Pyrus pyrifolia

Scientific Name

***Pyrus pyrifolia* (Burm.) Nak.**

Synonyms

Ficus pyrifolia Burm. f., *Pyrus montana* Nakai, *Pyrus pyrifolia* (Burm. f.) Nakai f. *stapfiana* (Rehder) Rehder, *Pyrus serotina* Rehder, *Pyrus serotina* Rehder var. *stapfiana* Rehder, *Pyrus sinensis* auct. jap., non Poiret.

Family

Rosaceae

Common/English Names

Asian Pear, Apple Pear, Chinese Pear, Korean Pear, Japanese Pear, Nashi, Nashi Pear, Oriental Pear, Sand Pear.

Vernacular Names

Chinese: Sha Li;
Czech: Jabloň Hruškolistá;
Danish: Japanpære, Japansk Pære, Kinesisk Pære, Sandpære;
Dutch: Japanse Peer;
Eastonian: Liiv-Pirnipuu;
French: Poirier Chinois, Poire Nashi, Poirier Des Sables, Poirier Japonais;
German: Nashi-Birne, Sandbirnbaum;
India: Nashpati (Hindu);
Indonesia: Appel Jepang;
Japanese: Nashi, Nihon Nashi, Tyô-Sen, Perusu Serotina, Yama Nashi;
Korean: Bae, Paenamu, Tolpaenamu;
Malaysia: Lai;
Nepal: Naxhpati;
Philippines: Peras;
Russian: Gruša Pesčanaja;
Spanish: Pera;
Thai: Sa Li;
Vietnam: Lê.

Origin/Distribution

The species is native to Eastern Asia – China, Japan and Korea. It is cultivated throughout central and South China, in the Far East of Russia, Korea, Southern Japan, in the northern mountainous parts of Vietnam, Thailand and India and to a lesser extent in Middle Asia, Indonesia and Philippines. Recently, it is also cultivated in Australia, New Zealand and USA (California) and in the warmer regions of Europe (Italy, France).

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Agroecology

Nashi pear is adapted to a temperate climate regime with warm (24–32°C), humid (relative humidity 80–90%), rainy summers and cold winters (−5°C to 10°C) when it remains dormant. The variation of annual mean temperature ranges from 10°C to 16°C and mean annual precipitation hovers around 1,500 mm. It is cultivated from 100 m to 1,400 m altitude in full sun and in fertile, well-drained soils.

Edible Plant Parts and Uses

Nashi pear fruit is large with firm, crispy, sweet, juicy flesh and is best eaten raw or fresh out of hand or in fruit salads. It is also eaten cooked. In cooking, ground pears are used in vinegar or soy sauce-based sauces as a sweetener, instead of sugar or as a garnish or ground and added to mixtures. They are also used for marinating meat, especially beef. Nashi pears generally are not baked in pies or made into jams because they have a high water content and a crisp, grainy texture, very different from the buttery European varieties (*Pyrus communis*). Because of the large size and the unique and refreshing taste of Nashi, the fruit commands a premium price and tends to be served to guests or given as gifts, or eaten together in a family context.

Botany

A deciduous, small to medium sized tree, 7–15 m high with a dense broadly pyramidal to rounded canopy. Branchlets terete, purplish brown and tawny tomentose when young becoming dark brown and glabrescent with age and sparsely lenticelled. Stipules caducous, linear-lanceolate; petiole 3–4.5 cm, initially tomentose, glabrescent. Leaves alternate, ovate-elliptic or ovate, 7–12 × 4–6.5 cm, glabrous or brown lanate when young, base rounded or subcordate, margin spinulose-serrate, apex acute, mature leaf shiny, dark green in summer (Plates 1, 2 and 3), yellow, orange, red in autumn. Raceme umbel-like, 6–9-flowered. Flowers 2.5–3.5 cm across, sepals triangular-ovate, 5 mm; petals white, ovate, 1.5–1.7 cm, base shortly clawed, apex rounded; stamens 20; ovary 5- or 4-loculed, with 2 ovules per locule; styles 5, rarely 4, nearly as long as stamens, glabrous (Plate 1). Fruit a pome yellowish-brown or greenish- yellow, with pale dots, subglobose, 5–8 cm in diameter and subglabrous (Plates 3, 4, 5, 6 and 7).

