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# Ginsenosides Analysis of New Zealand Wild Grown *Panax ginseng*

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## Introduction

Ginsenosides are the main bioactive components of ginseng<sup>1</sup>. They are affected by the growing environment and conditions<sup>2</sup>. With the increasing demand for ginseng, wild ginseng is becoming rare, and most of the world supply of ginseng is from farmed ginseng<sup>3</sup>. In New Zealand (NZ), ginseng is grown as a secondary crop under a natural pine forest canopy in an open-field simulation of a wild environment. No pesticides and chemical fertilizers are used and it simulates wild ginseng. Therefore, it is hypothesized that ginseng grown in NZ may have a unique ginsenoside profile based on how it is grown, such as the unique volcanic soil, high-intensity UV, and different climate.



## Materials & Method

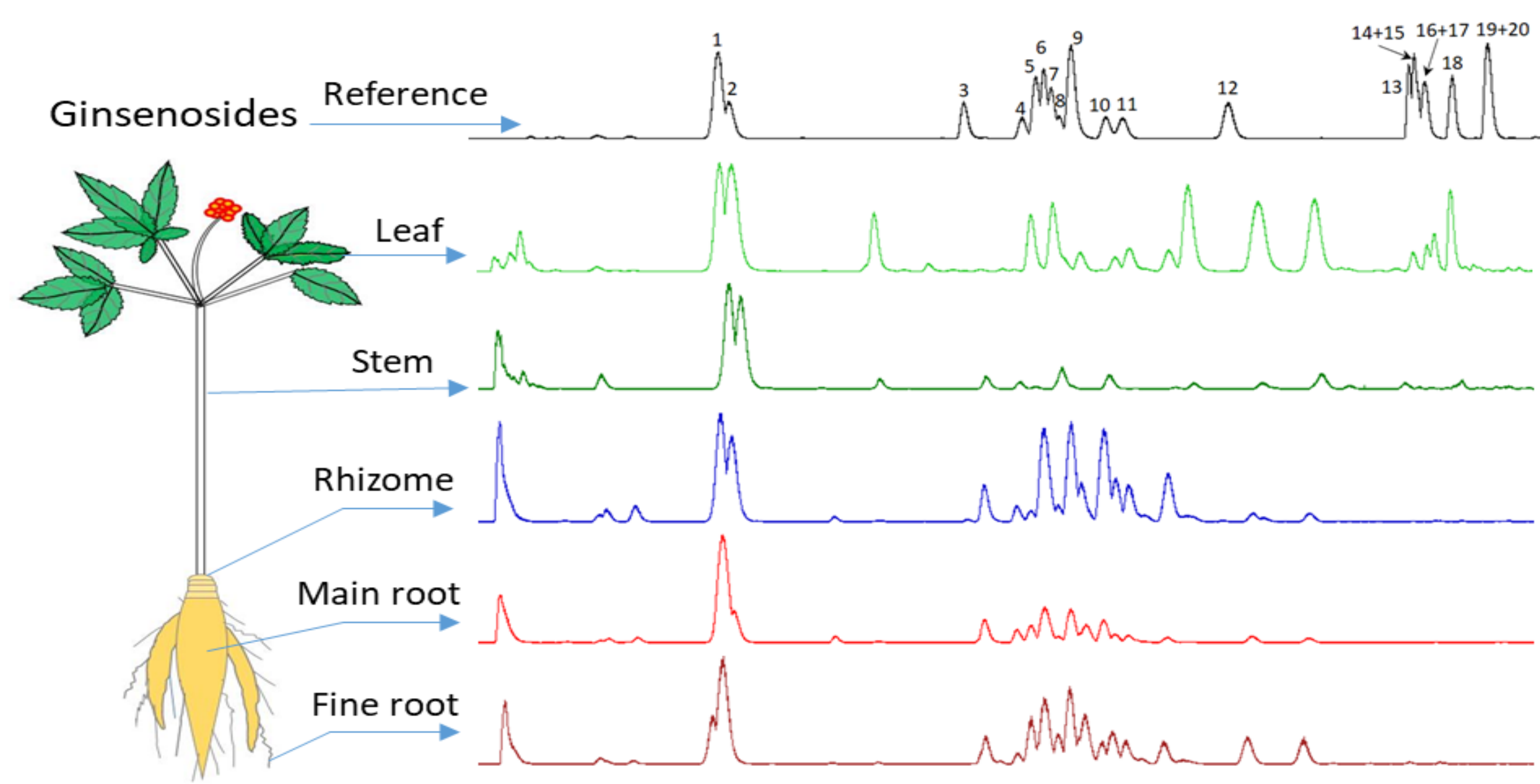
The fresh *P. ginseng* materials with different ages were harvested from Turangi pine forest (NZ). Five parts (main root, fine root, rhizome, stem, and leaf) of *P. ginseng* were detached, lyophilized, and crushed.

