



## Gastroprotective Effect of Medicinal Plants from Chapada do Araripe, Brazil

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### ABSTRACT

Gastric ulcer is a serious gastrointestinal disorder that requires a well targeted therapeutic strategy. A number of drugs are available for the treatment of gastric ulcer, but clinical evaluation has shown incidence of relapses, side effects, and drug interactions. The search for novel molecules has been extended to herbal drugs that offer better protection and decreased relapse. The essential oils from *Croton zehntneri* (EOCZ) and *Vanillosmopsis arborea* (EOVA), the oil from *Caryocar coriaceum* pulp (OCC), the latex from *Himatanthus drasticus* (LHD), and the extract from *Stryphnodendron rotundifolium* (ESR) obtained from Chapada do Araripe, Ceará (Brazil) have been evaluated for cytoprotective activity on ethanol-induced ulcer formation in mice. EOCZ, EOVA, OCC, and ESR were administrated by gavage at doses of 200 and 400 mg/kg and LDH, by the same way, at 0.2 and 0.4 mL/animal (n=8). Following 60 min, mice were given 0.2 mL of ethanol (96%) by gavage. Thirty minutes after the administration of ethanol, all groups were sacrificed and the gastric ulcer index was calculated by planimetry. Preliminary results suggest that all the plants tested showed significant activity. EOVA (6.47±1.91%\*), OCC (8.86±2.45%\*) and ESR (1.50±0.30%\*\*\*) were the most active. Data are expressed as mean±s.e.m. of the lesioned area (%) and were analyzed by ANOVA and Student-Newman-Keul's test (\*P<0.05 and \*\*P<0.01 vs. control). Phytochemical screening showed the presence of tannins, terpenes, and essential fatty acids, thus suggesting that these substances may be involved in the observed antiulcer activity.

**Key words:** *Croton zehntneri*, *Vanillosmopsis arborea*, *Caryocar coriaceum*, *Himatanthus drasticus*, *Stryphnodendron rotundifolium*, gastroprotection

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### INTRODUCTION

Plant extracts are attractive sources of new drugs and have been shown to produce promising results in the treatment of gastric ulcers.<sup>[1]</sup> The pathogenesis of gastroduodenal ulcers are influenced by various aggressive and defensive factors, such as acid-pepsin secretion, mucosal barrier,

mucus secretion, blood flow, cellular regeneration, and endogenous protective agents (prostaglandins and epidermal growth factor).<sup>[2]</sup> Gastric ulcers are caused due to imbalances between offensive and defensive factors of the gastric mucosa.<sup>[3]</sup> Oral administration of absolute ethanol in rats is noxious for the stomach, affecting the gastric mucosa topically by disrupting its barrier and provoking

pronounced microvascular changes a few minutes after its application. Thus, rapid and strong vasoconstriction is accompanied by rapid and vigorous arteriolar dilation and this combination of microvascular events induces damage in the mucosal capillaries.<sup>[4,5]</sup>

Natural medicinal products have been used for millennia for the treatment of multiple ailments. Although many have been superseded by conventional pharmaceutical approaches, there is currently a resurgence of interest in the use of natural bioactive products by the general public, with many healthy subjects and patients taking them for the prevention and treatment of multiple conditions, including gastrointestinal disorders and postoperative recovery.<sup>[6]</sup> Unfortunately, current evidence of the scientific validity of many of these traditional and commercial compounds is severely limited.<sup>[7]</sup>

In order to validate the medicinal properties of *Croton zehntneri*, *Vanillosmopsis arborea*, *Caryocar coriaceum*, *Himatanthus drasticus*, and *Stryphnodendron rotundifolium*, we investigated the anti-ulcerogenic effects in a model of gastric ulcers induced by alcohol in mice.

## MATERIALS AND METHODS

### Plant Material

*Croton zehntneri* leaves, *Vanillosmopsis arborea* bark, *Caryocar coriaceum* fruit pulp, *Himatanthus drasticus* latex, and *Stryphnodendron rotundifolium* leaves were collected from Chapada do Araripe, Ceará State, Brazil. The essential oils were obtained by hydrodistillation and dried and the powdered stem bark of *S. rotundifolium* was extracted with EtOH.

### Animals

Experiments were performed in male Swiss mice (20-25 g) obtained from the Central Animal House of Regional University of Cariri. They were housed at 22 ± 2° C under a 12 h light/12 h dark cycle and had free access to a standard pellet diet (Purina Chow) and tap water. For experiments, the animals were deprived of food for 12h but allowed free access to water. The experimental protocol was approved by the Animal Care and Use Committee of this University in accordance with the guidelines for Care and Use of Laboratory Animals.

