

## On the probable composition of 'Jamaican stone' aphrodisiac



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### ABSTRACT

A dangerous aphrodisiac, commonly known as 'Jamaican stone', banned by the U.S. Food and Drug Administration, has been studied by vibrational spectroscopy in order to solve the controversy on its composition. The results of the ATR-FTIR analysis revealed the presence of the  $\alpha$ -pyrone ring, which is characteristic of bufadienolides from toad venom and bulbs of squill (*Drimia maritima* (L.) Stearn). This conclusion was reached after a comparative study with the spectra for phytochemicals derived from gambir and cat's claw, two *Uncaria* species also preconized as aphrodisiacs and deemed as possible constituents of the 'stone'. Owing to their physiologic similarities to digoxin, bufadienolides have been shown to produce a toxic profile similar to that of digoxin, although the lack one of the side chains found on digoxin should allow the use of hemodialysis to treat 'Jamaican stone' overdose.

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### 1. Introduction

'Jamaican stone' (also referred to as 'Piedra china', 'love stone', 'black stone' or 'China rock') is a hard, dark brown drug, sold as a solid chunk (pills or dice). In the US, in spite of being banned by the Food and Drug Administration (FDA) and even when its importation and distribution are prosecuted, it can still be found in some adult stores and in neighborhood stores in some Hispanic districts. It is usually packaged in a clear plastic bag with some labeling and an information leaflet, warning that its use should be restricted to topical applications (Fig. 1).

The 'stone' can cause serious heart problems or even death when ingested. Even when applied on the skin, which is its most frequent use, it can still be dangerous. Symptoms of poisoning include vomiting and chest and abdominal pain.

Although it has been used for years, there is still very little research done on the composition of the 'Jamaican stone'. The manufacturer indications on its origin simply state that it is made from the concentrated sap of a tree which only grows in Asia and Jamaica and give elusive references to its anesthetics-like effects among the local people from where it is originated.

In 1967, a study by Das and Griffiths (1967) claimed that its main constituent would be *Uncaria gambir* Roxb. extract (gambir or gambir) and led to the identification of ethyl acetate as the chemical responsible for its bitter taste. Other plant species that have been suggested as components of the 'Jamaican Stone' are the Caribbean cat's claw (*Uncaria tomentosa* (Willd. ex Schult.) DC), some species of seaweed (e.g., Irish moss seaweed, *Chondrus crispus* Stackh.) and squill (*Drimia maritima* (L.) Stearn; syn. *Urginea maritima* (L.) Baker).

Gambir is an astringent bark from a shrub growing in Borneo which has been traditionally used to handle the pain from tooth aches and as a chew when combined with nuts (for food). Gambir is mainly composed of catechu-tanic acid (a tannin), (+)-catechin (see Fig. 2), (+)-epicatechin, dimeric proanthocyanidins, procyanidins B1 and B3, and gambiriins A1, A2, B1, B2 and C (Taniguchi et al., 2007), much of them 3',4',5,7-tetrahydroxysubstituted derivatives of 3,4-dihydro-2-phenyl-2H-1-benzopyran.

Gambir, in a similar fashion to cocoa and chocolate, has been reported to exert an effect on human sexuality, acting as an effective aphrodisiac, increasing sexual desire and improving sexual pleasure (Salonia et al., 2006). Cocoa products, apart from phenylethylamide (PEA), which has been reported stimulate the hypothalamus inducing pleasure sensations (Maxwell, 1996), also include (+)-catechin, (+)-epicatechin and procyanidins (Todorovic et al., 2015), which are present in gambir too. Thus, gambir's aphrodisiac properties may be referred to its flavonoid

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Fig. 1. Photographs of a commercial sample of 'Jamaican stone'.

