

## Chapter 83

# *Perilla frutescens* (L.) Britt. 紫苏 (Zisu, Common Perilla and Purple Common Perilla)

Yang Zhao and Xin Zhou

### 83.1 Botanical Identity

Perillae Fructus (Zisuzi in Chinese, Fig. 83.1a), Perillae Folium (Zisuye in Chinese, Fig. 83.1b), and Perillae Caulis (Zisugeng in Chinese, Fig. 83.1c) are dried, mature fruits, leaves, and stems, respectively, of *Perilla frutescens* (L.) Britt., which belongs to the Mint Family [1]. It is a very attractive plant for the garden and attracts butterflies with a strong minty smell. Growing up to four feet tall when in bloom, the stems are square, reddish-purple and branching [2].

Generally, Perillae Fructus, the fruits, are harvested in autumn when they are mature. The fruits are then dried in shaded areas and used for medicinal purposes. Perillae Fructus are oval or spherical with a diameter of around 1.5 mm. The surface of the fruit is taupe brown or greige with slightly bulging dark purple cobwebbing. The epicarp is thin, brittle and squashy.

Perillae Folium, the leaves, are harvested when they are flourishing in summer. The leaves are then dried and impurities are removed. Most of the Perillae Folium are shrinking and crinkling. Unbroken ones are oval with length from 4 to 11 cm, width from 2.5 to 9 cm, when flattened. Petiole 2–7 cm, purple or purplish green, fragile, delicate fragrance, bitter taste.

Perillae Caulis, the stems, are collected after the fruits are mature in autumn and then dried or cut into slices. Perillae Caulis assume to be square shape with different lengths, diameter 0.5–1.5 cm, surface purple brown or darkviolet, light smell and taste.

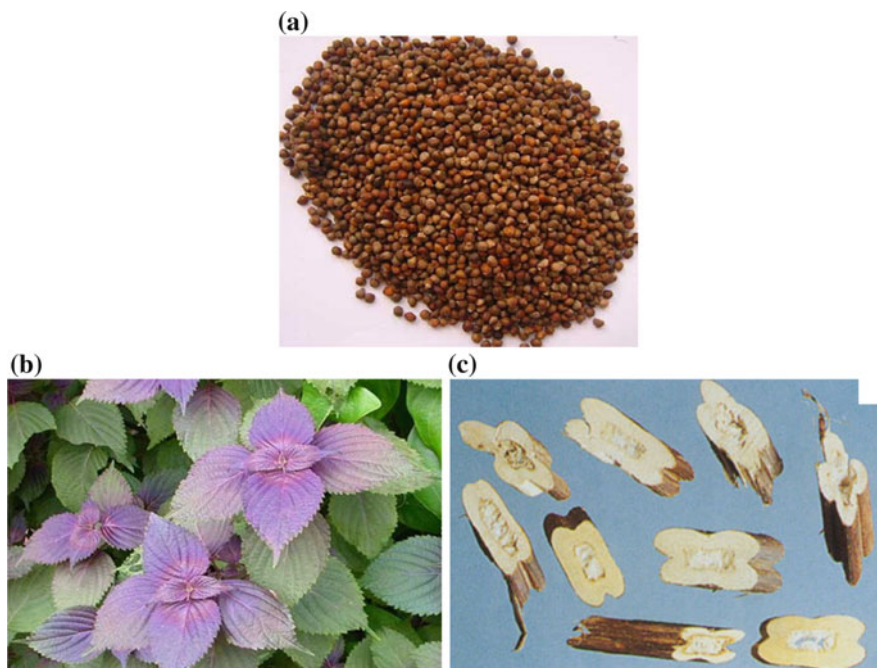
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Y. Zhao · X. Zhou (✉)

Key Laboratory for Information System of Mountainous Areas and Protection  
of Ecological Environment, Guizhou Normal University, Guiyang 550001, China  
e-mail: alice9800@sina.com

Y. Zhao · X. Zhou

The Research Center for Quality Control of Natural Medicine,  
Guizhou Normal University, Guiyang 550001, China



**Fig. 83.1** *Perillae Fructus* (a), *Perillae Folium* (b), and *Perillae Caulis* (c)

*P. frutescens* have been traditionally cultivated in Asia for their seed oil and for their fragrant leaves that are used as medicine or as a garnish for fish. In China, *P. frutescens* is widely distributed. Much cultivation for oil was found around the Wei River valley in northern China in 1999. In Sichuan and Yunnan provinces in southwestern China, *P. frutescens* was also cultivated for oil. In southeastern China, *P. frutescens* was cultivated or grew spontaneously. In Korea, cultivation of *P. frutescens* for oil can be seen everywhere. Its weedy form was also frequently found along roadsides or in abandoned fields [3].

## 83.2 Chemical Constituents

Essential oils including aldehyde (1), limonene (2), and  $\beta$ -caryophyllene (3), flavonoids as well as phenolic acids such as rosmarinic acid (4), catechin (5), apigenin (6), luteolin (7), caffeic acid (8), and ferulic acid (9), shown in Fig. 83.2, were found to be the main chemical compounds in the leaves and seeds of *P. frutescens*.

