

# SOUVENIR AND ABSTRACTS



## NATIONAL SEMINAR ON STRATEGIES FOR CONSERVATION, IMPROVEMENT AND UTILIZATION OF UNDERUTILIZED FRUITS

1-3 December 2014

CHES, Chettalli, Madikeri, Kodagu, Karnataka



Organized by  
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## Success story of nutmeg cultivation - A spice in spice

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The westernmost belt of Tamil Nadu encompassing the western ghats has abundant wealth of horticultural species comprising of spices and plantation crops. Pollachi, globally known for the world's highest productivity in coconut is acclaimed as the 'Coconut City'. Geographically, the Pollachi region is blessed with conducive agro climatic conditions. Coconut, cocoa, black pepper and nutmeg are predominant crops of this region. Farmers of this region are more informative on the advanced technologies of crop production. Besides, coconut based agro processing industries and close vicinity of the spices growing Kerala districts have accounted for increased productivity of these crops. Moreover, the farmers are at advantageous location of tapping all the technological inputs from scientific institutions like Tamil Nadu Agricultural University, Kerala Agriculture University, Department of Horticulture & Plantation crops besides central institutes like Indian Institute of Spices Research, Central Plantation crops Research Institute, Indian Institute of Horticulture Research, Coconut Development Board, Spices Board, Directorate of Arecanut and Spices Development etc for enhancing the productivity of coconut and spices. Hitherto, nutmeg was known only in very few places like Kallar, Burliar and Courtallam.

I established my coconut plantation 44 years ago in an extent of 75 acres at Odayakulam village, Pollachi taluk, Coimbatore district which is located along the foot hills of the westernghat hills of Tamil Nadu. Foreseeing the possibility of exploring high value spices as intercrop in coconut, I adopted a wider spacing of 29 feet for coconut which was not in practice that period. Now I realise that the effort has become so fruitful that I have observed the per tree yield of coconut is far better than that of the normal spacing. Besides, the per unit area production also increased remarkably. It is my view that the single palm yield would be more when the palms are widely spaced but the unit area production would come down. Coconut is regarded as the Tree of Life which grows by itself besides facilitating the other crops also to flourish in its area by inducing favourable micro climate. The grown up coconut palm occupies 25 per cent of atmospheric area and 25 per cent of root zone area. I found lot of unutilized space available in my coconut plantation to the extent of 75 per cent. The leaves and fronds have a peculiar arrangement which allows sunlight to penetrate the ground. Witnessing this, I started exploring the possibility of mixed cropping for the effective utilization of the free space besides improving the net income from my plantation. With all these attributes, I regard coconut as 'Foster Mother of Plantation crops of the tropical plains' and is the best companion crop to be grown with many crops like cocoa, nutmeg, banana, black pepper.

I introduced nutmeg from Fruit Research Station, Kallar in 1987. Those days, only seedling progenies were available. The problem with the seedling progenies was that nutmeg is dioecious and male and female plants would be identified only after 6-7 years when it flowers. These progenies give 40 per cent of male population and 60 per cent female population. I later observed that among the 60 per cent female trees, very few were elite; as a result the productivity was low. Moreover, the grown up seedling progenies with less productive female and male trees needs top working to improve the productivity. For

top working, the unproductive male and female trees are beheaded just above the first tier branches. The period of beheading should be one year before budding. Lot of coppicing emerges along the main stem. Two healthy orthotropic shoots should only be allowed after removing the remaining shoots. Brown patch budding is done on both the selected shoots. If both the buds are successful, one will be allowed for collection of bud woods and the other bud wood for producing the main crop. If bud woods are continuously collected from trees, it results in reduction in yield of trees. To overcome this problem, bud woods can be collected from closely planted budded trees.

I started searching for alternate to improve the productivity of nutmeg. The only option was vegetative propagation through brown and green patch budding and also approach and epicotyl grafting. In nutmeg, the growth habit is in two forms viz., orthotropic (vertical shoots) and plagiotropic (lateral branches). I experimented vegetative propagation using orthotropic shoots as scion from my farm besides from other places. I was not convinced with this practice because I found lot of variation between trees. Finally, I started searching for the pedigree planting material. I could manage to procure scion from selected mother plants from Vaikom, Kerala in 1994. These pedigree plants yielded in three years after budding, besides having precocity of bearing with high yield as high as 1000 fruits in 7<sup>th</sup> year and 2000 fruits in 12<sup>th</sup> year and more than 10000 fruits after 20 years with good dry nut weight and dry mace weight. Here I would like to point that the nut and mace weight and size would go down when the tree yields heavily with more number of fruits and under such circumstances the farmer does not get the high grade mace and nuts.

