non significant vs ASA, n = 5.

Experimental procedures

Analgesic activity: The writhing test in mice was used. Contortions were induced by intraperitoneal injection of acetic acid 3%. The animals were divided in groups of 5 mices each. Different doses (30, 100, 300 mg/kg) of aqueous root extract (AE) of *C. sieberiana*, acetylsalicylic acid (ASA, 100 mg/kg) and physiological water (PW, 1 ml/100 g) were administered orally to groups, two hours prior acetic acid injection. The total number of contortions was counted at observation time of 30 min.

Anti-inflammatory activity: The rat paw oedema was induced with carrageenan 1%. The rats were distributed in groups of 5 and fasted 14 h before the experiment, with free access to water. The initial volume of right hind paw was measured using a plethysmometre.

The materials AE (30, 100, 300 mg/kg), ASA (100 mg/kg) and vehicle (1 ml / 100 g) were given orally to different groups, one hour prior to the local injection of carrageenan 1% into the plantar aponeurosis. The volume of rat hind paw was measured during 6 h, the percentages of increase (INC) of rat hind paw were determined.

$\% \text{ INC} = (VT_{minutes} - Vo) \times 100/Vo$

$VT_{minutes}$: rat hind paw volume at $T_{minutes}$; Vo: initial volume of rat hind paw

Statistical analysis

The means of contortions in treated groups were compared to control with Scheffer's test. A value of $p < 0.05$ had been considered as significant and n = 5 represent the number of mices in each group. The means of rat hind paw volumes were compared by an analysis of variance (ANOVA), in order to prove homogeneity between groups. The means of percentages of rat hind paw oedema variations at the 3rd and 6th h were also compared to control group with Ki-2 test. A value of $p < 0.05$ had been considered as significant and n = 5 represent the number of rats in each group.

RESULTS AND DISCUSSION

Intraperitoneal acetic acid 3% induced contortions (88.8 ± 4.7) ($p < 0.05$, n = 5) in mice which were treated with vehicle per os. Pre-treatment with acetylsalicylic acid (100 mg/kg, per os) prevented significantly the writhes induced with acetic acid, compared to control group (88.8 ± 4.7 vs 26 ± 1.8) ($p < 0.05$). Prior administration of *C. sieberiana* aqueous root extract dose dependently prevented the number of contortions, suggesting an analgesic effect of this plant root which has justified their folkloric use in Senegal for the treatment of pain. In fact, at 300 mg/kg *per os*, the analgesic activity of the extract was similar to the one observed with 100 mg/kg of acetylsalicylic acid administered in the same conditions (26 ± 1.79 contortions vs 20 ± 1.14 contortions) (ns, n = 5) (Figure 1). Several non-steroidal anti-inflammatory drugs such as acetylsalicylic acid inhibit active sites of cyclooxygenase-1 (COX-1) and cyclooxygenase-2 (COX-2). The constitutively expressed COX-1 isoform generally provides for homeostasis. The COX-2 isoform is inducible, and generally produces prostanoids that mediate pain, fever, and inflammation processes (Smith et al., 2000). This suggests the important role of COX-2 inhibition in the management of acute pain processes. In traditional medicine, many plant extracts possess both analgesic and anti-inflammatory properties; their mechanism of action involves COX 2 inhibition (Morteza-Semnani, 2002). It was also known that certain molecules which have flavonoidic, alkaloidic or tannic structure had an anti-inflammatory activity (Mavar-Manga, 2004, 2006). The aqueous root extract of *C. sieberiana has been* used in traditional medicine for the treatment of both pain and inflammation (Kerharo, 1974). Its analgesic and anti-inflammatory effects may involve COX-2 inhibition by flavonoidic or tannic compounds. In this study, in the control group, carrageenan 1 % administration induced a significant increase of rat paw oedema volume in 6 hours (1.77 ± 0.7 ml vs 0.938 ± 0.05 ml) ($p < 0.05$, n = 5). The percentage of variations of oedema was respectively 55.36 ± 7.34, 89.73 ± 7.50% in 3 and 6 hours. Pre-treatment with acetylsalicylic acid (100 mg/kg per os), significantly prevented the acute rat paw oedema induced by carrageenan 1%. At 30 and 100 mg/kg per os, oral administration of the extract, significantly prevented the rat paw oedema. The percentage of variations of rat paw oedema was respectively 37.12 ± 4.10 and 16.48 ± 5.86% in 3 h; 56, 11 ± 5.85 and 46.62 ± 8.22% in 6 h, compared to the control group (Table 1). However, anti-inflammatory effect of the extract was less potent than its analgesic activity. The roots of *C. sieberiana* were found to contain flavonoids and tannins which were extracted into aqueous solution. Some phytochemical compounds such as flavonoid groups may prevent or suppress

Table 1. Percentage of variations of rat paw oedema in groups treated with *Cassia sieberiana* aqueous root extract or acetylsalicylic acid.

