

Pharmacological characterization of *Solanum cernuum* Vell.: 31-norcycloartanones with analgesic and anti-inflammatory properties

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Abstract Cycloeucalenone (**1**) and 24-oxo-31-norcycloartanone (**2**) obtained from *Solanum cernuum* Vell. were assayed to explore their pharmacologic roles. Previous studies showed that (**2**) has selective activity against lung tumor cell line (NCIH460) which expresses high levels of COX-2, suggesting its role in inflammatory process, and also a link between chronic inflammation and cancer-associated process. Dichloromethane crude extract (DCE) significantly reduced writhing and stretching induced by 0.8 % acetic acid at a dose of 100, 300, and 600 mg/kg, po; oral administration of different doses of (**1**) and (**2**) also displayed significant analgesic and anti-inflammatory effects in the writhing acetic acid test ($p < 0.0001$). Selected oral doses of both compounds (100 and 50 mg/kg)

were assayed in the carrageenan-induced paw edema model. Compound (**2**) showed significant activity during the early phase (1.5–6 h) and also in the late phase (48 h) ($p < 0.01$). The anti-nociceptive activity observed for the compounds (**1**) and (**2**) and DCE was found to be related to the inhibition of different mediators involved in inflammation and nociceptive process. Both compounds decrease COX-2 protein expression, although only compound (**2**) reached a significant response ($p < 0.05$ vs control). However, in vitro Sirtuin 1 activity and TNF- α production in THP-1 macrophages were not affected.

Keywords *Solanum cernuum* Vell. · 31-Norcycloartanones · Analgesic · Anti-inflammatory · COX-2

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Introduction

Perhaps because of income limitations, the use of medicinal plants by populations in developing countries remains common, large biodiversity and the resultant availability of medicinal plants, as well as a long tradition of use, contribute to the popularity of medicinal plant use. The World Health Organization (WHO) has estimated that ~65 % of the world population uses plant-derived traditional medicines as their primary health care. Plant products also play an important role in the health care systems of developed countries (Cragg et al. 2009).

One important example is the *Solanum* genus (Solanaceae family) that is used in a number of cultures. In addition to their nutritional value, *Solanum* species are valued for their medicinal properties (Jain et al. 2011; Vlachojannis et al. 2010). *Solanum cernuum* Vell. is a Brazilian medicinal plant traditionally used in the