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Application Note

As published in "The Handbook of Analytical Methods for Dietary Supplements"

0062 - Schisandra for Schisandrins by HPLC

Botanical Name: *Schisandra chinensis*

Common Names: Wu-Wei-Zi

Parts of Plant Used: Berries

Uses: Liver protection, adaptogen

Modes of Action:

A berry extract standardized with total lignans was pharmacologically and clinically proven to be a good liver protective herb. In China, a clinical trial with more than 5000 patients with different types of hepatitis was performed in the 1980s. The patients were treated with a schisandra fruits preparation. The elevated GPT (glutamic pyruvic transaminase, an enzyme found primarily in the liver, which is released into the bloodstream as the result of liver damage) level returned to normal with 75% of patients after they were treated for 20 days with schisandra.[1] Schisandra also was found to improve physical performance and was used to prevent and to treat neurodegenerative diseases.[2]

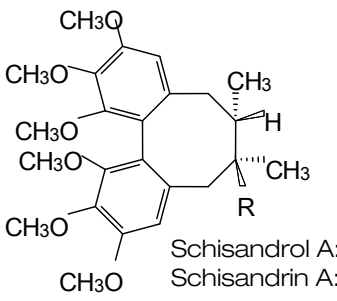
Chemical Markers:

Shisandra chinensis is a rich source of lignans. More than 30 lignans have been purified from it with schisandrol A (other names: schisandrin, wuweizi alcohol A, wuweizichun A), schisandrin B (γ-schisandrin, wuweizisu B), schisandrol B (gomisin A, wuweizi alcohol B, wuweizichun B), schisandrin A (deoxyshisandrin, wuweizisu A), schisantherin A (gomisin C, wuweizi ester A), and schisantherin B (gomisin B, wuweizi ester B) as the major ones.[3]

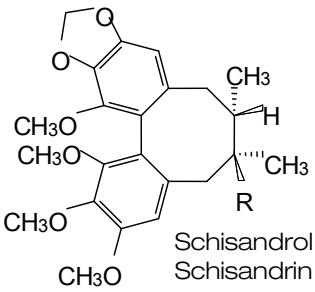
Several other type of chemicals including daucosterol, 5-hydroxymethyl-2-furancarboxaldehyde, 2-methyl citrate, protocatechuic acid, quinic acid, thymoquinol 2-glucoside, thymoquinol 5-glucoside, and zingerone glucoside also were identified in the fruits of *Schisandra chinensis*.[4]

The essential oil of schisandra was found to be composed mainly of terpenes with copaene, alpha-farnesene, and alpha-cubebene as the major constituents.[5] As the lignans have been proven clinically to be the bioactive components in schisandra, they are used as chemical markers for quality control.

Four Major Lignans in Schisandra



Schisandrol A: R = OH
Schisandrin A: R = H



Schisandrol B: R = OH
Schisandrin B: R = H

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Methods of Analysis

Various methods have been used to analyze the lignan content in schisandra, with HPLC being the most acceptable approach. Most of the published HPLC methods use a methanol–water or acetonitrile–water isocratic mobile phase and offer good separation, while a gradient mobile phase provides a little better separation. The detection wavelength was usually 254 nm. As schisandra lignans are fat-soluble compounds, GC is a good alternative.[6] Capillary electrochromatography and micellar electrokinetic capillary chromatography also have been used to analyze lignans in schisandra.[7]

Extraction is of key importance for accurate analysis of lignans in schisandra. Generally, pure methanol is a good solvent for extracting samples for analysis.

Method 1:

The method of Bartlova et al.[8] can be used to analyze the six major lignans: schisandrol A, schisandrol B, schisandrin A, schisandrin B, gomisin N, and schisandrin C. Their method used two chromatographic sets and columns.

Sample Preparation:

Initally, use supercritical fluid extraction, then dissolve the samples in methanol for analysis. Or extract 0.5 g of sample with 95% ethanol by refluxing for 0.5 hour, then dissolve in acetonitrile–water (85:15).

Chromatography:

Column 1: Nucleosil 100, 5 µm, C18 endcapped EC 250 × 4.0 mm.
Mobile phase: Solvent A = water, solvent B = acetonitrile.
Gradient:

Time (minutes)	%A	%B
0	50	50
5	50	50
35	40	60
55	30	70
70	30	70

Or mobile phase: Solvent A = water, solvent B = methanol.

