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Evaluation of two cucurbits (Genus: Momordica) for gastroprotective and ulcer healing activity in rats

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Abstract: The gastroprotective activity of the fruit extracts of two cucurbits *Momordica charantia* and *M. dioica* was evaluated by inducing experimental gastric ulcers in the rat. Both fruit extracts (1 mL/100g) significantly inhibited the development of absolute ethanol and aspirin induced acute ulcers. *M. dioica* (1 mL/100g) also showed significant protection against indomethacin induced acute ulcers, and furthermore, when administered daily for 14 days accelerated the healing of chronic ulcers induced with acetic acid. *M. charantia* did not show significant therapeutic effects in the latter two models. It is concluded that the fruit extracts of *M. charantia* and *M. dioica* show significant antiulcer effects but *M. dioica* is more potent and therapeutically effective in all the models tested. The precise mechanism of action remains to be determined.

Introduction: *Momordica charantia* L. (cucurbitaceae), commonly referred to as 'Karawila' in Sinhala and 'Pakal' in Tamil, is well known for its value in the treatment of diabetes, both in Sri Lanka and other parts of the world [1,2]. The fruits of both *M.charantia* and its wild relative *M. dioica* (Sinhala; Thumbakarawila, Tamil; Palupalagakalungai) have also been used in the traditional systems of medicine, as a 'stomachic' to treat chronic ulcers of the stomach [1,3]. Although the antidiabetic activity of *M. charantia* [4–6], and *M. dioica* [7] has been evaluated scientifically, their therapeutic potential in the treatment of gastric ulcers remains unexplored.

The fruit of another member of the cucurbitaceae family, *Trichosanthes kirilowii* var Japonica, which has been used to treat stomach ulcers in traditional Japanese medicine, has been scientifically evaluated [8] and found to have significant gastroprotective activity. This it seemed likely that evaluation of the gastroprotective activity of the fruits of *M. charantia* and *M. dioica* may lead to the discovery of therapeutically useful antiulcer agents.

We have evaluated the gastroprotective activity of the fruits of both *M. charantia* and *M. dioica* in the prevention of acute gastric ulcers and its healing potential towards chronic gastric ulcers in rats.

Materials and methods: Fresh fruits of *M. dioica* were purchased from a local market in the district of Moneragala, Sri Lanka. Their identity was authenticated by Professor R.N. de Fonseka, of the Department of Botany, University of Colombo, Sri Lanka. The fruits of *M. charantia* were purchased from a market in Colombo.

The fruits of each variety (1 kg) were washed, deseeded, cut into thin slices and minced in a domestic mincer. The pulp was squeezed through four layers of gauze, and filtrates of each fruit (*M. charantia* 500 mL, *M. dioica* 350 mL) were freeze dried (Hetosicc, Birkerod, Denmark) separately, weighed and frozen at –20°C for future use. The *p*H, osmolality, sodium and potassium content of the aqueous fruit extracts were recorded. When needed, the required weight of the freeze dried extract was macerated in a mortar and reconstituted in 1mL of distilled water.

Male and female Sprague-Dawley rats, obtained from the Animal House, Faculty of Medicine, Colombo, Sri Lanka, and weighing 200 ± 25g (mean ± SEM) were used in all experiments. The animals were kept under natural environmental conditions (30 ± 2°C, dark and light cycle 12 : 12h) and received standard pellet food (Moosaji Ltd, Colombo, Sri Lanka). Before the commencement of the experiment, the rats were housed in individual wire bottom cages to avoid coprophagia and deprived of food for 36 h but allowed drinking water *ad libitum* until 12 h before the experiment. The distribution of animals into groups, the sequence of the trials and the treatment allocated to each group were randomised.

Ulcers were induced in the stomach using the method of Robert [9] for ethanol, Onoda *et al.* [10] for aspirin, and Okabe *et al.* [11] for indomethacin except that the rats were fasted for 36h. The rats were divided into the three main study groups and within each group the rats were further subdivided into smaller groups ($n = 6 - 10$).

Each test group of rats was given the freeze dried equivalent of 1 mL/100 g body weight of the fresh fruit pulp reconstituted in 1 mL of distilled water by gastric intubation via a metal intragastric tube : *M. dioica* (50 mg/100 g body weight) or *M. charantia* 35 mg/100 g). 1 mL/100 g was chosen as this was the dose used in previous studies [4,7]. The control groups received distilled water (1 mL; vehicle) 30 min after the extracts or distilled water. Each group (test and control) received, orally, either absolute ethanol (1 mL, BDH Chemicals Ltd, Poole, UK) or aspirin (200 mg kg^{-1} Sigma Chemical Company, St Louis, MO, USA) or indomethacin (20 mg kg^{-1}. Sigma). The latter two ulcerogens were suspended in carboxymethyl cellulose (mL, 1% w/v, BDH Chemicals). One hour after the administration of ethanol, 4 h after aspirin and 5 h after indomethacin, the animals were laparotomised under anaesthesia with ether (May and Baker, Dagenham, UK) and the stomachs removed to determine the respective ulcer indices.

The ethanol-induced ulcer model was also used to evaluate the dose-response effects of *M. charantia* and *M. dioica*. The freeze-dried extract of *M. dioica* or *M. charantia* was administered orally at increasing dosage (25 mg/100g), 50 mg/100 g and 100 mg/100 g). The control rats received distilled water (1 mL, vehicle control). The rats were laparotomised under ether anaesthesia and the stomach removed for determination of the ulcer index and microscopical quantification.

Chronic ulcers were induced by the method of Okabe *et al.*, [11] to evaluate the healing effects of the fruit extracts. Strict asceptic conditions were used and the rats were not