### Ethanol-induced gastric damage

The gastroprotective activity was assessed by the method

of Robert, *et al.*<sup>[8]</sup> After 12 h of food deprivation, groups of animals (n = 8) were orally given EOCZ, EOVA, OCC, and ESR (200 and 400 mg/kg), or LDH (0.2 and 0.4 mL/animal) or vehicle (tap water 10 mL/kg, control). One hour after, each animal was orally given 0.2 mL of ethanol (96%) and the animals were killed 30 min later. Their stomachs were excised, opened along the greater curvature, rinsed with saline (0.9%), and the mucosal lesion area (mm<sup>2</sup>) was measured by planimetry with a transparent grid (1 mm<sup>2</sup> area) placed on the glandular mucosal surface and was expressed in percentage (%) in relation to the total area of the stomach. The results were expressed as mean ± s.e.m and the statistical significance was assessed using one-way analysis of variance ANOVA followed by Student-Newman-Keul's test. *P* values of less than 0.05 were considered to indicate a significant difference between means.

## RESULTS AND DISCUSSION

In the recent past, several reports documented the gastroprotective activity of latex, constituents that include flavonoids, oleo-resins, terpenes, xanthenes, saponins, alkaloids, and tannins.<sup>[9]</sup> Administration of absolute ethanol to fasted mice resulted in severe gastric damage visible from the outside of the stomach as thick reddish-black lines. In the present study, we have indicated that all plants studied have an effective anti-ulcer activity against ethanol-induced gastric ulcers [Table 1]. The gastric protective effect of the extract may be related to an antacid effect or cytoprotective properties of the plants.<sup>[10]</sup> It is possible that the inhibitory effect of the plants is due, at least partly, to the presence of tannins, terpenes, and fatty acids since

**Table 1: The effect of EOCZ, EOVA, OCC, ESR, and LDH on the ethanol-induced gastric mucosal lesions**

Group	Dose	% lesioned area	% of inhibition
Control	-	29.63±4.77	-
EOCZ	200 mg/kg	18.30±1.86	38.20
	400 mg/kg	9.40±2.65**	68.27
Control	-	14.43±2.59	-
EOVA	200 mg/kg	7.05±2.02*	51.14
	400 mg/kg	6.47±1.91*	55.16
Control	-	22.46±3.48	-
OCC	200 mg/kg	8.86±2.45*	60.55
	400 mg/kg	9.66±3.10	56.99
Control	-	18.15±2.75	-
ESR	200 mg/kg	9.30±0.35*	48.76
	400 mg/kg	5.10±0.95*	71.90
Control	-	20.69±2.18	-
LDH	0.2 mL/animal	15.07±2.65	27.16
	0.4 mL/animal	8.92±1.51**	56.88

EOCZ=*Croton zehntneri*; EOVA=*Vanillosmopsis arborea*; OCC=*Caryocar coriaceum* pulp; ESR= *Stryphnodendron rotundifolium*; LDH=*Himatanthus drasticus*. Each column represents the mean ± SEM (n=8/group). ANOVA, Student-Newman-Keul's test; \**P*<0.05 and \*\**P*<0.01 vs. control

these compounds were associated with anti-ulcerogenic activity in other plants.<sup>[11-13]</sup> In addition, such results justify the traditional use of *Croton zehntneri*, *Vanillosmopsis arborea*, *Caryocar coriaceum*, *Himatanthus drasticus*, and *Stryphnodendron rotundifolium*. Furthermore, it also supports some of the phytochemical and pharmacological investigation of these plants carried out by many researchers. The results suggest that traditional folk medicine could be used as a guide in our continuing search for new natural products with potential medicinal properties.

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### OTHER ACTIVITIES - INPHARM

- **Young Pharmacists Group of India** – InPharm is the main association of young pharmacists in India (Age upper limit - 35yrs) and aims at improving the knowledge of young Pharmacists. YPGI - InPharm exists to stimulate the exchanges and networking between young Pharmacists, to foster the co-operation and the sharing of best practices amongst them, particularly in the field of pharmaceutical education and research.
- **Global Pharmacy Students Federation (GPSF)** is one of the non - profit global network that enables students and youth to interact with students of other countries to collaborate on projects/studies that enhance pharmaceutical learning and make a difference in the world.
- **The mission of the Women Pharmacists Group (WPG-InPharm)** is to help & develop outstanding women pharmacists, who impact with knowledge and integrity. The WPG-InPharm group is dedicated to support women through education and research. In addition, WPG-InPharm provides an atmosphere for personal growth and social networking for women pharmacists. WPG-InPharm recognizes, and works to eliminate, the multiple levels of oppression that act in society.