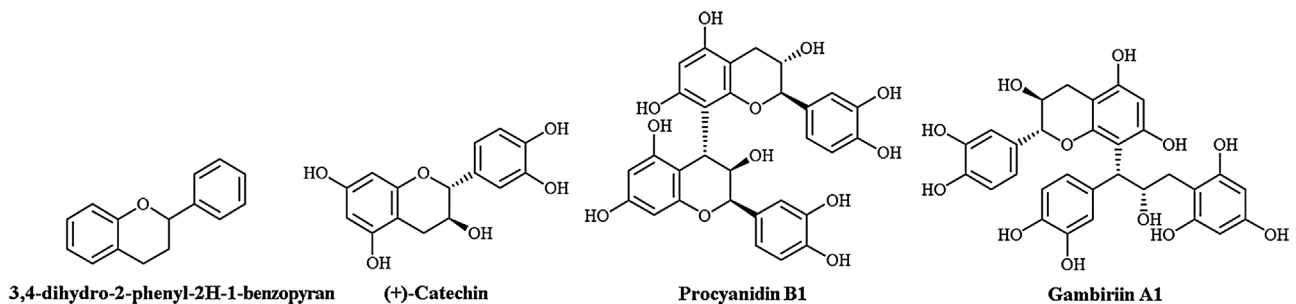


Fig. 2. Some constituents of gambir.

composition. It is worth noting that it has also enjoyed a spurt of popularity in a commercialized form (*Gambir Sarawak*) because it can be turned into a solution that is absorbed by the skin of the penis and delays the orgasm reflex.

Cat's claw is a plant whose bark contains quinovic acid glycosides, triterpenes, sterols and phenolic compounds and shares oxindole alkaloids with other *Uncaria* (Wahid et al., 2013) (Fig. 3). Nevertheless, at low doses, far from showing toxic effects, it has been reported to have anti-inflammatory and immunostimulant properties (Quintela and Lock de Ugaz, 2003).

The fact that Borneo and Malaysian traders recommend a product (*Gambir Sarawak* or *tambah power*), which is different (and better) than the 'Jamaican stone' (Lim et al., 2016), led us to consider an alternative composition: bufadienolides, suggested by the U.S. Food and Drug Administration on the basis of the arrhythmia problems reported by 'stone' users (Sifferlin, 2015). Bufadienolides and their glycosides, which are compounds with

steroid structure (Fig. 4), are derived from toad venom and bulbs of squill, and are cardiotoxic steroids that cause symptoms similar to digoxin (CDC, 1995; Iizuka et al., 2001; Kamano et al., 1998; Meng et al., 2016). Specifically, they can cause an atrioventricular block, bradycardia, ventricular tachycardia, and possibly lethal cardiac arrest (CDC, 1995).

In the work presented herein, a rapid and accurate method for the fast and simultaneous qualitative and quantitative characterization of natural products and their constituents (Huck, 2015), namely Attenuated Total Reflectance Fourier-Transform Infrared (ATR-FTIR) spectroscopy, has been used to discriminate among flavan and diphenol rings (in gambir), oxindole alkaloids (in cat's claw) and  $\alpha$ -pyrone ring (typical of bufadienolides) in order to ascertain the actual composition of the 'Jamaican stone' (Fig. 5).

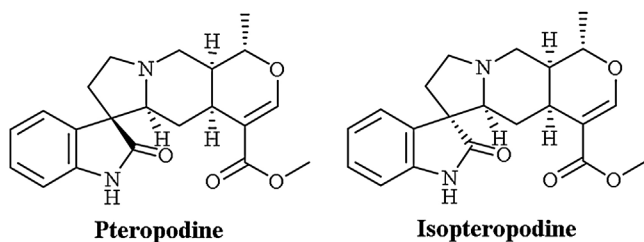


Fig. 3. Examples of oxindole alkaloid components of *Uncaria tomentosa* (Wahid et al., 2013).

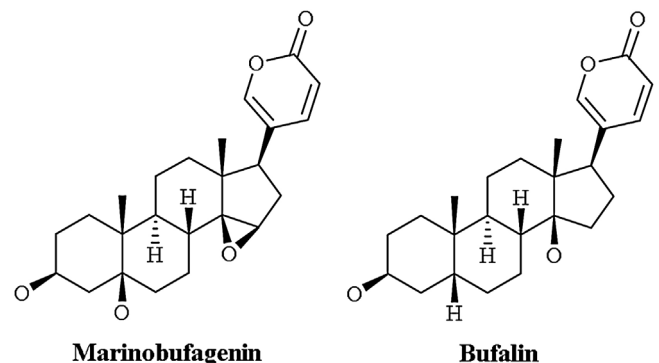


Fig. 4. Examples of bufadienolides (Miyashiro et al., 2008).

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