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Introduction

Spices are plants, plant parts or plant products that are used as flavouring agents in food. A number of them are trees, and in this chapter we shall deal with two of them, cinnamon and nutmeg.

Cinnamon

Cinnamomum verum (Lauraceae). Cinnamon is one of the oldest spices known to man. References to cinnamon are given in the Old Testament (Exodus 30: 23-5). Cinnamon is the dried inner bark of the shoots of the tree *Cinnamomum verum*, commonly known as Ceylon cinnamon (syn: *C. zeylanicum*). Cassia is often used as a cheaper substitute for cinnamon. Cassia cinnamon comes from various sources (Table 100.1).

The quality of cinnamon depends on the amount of various aromatic constituents present, the most important of which is cinnamaldehyde. Chinese cassia is equally important as a spice. It is grown on a large scale in south China and adjoining areas of Vietnam. It has a stronger aroma than cinnamon because of the higher content of cinnamaldehyde. The Indonesian cassia and Saigon cassia are important locally and have also some limited international market.

The major producers of cinnamon are Indonesia (19,000 t), Sri Lanka (16,000 t), Seychelles (1000 t), and Madagascar (1000 t). The world production is about 37,000 t, of which about 7000 t enter international trade. Production figures are not available for Chinese cassia, but about 31,000 t enter

international trade, almost the entire quantity coming from China (Spices Board, 1991).

Cinnamomum (Lauraceae) is a large genus of more than 250 species, having a distribution in south and Southeast Asia, China and Australia (Mabberley, 1989). The earliest description of cinnamon has been given in van Rhee's *Hortus Indicus Malabaricus* in 1678 and 1685. In this, two species are described, karua (*C. verum*) and Kattu (wild) karua (*C. malabathrum*) (Shylaja, 1984).

Cytological studies show a uniform chromosome number of $2n = 24$ for all the members of the cinnamon species so far studied. Thus, polyploidy is not thought to have contributed to their evolution.

The Lauraceae is considered to be one of the most primitive families along with the Magnoliaceae and Proteaceae. The existing fossil evidence has shown the presence of the Lauraceae in the Cretaceous period (Shylaja, 1984). The genus *Cinnamomum* and the Lauraceae generally are considered to be among the most primitive dicotyledonous plants.

Cinnamon is one of the oldest spices used by man. Queen Hatshepsut of Egypt mounted an expedition around 1485 BC to secure precious commodities like myrrh (a bitter aromatic gum) and cinnamon (Rosengarten, 1973). The Emperor Nero (AD 66) is stated to have burnt one year's stock of cinnamon on his wife's funeral pyre. The cinnamon trade was carried out by Arabs from early times until it passed to the Europeans after the discovery of the sea route

Table 100.1 Sources of cinnamon and cassia cinnamon (*Cinnamomum* spp.).

Botanical name	Common name	Origin
<i>C. verum</i>	Cinnamon	Sri Lanka and South India
<i>C. zeylanicum</i>	Ceylon cinnamon	China, Taiwan
syn: <i>C. aromaticum</i> , <i>C. cassia</i>	Chinese cassia	Vietnam
<i>C. burmanii</i>	Indonesian cassia	Indonesia
<i>C. loureirii</i>	Saigon cassia	Vietnam, Thailand
<i>C. tamale</i>	Indian cassia	North-east India
<i>C. malabathrum</i>	Folia Malabathri	South India
<i>C. macrocarpum</i>	Wild cinnamon	South India
<i>C. nicolsonianum</i>	Wild cinnamon	South India
<i>C. camphora</i>	Camphor	China, Japan

to the Orient by the Portuguese navigator Vasco da Gama in 1498 (Rosengarten, 1973).

Cinnamomum verum occurs in the forests of Sri Lanka and south-west India. Individual trees of natural stands show variation with regard to quality. This has been taken advantage of in Sri Lanka, a major producer of cinnamon in the world, where distinct varieties of cinnamon are available. These are the result of selection of elite trees and their further multiplication. Flowers are cross-pollinated, but because of the very large number of flowers produced on a tree, such pollinations are mostly limited to flowers on the same tree (Joseph, 1980). The major centres of diversity and the centre of origin are considered to be in Sri Lanka. It is, however, difficult to assign a centre of origin to this crop, because differences between the present-day varieties and wild populations of Sri Lanka and south-west India are similar in extent.

The demand for this spice is likely to remain steady; only moderate increases in demand are likely to be experienced even if prices fall.

Nutmeg

Myristica fragrans, *Myristica argentea* (Myristicaceae). The nutmeg tree yields two spices, nutmeg and mace. Nutmeg is the dried shelled seed and mace the dried aril covering the seed in the fruit. World production is estimated at 10,000 t annually. Indonesia (6000 t) and Grenada (3000 t) account for 90 per cent of the production. Other countries that produce nutmeg in smaller quantities are Sri Lanka, Papua New Guinea, India and Brazil.

