

Article

Phenolic Profiling of *Duchesnea indica* Combining Macroporous Resin Chromatography (MRC) with HPLC-ESI-MS/MS and ESI-IT-MS

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Abstract: *Duchesnea indica* (*D. indica*) is an important traditional Chinese medicine, and has long been clinically used to treat cancer in Asian countries. It has been described previously as a rich source of phenolic compounds with a broad array of diversified structures, which are the major active ingredients. However, an accurate and complete phenolic profiling has not been determined yet. In the present work, the total phenolic compounds in crude extracts from *D. indica* were enriched and fractionated over a macroporous resin column, then identified by HPLC-ESI-MS/MS and ESI-IT-MS (ion trap MS). A total of 27 phenolic compounds were identified in *D. indica*, of which 21 compounds were identified for the first time. These 27 phenolic compounds encompassing four phenolic groups, including ellagitannins, ellagic acid and ellagic acid glycosides, hydroxybenzoic acid and hydroxycinnamic acid derivatives, and flavonols, were then successfully quantified using peak areas against those of the corresponding standards with good linearity ($R^2 > 0.998$) in the range of the tested concentrations. As a result, the contents of individual phenolic compounds varied from 6.69 mg per 100 g dry weight (DW) for ellagic acid to 71.36 mg per 100 g DW for brevifolin carboxylate. Not only did this study provide the first phenolic profiling of *D. indica*, but both the qualitative identification and the subsequent quantitative analysis of 27 phenolic compounds from *D. indica* should provide a good basis for future exploration of this valuable medicinal plant.

Keywords: *Duchesnea indica*; phenolic profiling; HPLC; mass spectrometry

1. Introduction

Duchesnea indica, distributed widely throughout Asia, Europe and America, is a perennial plant that belongs to the Rosaceae family [1–3]. It has been used as a traditional herbal medicine in Asia for thousands of years, mainly for the treatment of leprosy, congenital fever, tissue inflammation, haematemesis, and cancer, among other uses [3]. Nowadays, it is clinically used for cancer therapy alone or as a main ingredient in Chinese herbal medicine formulas for the treatment of cancers, especially gynecological cancers [3]. Several phenolic compounds, including phenolic acids, ellagic acids and flavonoids [4–6], have been isolated from genus *Duchesnea*, and further pharmacological studies have shown that phenolic compounds are the major active ingredients [3,4,7]. It was reported that some phenolic compounds isolated from *D. chrysanth*, especially brevifolin carboxylic acid, showed a strong cytotoxic activity to PC₁₄ human lung adenocarcinoma cells and MKN₄₅ human