

---

## Flash presentations

---

### Isolation by countercurrent chromatography and biological membrane permeation studies of phenylpropylamino alkaloids from khat (*Catha edulis* (Vahl) Endl.)

---

Minaleshewa Atlabachew Gebretsadik<sup>1\*</sup>, Sandra Combrinck<sup>2</sup>, Alvaro M. Viljoen<sup>2</sup> and Josias H. Hamman<sup>3</sup>

<sup>1</sup>*Department of Pharmaceutical Sciences, Tshwane University of Technology, Pretoria, 0001, South Africa*

<sup>2</sup>*Department of Pharmaceutical Sciences, Tshwane University of Technology, Pretoria, 0001, South Africa*

<sup>3</sup>*Centre of Excellence for Pharmaceutical Sciences, North-West University, Potchefstroom, 2520, South Africa*

Khat, the leaves of *Catha edulis* (Vahl) Endl., is used as a "natural amphetamine" stimulant in eastern and southern Africa, and the Arabian Peninsula. The psychostimulatory effects of the leaves are attributed to the presence of the alkaloids cathinone, cathine and norephedrine. Leaves are masticated to elicit these activities, however, it has not yet been shown that the compounds are absorbed across the oral membranes. Furthermore, The synthetic forms of these alkaloids are expensive as well as there was no developed procedure for large scale isolation of these drugs from the natural source. Cathinone was isolated in the form of the oxalate salt from young leaves following acid-base extraction. High performance countercurrent chromatography (HPCCC) was optimized and used to isolate cathine and norephedrine with purities in excess of 90%. These alkaloids in their pure form and present in a crude extract were further evaluated for their *in vitro* permeability across Caco-2 cells, as a model of the human intestinal epithelium, as well as across excised porcine intestinal, sublingual and buccal tissues. The apparent permeability coefficients, calculated from the transport data, indicated that the transport of the three alkaloids across intestinal, buccal and sublingual tissue and the Caco-2 monolayer were comparable to that of the highly permeable reference compound caffeine. In all the studied membranes, cathinone and cathine were found to have a higher permeability than norephedrine. These results indicate that extended chewing of khat allows the psychoactive compounds to enter the bloodstream directly across the oral mucosal membranes. However, they will also be absorbed from the gastrointestinal tract when swallowed.

#### Keywords

Counter current chromatography, apparent permeability coefficient, *in vitro* transport, khat alkaloids, Sweetana Grass diffusion, Caco-2 cells, *Catha edulis*