Nutritive/Medicinal Properties

Proximate nutrient composition of fresh nashi fruit (*Pyrus pyrifolia*) per 100 g edible portion excluding refuse 9% of the core and stem was reported as follows (UDSDA 2011): Water 88.25 g, energy 42 kcal (176 kJ), protein 0.50 g, total lipid (fat) 0.23 g, ash 0.37 g, carbohydrate 10.65 g, fibre (total dietary) 3.6 g, sugars (total) 7.05 g; minerals Ca 4 mg, Fe 0.0 mg, Mg 8 mg, P 11 mg, K 121 g, Na 0 mg, Zn 0.02 mg, Cu 0.050 mg, Mn 0.060 mg, Se 0.1 μg; vitamins – vitamin C (ascorbic acid) 3.8 mg, thiamine 0.009 mg, riboflavin 0.010 mg, niacin 0.219 mg, pantothenic acid 0.070 mg, vitamin-6 0.022 mg, folate (total) 8 μg, total choline 5.1 mg, vitamin E (α-tocopherol) 0.12 mg, vitamin K (phylloquinone) 4.5 μg; lipids – total saturated fatty acids 0.012 g, 16:0 (palmitic acid) 0.010 g, 18:0 (stearic acid) 0.002 g; total monounsaturated fatty acids 0.049 g, 16:1 undifferentiated (palmitoliec acid) 0.001 g, 18:1 undifferentiated (oleic acid) 0.047 g, 20:1 0.001 g; total polyunsaturated fatty acids 0.055 g, 18:2 undifferentiated (linoleic acid) 0.055 g, 18:3 undifferentiated (linolenic acid) 0.001 g; amino acids – tryptophan 0.005 g, threonine 0.013 g, isoleucine 0.014 g, leucine 0.025 g, lysine 0.017 g, methionine 0.006 g, cystine 0.005 g, phenylalanine 0.013 g, tyrosine 0.004 g, valine 0.018 g, arginine 0.009 g, histidine 0.005 g, alanine 0.017 g, aspartic acid 0.098 g, glutamic acid 0.036 g, glycine 0.014 g, proline 0.016 g, serine 0.018 g, lutein + zeaxanthin 50 μg.

Studies showed that different Asian pear (*P. serotina*) cultivars differed in their contents of different sugars and organic acids (Hudina and

Plate 1 Nashi flowers and young foliage

Plate 2 Young nashi fruits and leaves

Plate 3 Mature nashi fruit

Štampar 2000). The fructose content in 4 European pear cultivars ranged from 27.9 to 45.7 g/kg and sorbitol varied from 5 to 19.0 g/kg. The Asian pear cultivars contained more total sugars than the European ones.

The total organic acid content in the fruits of *P. pyrifolia* cultivars ranged from 1.84 to 3.46 mg/g FW (fresh weight) (Sha et al. 2011) Malic, citric, quinic, oxalic, shikimic, and fumaric acids were detected in all of the 10 cultivars, tartaric acid was detected in 2 cultivars, and acetic acid was detected in only 1 cultivar. Malic and citric acids were the major constituents. The citric acid content was higher than the malic acid content in 3 cultivars. The malic acid content ranged from 0.61 to 2.11 mg/g FW (= 32–73% of the total) followed by citric acid with a content of 0.36–1.48 mg/g FW (= 13–43% of the total). The minor organic acids in the fruit were quinic and oxalic acids with contents of 0.12–0.44 mg/g FW (= 6–19% of the total) and 0.01–0.17 mg/g FW

