

대만의 매실산업

Japanese Apricot in Taiwan

Kuo-Tan Li

Department of Horticulture and Landscape Architecture,
National Taiwan University

Abstract

Japanese apricot (*Prunus mume* Sieb. et Zucc.) is the national symbol and was once the most important temperate fruit crop in Taiwan. Fruiting cultivars were originally introduced from southern China but commercial production was not significant until the 1970s. Currently 6,400 ha of Japanese apricot orchards distribute on shallow mountain hills in the central and the southern part of the island. Taiwanese commercial fruiting cultivars are plausibly chance seedlings or sports from the early introduction and are very low chilling required for budbreak. Ornamental cultivars have been mainly introduced from Japan but cultivations have been limited in high altitude area due to their high chilling requirement. In 2009, Taiwan Agricultural Research Institute's breeding program released the first low chill ornamental cultivar 'Tainung No.2'

with a great ornamental potential in subtropical regions. Cultivation and production of Japanese apricot fruit in Taiwan continue to dwindle due to the declining Japanese market share. Ongoing industry transformation to increase domestic consumption and consumer's interest will sustain the future of Japanese apricot in Taiwan.

1. Introduction

Japanese apricot (*Prunus mume* Sieb. et Zucc.), or Mei (梅) in Chinese, was originated in the Yangzi Valley and has been appreciated by ancient Chinese since the Neolithic age (8). Archeological evidence and documentary records suggest that the domestication of Japanese apricot as a fruit or an ornamental tree occurred in China long before Han dynasty (about 200 BCE). Regardless of the distance from the origin and the subtropical climate,

Corresponding author: Kuo-Tan Li
Department of Horticulture and Landscape Architecture, National Taiwan University,
1 Roosevelt Road Section 4, Taipei 10617, Taiwan
Tel: 886-2-33663725
Fax: 886-2-23625542
E-mail: kuotanli@ntu.edu.tw

Taiwan has shared an intimate relationship with Japanese apricot since the founding of the Republic. The symbolic value of Japanese apricot trees and blossoms has deeply rooted in the traditional culture of immigrants from the mainland; the production of Japanese apricot fruit in the mountainous region has profited the indigenous Taiwanese communities, and the recent trend of recreational transform of Japanese apricot orchards has encouraged urban residents to rediscover the potential of Japanese apricot.

The blossom of Japanese apricot has long beloved by the Chinese immigrants who brought this species to Taiwan. During the establishment of the Republic of China, the blossom of Japanese apricots was appreciated by revolutionaries in the mainland as a symbol of perseverance to take down the ruining empire. The appreciation continued after the retreat of the government to Taiwan in 1949 and led to the official designation of Japanese apricot blossoms as the national flower of Taiwan, the Republic of China, by the Executive Yuan of the Republic in 1964 (4). The very early bloom season makes Japanese apricot symbol for resilience and perseverance in the face of adversity during the harsh winter. The triple grouping of stamens (three stamens per petal) on the national emblem represents Dr. Sun Yat-sen's Three Principles of the People, while the five petals symbolize the five branches of the government structure (Figure 1, top). The blossom has been featured on New Taiwan Dollar bills and coins as well as on emblems for numerous government agencies, public schools, and academic institutes (Figure 1, bottom) (9). A freehand painting of Japanese apricot blossoms is used by China Airlines, the national carrier of the Republic, as the enterprise identity.

Regardless of the symbolic value and the frequent appearance of the Japanese apricot blossom



Figure 1. The national emblem of Taiwan, the Republic of China (top, source: Government Information Office, Taiwan) and the University emblem of National Taiwan University (bottom, source: National Taiwan University).

figure, it is, not surprisingly, neither fruiting nor ornamental Japanese apricot trees is common in reality in the urban area due to the subtropical and tropical climates.

