Pyrus bretschneideri

Scientific Name

***Pyrus x bretschneideri* Rehd.**

Synonyms

Pyrus serotina sensu Hedrick, non Rehder, *Pyrus ussuriensis* var. *chinensis* Kikuchi.

Family

Rosaceae

Common/English Names

Chinese White Pear, Crisp Chinese Pear, Duck Pear, White Pear, Ya Pear, Ya Li Pear.

Vernacular Names

Chinese*:* Ba-Li, Pai, Li, Guan-Li, Kuan-Li, Lai Yang Zu Li, Ya-Li;
German: Weiße Birne.

Origin/Distribution

This species is native to Northern and north-western China. It is cultivated from central to Eastern China, Japan, Central Asia and USA.

Agroecology

Ya pear is a cold temperate species, preferring sunny, loamy soils and is found from 100 to 2,000 m altitudes. It is often cultivated on slopes.

Edible Plant Parts and Uses

Ya pear is juicy, sweet and crispy and is best eaten fresh or in fruit salads. It also can be blended into drinks.

Botany

A small, deciduous tree 5–8 m tall, with stout hairy branchlets. Leaves, alternate on 2.5–3 cm long petioles, lamina ovate or elliptic-ovate, 5–11 × 3.5–6 cm, both surfaces tomentose when

T.K. Lim, *Edible Medicinal And Non-Medicinal Plants: Volume 4, Fruits*,
DOI 10.1007/978-94-007-4053-2_60, © Springer Science+Business Media B.V. 2012

Plate 1 Harvested Ya pears

Plate 2 Close-view of ya pear

young, soon glabrescent, base obtuse to broadly cuneate, margin spinulose-serrate, apex acuminate. Raceme umbel-like, 7–10-flowered. Flower white, floccose, glabrescent, 2–3.5 cm in diameter, pedicels 1.5–3 cm long, hypanthium cupular, slightly pubescent, sepals caducous, glabrous, petals white, ovate, 1.2–1.4 × 1–1.2 cm, base shortly clawed, apex rounded. Fruit a pome, ovoid to subglobose 2.5–4 cm diameter, yellow, with fine dots (Plates 1 and 2), 4- or 5-loculed, flesh white, gritty, juicy and crisp.

Nutritive/Medicinal Properties

Total sugar content in 13 varieties of *Pyrus bretschneideri* was very variable ranging from 90 to 156 mg/ml juice, fructose 35.2–84.6 mg/ml juice, glucose 25.5–39.2 mg/mL juice, sucrose 3.4–31.6 mg/mL juice and sorbitol 7.4–22.3 mg/mL juice (Pan et al. 2002). Ya pear was found to have in g FW β-cryptoxanthin 0.03 μg/g, δ-tocopherol 2.68 μg/g, γ-tocopherol 1.08 μg/g, α-tocopherol 4.26 μg/g, δ-tocotrienol 0.04 μg/g and α-tocotrienol 0.03 μg/g (Isabelle et al. 2010).

The total organic acid contents in fruits of *P. bretschneideri* cultivars ranged from 1.74 to 4.88 mg/g FW (fresh weight) (Sha et al. 2011). Malic, citric, quinic, oxalic, and shikimic acids were found in the fruit of all 10 cultivars. Malic and citric acids were the major constituents. The malic acid content ranged from 0.71 to 1.98 mg/g FW, accounting for 22–83% of the total organic acid content. The citric acid content ranged from 0.05 to 2.35 mg/g FW, accounting for 2–58% of the total organic acid content. The minor organic acids in the fruit were quinic and oxalic acids with contents of 0.08–0.57 mg/g FW (3–20% of the total) and 0.002–0.19 mg/g FW (0.1–9% of the total), respectively. The content of acetic, shikimic, succinic, fumaric, tartaric, and lactic acids was relatively low. Again, the organic acid composition did not differ significantly between cultivars, but the contents of the individual organic acids varied greatly.