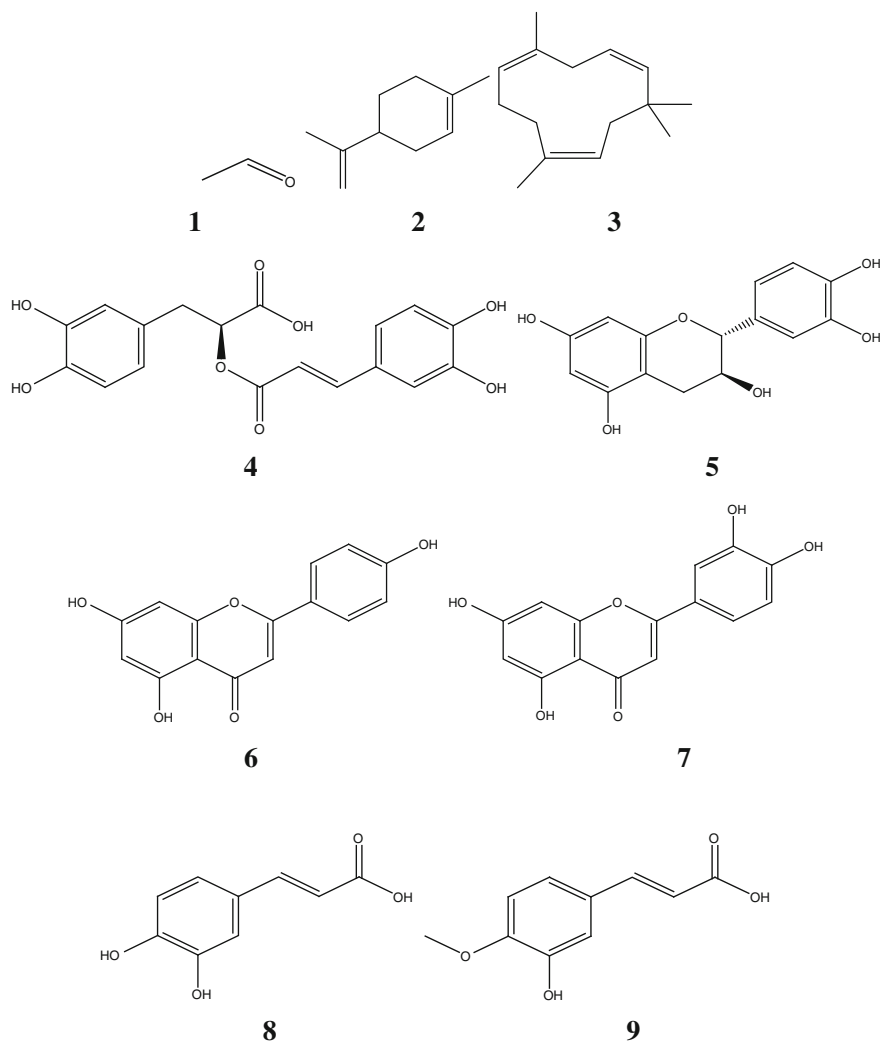


Fig. 83.2 Representative chemical compounds found in *P. frutescens*

### 83.2.1 Essential Oils

Liu et al.'s [4] research indicated that 87 volatile components were identified and determined, accounting for 99.38 % of the total area of the all the peaks in the chromatograms.

### 83.2.2 *Flavonoids and Phenolic Acids*

Ishikura [5] showed that sixteen flavonoid compounds including five anthocyanins, two flavones and nine flavone glycosides were found in mature dark-red leaves and seeds of the *Perilla* plant. In seeds, apigenin and luteolin were present in a ratio of about 1:1. Both flavones and flavone glycosides were found in the leaves. In addition, the leaves contained five kinds of anthocyanins including cyanidin 3,5-diglucoside and its esters with cinnamic acid derivatives. Among these flavonoids, the 3-*p*-coumarylglucoside-5-glucoside of cyanidin and the 7-caffeoylglucosides of apigenin and luteolin were the major compounds in the leaves. Rosmarinic acid was isolated from the dried leaves of *P. frutescens* and was found to be the main chemical compound in 1985 by Aritomi et al. [6].

### 83.3 Pharmacological Studies

The medicinal uses of *P. frutescens* as antiasthmatic, antidote, antimicrobial, antipyretic, antiseptic, antispasmodic, antitussive, aromatic, carminative, diaphoretic, emollient, expectorant, stomachic, and tonic substances have been shown [7]. The plant constituents confirm these properties in alternative medicines and usefulness in curing various diseases and disorders, including many cancers [8–10]. The plant is useful in the treatment of asthma, common cold, cough and lung afflictions, nausea, vomiting, abdominal pain, constipation, food poisoning and cancers, and it can also be used to prevent influenza and to restore health and balance [11, 12]. The stems are a traditional Chinese remedy for morning sickness.

