

Two in One! Grafting technique to harvest two spices from a single tree

Malabar tamarind (*Garcinia gummi-gutta*) and kokum (*Garcinia indica*) are two underutilized spice crops native to the Western Ghats of India, valued for their culinary uses and health-promoting compound hydroxycitric acid (HCA). Typically grown in home gardens, their cultivation is limited by space constraints and the unproductive nature of male trees. This study explores an innovative interspecific grafting technique enabling both species to be grown on a single tree, thereby enhancing space efficiency and productivity in small-scale gardens. Various grafting approaches nursery grafting, in situ grafting, and top working were evaluated using compatible rootstock-scion combinations, primarily employing Malabar tamarind as the rootstock due to its vigorous growth. Grafting success and canopy architecture were influenced by scion type (orthotropic vs. plagiotropic). The study demonstrates the viability of producing multiple species on a single tree, presenting a sustainable model for high-value spice cultivation in constrained spaces. The approach also offers aesthetic and ecological benefits for home garden ecosystems.

THE Malabar tamarind (*Garcinia gummi-gutta* L.) and kokum [*Garcinia indica* (Thouars) Choisy)], which belong to the family Clusiaceae, are two popular spice crops of western coast of South India that add taste and flavour to various culinary preparations. Both Malabar tamarind and kokum are endemic species to the Western Ghat region, which are mainly grown as a backyard crop rather than a plantation crop. These crops are polygamodioecious with wide variability in terms of yield and quality. The bisexual or female trees produce fruits, whereas the male trees are unproductive. Though not common in other parts of the country, these spices are slowly gaining popularity throughout the country and abroad, owing to the presence of the natural anti-obesity compound viz., hydroxycitric acid (HCA) in their rind. HCA is believed to reduce obesity by inhibiting an enzyme, adenosine triphosphate-citrate lyase, which is involved in the conversion of citrate to acetyl-CoA, a key precursor

for fatty acid synthesis. Malabar tamarind and kokum are two hardy tree crops that are well suited to the tropical humid areas of the country. Apart from the Southern Western Ghat region of India, these crops can thrive well in the Andaman and Nicobar Islands, some parts of the Eastern Ghat region and the Northeastern States. Malabar tamarind is now popular in the states of Kerala, Karnataka, and Tamil Nadu, whereas kokum is widely grown in the states of Karnataka, Goa and Maharashtra. The dried rind of kokum and Malabar tamarind can be stored as a spice



and utilised throughout the year for imparting a sour taste to fish curries and various other culinary preparations. Apart from the use as a spice, the kokum fruits are utilized in numerous ways as kokum juice, syrup, squash, etc. The kokum seed contains natural fat, which is used for culinary and cosmetic purposes. The harvest of the crop coincides with the southwest monsoon in India, and hence, the curing process needs adequate care, without

