

## 0061 - Rhodiola by HPLC

**Botanical Name:** *Rhodiola rosea*

**Common Names:** Arctic root, golden root

**Parts of Plant Used:** Rhizomes

**Uses:** Improvement in mental health; as an adaptogenic, an antistress, and a cardioprotective agent.

### Modes of Action:

*Rhodiola rosea* extracts exhibited adaptogenic effects in mice and rabbits<sup>1</sup> and cardioprotective and antiadrenergic activities during stress.<sup>2</sup> An alcohol-water extract (1:1) was found to improve learning and long-term memory in mice.<sup>3</sup> One standardized extract, SHR-5, was reported to relieve stress-induced fatigue significantly in a double-blind cross-over study<sup>4</sup> and to improve capacity for mental work against a background of fatigue and stress.<sup>5</sup> But currently, no specific compound has been identified as responsible for these activities.

### Chemical Markers:

Phytochemistry study of *Rhodiola rosea* root has revealed the presence of several types of chemical compounds<sup>6-8</sup> including:

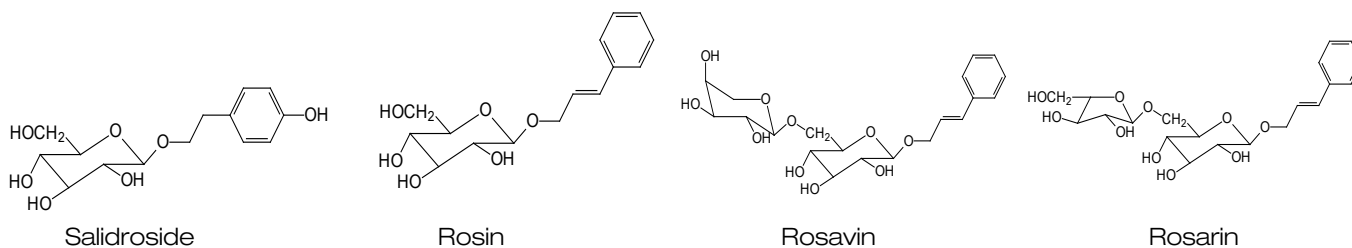
Phenylpropanoids [rosavin, rosin, rosarin, 4-methoxycinnamyl-O- $\beta$ -glucopyranoside, cinnamyl-(6 - $\beta$ -xylopyranosyl)-O- $\beta$ -D-glucopyranoside, cinnamyl-(6 - $\alpha$ -arabinopyranosyl)-O- $\beta$ -D-glucopyranoside].

Phenylethanol derivatives (salidroside, tyrosol), flavanoids (acetylrodalgin, kaempferol, kaempferol 7-rhamnoside, rodiolin, rodionin, rodiosin, tricin, tricin 5-glucoside, tricin 7-glucoside), monoterpenes (rosiridol, rosaridin), sterols (daucosterol,  $\beta$ -sitosterol), phenolic acids (chlorogenic acid, hydroxycinnamic acid, gallic acid), picein, and benzyl-O- $\beta$ -D-glucopyranoside.

The essential oils of rhodiola rhizomes were found to contain decanol, geraniol, and 1,4-p-menthadien-7-ol as the most abundant volatiles.<sup>9</sup> Usually salidroside, rosavin, rosarin, rosin, and/or tyrosol are used as marker compounds for quality control of rhodiola, although they may not be the bioactive compounds.



## Marker Compounds in Rhodiola rosea



## Methods of Analysis

Very few methods have been published for the analysis of chemicals in rhodiola and most of the published methods only focused on the analysis of salidroside, not on rosavin, rosin, and rosarin because of the shortage of reference standards.

### Method 1:

The method of Lin et al.<sup>4</sup> was used. This method separates and identifies more than 30 compounds in red clover.

#### Sample Preparation:

Extract 1 g of the powdered root three times with 3 mL of methanol by sonication for 10 minutes. Centrifuge, combine the supernates, and dilute to a volume of 10 mL with methanol.

#### Chromatography:

Column: Phenomenex Luna C18, 5  $\mu$ m, 150  $\times$  4.6 mm.

Mobile phase: Solvent A = 25 mM phosphate buffer adjusted to pH 7, solvent B = acetonitrile.

Gradient: 95%A/5%B to 80%A/20%B in 30 minutes.

Flow rate: 1.0 mL/minute

Injection volume: 10  $\mu$ L

Detection wavelength: 205 nm

Column temperature: 60°C

#### Validation Data:

Linearity: 16.5 to 500 mcg/mL with correlation coefficients over 0.9998 for all five compounds.

Accuracy: The percent recoveries were from 97.49 to 100.88 for these five compounds.

Precision: Not specified

Selectivity: Peak identification was determined against standards.

Ruggedness: Not specified

Robustness: Not specified

LOD/LOQ: LOD = 0.16 mcg/mL for rosavin and 0.62 mcg/mL for rosiridin.

### Method 2:

The method of Wang et al.<sup>11</sup> was used.

### Sample Preparation:

Weigh 500 mg of root powder or 250 mg of root extract into a 50-mL volumetric flask, add 35 mL of 40% methanol aqueous solution, and sonicate for 45 minutes. Cool to room temperature and fill to volume with 40% methanol.

### Chromatography:

Column: Phenomenex Phenylhexyl, 3  $\mu$ m, 4.6  $\times$  150 mm.

Mobile phase: Solvent A = 0.2% phosphoric acid, solvent B = acetonitrile.

Gradient: Initial 4%B, linear to 30%B in 20 minutes.

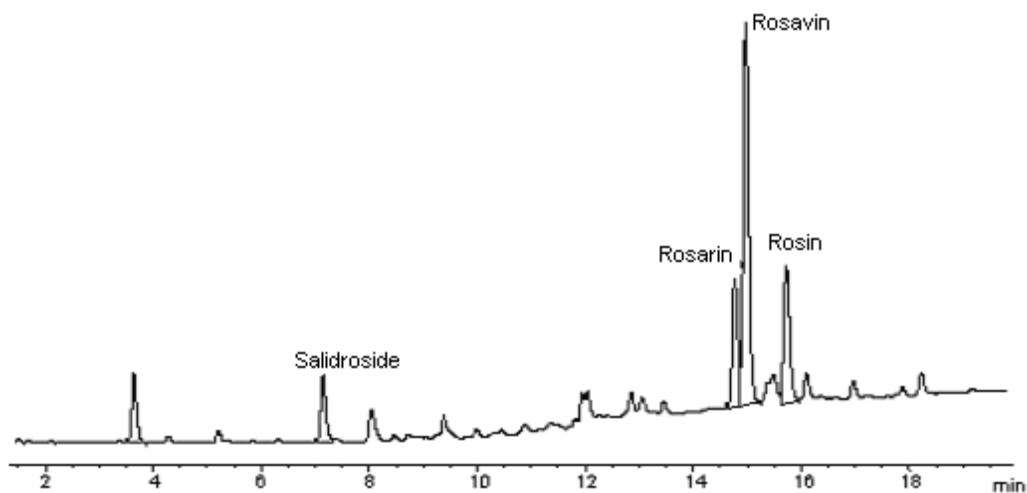
Flow rate: 1.2 mL/minute

Temperature: Ambient

Detection wavelength: 225 nm for 0 to 10 minutes and 254 nm for 10 to 20 minutes.

Injection volume: 10  $\mu$ L

### Representative HPLC Chromatogram of Rhodiola rosea Run by Method 2



## References:

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