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Study on acute ulcerous pain in rats treated with aqueous root extract of *Lonchocarpus cyanescens*

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ABSTRACT

Objective: To evaluate the antiulcer and analgesic effects of the aqueous root extract of *Lonchocarpus cyanescens* (*L. cyanescens*) since the plant is said to have medicinal properties.

Methods: The filtrate of the aqueous root extract of the plant (100 mg/mL) was used to evaluate for antiulcer activity in 20 rats divided into five groups of four rats each, which were Groups A, B, and C that received 100, 200 and 300 mg/kg doses respectively, while Group D was served as negative control and animals of Group E received 20 mg/kg dose of ranitidine. Indomethacin at a dose of 15 mg/kg was used to induce ulcer on the day of sacrifice. For acetic writhing test (antinociception), same design was used except that Group E received 100 mg/kg dose of acetyl salicylic acid as standard drug. Abdominal contractions were induced in the animals by intraperitoneal administration of 10 mL/kg of 0.6% of acetic acid.

Results: The aqueous root extract of *L. cyanescens* at all doses (100, 200 and 300 mg/kg) showed significant ($P < 0.05$) decrease in ulcer parameters compared with the negative control. The extract also produced a significant ($P < 0.05$) decrease in the number of writhing reflexes in treated rats compared with negative control.

Conclusions: The aqueous root extract of *L. cyanescens* exhibited both antiulcer and analgesic effects justifying folklore claim for the health benefits of this plant.

1. Introduction

Peptic ulcer, a gastrointestinal disorder, is usually acidic and extremely painful[1]. Peptic ulcers are small sores that form in the lining of the esophagus, stomach or duodenum[2]. Peptic ulcer disease can lead to serious complications including massive hemorrhage or bowel perforation[3]. The pathophysiology of peptic ulcer has to do with an imbalance between offensive factors such as acid, pepsin, or *Helicobacter pylori* and defensive counterparts including mucin, prostaglandin, bicarbonate, nitric oxide and growth factors[4]. It was thought that this imbalance is as a result of the association of several endogenous factors and aggressive exogenous factors leading to constant confrontation in the stomach and upper small bowel between acid-pepsin aggression and mucosal defense. This imbalance is also known to release leukotrienes and reactive oxygen species[5]. It is said that factors such as alcohol consumption, use of steroidal and non-steroidal anti-inflammatory drugs, *Helicobacter pylori* infections, improper digestion, smoking, metabolism, elimination of food, mental and physical stressful lifestyle as well as drugs which stimulate gastric acid and pepsin secretion could contribute to the pathogenesis of gastritis[6]. Even though drugs are available for the treatment of this condition, indications are that the high incidences of side effects and drug interactions make these drugs of limited use. These side effects culminate in the search for the development of new antiulcer drugs in plants[7]. Medicinal plants have great applications in the African region, hence there is heavy reliance on these plants for alleviation of disease conditions in many rural areas of Africa[8–10]. There is therefore the need to evaluate some of these for efficacy in line with folklore's claims. In this study, *Lonchocarpus cyanescens* Benth (*L. cyanescens*) (Fabaceae) will be evaluated for its antiulcer and analgesic properties.

L. cyanescens is a shrub or tree that grows in savannah forest[11,12]. The bark is implicated in the treatment of bone pains, diabetes and the leaves and roots for treating boils and

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yaws[13]. The entire herb of this plant is also said to have anti-inflammatory and anti-arthritic properties[14]. The leaves and roots of *L. cyanescens* are applied as a poultice to treat skin diseases, leprosy and ulcers but the roots are believed to be more effective than the leaves in curative effect. The decoction from the leaves and roots is also given to women during or after childbirth and this decoction may also used as an aphrodisiac. The decoction can also be used in the treatment of anti-arthritic conditions, venereal diseases and diarrhea[14]. Phytochemically, the leaves of *L. cyanescens* are rich in indoxyl which yields indigotin contained in the indigo dyestuff. Oleanane derivatives and glycyrrhetinic acid (GA) contained in this plant have anti-inflammatory properties and are responsible for relief of peptic ulcers observed in *L. cyanescens*[15]. The triterpenes act against arthritis[14–16].