2. Early records of fruiting Japanese apricot in Taiwan

The Japanese apricot is a typical temperate tree species and requires certain winter chills for bud-break and normal bloom in the spring. In general, fruiting cultivars of Japanese apricots need less chilling hours, a given period of chill temperature when the tree is dormant, than ornamental cultivars and have long been commercially cultivated in southern China at where winter is warmer and ends earlier than that of the Yangzi Valley in the north (8). Fruiting Japanese apricot cultivars in Taiwan were first introduced from southern China, possibly from the province of Fujian and Guangdong, 300 years ago by the early immigrants (11,

18). The exact date and origin of the early acquisition were elusive and planting of Japanese apricots was scarcely documented. The early introduction of Japanese apricot did not result in a measurable commercial production, nor did systematic cultivar conservation in Taiwan. Along with the expanding of early Chinese immigrants to the mountainous region and through the trading tie between immigrants and indigenous communities, it is presumable that Japanese apricot might have gradually spread from the tropical lowland to the higher altitude area at where the cooler temperature might have provided an opportunity for this species to be naturalized. During the early years of the last century, several specimens of “native” Japanese apricot trees in Ali Mountain and the Central Mountains were collected and nomenclatured as *Prunus mume* Sieb. et Zucc. var. *formosana* Masam. (3). However, without further investigation, whether these wild Japanese apricot trees were aboriginal or escaped remains debatable.

Arguably the first official record of fruiting cultivar introduction was reported in the First Orchard Record of the Taihoku Imperial University Farm (15). ‘Shirokaga’, a fruiting cultivar still popular in Japan today, and ‘Hanagami’, a dual-purpose fruiting-ornamental cultivar were introduced from Japan to the Taihoku Imperial University, now National Taiwan University (NTU), in 1930. Both cultivars

grew weakly in Taipei’s subtropical climate due to insufficient winter chills. The result from this report indicated that fruit production of Japanese apricots is not likely of any economic potential. Seemingly the investigators were unaware of the existence of Japanese apricots in southern Taiwan that had been introduced from China long before their work, nor did they notice the capability of acclimation of this species to warm regions.

3. Fruiting cultivars in Taiwan

Many fruiting cultivars have been cloned and commercially cultivated in Taiwan (11). Some of them are widely planted in most commercial orchards, others remain local. It is speculated that current fruiting cultivars in Taiwan may not be direct clones of those original Japanese apricot trees brought in from southern China 300 year ago. Rather, they are more plausibly chance seedlings or sports off their ancestors. Regardless of the relatively small fruit size compared to that of quality Japanese cultivars, other basic fruit properties of Taiwanese cultivars are acceptable for commercial production (Table 1).

Table 1. Properties of major fruiting Japanese apricot cultivars in Taiwan (source: Ou, 1995)

Cultivar	Mean fruit wt. (g)	Flesh (%)	Sugar (Brix)	Acid (%)	Vit. C (mg)	Ash (%)
Ta-ching	13.6	84.6	7.0	5.2	5.5	0.5
Shan-lien	7.4	83.0	7.9	5.6	4.8	0.6
Chan-tern	17.5	87.1	8.4	6.5	4.6	0.6
Taur-hisng-mei	12.9	84.4	7.3	4.8	3.2	0.6
Yen-chi-mei	13.5	88.3	7.4	5.2	4.6	0.5
Wan-shan	11.6	83.5	6.9	4.6	5.6	0.5

Several important physiological characters of these Taiwanese cultivars are the extremely low chilling requirements, short dormancy periods, and early bloom, ensuring them to flourish and to produce satisfactory yield in the subtropical climate (5, 10-11). It was estimated that < 100 chilling units (CU, based on 12°C) are sufficient for 'Wan-shan' and 'Yen-chi-mei'; 80 CU for 'Ta-ching' and 'Taur-hisng-mei'; 60 CU for 'Shan-lien' to break dormancy (10). With the low chill cultivars and the mild winter in Taiwan, full bloom of fruiting Japanese apricots starts by late December and fruit are usually mature by mid-April. Some low chill Taiwanese cultivars were tested and were proven promising as a cash crop for the northern highland of Thailand (14).

