Proteomic analysis of cell suspension cultures of *Boesenbergia rotunda* induced by phenylalanine: identification of proteins involved in flavonoid and phenylpropanoid biosynthesis pathways

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**Abstract** *Boesenbergia rotunda* belongs to the Zingiberaceae family. It is widely found throughout Southeast Asia and is commonly used as a food ingredient and in folk medicine. Extracts from this plant contain a number of important bioactive compounds such as boesenbergin, cardamonin, pinostrobin, pinocebrin, panduratin A and 4-hydroxy-panduratin A. These compounds have been shown to exhibit anti-HIV protease, anti-dengue NS2B/NS3 protease, antibacterial, antifungal, anti-inflammatory, anticancer, and antioxidant activity. Here we report the use of proteomic approaches to identify proteins that may be involved in the biosynthesis of these compounds. Protein expressions of *B. rotunda* suspension cultures for phenylalanine-treated and normal cells were compared by two-dimensional gel electrophoresis. Following image analysis, protein spots whose expressions were found to be regulated were identified using Matrix Assisted Laser Desorption-Ionization tandem mass spectrometry. In all, thirty-four proteins were identified. These proteins were categorized into nine functional categories—defence mechanism, protein biosynthesis, metabolism, terpenoid biosynthesis, cell division, cell organization, energy-related, signaling processes and proteins of unknown function. Eleven of the proteins involved in the phenylpropanoid biosynthetic pathway are related to the biosynthesis of cyclohexenyl chalcone derivatives.

**Keywords** *Boesenbergia rotunda* · Flavonoids · Panduratin A · Proteomics · 4-Hydroxy-panduratin A

**Introduction**

*Boesenbergia rotunda* is a small perennial plant belonging to the Zingiberaceae family. It is widely found in South East Asian countries with local names such as Chinese keys, finger root, and temu kunci. It is commonly used as a food ingredient and folk medicine to treat diseases such as arophous ulcer, stomach discomfort, leucorrhoea, dysentery, rheumatism and muscular pain. It has been shown that the primary bioactive compounds of this ginger are boesenbergin, cardamonin, pinostrobin, pinocebrin, panduratin