

# PROCESSING OF NUTMEG AND MACE

## Introduction

The nutmeg tree (*Myristica fragrans*) is native to Moluccas in East Indonesia, known as the Spice Islands. The first commercial plantations were in Granada. The Tree yields two spices, nutmeg which is the kernel of the seed, and mace which is the net like crimson coloured leathery outer growth (aril) covering the shell of the seed. Nutmeg and mace are the fruits of a spreading evergreen tree that grows to a height of 20m. The main countries of production are; Indonesia, Grenada, Sri Lanka, Trinidad, China and India.

## Cultivation

The tree requires a deep, well-drained loamy sandy soil. Shade is required for the first two to three years. The optimal growing temperature is between 20-30°C and the annual rainfall should be between 1500-2500mm.

Half the trees are male and do not produce fruit. Unfortunately, the sex of the plants cannot be identified until they are six to eight years old.

Propagation should be from mother trees selected for their regular bearing, high yields, large nuts and heavy mace. The quantitative criteria for selecting mother trees are:

Large number of fruits per tree ~ over 10 000 per year

Wet weight of fruits ~ over 30g per fruit

Wet weight of mace ~ over 1g per fruit

Wet weight of nuts ~ over 10g per nut

The usual method of propagation is by seed. Only uniformly dark brown seeds taken preferably from fruits that have split open should be used. Seeds that rattle will not germinate, as they are too dry. The seeds have to be sown as soon as possible since viability is lost in eight to ten days. They are planted with the shell.

The soil should consist of a mixture of measures of well-composted manure, topsoil, and coarse sand. One per cent rock phosphate can be added to the mixture. The seeds should be lightly buried so that part of the shell is exposed, they should be watered and left in the shade to germinate. Germination takes between four and eight weeks. The seedlings should remain in the shade for six to eight months.

Marcotting (splitting young trees) and grafting are also possible but more difficult.

Before field planting, temporary shade from *Gliricidia*, Dadap, Cocoa or Banana has to be established. This should be done six to twelve months before planting. The seedlings are planted at the beginning of the rainy season. There should be bench terracing at the base of the seedling, particularly on sloping land, of approximately half a meter in diameter. Inward sloping terracing will help to keep soil erosion to a minimum. The terracing can be increased as the tree grows.

Weeds should be kept in check by occasional slashing and the cut material can be applied to the base of the trees in the form of mulch. Additional fertiliser is not generally applied.

Shading can be gradually removed after two to three years. Seedlings can be planted close together so that later on when the male trees have been identified (after the first flowering) most of them can be removed, as they do not bare fruit. Some male trees must remain for pollination, a ratio of 1:10 is common.

Pruning will help to maintain flower, fruit and seed production. Water shoots, upright branches, dead wood, and some lower branches can be removed.

The most threatening disease is Nutmeg Wilt in which the plant will gradually wilt and drop leaves and fruit. There is no definitive treatment. Fruit rot has been recorded in India and a thread blight in Grenada and Trinidad. Soil fungi will attack nutmeg trees. The main pests are borers, or bark beetles, which are small dark brown weevils about 3mm long.

Yield depends on the size and the age of the tree. Trees will start to bear fruit from around five to seven years old. The yield will increase considerably until the tree is about twenty-five and then more slowly until it reaches its maximum capacity at around thirty-five to forty years of age. Yields can be above ten thousand nuts per tree.

### Harvesting

The tree bears fruit when five to eight years old. There are two types of mace, West Indian and East Indian. The fruit turn yellow when ripe and the pulpy outer husk (pericarp) splits into two halves exposing a purplish-brown shiny seed surrounded by a red aril. Usually the fruits are allowed to split and fall to the ground before harvesting. They should be collected as soon as possible or the underside of the fruit will become discoloured and the risk of mouldiness will be increased. In some areas, a long pole is used to take opened pods directly from the tree. This ensures a better quality harvest but can also result in damage to flowers and younger fruit.