The low chill character of Taiwanese cultivars is associated with low accumulation of dehydrin in dormant buds (17). Previous studies show that fruiting cultivars from Taiwan can be clearly segregated from cultivars from Japan and China by molecular markers. With simple sequence repeat (SSR or microsatellite) markers, distinctive genetic differences between Taiwanese cultivars and germplasms from Japan and China were identified (5). In a recent study, differential expression of *PmDAM* genes contributing to the low chill property of Taiwanese fruiting cultivars was reported (12)

4. Production status of Japanese apricot fruit in Taiwan

Commercial cultivation of fruiting Japanese apricots concentrates on the central and the southern hill sites between 500 m and 1500 m alt. The moderate elevation provides sufficient winter chills for breaking dormancy while the dry and warm spring climate encourages good pollination and promotes fruit growth. Although the temperature in the

northern part of the island is appropriate for most Taiwanese low chill cultivars, the wet and cool spring are detrimental for commercial fruit production.

The domestic market of Japanese apricot fruit has been relatively small and hence commercial production in Taiwan was not of economic importance until 1970. Benefited from the increasing market share in Japan, the planting area of fruiting Japanese apricots steady increased between 1970 and 1993 (figure 2). By 1996 the planting area reached a historical record of 10,835 ha with an annual fruit production over 90,000 tons (2). During the glorious period of Japanese apricot industry, most fruit were simply pickled with salt after harvest and exported to Japan in the form of umebashi (dry pickled Japanese apricots). The industry boom, however, was ephemeral. Taiwan's market share in Japan was quickly taken over by similar but cheaper commodities from China and Southeast Asian countries (Thailand and Vietnam). Orders from Japan continuously shrunk after 1998, leading to the removal of Japanese apricot trees for other fruit production or the completely negligence of many Japanese apricot orchards.

Currently there are less than 6,500 ha of Japanese apricot orchards in Taiwan. 40% of the orchards are located in the central hill site in Nantou and Taichung, 30% in the southeast hills in Taitong, and 27% in the southern hills of Kaohsiung and Tainan. By planting area, Japanese apricot is still the top 10 among all fruit crops and ranks second among temperate fruit crops in Taiwan (2). However, due to the shrinking oversea market share, many orchards are not commercially managed, thus continuously declining yield and total production being expected in the future (Figure 2).

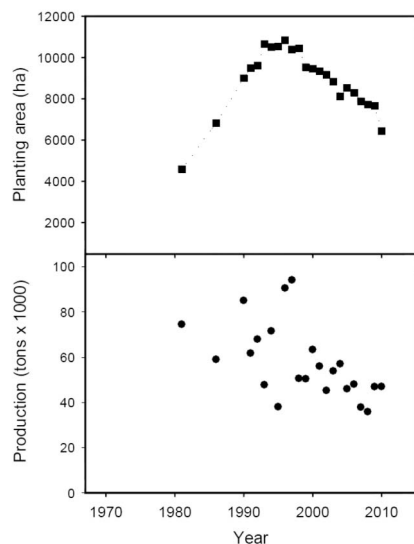


Figure 2. Commercial fruiting Japanese apricots planting area (top) and production (bottom) in Taiwan (source: Council of Agriculture, Taiwan)

5. Cultivation of ornamental Japanese apricots

Regardless of the symbolic value and the popularity of Japanese apricots, ornamental cultivars are not commonly seen in Taiwan due to their high chilling requirement. Many ornamental cultivars in Taiwan were introduced from Japan after 1960 through various official agencies and events. In the Year Book of National Taiwan University's Highland Experimental Farm published in 1984, twenty two ornamental cultivars under evaluation were reported (6). This is arguably the most complete collection of ornamental Japanese apricot cultivars from the early introduction in Taiwan. Located at 2,200 m altitude in central Taiwan, the NTU Highland Experimental Farm offers sufficient winter chills for all accessions in the collection. Many accessions still grow vigorously and bloom normally today. Unfortunately, due to lack of enthusiasm and resources for promotion and maintenance,

records have been discontinued and correct labels for the remaining accessions have been missing. Some ornamental cultivars from early introductions also conserved in several public forestry resorts. Re-identification of these anonymized cultivars and restoring the ornamental Japanese apricot conservation is a future project in NTU Highland Experimental Farm.