When I brought the scions for the first time, I found that the success rate of budding was low due to the huge time gap from the cutting of scions and budding operation. I once again repeated this process of bud wood collection from Kerala, however this time by using ice box to transport the bud wood scion. I could find lot of improvement in the success rate.

With this experience, I started in situ budding with root stock of 18 months old in which *Myristica fragrans* was used as root stock. But based on the literature as well as my field visit to other farms in Kerala, I found that *M. fragrans* is a surface rooter and highly prone for wind damage as well as persistent rainfall. So I tried using wild root stocks viz., *M. beddomei* and *M. malabarica*. However these root stocks were found to have poor compatibility and these are suitable only for very high humid places and high ranges. Finally, I decided to use only *M. fragrans* as root stock on which budding was done two tiers above and I could observe lot of male branches growing below the bud union which I consider as an advantage.

While using seedling progenies, the recommended female male ratio is 10:1. But through vegetative propagation, male and female flowering branches can be possible within the same tree facilitating better pollination. However, more scientific work is required to confirm this.

I am currently taking an experiment by budding male budwoods 5-6 steps higher and further by budding female budwoods at subsequent levels above the male branches with an aim of achieving 100 per cent pollination year after year. As the yield in nutmeg depends on the age, height and canopy with more vegetative shoots, allowing fruits during early stages will arrest the vegetative growth leading of exhaustion of plants and dying. Therefore my suggestion to nutmeg growers is that the plants should not be allowed to fruit earlier than five years. The demand for nutmeg scions is on increase and I would suggest adopting closer planting of scion trees to meet the demand. Alternately, plagiotropic branches can be cut at half way to induce more orthotropic water shoots to be used as bud wood. Vegetative





propagation through plagiotropic shoots is also in practice but canopy management is very difficult which depends on the place from which the scion is collected either from primary, secondary or tertiary and is normally bushy in nature.

Similar to other crops, nutmeg also exhibits alternate bearing resulting in over production during the first year and low yield in the subsequent year. I have also observed that root stock influences the yield pattern. When scion collected from a same plant was budded on the common root stock (M.fragrans), I find lot of variability in yield pattern among the trees even though no genetic variation with physiological variation could be observed. I have also observed that in many budded trees, the root stock performed better than the scion which I could observe the two tiers below the bud union. The success rate of budding depends upon the season and the health of root stock as well as scion. I recommend regular maintenance of both root stock and the scion trees by maintaining uniform and scattered sun light besides optimum irrigation and manuring.

All the literature says nutmeg comes only under warm and humid conditions like west coast (Kerala), Srilanka, Indonesia, Pacific Carribean and Malaysia. But I owe the success of nutmeg in Pollachi region to the moderate climatic conditions, availability of irrigation throughout the year, annual rainfall of 1200-1300 mm in both south west and north east monsoon, humidity range of 70-85%. Under such climatic condition, the transpiration loss compared to the other conventional nutmeg growing regions is higher. Since we are supplementing with irrigation through fertigation, this loss is compensated. Moreover, due to the supplemental irrigation, the moisture and nutrient uptake is enhanced. In Pollachi, irrigation is mainly through drip and the required macro and micro nutrients are supplied through drip every week. Because of this, harvesting is extended upto two months. The nutmeg production in Pollachi region is expected to surpass the production of leading countries like Indonesia and second largest producer Grenada. In this context I like to add that rise in humidity due to unprecedented rain, the tree become conducive for Phytophthora fungal infestation leading to defoliation and nut fall which occurred in Kerala for the last two years. In my experience, I account the soil and root health as the successful factor to decide on the output of the nutmeg. So far, it is a general practice of putting all the efforts to manage the canopy alone ignoring the rhizosphere. Nutmeg being a shallow rooter, the root health should be regularly monitored. Organic mulching using dried and shredded coconut leaves and fronds, cocoa leaves are one good management practice. Mulching helps in maintain the soil moisture as well as to protect the raising soil temperature during summer and equally to keep the soil temperature warm during winter. It should be noticed that the mulch should have ample clearance from the trunk to avoid fungal problems. Soil microbes play a major role in betterment of root and plant health. Application of biofertilizers and biocontrol agents can help in maintaining the tree health with reduced input cost.