Ginseng samples were extracted using ultrasonic extraction and analyzed with 25 ginsenoside reference standards by HPLC and LC-QTOF-MS/MS.

## Results

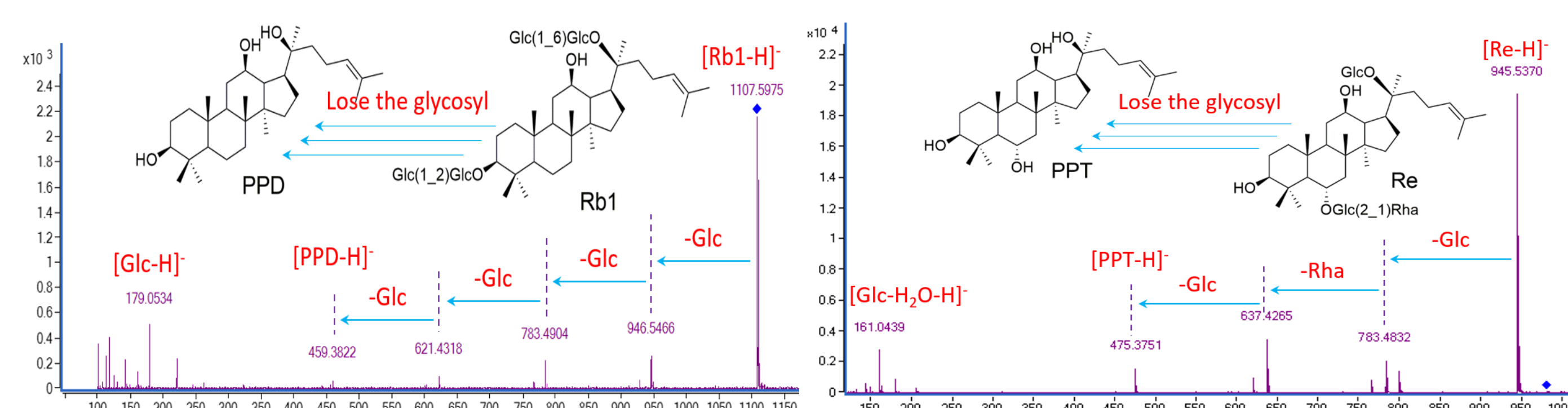
### 1. The profiles of different parts of NZG

The compounds were well separated by Extend C18 column with gradient elution system of 0.1% FA water and 0.1% FA acetonitrile at 33°C. The underground parts (main foot, fine root, and rhizome) and aboveground parts (stem and leaf) have different profile features.