2. Materials and methods

2.1. Plant collection and extract preparation

Fresh roots of *L. cyanescens* were collected at the University of Ibadan Campus and washed with water to remove the dirt. It was then authenticated at the Department of Botany University of Ibadan where a voucher specimen was deposited. About 20 g of the plant was macerated using mortar and pestle and then dissolved in 200 mL distilled water to make a 100 mg/mL concentration. This was then filtered using Whatman No. 1 filter paper and the filtrate collected was served as the aqueous extract used in this study.

2.2. Animals

A total of 40 healthy male albino rats weighing between 100 and 200 g used in this study were procured and kept at the Experimental Animal House, Department of Veterinary Physiology, Biochemistry and Pharmacology, University of Ibadan and kept in iron cages and fed with standard diet and clean water *ad libitum*. All experimental procedures were conducted in accordance to the University of Ibadan Ethics Committee on Research in Animals. The study was conformed to internationally accepted principles for the use and care of laboratory animal[17].

$$\text{Preventive index} = \frac{\text{Ulcer index of negative control} - \text{Ulcer index of treated group}}{\text{Ulcer index of negative control}} \times 100$$

2.3. Reagents and drugs

Drugs included indomethacin (Anthralon®, Ningbo Second Pharma, China), ranitidine tablets (Aciloc 150®, Cadila Pharmaceuticals, India) and acetylsalicylic and aspirin tablets (Bond Chemicals Co., Ltd). Normal saline and distilled water were also used.

2.4. The analgesic activity of L. cyanescens

A total of 20 male rats were randomly separated into five groups of four animals each and they were treated as follows: in Group I, rats were treated with the root extract of *L. cyanescens* at a dose of 100 mg/kg. Rats of Groups II and III were treated with 200 and 300 mg/kg root extract respectively. Rats of Group IV were served as the negative control group and received distilled water (2 mL/kg) while rats of Group V were served as the positive control group and received acetylsalicylic acid at a dose of 100 mg/kg. At 60 min after extract administration, abdominal contractions were induced in the animals by intraperitoneal administration of 10 mL/kg of 0.6% of acetic acid[18]. The numbers of abdominal contractions over a period of 20 min following the injection of acetic acid were recorded. The degree of analgesia was calculated using the formula below:

$$\text{Degree of analgesia} = \frac{\text{Negative control} * - \text{Treated group}\#}{\text{Negative control} *} \times 100$$

where, * was number of abdominal contraction of negative control and # was number of abdominal contraction of treated group.

2.5. Antiulcer study of L. cyanescens

The experimental rats were randomly separated into five groups of four rats each and were treated as follows: rats of Groups A, B and C were treated with *L. cyanescens* leaves extract at the dose of 100, 200 and 300 mg/kg respectively. While rats of Group D were served as the negative control group and received normal saline at a dose of 2 mL/kg, and rats of Group E were served as the positive control group and received ranitidine at 20 mg/kg. The plant extracts and drugs were administered to the animals for 8 day. After 8-day treatment, the animals were fasted for 24 h. Ulcer was induced using indomethacin at a dose of 15 mg/kg on the day of sacrifice. The animals were sacrificed at 6 h after indomethacin administration. After this the rats were eviscerated and the stomachs were removed and cut open along the greater curvature and washed in normal saline. Then it was laid flat and the number and degree of erosions were counted and scored[19]. The criteria were used in the scoring of the ulcer (Table 1).

2.5.1. Determination of preventive index

The preventive ulcer index was determined using the formula:

Table 1
The criteria of ulcer score.

Criteria	Ulcer score
No ulcer	0
Haemorrhagic and slight ulcer length less than 2 mm	1
Haemorrhagic and slight ulcer length less than 5 mm	2
More than 1 ulcer of grade 2	3
One ulcer less than 5 mm and diameter 2 mm	4
From 1 to 3 ulcers of grade 4	5
From 4 to 6 ulcers of grade 4	6
More than 6 ulcers of grade 4	7
Complete lesions with hemorrhage	8