In India, Kerala being the leading nutmeg producer faces very high difficulty of harvesting aflatoxinfree nutmeg and mace due to heavy rains and high humidity for a prolonged period besides availability of work force. Nutmeg producers in Pollachi region are making use of this opportunity by producing aflatoxinfree nutmeg and mace. The western countries like Europe and USA who consume more have imposed stringent quality restrictions like aflatoxin free produce and free of carcinogens. Under these circumstances, farmers of Pollachi region by adopting ethical and scientific practices using solar driers with back up heating during monsoon by other energy resources like biomass energy earn a better income from nutmeg. The success of nutmeg production depends on spacing, nutrition, shade management in the initial stages, plant protection. As a mixed cropping in coconut plantation, spacing



is a limited criteria and normally adopted at 1:1 ratio. Each nutmeg is planted at the centre of four coconut palms. A common spacing of 27 feet between nutmeg to nutmeg is recommended. However this depends on the nature of scion trees and age as the tree shape is conical with some trees broader at base and few narrower. Broader trees need more spacing which results in interlocking of trees and poor penetration of sunlight and poor yield. In my experience, I have found that coconut nutmeg and cocoa as a good combination in the ratio of 1:1 (coconut nutmeg) and 1:2 (coconut cocoa). In later stages, cocoa needs to be removed to maintain nutmeg. Black pepper also performs well under this cropping system, however too much of crops would result in higher micro climate and invite fungal problems. Nutmeg being a shallow rooted crop is sensitive to water logging, moisture stress and drought. Therefore irrigation and nutrition at optimum level are important. High soil organic content is required besides meeting the macro and micro nutrients. The crop responds well to foliar nutrients comprising macro and micro nutrients. Depending on the vegetative stage or flowering stages and fruiting stage, the nutrient level varies. Humic acid gives better result as fertigation as well as foliar application. Training is an important operation in nutmeg. Orthotropic (water shoots) shoots should be removed other than the main vertical shoots. Pruning the lower branches is required to facilitate cultivation operation like weeding, manuring, harvest, collection of fruits. Harvesting in nutmeg is a skilful operation requiring manpower and knowledge. Split fruits are immediately harvested and no fruits should be allowed to fall on the soil. By using nylon nets, fruits can be safely harvested without spoilage. The flower mace fetches premium price and therefore the mace should be removed carefully without any breakage. The mace should be shade dried to prevent volatilization and colour change and depending upon the weather conditions, it takes 5-8 days. Both nut and mace requires gentle and slow drying. The dried mace should be packed in air tight containers and kept in dark cooler places. The colour of dried and stored mace would change from red to orange, yellow and amber.

The price range is seasonal depending upon the requirement. Low temperature and low humidity will result in premature splitting. In 2012, December and January, the night temperature went to 12°C and humidity went to 40% and day temperature reached 29-30°C. Premature nuts and mace will not have colour and weight. During the summer, the temperature is increasing year by year due to climate change and shade management is recommended. I am currently experimenting with mechanised drying to ease the manpower and to get the quality product. In 2011-12, the price of nutmeg was Rs.550/kg and that of flower red mace was Rs.2000/kg. Why? The second largest producing country Grenada (Caribbean) witnessed the hurricane IVON in 2004 and EMILY in 2005. Now the prices are going down. Why? Extensive coverage of area comprising Pollachi, Udumalpet, Theni, Nagercoil, upto Konkan region under nutmeg in the last few years is the main reason. There is a limited usage and not a common edible produce. Nutmeg goes for culinary, pharmaceutical, food processing as sauce and sausage processing. Under these circumstances my advice is to go for mixed cropping and not monocropping. Even the pericarp of nutmeg is used in preparation of food products like pickles, jam, jelly and wine.

Nutmeg prefers warm tropical humid region ranging from plains to 3500 feet for successful cultivation and the mean temperature requirement is 22°-34°C.

**Nutmeg is a seed of a fruit, farmer friendly, sleep friendly spice.**

Thirst for knowledge, travelling within the country and abroad, reading, net browsing, interacting with scientists, experienced farmers and crop specialist-Attributes of my success. Thanks.