Arbutin and chlorogenic acid were found as the main phenolic constituents in Ya pear (Cui et al. 2005). The two compounds existed in different organs of the Yali pear, one of the major cultivars of *Pyrus bretschnrideri*. The contents of arbutin in the leaf bud, floral bud, flower, and young fruit were 11.9, 12.4, 8.29, and 9.92 mg/g fresh weight (FW), respectively. Chlorogenic acid amounts in the same organs were 2.26, 3.22, 5.32, and 3.72 mg/g FW, respectively. During development, the concentration of the two compounds in Yali pears was the greatest in young fruit (9.92 mg/g FW of arbutin and 3.72 mg/g FW of chlorogenic acid), and then declined swiftly with fruit growth to less than 0.400 and 0.226 mg/g FW, respectively, in mature fruit. Arbutin and chlorogenic acid were also the main phenolic constituents in ya pear fruit skin (Lin and Harnly 2008). Yali pear (group 2) was found to contain significant amounts of dicaffeoylquinic acids compared to other pear groups.

Antioxidant Activity

Pyrus bretschdneideri fruit was found to have the following antioxidant profile H-ORAC (Hydrophilic- Oxygen Absorbance Capacity) 8.45 μmol TE/g FW, total phenolic content 0.6 mg GAE/g FW and ascorbic acid 6.7 μg ascorbic acid/g FW (Isabelle et al. 2010). The N-butanol extract of *Pyrus bretschdneideri* showed the best antioxidant potential as evaluated by the DPPH assay, B-carotene bleaching and FRAP methods (Li et al. 2011a). The main phenolic compounds in five commercial pear cultivars were found to have gallic acid ranging from 5.23 to 10.72 μg/g, catechin from 0.41 to 28.83 μg/g, chlorogenic acid from 485.11 to 837.03 μg/g, caffeic acid from 0 to 1.16 μg/g, epicatechin from 6.73 to 131.49 μg/g, and rutin from 0.92 to 104.64 μg/g (Li et al. 2011b). The total antioxidant capacity was found in descending order: *Shuijing* (*P. pyrifolia*) > *Fengshui* (*P. pyrifolia*) > *Xuehua* (*Pyrus bretschneideri*) > *Ya* (*Pyrus bretschneideri*) > *Xiang* (*Pyrus* sp. nr. *communis*) pears, which was consistent with the total phenol and flavonoid contents. The antioxidant capacity of pears may be attributed to their high contents of phenolics and flavonoids.

Antiinflammatory Activity

The ethanol extract of *P. bretschneideri* was found to have significant antiinflammatory activity (Huang et al. 2010). Its ethyl acetate fraction exhibited the strongest antiinflammatory effect. two sterols β-sitosterol, daucosterol, and two triterpenes, oleanolic acid, and ursolic acid were identified in the fraction. All of the isolated compounds were found to significantly inhibit the ear oedema induced by xylene. Ethyl acetate extract of *Pyrus bretschdneideri* exhibited high antiinflammatory followed by the n-butanol and ethanol extracts (Li et al. 2011a). The antiinflammation activity of five commercial pear cultivars was found in decreasing order: *Xuehua* (*Pyrus bretschneideri*) > *Xiang* (*Pyrus* sp. nr. *communis)* > *Ya* (*Pyrus bretschneideri*) > *Fengshui* (*P. pyrifolia*) > *Shuijing* (*P. pyrifolia*) pear, which indicated that compounds other than antioxidants may be responsible for the antiinflammation effect.

Miscellanous Activity

Pyrus bretschneideri, as a pharmaceutical supplement, is widely used in northern China to treat respiratory diseases (Huang et al. 2010).

Other Uses

The tree is also planted as shelter-belt and its wood can be used for making cabinets and instruments.

Comments

Pyrus × *bretschneideri* is considered an interspecific hybrid of *P. ussuriensis* and *P. pyrifolia*. It is also considered as one of the parents of the hybridogenic *Pyrus singkiangensis*. There are about 200 cultivars of the *Pyrus x bretschneideri.*

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