### Processing

The fruits are opened by hand and the scarlet aril (mace) surrounding the nut is removed. This is removed by cutting with a small pointed knife the attachment of the mace to the base of the nut (nutmeg). Care needs to be taken to avoid damage to the nut, alternatively, the nuts can be shelled by tipping them onto a sloping cement floor from a height of three to four metres. Another option is to soak the nuts in water for four to twelve hours and then squeezed between the thumb and forefinger until the nut pops out.

The separated mace is flattened by hand and dried on mats in the sun. This takes between two and four hours. Grenadian mace is cured by storage in the dark for four months. This produces a brittle, pale yellow mace that attracts a premium price and is graded according to size, the bigger the mace, the better the premium. After grading the mace can be classified and bagged. The mace will also need to be fumigated.

The nutmegs are dried in their shells in the sun and are turned each day to prevent fermentation. The nuts are sufficiently dry when they rattle. This takes about one week. Sometimes artificial dryers are used. To produce shelled nutmegs, they should be cracked by tapping the end of the nuts with a small wooden mallet. If the nuts are tapped on the side there is a possibility that the kernel may be bruised. Once dried the nuts can be stored for a considerable time.

Cracking the shell is often done by machine. Often machine are of the centrifugal type in which the rotary motion of the machine forces the nut to be thrown at high speed against the inside of a drum.

Once the cracking has been completed, the nuts are sorted. Whole kernels will be separated from the broken pieces of kernel.

Floation in water is used to remove unsound kernels, as these kernels are lighter than water and float to the surface. They can then be easily removed. The sound kernels can then be sorted based on their quality and size. Good quality whole kernels are separated from the lower quality and broken kernels. Sizing can be carried out using different mesh sized sieves.

Sorted kernels are then bagged and labelled appropriately. For export, the bagged nutmeg is fumigated with methyl bromide.

### **Uses**

Around four per cent of the essential oils within nutmeg is poisonous and as such it should be used sparingly.

Nutmeg and mace are used to flavour drinks and foods such as cakes, soups, pickles and relishes. It is an ingredient for some ground spice mixtures.

Oil extraction, usually by hot manual pressing, produces nutmeg butter (also known as concrete or expressed oil). The butter is a highly aromatic, orange coloured fat which can then be processed into ointments and perfumes. This can be a good use of crop rejects.

Nutmeg essential oil can be prepared by distillation. The nutmeg should be turned into a coarse powder and then transferred to the still immediately. Repeated distillation, achieved by pouring the distillation liquid over the nutmeg powder, may be necessary. During the process exposure to the vapours should be kept to a minimum due to the toxic nature of some of the essential oils.

Nutmeg jelly can be made from the pericarp.

Nutmeg and mace oleoresins are extracted from the plant using organic solvents. They are produced for commercial flavourings and perfumes.

### **References and further reading**

1. Production, Handling And Processing of Nutmeg and Mace and Their Culinary Uses, Food And Agricultural Organization of the United Nations, 1995
2. Minor Oil Crops Part I, II, & III, FAO Agricultural Service Bulletin 94
3. Nutmeg: Cultivation and Processing, 1981, The Department of Minor Export Crops, Ministry of Agricultural Development and Research, Sri Lanka.
4. Spices Volume 1, Tropical Agriculture Series, J.W. Purseglove, E.G. Brown, C.L. Green & S.R.J. Robbins, Longman, 1981

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Agromisa is a Dutch non-profit organisation affiliated with the Agricultural University of Wageningen in the Netherlands. Agromisa provides information and advice on small-scale sustainable agriculture and related topics in order to support and strengthen self-reliance of the rural populations in the South.

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The HDRA is the leading organisation for promoting, researching and demonstrating organic horticulture and agriculture in the UK. For several years, the HDRA International Research Department has been running an overseas programme.

## Useful Internet Sites

1. Humanity Development Library 2.0, for sustainable development and basic human needs  
<http://media.payson.tulane.edu:8083/>
2. Food and Agriculture Organization of the United Nations  
<http://www.fao.org/>

technical brief