

harvested when the length is 5.5-7.0 cm and diameter is 4.4-5.0 cm. The flesh is crispy and tastily which is about 1.0 cm in thickness. On an

average 2.15 kg tender fruits can be harvested per vine giving an yield of 85-125 q/ha. The variety also has high heat tolerance.

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## Biodiversity of Spices in Western Ghats of India

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India is a land of spices. The Western Ghat forests and north eastern India are well known centres of biodiversity for some of the major spices. Western Ghat, in fact comes under one of the 18 hot spot areas of diversity in the world. In the last few years, there has been increasing international action regarding biodiversity, culminating in the 1992 earth summit, with the completion of Agenda 21 and an International Convention of Biological Diversity, signed by 165 nations including India. India is recognised as a country rich in all aspects of biodiversity: ecosystems, species and genetic diversities. Black pepper, the King and cardamom, the Queen of spices originated in Western Ghats and hence this region is enriched with a wealth of biodiversity of *Piper* and *Elettaria*.

Black pepper, the most widely used and very important spice, is the matured fruit of the perennial climber *Piper nigrum* L. More than 1000 species are included in the genus *Piper*, of which 110 are of Indian origin. Seventeen *Piper* species are reported from Western Ghats, of which 12 are endemic. *Piper* species with 2nd numbers 26, 32, 52, 58, 64, 96, 104, 132 etc. are available in Western Ghats. The *Piper* species, present in Western Ghats differ one another with respect to plant type, growth habit and distribution. Most of them are dioecious. All species except *P. longum* are climbers either a woody climber (as in *Piper nigrum* and *P. galeatum*) or a scandent shrubby climber as in *P. mullesua*. Considerable variability exists for all morphological characters. The various species do differ very much in leaf and stomatal characters also. Much variability has been noticed among the cultivars for important quality characters also. The cultivar diversity is enormous with more than 100 cultivars available. Out of 10 varieties released, two are hybrids. Though wild pepper species are present in certain localised regions of Western

Ghats, the depletion of forest areas and rampant destruction of forest eco-system led to sharp decline in their population as well that of related taxa. Some species had already been taken to red data book as endangered ones.

Small cardamom (*Elettaria cardamomum* Maton), contributes a major share in earning India's foreign exchange. *Elettaria* is a monotypic genus cultivated in evergreen forests of Western Ghats. Being cross pollinated, a wide range of variability with rich genetic diversity is observed. The diversity is encountered in flowering type, inflorescence pattern, yield, quality of capsule and reaction of pests and diseases. Ecosystem diversity and species diversity are very limited and most of the biodiversity in cardamom comes from varietal diversity are very limited and most of the biodiversity in cardamom comes from varietal diversity. Three types of varieties are distinguishable in cardamom based on plant type, viz., Malabar, Mysore and Vazhukka. Eight improved varieties in cardamom with high yield quality are available.

Ginger (*Zingiber officinale* Rosc.) is a rhizomatous spice propagated exclusively through rhizomes. Species diversity and varietal diversity are the principal components of biodiversity in ginger. Ginger is considered to have originated in South Asia but its existence in wild is yet to be established beyond doubt. Seven species are reported from South India including *Z. officinale* Rosc. However, none of these is related to cultivated ginger in quality and morphology though most species are cytologically  $2n = 22$ . But in a putative wild type ginger from 'Ponnambalamedu' (Sabarimala Hills)  $2n = 24$  is also reported. This collection is distinctly different, morphologically and qualitatively from the cultivated types. Good variation exists for yield and quality in cultivated ginger. These are many



distinct cultivars, for trade purpose like 'Wayanadan', 'Kuruppampadi', 'Elakkalan', 'Krishnapuram' etc. possessing distinct quality features besides about 50 land races. Most varieties are named after their place of origin/domestication. Geographical spread accompanied by genetic differentiation into locally adopted populations, caused by mutation, could be the main factor responsible for the diversity in this crop. The early movement of farmers/settlers across the Western Ghats might have led to different cultivars. Apart from ginger, the other important economic species of the genus are *Z. zerumbet* and *Z. casumunnar* (used in medicine).

Turmeric (*Curcuma longa* L., syn. *C. domestica* Val.) is also a rhizomatous crop, but viable seed set is observed in this crop, unlike ginger. It is adopted for cross pollination. Seventeen species of *Curcuma* are reported from South India. Species diversity and varietal diversity are observed. Among the related species *C. aromatica* is important in medicine and in the preparation of toiletry articles. *Curcuma amada* (mango ginger) is used as a vegetable, while *C. zedoaria*, the Indian arrowroot, is a major source of starch in many parts of India. *Curcuma angustifolia*, *C. caulina*, *C. montana*, *C. leucorrhiza*, *C. decipiens*, *C. rakatkanta*, *C. pseudomontana*, *C. erudescens*, *C. xanthorrhiza*, *C. malabarica* and *C. harita* are also reported to be useful for arrowroot preparation. Even though no distinct taxonomical varieties are established in *C. longa*, the cultivated turmeric, there are about 60 agricultural varieties or cultivars, which are named after the place of origin or cultivation. This includes 18 high yielding and high quality varieties.

Nutmeg, clove and cinnamon are the common tree spices grown in Western Ghats. These were introduced into India by colonial rulers, during the 18th century. In nutmeg, (*Myristica fragrans* Houtt.) tree and species diversity are observed. The cultivated type is not known to occur in wild. However, many wild and related species of *Myristica* do occur. *Myristica* is the most primitive

genus of the family, Myristicaceae and the related species of *Myristica* occurring in western Ghats are: *M. beddomeii*, *M. malabarica*, *M. magnifica*, *M. amygdalina*, *M. glabra*, *M. glauscescens*. The seeds and made of *M. fragrans* are used as a spice and medicine. Some wild species like *M. malabarica* and *M. magnifica* are used in dye industry and in tribal medicine. There are no recognizable agricultural varieties/cultivars. However, many elite trees do exist. The lack of genetic variability in nutmeg population is observed, as the present day population was derived from a narrow genepool.

Clove (*Syzygium aromaticum* L.) belonging to the family Myrtaceae, is an important tree spice grown in Kerala, Tamil, Nadu and Karnataka. The dried, aromatic, fully grown but unopened flower buds are used as spice and in medicine. The flower is self pollinated in nature and seed propagation is rule. Many species of *Syzygium* occur in Kerala and in Western Ghat forests. The most important ones are *S. arnottianum*, *S. cuminii*, *S. fruticosum*, *S. zeylanicum*. However none of these species is closely related to cultivated clove. Through the diversity in clove is very low, some morphological variants/mutants like small leaves type, king clove and dwarf clove are recorded in certain estates of Western Ghats.

The true cinnamon comes from *Cinnamomum verum* Presl., belonging to Lauraceae. Seventeen species are reported from Western Ghats, out of which 13 are endemic. In *Cinnamomum*, species diversity only is observed. Four varieties of cinnamon had been released in the recent past. Large amount of variability for morphological, yield and quality traits were observed.

*Garcinia* : India is endowed with 15 endemic species and 3 endemic varieties. Out of these, 7 species and 2 varieties are confined to Western Ghats. *G. gummi-gutta* is found wild in evergreen or semi-evergreen forests of Western Ghats upto 1800 m in Maharashtra, Goa, Karnataka, Kerala and also in the shola forests of the Nilgiris, Tamil Nadu. *G. indica* occurs wild in the evergreen forests of Western Ghats.