Anti-Ulcerogenic Effect of Methanolic Extracts from Enicosanthellum pulchrum (King) Heusden against Ethanol-Induced Acute Gastric Lesion in Animal Models

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Abstract

A natural source of medicine, Enicosanthellum pulchrum is a tropical plant which belongs to the family Annonaceae. In this study, methanol extract from the leaves and stems of this species was evaluated for its gastroprotective potential against mucosal lesions induced by ethanol in rats. Seven groups of rats were assigned, groups 1 and 2 were given Tween 20 (10% v/v) orally. Group 3 was administered omeprazole 20 mg/kg (10% Tween 20) whilst the remaining groups received the leaf and stem extracts at doses of 150 and 300 mg/kg, respectively. After an additional hour, the rats in groups 2–7 received ethanol (95% v/v; 8 mL/kg) orally while group 1 received Tween 20 (10% v/v) instead. Rats were sacrificed after 1 h and their stomachs subjected to further studies. Macroscopically and histologically, group 2 rats showed extremely severe disruption of the gastric mucosa compared to rats pre-treated with the E. pulchrum extracts based on the ulcer index, where remarkable protection was noticed. Meanwhile, a significant percentage of inhibition was shown with the stem extract at 62% (150 mg/kg) and 65% (300 mg/kg), whilst the percentage with the leaf extract at doses of 150 and 300 mg/kg was 63% and 75%, respectively. An increase in mucus content, nitric oxide, glutathione, prostaglandin E2, superoxide dismutase, protein and catalase, and a decrease in malondialdehyde level compared to group 2 were also obtained. Furthermore, immunohistochemical staining of groups 4–7 exhibited down-regulation of Bax and up-regulation of Hsp70 proteins. The methanol extract from the leaves and the stems showed notable gastroprotective potential against ethanol.


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Introduction

Stomach ulcer is a gastric mucosal rupture that extends via the muscularis mucosa into the submucosa or deeper [1]. For decades, this disease has been considered one of the world’s most common illnesses, and it is a global problem among youths [2]. Some of the main aggressive factors that can contribute to ulcer are gastric acid, pepsin, bile salts, abnormal motility, alcohol and nonsteroidal anti-inflammation drugs (NSAID), as well as infection with Helicobacter pylori. However, there are several factors that can protect the stomach from ulcer formation such as mucus secretion, gastroprotective prostaglandin synthesis, bicarbonate production and normal tissue microcirculation [3,4,5,6]. Reducing gastric acid production and increasing gastric mucosal protection have been the major strategies proposed for the prevention of peptic ulcer disease [7]. Ethanol-induced gastric injury is a commonly known method used in the evaluation of therapeutic potencies against gastric ulcer [8]. Ethanol causes intense lesions penetrating into the submucosa [9], enhances reactive oxygen species (ROS) formation, and depletes the mucus membrane [10,11,12] which renders cell death in gastric mucosal cells. Ethanol also inhibits cyclooxygenase enzyme and suppresses the output of endogenous prostaglandins [13]. Alternative and complementary medicine has gained global attention because of their widespread use in the field of medicine for treating many diseases. There are three species of the Annonaceae family which also have antulcer activities such as Polyalthia longifolia cv. Pendula. [14], Annona squamosa L. [15] and Annona reticulata L. [16]. Some of these have been traditionally used to treat peptic ulcers. The protective potential of many other compounds and extracts have been evaluated according to how they enhance gastric toleration against aggressive factors such as endogenous, exogenous or infectious agents. Studies on synthetic compounds and plant extracts emphasize the importance of introducing novel herbal resources with gastroprotective healing properties.