In recent years, a moderate fever for ornamental Japanese apricots arose among amateur gardeners in northern Taiwan. Although the consistent winter and spring rain in this region is a lethal detriment for fruiting Japanese apricots cultivation, the winter chills are, at least, capable of partially satisfying most ornamental cultivars, allowing many to grow and bloom for home gardening. Unlike the early introduction which was exclusively made by official agencies, current introductions of ornamental Japanese apricots were made by commercial trading activities with Japanese garden retailers or nurseries, or through undocumented imports from China. These plants are often not true to type due to mislabeling or mixed shipping.

6. Breeding programs for Japanese apricot cultivars

The only controlled breeding program for Japanese apricot in Taiwan has been held in Taiwan Agricultural Research Institute (TARI) in Taichung, central Taiwan. In 2009, TARI released 'Tainung No.2', the first cultivar from its Japanese apricot program breeding program, with a great ornamental potential for subtropical regions (16). This cultivar was the result of a cross between a low chill, local fruiting cultivar and a double, pink ornamental cultivar. Chilling requirement for 'Tainung No. 2' was only 75 CU estimated by the Florida low chill peach model (13). 'Tainung No.2 is

also the first Japanese apricot cultivar that a plant variety right has ever granted by the Council of Agriculture in Taiwan. With this new low chill ornamental cultivar, it is expected that Japanese apricot will be a popular plant material and will be widely used for landscaping and gardening in the urban area in Taiwan.

7. Future perspectives

In the past, the export-oriented market destined the rise and fall of Japanese apricot cultivation in Taiwan. The primary commodity of the Taiwan's previous Japanese apricot industry was umebashi, or pickled mei fruit, for the Japanese market. Consumption of umebashi is not common in Taiwanese diet and therefore domestic market size was small. In addition to the dwindling market share in Japan, aging populations and lack of labor resources in the rural region have been a challenge even though orchard management for Japanese apricot trees is much less intensive than for other fruit trees. These harsh situations have forced growers to abandon their orchards or to seek alternative crops with high profits.

In recent years, efforts have been made by government agencies and individual growers to revitalize the Japanese apricot industry in Taiwan through various moves of industry upgrade, market redirection, and orchard transformation (7).

Developing a high-end customer base production strategy is the first step of industry upgrade. Improving fruit quality by renewing inferior old cultivars with prominent new cultivars, replacing the traditional tree or branch shacking, strip harvesting technique with a more gentle, selective hand harvesting technique, and handling fruit with care after harvest ensures high quality commodities to be produced for high-end customers in both

oversea and domestic markets.

Increasing local customer's interest and consumption by diversifying commodity types and by evoking customer's awareness of the many health benefits of Japanese apricot is of importance to increase local market demand. In addition to candied, salted, and spiced Japanese apricot fruits in various forms that have traditionally been popular snacks in Taiwan, new products with better health benefits, such as Japanese apricot vinegar, Japanese apricot wine, Japanese apricot juice, have been promoted in the market. Various types of new products derived from concentrate Japanese apricot pastes (umeeekis), a traditional health food long beloved in Japan, have been manufactured and technology transferred to the industry (1). These new types of Japanese apricot commodities have received customer's attentions in the local functional food stores and farmers markets in recent years. With these efforts, a gradual increment in domestic market size is expected.

Another ongoing trend is the transformation of Japanese apricot orchards to recreation gardens or farm resorts. Although flowers of fruiting Taiwanese cultivars are monotonous and smaller than those of ornamental cultivars, the symbolic value, the scenic orchard landscape, and the aromatic sensation of Japanese apricot trees at full bloom are still attractions for many Taiwanese. Visiting Japanese apricot orchards at blooming season has become a popular outdoor activity in the late winter/early spring. Some orchard managers have invested in the transformation of conventional orchards exclusively for fruit production to modern recreation farms or resorts. In combination with the pleasant climate in the subtropical moderate elevation and the nearby tourist attractions, such transformation has not only generated satisfactory profit for elder growers but also encouraged young

generations to stay in the industry.

In conclusion, the planting area and fruit production of Japanese apricot in Taiwan may still continue to decrease in the near future. However, the emotional significance of Japanese apricot to the nation and the rediscovery of its health benefit and ornamental potential, in combination with the government and individual inputs for industry revitalization, a more sustainable managing, utilizing, and marketing system for the Japanese apricot industry in Taiwan is foreseeable.

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