

Bayberry (*Myrica* spp.): A Lesser-Known Fruit

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SUMMARY

Bayberry is a perennial underutilized fruit crop belonging to family Myricaceae. It is naturally grown edible fruit trees found mostly in the hills of Asian countries particularly China. It is nutritionally rich in vitamins, minerals and anti-oxidants. In India large scale cultivation of this potent fruit crop is not practice. However, it is found in the hills of Himachal Pradesh, Uttaranchal and NE states of India where the farmers harvested the fruits and generates income from this fruit crop. Since the fruit has a short shelf life, it is processed into various value-added products like pickle, juice and syrup apart from fresh consumptions.

INTRODUCTION

Bayberry is a naturally grown perennial fruit which is less commonly exploited and treated as wild edible forest fruit. It is originated in Southern China where most of the species exist. It comprises of more than 50 species distributed throughout tropical, sub-tropical and temperate climates (He *et al.*, 2002) of which the four main species are:

- *Myrica rubra* (Lour.) Sieb. & Zucc. - Red bayberry mostly found in Southern China, but also in Japan, South Korea and the Philippines
- *M. esculenta* Buch. Ham. – Also known as Soh-Phie or Kafal is small, ovate and red when ripe. It is found in the mountains of southwest China, India (NE regions), Nepal and Vietnam.
- *M. adenophora* Hance - The fruit of this species is usually elliptic and red in colour. It is found in Guangdong, Guangxi and Hainan Provinces of China.
- *M. nana* Cheval. - The fruit of this species is small and sour, but edible. It is indigenous to Yunnan and Guizhou Provinces.

The fruits are white, purple, red or greenish yellow according to species and has a pleasant combination of sweet (sugar) and tart (acid) tastes. It is rich in vitamin C, carbohydrate, organic acid, thiamine, riboflavin, carotene and are packed with antioxidants. It also contains the minerals calcium, phosphorous, iron and potassium (Wang *et al.*, 2002b). It is also treated as medicinal shrubs as bayberry extracts contain antioxidants that exhibit bioactivities counteracting inflammation, allergens, diabetes, cancer, bacterial infection, diarrhoea and other health issues (Sun *et al.*, 2012).



Table 1: Nutritional composition of *Myrica rubra* fruit (amount/100g) (Wang *et al.*, 2002b)

Composition	Amount	Composition	Amount
Edible part	82 g	Ascorbic Acid	9 mg
Calories	117 KJ	Potassium	149 mg
Moisture	92.0 %	Sodium	0.7 mg
Protein	0.8 g	Calcium	14 mg
Lipid	0.2 g	Magnesium	10 mg
Dietary fibre	1.0 g	Iron	1.0 mg

Carbohydrate	5.7 g	Manganese	0.72 mg
Ash	0.3 g	Zinc	0.14 mg
Carotene	40 µg	Copper	0.02 mg
Retinol	7 µg	Phosphorus	8 mg
Thiamine	0.01 mg	Selenium	0.31 µg
Riboflavin	0.05 mg	Leucine	66 mg
Nicotinic Acid	0.3 mg	Lysine	65 mg

Botany

The species varies to about 2-20 m high, have a round-shaped canopy with dense foliage. Some of the species are deciduous but the majority of them are evergreen. The root system is fibrous, usually with tap roots and have symbiotic relationship with nitrogen fixing bacteria that allowed the plants to fixed nitrogen from the air and thus they can be grown even in soil deficient of nitrogen.

Leaves

The dark green leaves are glossy and glabrous. The oblanceolate-shaped leaf has midrib protruding on the lower side and lateral veins extending in a parallel pattern from the midrib (Ruan and Wu, 1991).

Flower

There are four types of flowers in bayberry depending on the presence of male and female flower (Miao and Wang, 1987) viz., only male flowers, only female flowers, female flowers > male flowers and male flowers > female flowers. The catkins arise axially from shoots as a racemose inflorescence. Numbers of catkins per shoot varies from 10-20 catkins per shoot for male plants and 6-9 catkins per shoot for female plants. The pollen grains are small (*ca.* 20 µm diameter) and the stigma presents in pinnatipartite form and has scarlet colour. Pollination is carried out by wind.

Fruit

The fruit of *Myrica* is a drupe (stone fruit) with single seed. Soft and succulent edible flesh (epicarp) surrounds the seed. The flesh (pericarp and mesocarp) develops from the exocarp and consists of many papillae. These papillae are arranged in a radial fashion around the endocarp that develops into a stony pit either clinging to or free from the flesh. Colour of the fruit varies depending on the species and varieties.

Soil and climate

Bayberry prefer acidic with well-drained sandy loam or clay soil (pH 4-5) and warm temperature, with an average temperature range of 15-20°C. Some species can tolerate a temperature as low as -10°C but high temperature of more than 35°C is not suitable for the plants (Mao and Wang, 1987). Fruit ripens in late May and early July. Sun exposure during the end of summer to early autumn favours fruit colouration and flower bud formation. An ambient relative humidity plays an important role in improving the fruit quality. At high humidity, fruits are soft and succulent with rounded tips on their papillae whereas fruit from drier areas have more pointed papillae and are comparatively firmer. As a result, they have better transport and storage but poorer organoleptic characteristics.

Propagation

Seeds of *Myrica* can be sown fresh to obtain seedlings but stored seed through stratification is more beneficial (Anon, 2002). Vegetative propagation can be achieved from both cuttings and suckers arising from layering. The juvenile period from planting seeds to fruit bearing can be 8-10 years or more which can be reduced by grafting of elite scion on to a suitable rootstock. Vegetative propagation increases the survival rate for plantation trees, enhances new root system development and decreases the time to initial fruit bearing (Li *et al.*, 1999; Zou, 2001).

Variety

Till date, there is no varieties developed in India. Donkui and Hetian are two varieties derived from *Myrica rubra* which are widely cultivated in China. Other varieties include Shuijing, Shuimei, Wumei and Zaodamei etc.

Training and Pruning

Tree form is controlled by tipping and pruning. The vase-shape is useful for tree vigour control and ease of harvest. Stem girdling also promotes flowering.

Harvesting and Post-harvest management

Bayberry is a non-climacteric fruit and thus will not continue to ripen once removed from the tree (Joyce and Li, 2002a; Joyce and Li, 2003). Maturity may be determined on the basis of fruit weight, colour, sugar content, acid level, sugar: acid ratio, flavour and days taken from anthesis. The fruits are handpicked and fallen fruits are usually used for processing into various product. The fruits of bayberries have a short shelf life and thus cannot be stored for a long period. Maximum postharvest life is attained in the lower temperature range of 1-5⁰ C. They are processed into pickles, syrup, juices or canned.

Diversity of bayberry in India

In India, bayberry is found mostly in the tropical and sub-tropical region. It is reported in the range of Himalayan range including the hills of NE states of India. It is found in the local markets of Himachal Pradesh (Parmar and Kaushal, 1982) and Uttarakhand (Bhatt *et al.*, 2000a). the species *Myrica esculenta* is also widely found in the hills of Sikkim and Meghalaya (Patel and De, 2006). However, commercial cultivation of this potential fruit crop is not practice at a large scale.

CONCLUSION

Although Bayberry and its wild relatives has a high potential of nutritional and medicinal values, it is still considered underutilized fruit crop due to its limited cultivation. Intensive scientific research on its production technologies, crop improvement and conservation of its species, biochemical and nutritional composition are yet to be explored and harness the potential of this fruit crop in future.

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