

Secondary Metabolites of Ponderosa Lemon (*Citrus pyriformis*) and their Antioxidant, Anti-Inflammatory, and Cytotoxic Activities

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Z. Naturforsch. **66c**, 385–393 (2011); received October 5, 2010/March 30, 2011

Column chromatography of the dichloromethane fraction from an aqueous methanolic extract of fruit peel of *Citrus pyriformis* Hassk. (Rutaceae) resulted in the isolation of seven compounds including one coumarin (citropten), two limonoids (limonin and deacetylnomilin), and four sterols (stigmasterol, ergosterol, sitosteryl-3- β -D-glucoside, and sitosteryl-6 α -O-acyl-3- β -D-glucoside). From the ethyl acetate fraction naringin, hesperidin, and neohesperidin were isolated. The dichloromethane extract of the defatted seeds contained three additional compounds, nomilin, ichangin, and cholesterol. The isolated compounds were identified by MS (EI, CI, and ESI), ^1H , ^{13}C , and 2D-NMR spectral data. The limonoids were determined qualitatively by LC-ESI/MS resulting in the identification of 11 limonoid aglycones. The total methanolic extract of the peel and the petroleum ether, dichloromethane, and ethyl acetate fractions were screened for their antioxidant and anti-inflammatory activities. The ethyl acetate fraction exhibited a significant scavenging activity for DPPH $^{\cdot}$ free radicals ($\text{IC}_{50} = 132.3 \mu\text{g/mL}$). The petroleum ether fraction inhibited 5-lipoxygenase with $\text{IC}_{50} = 30.6 \mu\text{g/mL}$ indicating potential anti-inflammatory properties. Limonin has a potent cytotoxic effect against COS7 cells [$\text{IC}_{50} = (35.0 \pm 6.1) \mu\text{M}$] compared with acteoside as a positive control [$\text{IC}_{50} = (144.5 \pm 10.96) \mu\text{M}$].

Key words: Limonoids, Antioxidant, Anti-Inflammatory Properties