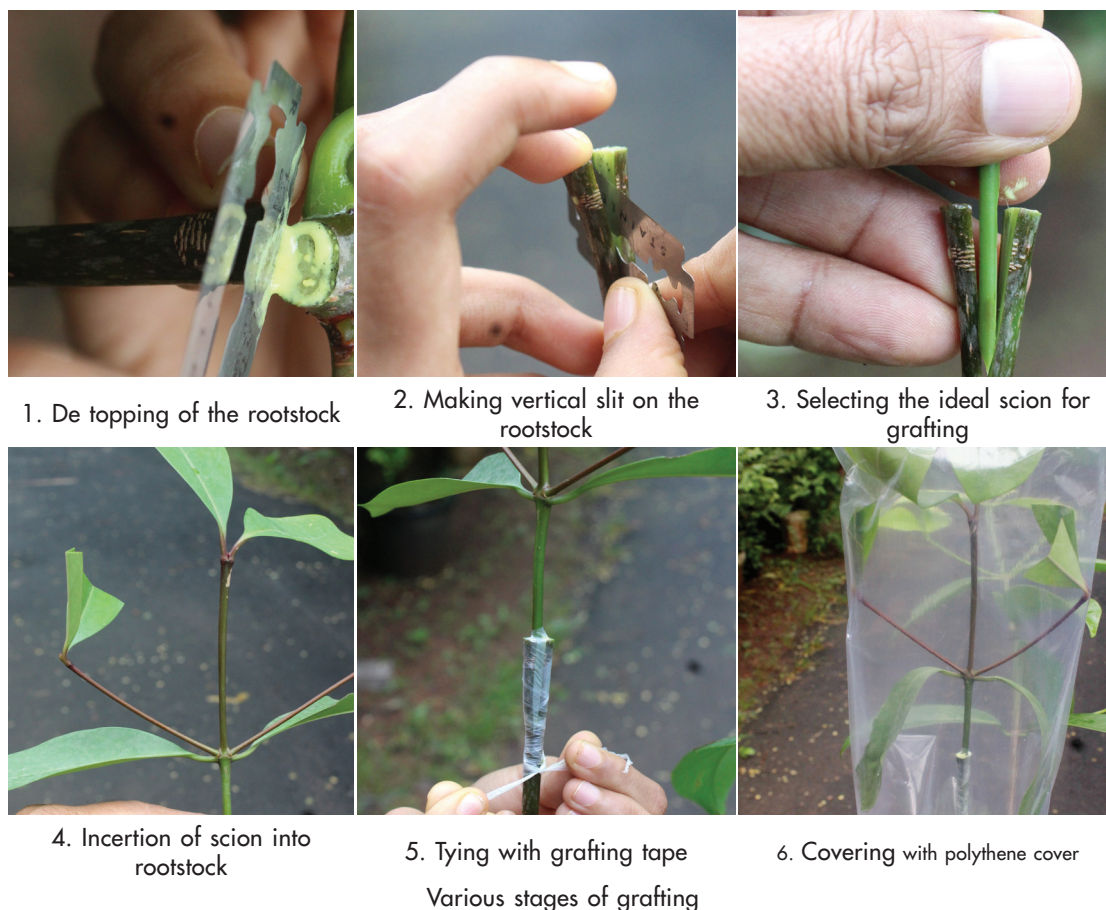
which the produce can get contaminated with mold and various impurities. Small-scale production and processing of Malabar tamarind and kokum in home gardens for domestic consumption will assure hygienic processing and quality products. The produce from a single tree can serve the needs of a family. Since the home gardens in South India are generally small holdings, which accommodate several horticultural crops, judicious utilization of space and sunlight is the key factor for attaining productivity. To save space and to accommodate more crops in a limited area, the interspecific grafting technique can be effectively used. Being the two closely related species under the same genus, the interspecific grafting technique can be efficiently used to produce Malabar tamarind and kokum on the same tree. Interspecific grafting is widely used in many horticultural crops for various purposes, such as combating drought, altering canopy disease resistance, etc. Here, the interspecific grafting technique is proposed to save space in home gardens. The evergreen tree with colourful fruits also adds aesthetic value to the home gardens.

Grafting technique

Malabar tamarind and kokum are handsome, evergreen trees that have a conical canopy with a main trunk of vertical (orthotropic) growth and lateral branches of horizontal (plagiotropic) growth. The Malabar tamarind tree has a comparatively wider canopy, whereas the kokum tree has a compact canopy. Hence, the grafting procedure has to be done judiciously, avoiding the mutual competition for sunlight. The stage of grafting and the type of scions used determine the shape and vigour of

the canopy of the grafted tree. Various types of grafting methods are suggested below to ensure the proper yield. Malabar tamarind is normally preferred as the rootstock owing to its deeper root system and vigorous growth habit. The scion of healthy, high-yielding, high-quality varieties/genotypes with 2-6 mature leaves on the top is used as scion. The scion with a dormant apical bud and leaves is cut to a convenient length of 15-20 cm. The scions extracted from the mother plants should be moistened by sprinkling water and immediately sealed inside polythene covers for transportation. The grafting method followed in *Garcinia* is softwood grafting or wedge grafting. For this, the actively growing rootstock is beheaded at a convenient height, and the oozing sticky latex on the cut surface is wiped off with a clean cotton or tissue paper. A vertical slit of 3.0 cm is made in the centre of the cut end with a sharp razor. The base of the scion is sharpened by making slanting cuts on either side in a way that it perfectly fits the vertical slit made on the rootstock. The base of the scion is inserted into the vertical slit on the rootstock and tied with grafting tape without leaving any gap between the cut ends. The scion portion, including the graft joint, is covered with a moist, transparent polythene cover to maintain humidity till the proper union of the graft. Direct exposure of sunlight to the grafted plants should be avoided by providing proper shade. The graft union happens within 15-30 days, depending on the climatic conditions and soil moisture. The sprouting of the apical bud indicates the graft success. The cover is removed 2-3 days after the sprouting of the scion. All the sprouts below the graft union have to be removed periodically. In *Garcinia*, the type of scion selected determines the

