

Toxicity and teratogenicity evaluation of ethanolic extract from *Momordica charantia* fruit using zebrafish (*Danio rerio*) embryo model

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Abstract

Zebrafish (*Danio rerio*), a freshwater fish, has become a favoured animal model to assess the teratogenicity effects of various compounds. *Momordica charantia* is a fruit traditionally used as a functional food to treat various ailments. In the present work, 80% ethanolic extract of *M. charantia* fruit was investigated for its teratogenicity effects on the zebrafish embryos. The embryos of 12 h post-fertilisation were immersed in the ethanolic extract at various concentrations of 250, 500, 750, 1,000, and 1,250 mg/L prepared in 2% DMSO. Microscopic observation was carried out every 24 h. Results showed an increased mortality rate, and a delayed hatching rate with increasing concentration. Some of the deformities observed included hyperactivity, crooked backbone, reduced pigmentation, awkward positioning, and coagulation at the highest concentration. Probit analysis resulted in 725.90 mg/L as the median lethal concentration (LC₅₀). Chromatographic analysis revealed the presence of propanedioic acid, malic acid, contrunculin-A, glutamine, D-fructose, sorbopyranose, xylitol, galactonic acid, D-mannitol, and mannose. These compounds may contribute to the deformities observed in a concentration-dependent manner. Therefore, *M. charantia* fruit must be consumed with caution and within the recommended amount.

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Introduction

Medicinal plants and their phytoconstituents are continuously explored for their healing properties. One of the medicinal plants that have been reported to exhibit various pharmacological effects and traditionally consumed as a functional food is *Momordica charantia* Linn. This plant belongs to the Cucurbitaceae family, and is also known as bitter melon, bitter gourd, balsam pear, *condemnor* (South America), *karela* (India), and *carilla* (Jamaica), and *peria katak* (Malaysia) (Lee *et al.*, 2009; Kumar *et al.*, 2010). According to Raman and Lau (1996), *M. charantia* is widely distributed throughout the tropics, particularly in India, China, East Africa, and

South America. The proximate analysis of the fruit has been reported to contain high crude protein as compared to cucumber and tomato (Jules, 2003). Other nutritional elements found in *M. charantia* fruit include carbohydrates, vitamins, iron, zinc, calcium, magnesium, phosphorus, and ascorbic acid. It has numerous medicinal properties such as antidiabetic, antimicrobial, antioxidant, antimalarial, anticarcinogenic, and anti-obesity (Virdi *et al.*, 2003; Grubben, 2004). Besides possessing diverse metabolites that have the potentials to cure ailments, some of the fruit's constituents are considered toxic, carcinogenic, mutagenic, and teratogenic.

In the present work, the teratogenicity effects of *M. charantia* fruit extracts were assessed by using

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