PharmacologyOnLine
April 30, 2012
Special ISSUE • 2012 • vol.1 • 22 - 26

Gastrointestinal property of *Serjania caracasana* (Jacq.) Willd. (Sapindaceae) on rats

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Abstract

Serjania caracasana is known as "tingui-da-mata" and is found mainly in Cerrado biome (Brazil). Gastroprotective effect has already been reported for *S. erecta*, thus the aim of this study was to investigate the effects of the ethanol crude extract from the aerial parts of *S. caracasana* (Sc-EtOH) on ulcer ethanol-induced in rats and on *in vitro* rat ileum contractile response. The Sc-EtOH (50, 150 or 500 mg/kg, o.r.) induced a dose-dependent (UA= 1.11.1; 0.60.5; 0.020.02 cm^2, respectively) and significant protection effect ($p < 0.01$) similar to those induced by ranitidine (UA= 1.20.4 cm^2), all were observed compared with the control (UA= 5.5±0.8 cm^2). Sc-EtOH, in 243 or 500 µg/mL, inhibited in a potentially and concentration-non-dependent way the ileum pre-contracted by KCl (Emax= 49.77.5 and 66.38.3%, respectively). These results demonstrate that the aerial parts from *S. caracasana* have gastrointestinal activity both *in vivo* and *in vitro*.

Key words: Serjania caracasana; gastric ulcer; antispasmodic; rat ileum.

Introduction

The *Serjania* genus (Sapindaceae) has 226 species [1] which are found mainly in Cerrado biome (Brazil) [2]. Pharmacological activities have been reported for *Serjania* species such as gastroprotective and anti-inflammatory effects for *S. erecta* [3,4], antioxidant for *S. glabrata* [5], antileishmanial, antibacterial and anti-inflammatory for *S. lethalis* [6-8] and analgesic for *S. communis* [9].

Serjania caracasana (Jacq.) Willd. is known as "tingui-da-mata" and is found in Rio Grande do Sul, Paraná and Mato Grosso (Brazilian federal states) [2]. It is used to make baskets and rustic strings, apiarian, ornamental stuff [2]. It is toxic for fish due to its saponins content [10-13].

Gastric hyperactivity and gastroduodenal ulcers are common problems that are spread all over the world involving great number of people [14]. The conventional medicine treatment have promoted many side effects [15,16]. Thus, we investigated the effects of the ethanol crude extract from the aerial parts of *S. caracasana* on ulcer ethanol-induced in rats and on *in vitro* contractions of rat ileum.

Methods

Plant material and preparation of extract: Aerial parts from *S. caracasana* were macerated on ethanol followed by its concentration and evaporation resulting a crude ethanol extract (Sc-EtOH). This procedure was realized by MsC. Fabiana L. Silva supervised by Dr. José M. Barbosa Filho, in Laboratório de Tecnologia Farmacêutica of the Universidade Federal da Paraíba. The extract was dissolved in cremofor (3%) and diluted in MiliQ water to obtain store solution (10mg/mL) when was used *in vitro* experiments. Or it was dissolved in TWEN-20 (0.32mg/mL) and diluted in distilled water to obtain doses used *in vivo* experiments.

Animals: 20 male Wistar rats (250-300g) were housed into groups of five under standard laboratory conditions at temperature (22 ± 1°C) in a 12 h light–dark cycle with free access to food and water. The experiments were performed during the light portion (8-17h) of the light-diary cycle. The research procedures *in vitro* were approved by the Ethics Committee in Research of Universidade Federal de São Paulo (CEP 0038/10) and *in vivo* by Ethics Committee in the Animal Use of Universidade Nove de Julho (AN 0002/11).

Preparation *in vivo*: After 24h fasting, rats received ethanol 95% (1mL/animal, v.o.) and after 1h were divided in three groups (n = 3): control (vehicle 10mL/kg, r.o.); Sc□EtOH (extract 50, 150 or 500mg/kg, r.o.); control positive (ranitidine 50mg/kg, i.p.). Following 1 hour of the treatments, all animals were euthanized in a CO_2 chamber, their stomachs removed and opened along the greater curvature. The ulcer area (UA) of each animal was calculated [17].