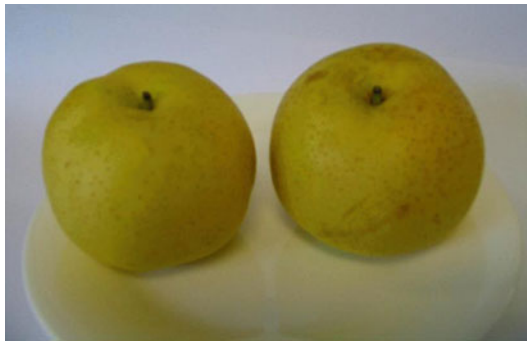

Plate 4 Greenish-yellow nahsi cultivar

Plate 5 Yellow nashi cultivar

Plate 6 Brown nashi cultivar

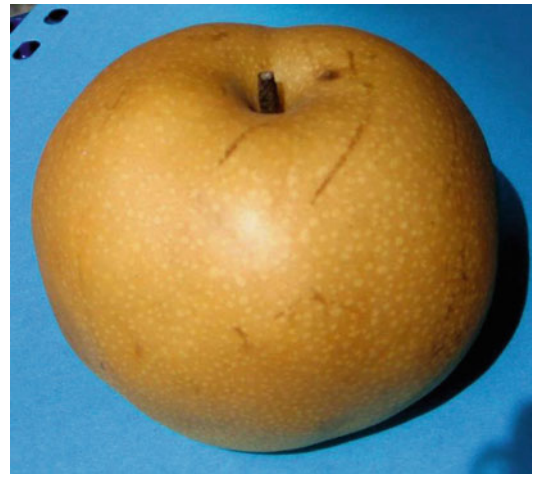

Plate 7 Close-up of brown nashi cultivar

(= 0.4–8% of the total), respectively. The content of acetic, shikimic, succinic, fumaric, tartaric, and lactic acids were relatively low. Although all of the cultivars showed similar organic acid composition, the total organic acid content varied significantly.

Nashi pear was found to contain pectin (0.9%) and arbutin and chlorogenic acid as the main phenolic constituents in nashi fruit (Cui et al. 2005). Arbutin and chlorogenic acid were also the main phenolic constituents in the fruit skin (Lin and Harnley 2008). Asian pear (group 2) contained only trace quantities of the remaining phenolics such as dicaffeoylquinic acids, quercetin glycosides, isorhamnetin glycosides and the glycosides of luteolin, apigenin, and chrysoeriol; and cyanidin 3-O-glucoside compared to other pear groups.

Two caffeoylmalic acid methyl esters, 2-O-(trans-caffeoyl)malic acid 1-methyl ester and 2-O-(trans-caffeoyl)malic acid 4-methyl ester were isolated from pear (*Pyrus pyrifolia* Nakai cv. Chuhwangbae) fruit peels (Lee et al. 2011). Further, 5 known hydroxycinnamoylmalic acids

and their methyl esters were identified: 2-O-(trans-coumaroyl)malic acid, 2-O-(cis-coumaroyl)malic acid, 2-O-(cis-coumaroyl)malic acid 1-methyl ester, 2-O-(trans-coumaroyl)malic acid 1-methyl ester and 2-O-(trans-caffeoyl)malic acid (phaselic acid).

The aqueous ethanolic extract of *Pyrus pyrifolia* bark was found to exhibit protein glycation inhibitory activity and the extract also showed antioxidative activity (Kim and Kim 2003). The glycation inhibitory activity was significantly correlated with the antioxidative potency of the extract. The positive glycation inhibitory and antioxidative activities of nashi bark extract might suggest a possible role in targeting aging and diabetic complications.

Other Uses

In Japan, nashi seedlings are used as rootstock for various pear cultivars.

Comments

Fruits of the Akanashi cultivar group are brownish (Plates 3, 6 and 7) and those of the Aonashi cultivar group are greenish-yellow (Plates 4 and 5).

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