The spice is widely used in cooking and in native systems of medicine. Nutmeg has stimulative, astringent and carminative properties. The ripe pericarp is used for making jams. Nutmeg oil is used for flavouring liqueurs and in perfumery (Pruthi, 1980; Purseglove *et al.*, 1981).

The source of true nutmeg is *M. fragrans*. In addition, fruits of several other species are used as substitutes or adulterants of nutmeg. Its closest relative is *M. argentea* which occurs in both the wild and cultivated states in Papua New Guinea. This territory is thought to be its centre of diversity (Flach and Willink, 1989).

The Bombay nutmeg is obtained from *M. mala-*

baricam and *M. beddomii*. They occur wild in the Western Ghats forest of peninsular India and their nuts and aril are often used for adulterating true nutmeg. The Brazilian nutmeg is obtained from *Cryptocarya moschato* (Lauraceae) and is used locally as a spice. Madagascar nutmeg is obtained from *Ravensara aromatica* (Lauraceae) and is also used locally as a spice.

The Myristicaceae, to which nutmeg belongs, is a medium-sized family with 19 genera and about 440 species. They are native to lowland tropical forests. They are dioecious or monoecious trees with aromatic tissues. The genus *Myristica* contains about 80 species. They occur from south Asia to Australia and the Polynesian islands (Mabberley, 1989). New Guinea appears to be the centre of diversity of the species with some 40 species present, 34 of them endemic (Sinclair, 1958). Flach and Willink (1989) have, however, stated that *M. fragrans* shows maximum variability in Banda and nearby islands in eastern Indonesia. In this region the species does not occur in the wild state, but a number of related species are found in the region. The present areas of main cultivation of nutmeg are Indonesia, New Guinea and Grenada.

Nutmeg, like most members of the family Myristicaceae, is dioecious. It is insect pollinated; occasionally a few male flowers produce fruits. Efforts to identify male and female trees at the juvenile phase have not met with much success.

The somatic chromosome number of *M. fragrans* is $2n = 44$ (Flach and Willink, 1989). No detailed studies of the chromosomes have been carried out, nor have any heteromorphic bivalents indicative of sexual differences in chromosomes been observed. The chromosome number of *M. argentea* is also $2n = 44$ (Flach, 1966; cf. Flach and Willink, 1989).

The time when nutmeg came to be used by man is shrouded in mystery. It has been widely used in south and south-east India from time immemorial. Nutmeg was first introduced into Europe (Constantinople) in AD 540 (Flach and Willink, 1989). By the end of the twelfth century, nutmeg became popular in Europe, and thus began the association of this spice with Western colonial expansion. In 1512, the Portuguese discovered Banda and established a monopoly in the nutmeg trade. This later passed to the French who in 1772, took control of the islands and the monopoly. The British captured the islands in 1802, and during their occupation the nutmeg was introduced into

Grenada, where it naturalized. Today, Grenada is the second largest producer of nutmeg in the world (Flach and Willink, 1989).

Nothing is known about the origin of the species, though as already stated, it shows maximum diversity in Banda, and a high level also in New Guinea. Wild populations of *M. fragrans* no longer occur in Indonesia (Flach and Willink, 1989). Southeast Asia can be taken as the centre of diversity and origin of the species.

In view of its manifold uses in the food industry, confectionery and medicine, the outlook for this spice appears to be moderately good. However some sales promotional efforts would help promote its usage. As with other spices, its cultural requirements are also very specific.

Little improvement work has been carried out on the nutmeg. Some work has been done on sexing individuals of this species in the juvenile phase, but without much success. Work has also been carried out on vegetative propagation. However, more basic and applied studies are called for in this crop.

References

- Flach, M. and Cruickshank, A. M. (1969) Nutmeg. In F. P. Ferweda and F. Wit (eds), *Outlines of perennial crops breeding*. Misc. Papers No. 4, Agricultural University, Wageningen.
- Flach, M. and Willink, M. T. (1989) *Myristica fragrans* Houtt. In E. Westphal and P. C. M. Jansen (eds), *Plant resources of South East Asia: a selection*. Pudoc, Wageningen, pp. 192-6.
- Joseph, J. (1980) The nutmeg: its botany, agronomy, production, composition and uses. *J. Plant. Crops* 8, 61-72.
- Mahberley, D. J. (1989) *The plant book*. Cambridge.
- Pruthi, J. S. (1980) *Spices and condiments*. New York.
- Purseglove, J. W., Green, C. L., Brown, D. G. and Robbins, S. R. (1981) *Spices*. London.
- Rosengarten, F. Jr (1973) *The book of spices*. New York.
- Shylaja, M. (1984) Studies on Indian cinnamomums. PhD thesis, University of Calicut, Calicut, Kerala, India.
- Sinclair, J. S. (1958) A revision of the Malaysian Myristicaceae. *Gard. Bull. Singapore* 16, 205-470.
- Spices Board (1991) *Spices statistics*. Spices Board, Cochin, Kerala, India.