Osmanthus Fragrans in China

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A traditional, famous flowering tree, *Osmanthus fragrans*, Lour. has been cultivated as an ornamental and scent plant for about 2,500 years in China.[1] It was usually planted at the Imperial gardens in ancient China. A large number of poems had been written and popular mythical tales were told and read with admiration by Chinese people. Since the Ming and Qing dynasty, the cultivation extended to the public in many regions especially in Suzhou, Hangzhou, Guiling, Xianing and Chengdu.

The small golden or yellowish flowers possess delicate fragrance and a fruity, sweet floral note. It was utilized as a traditional flavoring additive in pastries, candies, preserved fruits, wines and tea. Because of the recent development of the food and cosmetic industry in China, the concrete of *Osmanthus fragrans* is produced 500 kg. annually and used as ingredients of fragrances and flavors.

Geographical Distribution

Osmanthus fragrans is a representative species of the genus Osmanthus. It is distributed widely in the south of Chinling Mountain and Huaihe River Basin, but it is always cultivated in a keg or barrel for ornamental purposes in North China. Green suggested that *Osmanthus fragrans* originated in Southeast Asia, but now Southwest and south China is the central area of *Osmanthus fragrans.*[2] According to the author's investigation, north and mid sub-tropics is the main area of distribution of *Osmanthus fragrans* in China. Yangtse River Basin is more important in north sub-tropics and the output there is about 80 percent of the total yield while the producing areas are less in mid sub-tropics, with Guiling yielding about 20 percent of the total Chinese production.

Morphological Characteristics

Osmanthus fragrans is an evergreen tree or shrub 2-15 m. in height. It is a mesothytic species slightly favor to sunlight. Young trees are more tolerant to shade while adult trees favor sunshine. Therefore, the branches and leaves are mostly distributed on the surface of the crown. The leaves are simple and opposite with green or dark-green color. Their shapes are different according to species, ages and environment, either elliptic or long-elliptic. Leaf-margins are smooth, sawtooth or semi-sawtooth at the upper parts which are slightly wavy or revolute.

Four to eight flower buds of *Osmanthus fragrans* grow together in opposite and are superposed at a node. Each flower bud becomes an inflorescence and each inflorescence has five to nine florets. A good cultivar will bloom at least 30 to 50 florets at a node. The blooming period is as short as five to eight days and the best time for enjoying and harvesting is only two to four days. In moist weather, the blooming period will be earlier and the frequency between the former and later crop is rather short. But in dry weather, the blooming period will be later and the frequency between the two crops is longer.

There are several flower colors for the varieties, lemon yellow, orange yellow, reddish orange and silvery white. But the color of flower is not the only factor according to the varieties of Osmanthus, but also by the blooming phenology. The flowers' aroma is strong in the preliminary blooming stage, but turns strongest in pre-full and full-blooming stage and turn weaker in later full-blooming stage. By the way, the odor of flower of the same variety also changes with the time of blooming. The first crop is more heavily scented than the second crop.

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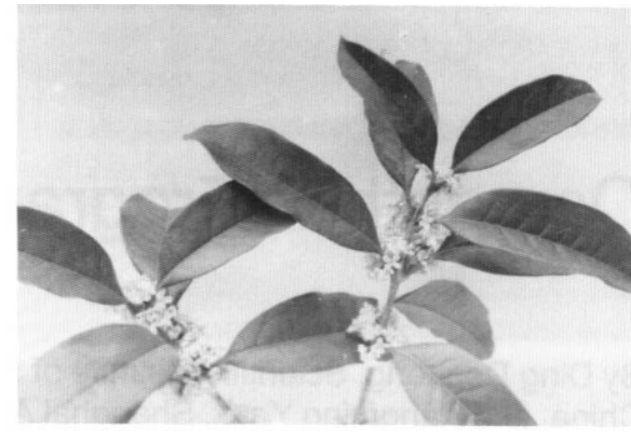

Photo 1. Blooming flower of Osmanthus fragrans.

Precipitation will greatly influence the strength of fragrance because the wax of petal is destroyed by rain and the essential oil suffers heavy losses. Therefore, the collection of flowers must be on time (Photo 1).

Blooming Phenology

The duration of the blooming period of *Osmanthus fragrans* is closely related with climate factors, especially the atmospheric temperature of the ten-days period prior to the time of blooming.

According to the authors' observations, the phenological stage of *Osmanthus fragrans* in the Suzhou area may be divided into ten stages, i.e. 1) bursting stage, 2) ball-shape stage, 3) bracts over the bud stage, 4) bud-pedicle stage, 5) bud-eye stage, 6) preliminary blooming stage, 7) pre-full blooming stage, 8) full-blooming stage, 9) late full-blooming stage, and 10) absission stage.

The appropriate time for harvesting the flowers should be arranged within three to four days of the preliminary blooming stage and the pre-full blooming stage.

The fruit of *Osmanthus fragrans* is a drupe. Young fruit is green, enlarges and develops in autumn, and then attains rippened-size in winter. Most of the cultivars of *Osmanthus fragrans* fail to produce seed because of their sterility.

Identification of Cultivars

By the traditional identification of flower color and other blooming characteristics, *Osmanthus fragrans* can be divided into varieties of var. thunbergii, var. latiflorus, var. aurantiacus and var. semperflorens.