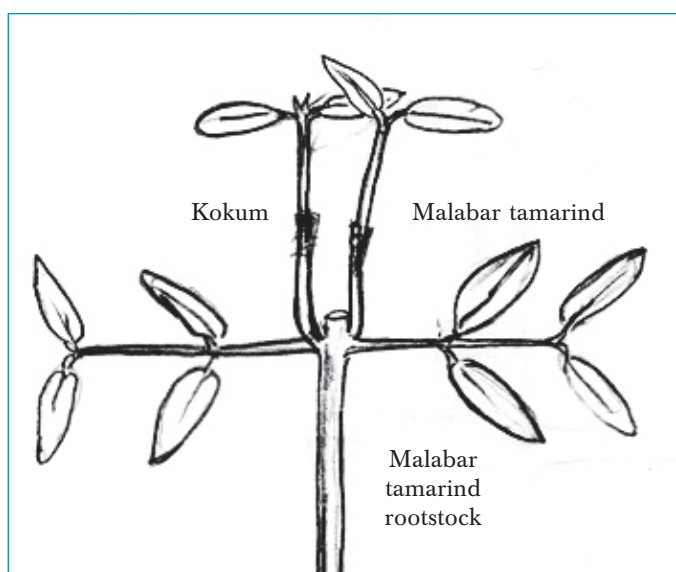
shape of the canopy of the grafted tree. If orthotropic shoots are used as scions, the graft will grow like a conical tree, similar to the seedling-raised trees. Such trees show vigorous growth and enhanced yield, proportionate to the canopy size. On the other hand, the plagiotropic scions will produce a compact bush with a spreading canopy. Though the growth and yield are reduced in plagiotropic grafts, the harvesting will be easier owing to the reduced plant height. Grafting can be done at any time of the year, provided that proper soil



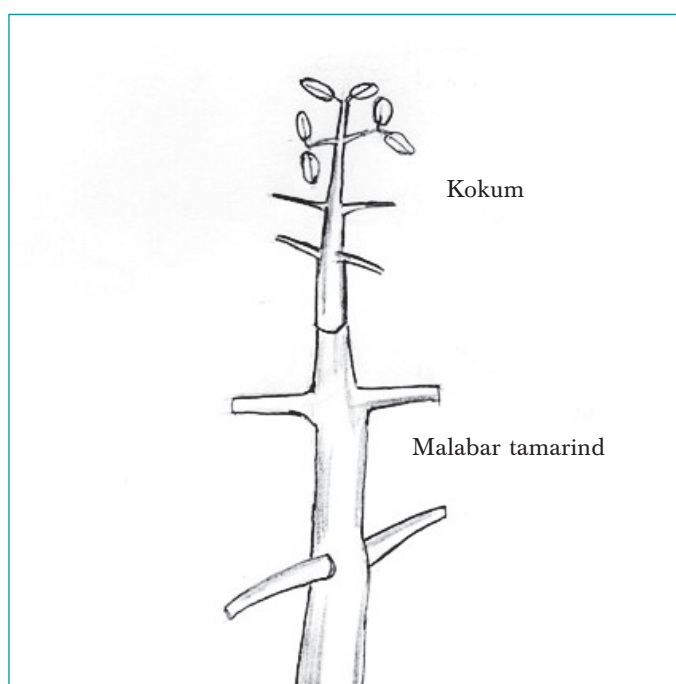
moisture and required shade are given to the grafted plants. The interspecific grafting can be performed in the nursery or field. Various steps of the grafting are given below.

