

## Perilla: Production in Japan and Potential for New Zealand

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### INTRODUCTION

*Perilla* (*Perilla frutescens*), a member of the family Labiatae, is an annual herbaceous plant native to Asia. It is used extensively in Japanese cuisine and has a wide variety of uses. There are two main types, red perilla and green-leaf perilla or "oba". Both types are commonly called "shiso". Red perilla is used as a dye for pickling fruits and vegetables, as a dried powder to be used as a side dish with rice, as an ingredient in cake mixes, and as a flavouring in beverages. It is generally harvested and sold as a bulk commodity directly to the processing industry. Red perilla flower heads are also used as a condiment with "sushimi", and 3- to 6-week-old seedlings or sprouts are used as a garnish. Green-leaf perilla, the product most commonly seen in the Japanese markets, is used as a vegetable. Its leaves are used as a wrapping for rice cake, in salads, and tempura. Perilla is also grown for its seed which can be used for oil production or for flavouring foods especially pickles.

### CLIMATE AND SOIL

Perilla requires an equitable climate to grow well as it is damaged by frost. Consequently, it is unsuitable for areas that experience out of season frosts. Warm temperatures, long day length and adequate moisture are required for good vegetative growth with short days required for flower production.

Most soils considered suitable for horticulture will grow perilla. Sandy soils rich in organic matter are considered optimum. Fertility levels and pH are often modified using dolomite, compost, and N : P : K fertiliser mixes. A typical fertiliser programme for producing red perilla in Japan, for example, would include a basal application of 12 t ha<sup>-1</sup> of compost, 1.5 t ha<sup>-1</sup> chicken manure, 1.0 t ha<sup>-1</sup> oil seed hulls, 0.6 t ha<sup>-1</sup> superphosphate, 1.5 t ha<sup>-1</sup> dolomite lime, and 0.8 t ha<sup>-1</sup> 8N : 8P : 8K. This would be followed by two side dressings of N : P : K at 0.4 t ha<sup>-1</sup>.

### PROPAGATION

Perilla is an annual and propagated by seed. Plants flower and seed in late summer-autumn and require a winter stratification before germinating. The seed germinates readily in spring with an optimum germination temperature of 20 to 22C. Cool temperatures or dry conditions during germination are likely to have a detrimental effect on germination and seedling emergence. Seed can be successfully stored for up to 2 years at a temperature of 0 to 3C and relative humidity of 50% to 60%. Seeding rates and spacing depend on the production system used.

### PRODUCTION METHODS

There are four production methods depending on the product required. These products are as follows:

**Perilla Sprouts.** Perilla sprouts are used as a garnish by restaurants and hotels. In order to supply these markets all year round, sprouts are produced in the open

during summer and under cover in heated beds in winter. Prior to sowing, base fertiliser is applied and worked into the soil. The ground is then worked into raised beds and the surface raked to produce a fine tilth. The seeds are then broadcast sown. Soil or sand is sieved over the seeds until they are just covered. The beds are next watered and covered with straw mats. After the shoots have started to appear the mats are removed. Once the seedling leaves have fully opened and the first true leaves have started to form the seedlings are cut with scissors, washed, and packaged into small wooden boxes ready for market.

**Perilla Flower Heads.** Perilla flower heads are used as a condiment and are required by the Japanese restaurant and hotel industry all year-round. This demand is satisfied by using a range of cultivars and growing under cover during winter. Seedlings are raised in a nursery and when they have developed 5 to 6 true leaves they are transplanted into beds. Seedlings are planted in rows 90 to 120 cm apart. Within row spacing depends on the time of the year. Early cultivars flower quicker and, therefore, require less space. If produced during the off season, the crop is covered by a plastic tunnel to maintain the temperature at 15C. Liquid fertiliser is sometimes applied depending on the rate of growth. For market the flower stalks are cut 15 cm from the tip when 5 to 6 of the flowers have opened. During grading the stalks are cut to a length of 8 to 10 cm before packaging ready for market.

**Red Perilla.** Red perilla, which is not usually produced out of season, is grown as a bulk commodity and used in Japan mainly by the processing industry. It is sown, in spring, directly into raised beds that have first been fertilised and cultivated. Five to six seeds are sown per station in 80-cm-wide raised beds. Seedlings are not thinned, with four plants per station at harvest considered optimum. Seeds are sown every 12 cm in rows 40 cm apart. A black plastic mulch is often used to keep the crop weed free. As perilla seeds require light to germinate, a thin plastic film is sometimes used to help keep the surface-sown seeds moist. In early summer, when the plants are about 40 cm high, the top 10 cm are machine harvested. This harvesting procedure is repeated as often as required until autumn when the crop starts to flower. Growers usually harvest their own seed.

**Green-Leaf Perilla or "Oba".** From a New Zealand perspective green-leaf perilla or oba is probably the most important form of perilla because of the high price it commands in the Japanese markets.

The most common production method in Japan is under cover in glass or plastic houses. The main period of leaf production is during long days with oba quickly running to seed with the onset of short day lengths. With artificial heating, lighting, irrigation, and successive planting, it is possible to produce oba continuously throughout the year. The high prices achieved for production in the off season make up for the high costs associated with production under cover.