Time (minutes)	%A	%B
0	30	70
1	30	70
35	5	95
40	5	95

Flow rate: 0.75 mL/minute
Injection volume: 20 µL
Detection wavelength: 254 nm
Column temperature: Ambient

Column 2: Merck-LiChrospher 100 RP-18, 5 µm, 250 × 4.0 mm.
Mobile phase: Solvent A = water, solvent B = acetonitrile.
Gradient:

Time (minutes)	%A	%B
0	60	40
60	30	70
90	30	70

Flow rate: 0.5 mL/minute
Injection volume: 20 µL
Detection wavelength: 254 nm
Column temperature: 25°C

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Validation Data:
Not available

Method 2:

The method of Wang et al.[3] was used.

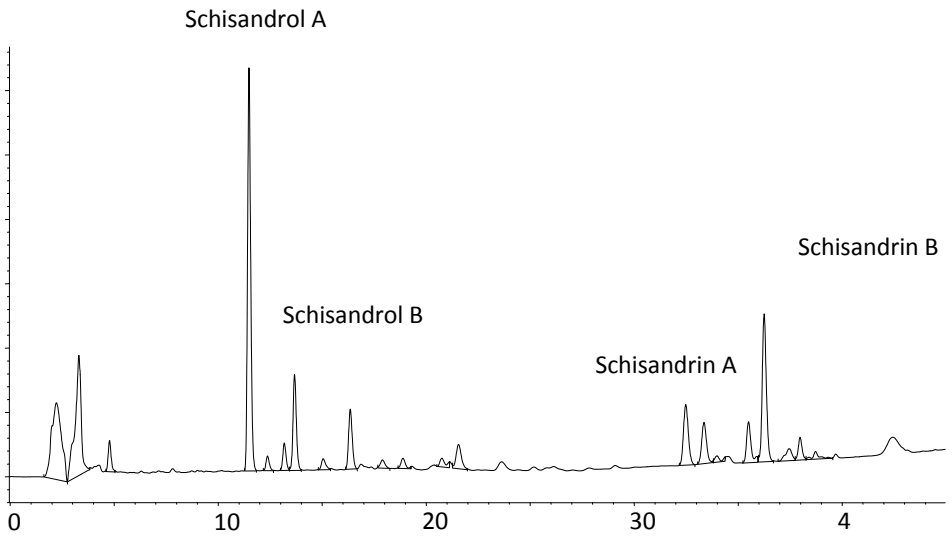
Sample Preparation:
Accurately weigh the dried schisandra fruits and fruit extracts (9 to 1) (400 mg for fruit powders and 200 mg for extract) into a 100-mL volumetric flask. Add 70 mL of methanol and sonicate for 30 minutes, then cool to room temperature, and fill to volume with methanol.

Chromatography:
Column: Phenomenex Luna C18 (2), 5 µm, 250 × 4.6 mm.
Mobile phase: Solvent A = water (0.1% formic acid), solvent B = acetonitrile.
Gradient:

Time (minutes)	%A	%B
0	55	45
12	40	60
24	40	60
40	10	90
45	10	90

Flow rate: 1.0 mL/minute
Injection volume: 10 µL
Detection wavelength: 255 nm
Column temperature: Ambient

Representative HPLC Chromatogram of Schisandra Run by Method 2



References:

1. Chang HM, But PH. Pharmacology and application of Chinese materia medica Singapore: *World Science*; 1986:1:773.
2. Hanche JL, Burgos RA, Ahumada F. *Schisandra chinensis* (Turcz.) Baill. *Fitoterapia.* 1999;70:451–71.
3. Wang M, Wu QL, Tadmor Y, et al. *Schisandra chinensis:* Chemistry and analysis. In: *ACS symposium series 859: oriental foods and herbs, chemistry and health effects*. Washington, DC: American Chemical Society; 2003:234–46.
4. Dai H, Zhou J, Peng Z, et al. Studies on chemical constituents of *Schisandra chinensis. Tianran Chanwu Yanjiu Yu Kaifa*. 2001;13(1):24–6.
5. Qin B, Tian Z, Lou Z. Constituents of the volatile oil from the fruit of *Schisandra chinensis*. *Yaoxue Tongbao.* 1988;23(6):338–9.
6. Sohn HJ, Bock JY, Baik SO, et al. Determination of lignan compounds in fruits of *Schisandra chinensis* Baillon by capillary-GC(FID). *Han'guk Nonghwa Hakhoechi.* 1989;32(4):350–6.
7. Sterbova H, Sevcikova P, Kvasnickova L, et al. Determination of lignans in *Schisandra chinensis* using micellar electrokinetic capillary chromatography. *Electrophoresis.* 2002;23(2):253–8.
8. Bartlova M, Opletal L, Chobot V, et al. Liquid chromatographic analysis of supercritical carbon dioxide extracts of *Schizandra chinensis. J Chromatogr B.* 2002;770(1-2):283–9.