1. *Osmanthus fragrans var. thungerbii*—It blooms one to two times in autumn, milk-yellow in preliminary blooming stage, golden-yellow in full-blooming stage and golden-yellow to white in late full-blooming stage. It is a tall tree with ascending shape and a round crown. Root systems are well

developed; the branches and leaves are dense. It has a honey sweet fruity note and is fit for ornamental and commercial cultivation.

2. *Osmanthus fragrans var. latiflorus*—It blooms one to two times in autumn with light yellow flowers in the preliminary blooming stage, lemon-yellow flowers in the full-blooming stage and lemon-yellow to silvery white in the late full-blooming stage. It is a shorter tree and the branches grow downward.

3. *Osmanthus fragrans var. aurantiacus*—Yellowish-orange in the preliminary blooming stage and reddish-orange both in the full blooming stage and the late full-blooming stage. They are tall trees and bloom in the autumn. Their branches are thicker and upward.

4. *Osmanthus fragrans var. semperflorens*—It is a shrub and blooms six to eight times during the autumn, winter and spring. The flower is light lemon-yellow in color and has less fragrance and bitter taste. Therefore, it is suitable for ornamental purpose only.

Propagation

The methods of propagation of *Osmanthus fragrans* may be divided into sexual and asexual propagations.

1. *Sexual propagation*—Propagation by seeding is easy. The nursery stocks are strong, with well-developed root systems, long-living in age and attractive in figure. But the blooming period of the seedings is very late. Flower yields are less and the fragrance is slight. The wild characteristics are more evident. The seedlings can be used as stocks in propagating promising varieties.

2. *Asexual propagation*—Asexual propagation is a method used in propagating the cultivated varieties. The procedure includes layering, grating and cutting (Photos 2 and 3).

Asexual propagation is better than sexual propa-

Photo 2. Cutting under temperature and humidity control.

Photo 3. Cleft grafting on the stock.

gation because the hereditary characteristics from the parents can be maintained successively and the nursery stocks can be multiplied quickly.

Cultivation

The growth and development of *Osmanthus* is related to the phyto-geographical distribution and the ecological conditions. They are:

1. North or mid-subtropic is the better region than south sub-tropics or south temperate zone;
2. Mountainous region or well-drained plain is better than low-land or level land;
3. Suburb is better than urban district;
4. Well-lighted conditions are required;
5. Deep fertile soil is preferred over thin soil and hard pan under the surface soil should be strictly avoided;
6. Non-paving surface condition is better than paving surface; and
7. Enclosed plot is better than open site for maintenance and protection.

Aroma Constituents

Although some articles on fragrant constituents of the *Osmanthus* absolutes have revealed the works of Sisido,[3] Kaiser[4] and others, the testing samples may have been a commercial available concrete from mixed flowers of different varieties of *Osmanthus fragrans*. During the processing of concrete, some fresh top-note and delicate fragrances are usually lost and some side reactions such as oxidation and degradation may occur.

Three main varieties of *Osmanthus fragrans* flowers were collected in the Hongzhou Botanical Garden separately during the pre-full-blooming

stage. The concrete of different varieties were prepared by extraction of fresh flowers in batches with petroleum ether (Table I).

In the volatiles of three different varieties of concretes, a total of 263 components have been separated, detected and elucidated by LC, GC, GC-MS and GC-FTIR. More than 60 compounds were not reported in the flower of *Osmanthus fragrans* previously.[5]

Obviously, ionones, α and β-ionols, megastigmas, theaspirans and a lot of valuable terpenoic alcohols and esters of leaf alcohol greatly contribute to the sweet and floral-fruity note (Table II).

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Table I. Properties and Odor Characters of Three Varieties of *Osmanthus fragrans* Concretes

	O.f.Thu. Mak.	O.f.Lat. Mak.	O.f.Aur. Mak.
Odor character	sweet-floral, warm & stronger, less green note	floral-fruity, more green & fresh	sweet-floral, but weaker less fresh
Yield of concrete % (based on flower)	1.53	1.51	1.49
Yield of absolute % (based on concrete)	62.00	64.00	75.00
Yield of volatile % (based on concrete)	20.00	26.00	20.00
fragrance content %	5.00	9.00	9.00
solid acids %	12.00	14.00	3.00
wax content %	38.00	29.00	25.00
residue and loss	45.00	48.00	63.00
acid value of concrete	60.60	37.40	89.20
ester value of concrete	51.80	69.90	52.30
congealing point °C	38.30	38.60	37.10

Table II. The Main Components and Their Contents in the Volatile *Osmanthus fragrans* Concretes

Compounds	Content (%) O.f.Thu. Mak.	O.f.Lat. Mak.	O.f.Aur. Mak.
cis-hexen-3-ol	0.25	0.25	0.10
nonanol	1.50	-	1.30
myrcene	0.37	0.30	0.08
ocimene	0.36	0.12	0.10
linalool oxide (furanoid)	6.50	7.60	2.60
linalool	2.90	3.40	1.80
citronellol	0.05	0.03	0.90
geraniol	0.40	0.60	2.40
decanoic acid	1.50	-	1.10
theaspiran	1.20	0.90	0.60
p-methoxy-phenyl ethyl alcohol	4.50	1.60	1.60
α-ionone	2.20	6.50	1.30
dihydro-β-ionol	5.80	3.80	3.70
β-ionone	18.50	8.60	9.20
4,7-epoxy-megastigma(5,11)-8-diene	0.95	0.05	1.00
τ-decalactone	0.40	3.40	4.10
dibutyl phthalate	1.60	4.20	0.60
4-oxo-β-ionol	0.95	0.50	1.00
hexadecanoic acid	4.20	1.40	3.70