Preparation *in vivo*: Ileum strips were isolated from rats [18] and suspended glass cube bath (5mL) containing modified saline solution. The Krebs physiological composition was (mM): NaCl 117,0; KCl 4,7; $NaH_2HPO_4.H_2O$ 1,2; $MgSO_4.7H_2O$ 1,3; $CaCl_2.2H_2O$ 2,5; $NaHCO_3$ 25,0; glicose 11,0; pH 7.4 [19]. Tissues were maintained under 1g tension, bubbled continuously with O_2 at 37°C. The tissues were attached to force isometric transducers which were connected to a data system AQCD (AVS Projetos, Brazil). The contractions were induced by KCl (40mM) in the absence (control) or after 15 min. pre-treatment of the tissues with the Sc-EtOH (27, 81, 243 or 500 µg/mL). E_{max} values were obtained from the percentage of the contraction in absence (control) or presence of the extract.

Drugs and chemicals: Ranitidine was purchased from Farmapex (Brazil). TWEN-20 was purchased from Neon Comercial Ltda (Brazil). Calcium chloride bihydrate ($CaCl_2.2H_2O$), sodium chloride (NaCl), glucose, potassium chloride (KCl), sodium bicarbonate ($NaHCO_3$), monosodium phosphate-1-hydrate ($NaH_2PO_4.H_2O$), magnesium sulphate hepthydrate ($MgSO_4.7H_2O$) and ethanol PA were purchased from Merck (USA).

Statistical analyses: All data are represented as mean ± S.E.M. values and were performed using the

GraphPad Prism 5.0 software. One-way ANOVA followed by Bonferroni´s Multiple Comparison Test was done and the level of statistical significance adopted was $p < 0.05$.

Results

The ulcer control group exhibited severe mucosal injury (Fig. 1A), although pre-treatment with Sc-EtOH (50, 150 or 500 mg/kg, o.r.) protected gastric mucosal injury (Figure 1B, C and D, respectively). The protection was significant, dose-dependent (UA= 1.1 1.1; 0.6 0.5; 0.02 0.02 cm^2, respectively) and as efficient as ranitidine (UA= 1.2 0.4 cm^2) in comparison with the control (UA= 5.5 ± 0.8 cm^2) (Figure 2).

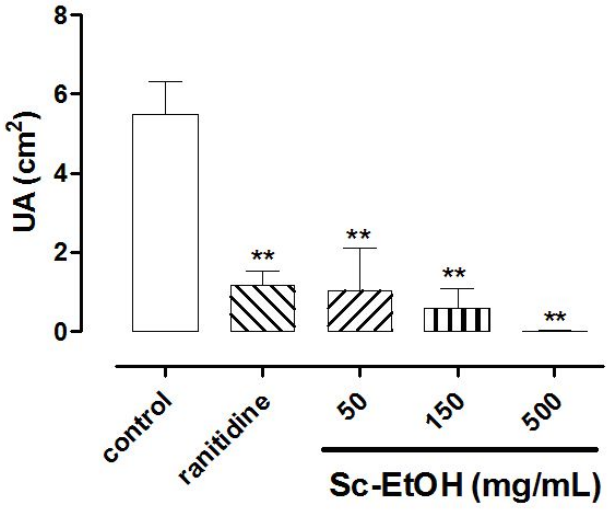

Figure 2. Effect of Sc-EtOH on the gastric mucosal injury induced by ethanol in rats (n = 3). One-way ANOVA following Bonferroni´s: **p<0.01 (ethanol x treatment).