### 83.4 TCM Applications and Dietary Usage

#### 83.4.1 *TCM Applications*

*P. frutescens* has been used as a traditional Chinese medicine for more than a thousand years. The leaves, stems, and fruits are applied for different diseases. *Perillae Fructus* is used mainly for relieving dyspnea and cough, for eliminating phlegm, and for relaxing the bowels; *Perillae Folium* is used to induce perspiration, to dispel cold, and to regulate stomach function; *Perillae Caulis* is used to regulate the flow of Qi and the function of the stomach, to alleviate pain, and to prevent miscarriage. Some monoterpenes from the leaves have been reported to possess bioactivity, such as promotion of intestinal propulsion, prolongation of hexobarbital induced sleep in mice, and inhibitory effects on xanthine oxidase and aldose reductase.

As one of the commonly used traditional Chinese medicines, *P. frutescens* is concluded as one of the most important herbs in many compound preparations. Zhike Huatan Pill is composed of Zisuye (leaf of *Perilla frutescens*), Kuxingren (seed of *Prunus armeniaca* var. *ansu*), Qianhu (root of *Peucedanum praeruptorum*), Banxia (tuber of *Pinellia ternata*), Chenpi (pericarp of *Citrus reticulata*), Chuanbeimu (bulb of *Fritillaria cirrhosa*), Gancao (root of *Glycyrrhiza uralensis*), et al., and is mainly used to treat cough, excessive phlegm, and chest congestion. Juhong Pill is composed of Juhong (outer pericarp of *Citrus reticulata*), Chenpi (pericarp of *Citrus reticulata*), Banxia (tuber of *Pinellia ternata*), Fuling (sclerotium of *Poria cocos*), Gancao (root of *Glycyrrhiza uralensis*), Jiegeng (root of *Platycodon grandiflorum*), Zisuzi (fruit of *Perilla frutescens*), and Kuxingren (seed of *Prunus armeniaca* var. *ansu*) et al., and is commonly used to relieve cough and reduce sputum. Sizheng Pill consists of Guanghuoxiang (herb of *Pogostemon cablin*), Xiangru (herb of *Mosla chinensis*), Mugua (fruit of *Chaenomeles speciosa*), Houpo (bark of *Magnolia officinalis*), Zisuye (leaf of *Perilla frutescens*) et al., and is usually used to treat symptoms of influenza such as diarrhea and vomit.

### 83.4.2 Dietary Usage

*P. frutescens* is an edible plant. The leaves have a very pleasant sweet taste and are used as a spice for fish, rice, vegetables, and soups to give color and flavor to many pickled dishes. It is also chopped and combined with ginger root and salads in many Asian countries. The seeds from the plant also supply nutritious cooking oil. The essential oil of the plant is used as a food flavoring. The entire plant is very nutritious with vitamins and minerals [13]. Seedlings of the plant are added to salads, older leaves are used as a garnish or flavoring. The leaves contain about 3.1 % protein, 0.8 % fat, 4.1 % carbohydrate, and 1.1 % ash. The seeds can also be eaten cooked. Seeds from purple leafed forms of the plant are preferred for culinary uses. The seed contains about 21.5 % protein, 43.4 % fat, 11.3 % carbohydrate, and 4.4 % ash. The plant yields an essential oil which is used as food flavoring in candies and sauces [8].

### 83.5 Clinical Evidence

The earliest clinical application of *P. frutescens* was recorded in “Bencaojing Jizhu”. As one of the famous Chinese medicines for the treatment of cough and asthma, *P. frutescens* is often used in combination with Chenpi (pericarp of *Citrus reticulata*), Fuling (sclerotium of *Poria cocos*), Gancao (root of *Glycyrrhiza uralensis*), et al., to treat Qi stagnation. Clinical application of Xiangsu Yiqi Pill, consisting of Xiangfu (rhizome of *Cyperus rotundus*), Zisugeng (stem of *P. frutescens*), Chenpi (pericarp of *Citrus reticulata*), Fuling (sclerotium of *Poria*

*cocos*), Gancao (root of *Glycyrrhiza uralensis*), et al. indicated that this compound preparation had significant curative effect on Qi depression and light-headedness. The recovery rate reached 100 % [14]. It has been used alone to prevent miscarriage, in combination with Juhong (outer pericarp of *Citrus reticulata*) and Sharen (fruit of *Amomum villosum*) for warming the middle energizer, in combination with Wuyao (root tuber of *Lindera aggregata*) for relieving pain, and in combination with Xiangfu (rhizome of *Cyperus rotundus*) and Mahuang (herb of *Ephedra sinica*) for treating diaphoresis.

### 83.6 Safety Evaluation and Toxicity Data

Essential oil from *P. frutescens* exhibited strong contact toxicity against the booklice at a concentration of 0.16  $\mu\text{L}/\text{cm}^2$  and possessed fumigant toxicity at a concentration of 0.04  $\mu\text{L}/\text{L}$  [15]. By i.g. only once, the essential oil of Hubei *P. frutescens* could poison the mice, even more to die successively. The LD50 of the oil in mice was 3.10 g/kg for i.g. [16].

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