### 2. Ginsenosides identified from NZG

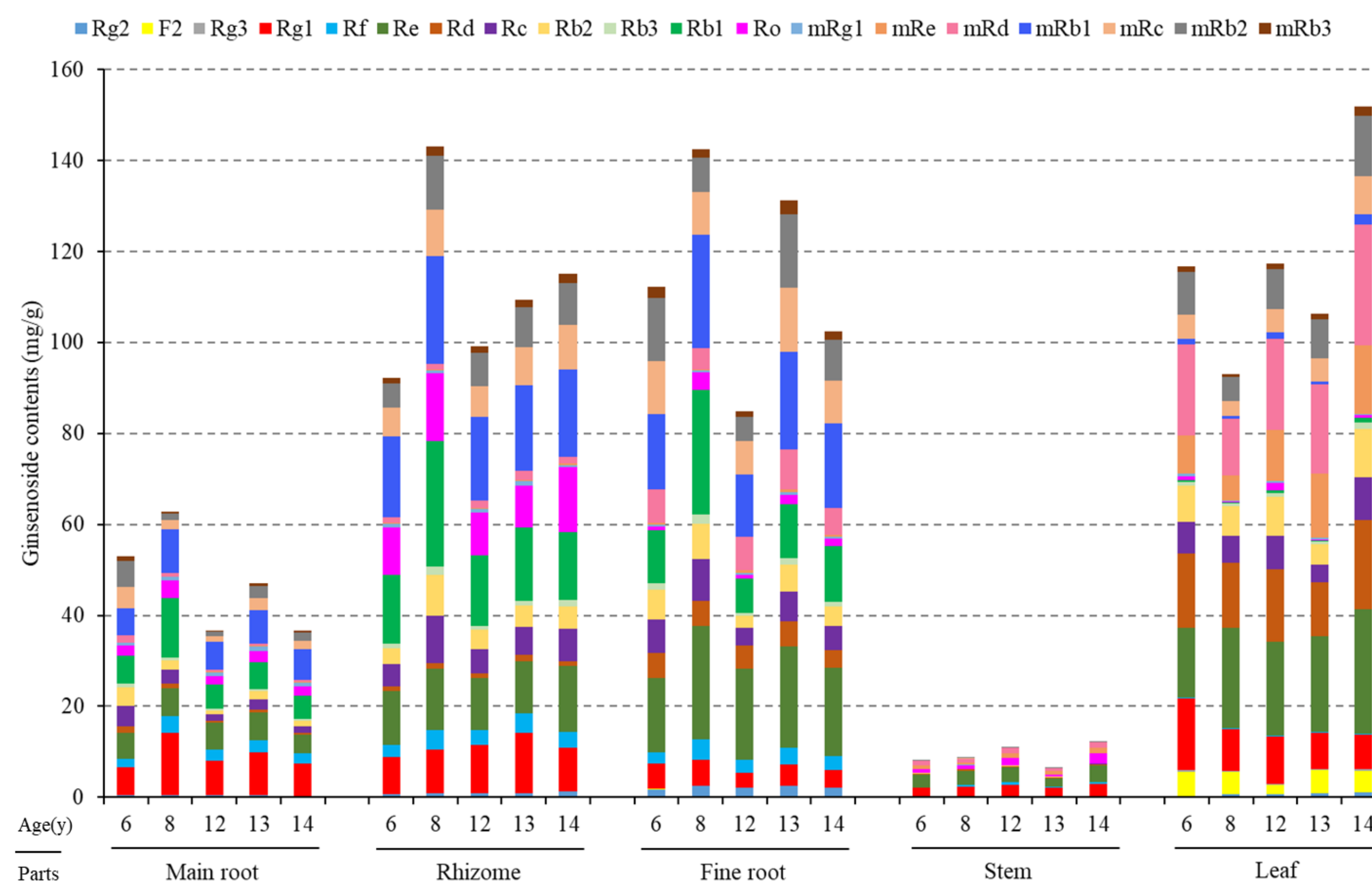
A total of 102 ginsenosides, along with three potential new ginsenosides, was detected from various parts of NZG. These ginsenosides were identified by matching the retention time with reference standards and the molecular formulas (MS) and fragmentation features (MS/MS) with those of the known ginsenosides.



### 3. Ginsenoside contents in different parts and ages of NZG

The results showed that the fine root, rhizome, and leaf contain more ginsenosides at different ages and the stem has the lowest content. In the underground parts, Rg1, Re, Rb1, mRb1 are the main components, and the 8-year old ginseng has the highest ginsenoside content. While in leaves, the main ingredients are Rg1, Re, Rd, mRd, and the highest content of ginsenosides is the 14-year old ginseng.

Interestingly, Ro has a high concentration in the rhizome, which is very low in other parts.



## Discussion

Some publications reported that the contents of ginsenosides increased with age<sup>4,5</sup>. However, in this study, the contents of ginsenosides fluctuated with age and did not increase strictly with age. To some extent, our results also suggested that the contents of ginsenosides are affected by other factors in addition to age, especially in the natural environment of the wild, they may be affected more by other uncontrollable factors such as soil, moisture, and light.

## Abbreviations

FA: Formic acid  
LC: Liquid Chromatogram  
MS: Mass Spectra  
NZG: New Zealand grown Ginseng  
PPD: protopanaxadiol  
PPT: Protopanaxatriol  
mRd: malonyl ginsenoside Rd

## References

- 1 Gyo et al. *J Ginseng Res* 2017, 41: 361-369.
- 2 Szakiel et al. *Phytochem Rev* 2011, 10: 471-491.
- 3 Baeg et al. *J Ginseng Res* 2013, 37: 1-7.
- 4 Shi et al. *Food Chemistry*, 2007, 102: 664-668.
- 5 Qu et al. *Food Chemisrty*, 2009, 115: 340-346.

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