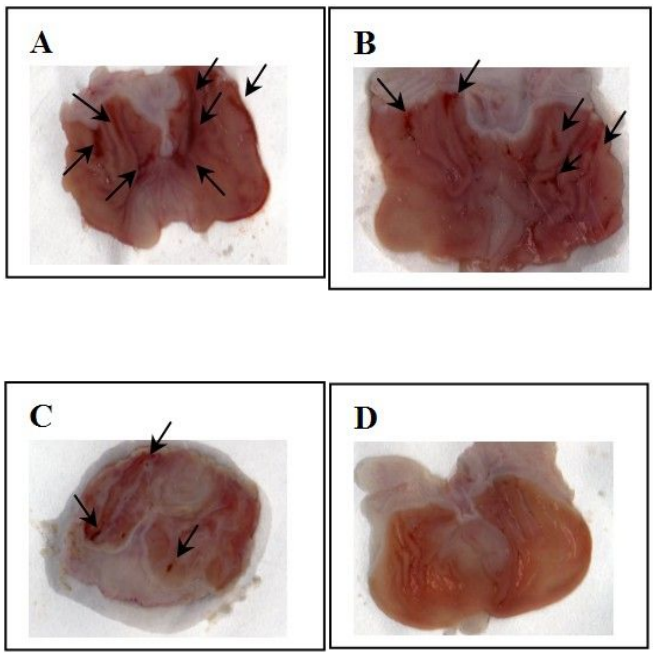

Figure 1. Digitalized image views from rat stomach treated with: ethanol (A); Sc-EtOH [50 mg/Kg (B); 150 mg/Kg (C); 500 mg/Kg (D)] + ethanol. Legend: arrow = lesion.

Significant inhibition of KCl– pre-contracted ileum were observed only in the presence of 81, 243 or 500 µg/mL Sc⍰EtOH (E_{max}= 46.3 0.3, 49.77.5 and 66.38.3%, respectively) (Fig. 3). This inhibition was independent of Sc-EtOH concentration as no significant difference was detected between the effects caused 81, 243 or 500 µg/mL.

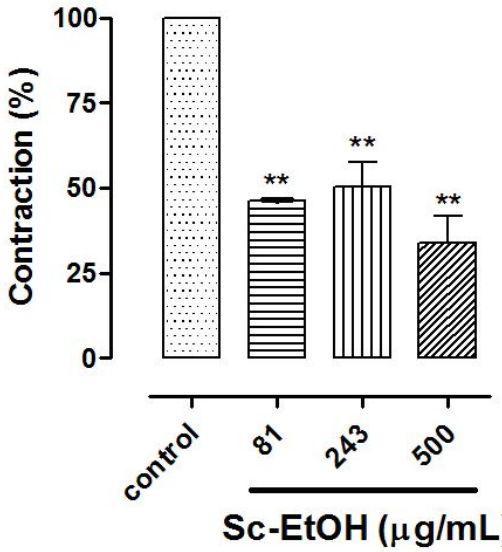

Figure 3. Effect of Sc-EtOH on pre-contracted ileum by KCl 60mM (n = 3). One-way ANOVA followed Bonferroni´s: **p<0.01 (control x Sc-EtOH).

Discussion

In the present study, the crude ethanol extract from *Serjania caracasana* showed gastroprotective and anti-spasmodic effects on rats

Gastric ulcers are usually caused due to mismatch between protective mechanisms and aggressive mucosal factors [20].

In the stomach, the main protection barrier is constituted by epithelial cells and the continuous secretion of ion bicarbonate by the mucosa layer [21]. The gastric damage induced by ethanol involves reduction in the gastric defensive mechanisms such as mucus production, blood flux, bicarbonate secretion, endogenous glutathione and prostaglandin decreases [22,23].

Serjania glabrata, *Serjania lethalis* and *Serjania erecta* have been reported to have antioxidant, anti-inflammatory and gastroprotective activities, respectively [5,8,3,4]. We now demonstrated that *Serjania caracasana* (Sc-EtOH) protected gastric mucosal (Figure 1 and 2), thus suggesting that it contain protective constituents such as terpenes and saponins in Sapindaceae [12,13,24,25].

Motility gastrointestinal modulators such as prostaglandins and atropine are related to decrease motility and healing of gastric ulcer [26-30]. As *Serjania caracasana* (Sc-EtOH) was able to inhibit the rat ileum pre-contracted with KCl 60mM (Figure 3), a depolarized agent contractile, it is concluded that this antispasmodic *in vitro* effect supports the *in vivo* gastroprotection of the plant extract.

Conclusion, ethanol extract obtained from the aerial parts of *Serjania caracasana* promote gastrointestinal effects, the principle actives responsible for that must be identified in the future.

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