Time (h) / Groups	$T_{2\ hours}$	$T_{3\ hours}$	$T_{4\ hours}$	$T_{5\ hours}$	$T_{6\ hours}$
Control group	37.858 ± 5,55	55.36 ± 7,34	63.714 ± 8,30	75.925 ± 7,99	89.734 ± 7,50
AE (30 mg/kg)	18.598 ± 5,12	3.12 ± 4,10*	44.283 ± 3,89	53.250 ± 4,69	56.113 ± 5,85*
AE (100 mg/kg)	13.253 ± 3,01	16.485 ± 5,86*	18.748 ± 6,76	28.925 ± 7,31	46.623 ± 8,22*
AE (300 mg/kg)	21.203 ± 0,41	25.527 ± 0,90*	34.56 ± 0,96	42.621 ± 1,39	50.857 ± 2,20*
ASA (100 mg/kg)	6.49 ± 1,25	4.06 ± 1,59*	7.04 ± 1,47	9.28 ± 1,59	16.42 ± 3,17*

inflammatory process. It was shown that *Taraxacum officinale* flavonoid compounds suppressed nitric oxide (NO) and prostaglandins E_2. This effect is attributed to the suppression of inducible nitric oxide synthase (iNOS) and COX_2 (Hu and Kitts, 2004). The *in vitro* anti-inflammatory activity of flavones isolated from *Siegesbeckia glabrescens* was recently described (Kim et al., 2008a). As well, Kim et al. (2008b) had shown implication of bioflavonoids in anti-inflammatory action. The roots of *C. sieberiana* which contain flavonoids and tannins, may involve similar mechanism to prevent both pain and inflammation, justifying their current use in Senegal traditional medicine.

REFERENCES

Fall AD, Diatta W, Sy GY, Lo M, Bassène E, Faye B (2005). Activité myorelaxante et antispasmodique des fractions de l'extrait total éthanolique de racines de *Cassia sieberiana* D.C. (*Caesalpiniaceae*) sur l'intestin isolé de rat. Dakar Méd. 50(3): 132-135.

Hu C, Kitts DD (2004). Luteolin and luteolin-7-O- from dandelion flower suppress iNOS and COX 2 in Raw 264.7 cells. Mol. Cell. Biochem. 265: 107-113.

Kerharo-Adam JG (1974). Pharmacopée sénégalaise traditionnelle, plantes médicinales et toxiques. Vigot et Frères; Paris p. 1011.

Kim HP, Park H, Son KH, Chang HW, Kang SS (2008b). Biochemical pharmacology of bioflavonoïds: Implication in the anti-inflammatory action. Arch. Pharm. Res. 31(3): 265-273.

Kim JY, Lim HJ, Ryu JH (2008a). *In vitro* anti-inflammatory activity of 3-O- methyl-flavones isolated from *Siegesbeckia glabrescens*. Bioorg. Med. Chem. Lett. 18(14): 1511-1514.

Mavar-Manga H, Brkic D, Marie DEP, Quetin-Leclercq J (2004). *In vivo* anti-inflammatory activity of *Alchornea cordifolia* Müll. Arg. (Euphorbiaceae). J. Ethnopharmacol. 92: 209-214.

Mavar-Manga H, Chapon D, Hoet S, Block S, De Pauw-Gillet MC, Quetin-Leclercq J (2006). N1, N2, N3 triisisopentenyl guanidine and N1, N2 diisopentenyl guanidine, two cytotoxic alkaloids from *Alkornea cordifolia* Müll. Arg. (Euphorbiaceae) root bark. Nat. Prod. Comm. 12: 1097-1100.

Morteza – Semnani K, Saeedi M, Hamidian M, Vafmehr-Dehpour AR (2002). Anti-inflammatory, analgesic activity and acute toxicity of *Glaucium grandiflorum* extract. J. Ethnopharmacol. 80: 181-186.

Silva O, Barboza S, Diniz A, Valdeira L, Gomes E (1997). Plant extracts antiviral activity against Herpes simplex virus type I and African swine fever virus. Int. J. Pharm. 35(1): 12-16.

Silva O, Ferreira E, Vaz-Pato M, Gomes E (1997). Guinea-Bissau's plants: *in vitro* susceptibility studies on *Neisseria gonorrhoeae.* Int. J. Pharm. 35(5): 323-328.

Smith WL, DeWitt DL, Garavito RM (2000). Cyclooxygenases: structural, cellular and molecular biology. Ann. Rev. Biochem. 69: 145-182.