Grafting in the nursery

Malabar tamarind seedlings grown in poly bags for 2-3 years are beheaded at a height of about 40-50 centimetres, after attaining a height of 60-100 cm. This will induce two sprouts from the cut plants. Normally, 1-2 months are required for the sprouts to attain the graftable stage. The scion of the Malabar tamarind and kokum is grafted on each of the sprouts after attaining a growth of about 15 cm. Once the grafting is successful, the grafted portion will be allowed to grow and planted in the field. Either orthotropic or plagiotropic scions can be used in this method, depending on the canopy requirement.



Interspecific grafting in the nursery



Grafting on the top of an existing tree

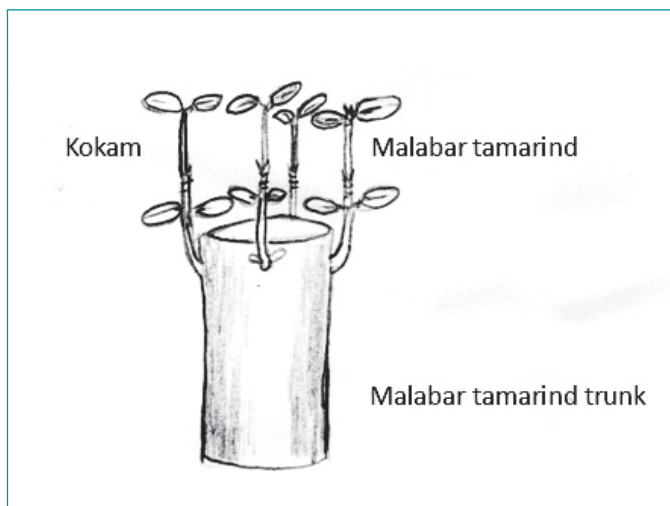
In situ grafting

In this method, the grafting is performed on the young Malabar tamarind seedling planted in the field. The plant in the field is cut at the desired height as mentioned above, and the grafting is performed on the two sprouts that emerged after cutting.

The alternate option is grafting an orthotropic scion of a high-yielding Malabar tamarind on the top of the existing plant at a height of 50 cm to 1 m, and the same is allowed to grow to the desired height. The second grafting with the kokum scion is done on the apical shoot of such grafted trees of Malabar tamarind after attaining the desired height. This will form a conical-shaped tree with lower branches bearing Malabar tamarind and the top branches bearing kokum.

Top-working

Top-working is the process of de-topping and converting the existing mature tree of Malabar tamarind or kokum into a productive multi-species grafted tree. The unproductive male trees or poor-yielding/low-quality genotypes can be made productive through this method. Since the mature trees possess a well-established, deeper root system, the top-worked trees will grow quickly and come to bear fruit faster. For top-working, the main trunk of the existing tree is beheaded at a height of 1.5 m or above. The cut end is applied with 1% Bordeaux paste. The stump of the trees will produce multiple sprouts within 3-4 months. Orthotropic or plagiotropic scions can be grafted on this sprout. In this method, multiple varieties of kokum and Malabar tamarind can be grafted on the sprouts. All other sprouts other than the grafted ones are removed. Care should be taken to maintain at least a sprout on opposite sides of the trunk or all four sides of the trunk, depending on the girth of the beheaded trees. This will ensure the cut end of the tree stays alive and prevent the decay of the main trunk.



Top-working

Need more?

If the horticulture enthusiasts desire to add more species to their gardens, there are many more multispecies grafting options in *Garcinia*, which are native to Northeast India and the Andaman and Nicobar Islands. In the interspecific grafting experiments conducted at



A top-worked tree with the trunk of Malabar tamarind (left) and kokum (right)



A grafted tree with lower branches of Malabar tamarind and the upper branches of kokum



A grafted tree with fruits of Malabar tamarind and kokum

ICAR-IISR, the edible and medicinally important species of *Garcinia*, such as *G. assamica*, *G. cowa*, *G. cowa* var. *kydia*, *G. lanceifolia*, and *G. dhanikhariensis*, are found to be compatible on Malabar tamarind and kokum rootstocks. The multi-species grafted trees with colourful

fruits adds beauty and value to your home gardens.

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