A less expensive production method is semi-protected planting. Seedlings are grown in heated beds in a plastic house in late winter for subsequent transplanting followed by harvesting during the summer months. With this method, plants can remain covered when growing conditions are marginal, giving protection from wind and rain. However, without artificial lighting, the plants quickly bolt in autumn.

The least expensive production method involves seedling production in unheated beds in early spring followed by transplanting in late spring. Harvesting is carried out over the summer months. Once the plants are 30 cm high, leaves that are 10 cm

long (excluding the petiole) are plucked from the stem. Bundles of 10 leaves are tied with a rubber band and packaged ready for market. Harvesting, which is labour intensive and a major cost to the grower, should be carried out at least once every 2 days and more often if the plants are growing rapidly.

### **CULTIVARS**

A wide range of perilla cultivars are grown, the choice of cultivar depending on the intended use of the product. The main cultivars for oba production are 'Ao-oba' (green large-leaf), 'Ao-jiso' (green), and 'Ao-chiri-men-jiso' (green cotton-crepe) but in reality most growers develop their own lines by continually selecting seed from their best plants. When selecting plants for oba production the following are considered desirable characteristics:

- 1) Bright-green, broad, oval-shaped leaves
- 2) Leaves with deep serrated edges
- 3) A strong aroma
- 4) Creped leaf surfaces
- 5) Vigorous growth
- 6) Tendency to produce many side shoots
- 7) Reluctance to bolt in autumn

### **PESTS AND DISEASES**

Cutworm, mites, aphids, and leaf-eating caterpillars are all problems in perilla production. A range of chemicals can be used to control these pests but withholding periods after chemical application must be strictly enforced. There are also reports from Japan that fungi including damping off, downy mildew, and rust may be a problem in growing perilla. In New Zealand, browsing caterpillars have been the main problem.

### **PROSPECTS FOR NEW ZEALAND**

Trials in the Waikato, Hawkes Bay, and South Auckland areas have demonstrated that perilla (red and green leaf cultivars) can grow well in New Zealand. This fact, coupled with the constant demand by Japanese restaurants and hotels for a year-round supply of high quality green-leaf perilla, could make this a profitable crop for New Zealand growers. In Japan, green-leaf perilla production is greatest during the summer months from May to September with production dropping in autumn as the plants start to run to seed. This reduction in supply is not necessarily associated with a price premium because the autumn supply is of poor quality.

New Zealand growers could easily produce green-leaf perilla during the Japanese off-season without the expensive heating and lighting systems required in Japan, and they would also benefit from the high prices paid at that time of the year. The main problem is likely to be the relatively short shelf-life of the harvested leaves and the high cost of labour required for picking and grading. However, these problems could be overcome by the use of appropriate storage, transport, and processing technologies. There may also be a small local market for perilla based on the growing number of ethnic Japanese restaurants in New Zealand.

The commercial production of red perilla in New Zealand for the Japanese market is unlikely because it is readily available in Japan and there is no local market. However red perilla may have potential as an ornamental herb for home gardens.

*Perilla* shoots and flower heads command small niche markets in Japan, however, an assessment of their potential for production in New Zealand is difficult without accurate market statistics. Other market opportunities include oil production from both foliage and seed or production for medicinal use (*perilla* has bactericidal properties).

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## Propagation of Chilean Native Plants with Ornamental Value

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**Many Chilean native plants may be used as ornamentals. Nevertheless, little knowledge exists on their propagation and culture. Experiments into the cutting propagation of six species have been carried out in order to determine the effect of auxin (IBA) concentrations on rooting. Results show the following: *Crinodendron hookerianum* roots best with 2500 ppm IBA; both *Mitraria coccinea* and *Sarmienta repens* have excellent natural rooting abilities; *Desfontainia spinosa* does not have an increased rooting response within the range of 0 to 5000 ppm IBA; rooting of *Lomatia ferruginea* cuttings fluctuates between 42% and 72% but no clear effects are obtained by the use of IBA; *Embothrium coccineum* roots best with concentrations up to 500 ppm IBA.**

### INTRODUCTION

Chile has a rich vascular flora, reaching 6265 species (Marticorena, 1990), from which almost 85% are endemic and/or native plants. A great many of those species have a potential use as ornamentals. Nevertheless, only a few have been brought into culture. That is why the propagation systems of most of the native plants have not been properly studied in our country, although many of them are well known in other latitudes for their ornamental use.

A few years ago we started the first experiments into the vegetative propagation of a number of native plants growing in southern Chile, selecting some species for their most ornamental character: flowers or foliage. A great help in this project has been the work of Hoffmann (1982), providing rich information including descriptions, use and distribution of the species, with excellent drawings of their shape, flowers, and foliage.

This paper deals with six species growing in different areas of southern Chile, which might be introduced to horticulture as ornamental plants. All these species grow in "the Chilean lake district from the south of Temuco to the island of Chiloé, covering an area of about half the size of New Zealand's South Island, with which it has many botanical affinities" (Gardner, 1990).

The species are as follows: