

Kokum: The purple pulse of the Konkan

Kokum (*Garcinia indica* Choisy), an underutilized fruit spice from the Western Ghats of India, shows strong potential as a functional food due to its rich phytochemicals and therapeutic effects. Traditionally grown in homesteads and mixed cropping systems of Maharashtra, Goa, Karnataka, and Kerala, kokum is a natural source of hydroxycitric acid, garcinol, and anthocyanins with antioxidant, anti-obesity, and cardiogenic benefits. Products such as kokum syrup, agal, amsul, butter, and tea are staples in regional cuisine and are gaining nutraceutical and cosmetic applications. Despite constraints in postharvest handling and value chains, varietal improvements and value-added products highlight kokum is growing agro-industrial promise.

KOKUM (*Garcinia indica* Choisy) is an underutilized fruit-bearing tree species native to India that has recently gained attention for its potential as a functional food. This perennial evergreen tree thrives predominantly in the Western Ghats, with natural distribution concentrated in the South Konkan region of Maharashtra, as well as in Goa, northern coastal Karnataka, Kerala, and parts of Assam and West Bengal. Characterized by a monopodial growth habit and tall stature, *G. indica* remains largely neglected in terms of systematic cultivation and commercial utilization. Its occurrence is mostly confined to homestead gardens, where it is commonly cultivated as a rainfed intercrop with coconut and arecanut in the Konkan region.



(A) *Garcinia indica* trees, and (B) Fruiting branches displaying kokum fruits

The fruit of *Garcinia indica* is small to medium in size, round, and varies in colour from deep purple to orange upon ripening. It contains 3–8 seeds embedded in a segmented, red, acidic pulp reminiscent of citrus fruits, with each seed surrounded by a white, mucilaginous layer. Both the rind and seeds hold considerable economic value. Owing to its sour taste and short postharvest shelf-



Developmental stages of *Garcinia indica* fruit: (A) Immature green fruits; (B) Fully ripened fruits exhibiting characteristic deep purple coloration; and (C) Seeds extracted from mature fruits

life of about one week, the fruit is typically processed by halving, seed removal, and subsequent drying.

Kokum has diverse uses and remains integral to local traditions and cuisine. The dried rind—resembling thick plum skin and locally known as *amsul*—is widely used in regional dishes to impart a characteristic sweet-sour taste and a distinct pink-purple hue, particularly in vegetarian and seafood preparations. It is also the key ingredient of *solkadhi*, a traditional refreshing drink. *Kokum* syrup (*Amrit kokum*) is another popular summer beverage valued for its cooling properties. The fat extracted from *kokum* seeds, known as *kokum* butter,

remains solid at ambient temperatures and is utilized in food, confectionery, cosmetics, and pharmaceuticals. Collection, processing, and commercialization of *kokum* seeds for butter production offer significant potential for income generation among rural and tribal communities within its native range.

Nutritional profile and health benefits

Kokum (*Garcinia indica*) has long been valued in Ayurvedic medicine for its wide-ranging therapeutic properties, including antidiabetic, anthelmintic, cardiogenic, and anti-obesity effects. Nearly all parts of the plant—fruit, rind, and seeds—find applications in culinary, pharmaceutical, and industrial domains. The fruit exhibits anthelmintic and cardiogenic activity, while rind juice has been traditionally used to manage gastrointestinal ailments such as colic, piles, dysentery, and diarrhoea.

The fruit rind is especially rich in α-hydroxy citric acid (HCA), a compound known to inhibit lipogenesis and lower cholesterol, positioning *kokum* as a natural candidate

for anti-obesity therapies. It is also a natural reservoir of anthocyanins—water-soluble pigments with strong antioxidant activity—and garcinol, which demonstrates potent anti-cancer, anti-ulcer, and antioxidant effects.

In addition, the rind contains citric acid, malic acid, polyphenols, and ascorbic acid, all contributing to its high antioxidant capacity. The fat extracted from its seeds, commonly known as *kokum* butter, is used in treating skin ailments such as cracks and wounds, and as a natural moisturizer enhancing skin elasticity. With high levels of beneficial fatty acids—particularly stearic and oleic acids—*kokum* butter also shows potential as an edible fat source in the confectionery industry.

Growing consumer awareness of *kokum*'s diverse bioactive compounds has fueled demand for its derivatives, highlighting its dual role as a functional food ingredient and a natural therapeutic resource.

Crop cultivation

Kokum thrives in warm, humid tropical climates and is typically cultivated along coastal regions up to 800 m above sea level. Optimal growth and fruit production require well-distributed annual rainfall ranging from 250 to 300 cm. The species performs well in lateritic and alluvial soils with a depth of at least 1.2 m and a pH around 6.7, particularly favouring valley regions. Agroclimatic zones suitable for coconut and arecanut cultivation are generally appropriate for *kokum* as well.

In Maharashtra and Goa's coastal belts, *kokum* is primarily cultivated as a rainfed crop on lower slopes and undulating terrain. While traditionally propagated through seeds—each fruit containing 4 to 8 seeds—vegetative propagation via softwood grafting is now commonly employed. The nature of the shoot used for grafting determines plant architecture: orthotropic shoots yield tall, tree-like plants resembling the mother tree, whereas plagiotropic shoots produce bushier, dwarf forms. Due to limited availability of orthotropic shoots, plagiotropic grafts are preferred in high-density plantations for ease of management and harvesting.

Kokum may be cultivated as a monocrop or intercropped with coconut, arecanut, or in home gardens. In grafted plantations, a female-to-male ratio of 9:1 is maintained to ensure adequate pollination. However, the sex of seed-derived plants remains unknown until flowering. For sole cropping systems, a spacing of 6 × 6 m² is recommended.

Harvesting requires multiple rounds of manual fruit collection, as fruit ripening is non-synchronous. High-yielding trees may need 6 to 8 plucking sessions per season. Fully ripened fruits are manually harvested by climbing the tree and shaking the branches, resulting in approximately 35–40% fruit loss due to immature or damaged fruits.

Improved varieties

Kokum is a dioecious and obligate cross-pollinated species, resulting in significant variability among natural populations. Two improved cultivars have been released by Dr Balasaheb Sawant Konkan Krishi Vidyapeeth (DBSKKV), Dapoli:

Composition of fresh *kokum* rind

Particulars	Value (%)
Moisture	87.50
TSS (Brix)	16.44
Protein (Nx 6.25%)	1.92
Crude fibre	14.28
Total ash	2.57
Tannins	2.85
Pectin	5.71
Starch	1.00
Crude fat	10.00
Acid (as hydroxycitric acid)	22.80
Pigment	2.4
Ascorbic acid	0.06

Source: Resource book on *kokum* (*Garcinia indica* Choisy), Western Ghats Kokum Foundation, Panaji, Goa

Chemical composition of *kokum* butter

Particulars	Value
Melting point	39-43°C
Sap value	189
Iodine value	34.7-36.7
Unsap matter (%)	1.4
Fatty acids component (%)	
Myristic acid	0-1.2
Palmitic acid	2.5-5.3
Stearic acid	52.0-56.4
Oleic acid	39.4-41.5
Linoleic acid	1.7

Source: Resource book on *kokum* (*Garcinia indica* Choisy), Western Ghats Kokum Foundation, Panaji, Goa



Value-added products derived from *Garcinia indica*: (A) Dried fruit rind (*amsul*), traditionally used as a souring agent in regional cuisine; and (B) *Kokum* squash, a concentrated beverage formulation prepared from *kokum* juice

- **Konkan Amruta:** An early-maturing, high-yielding variety producing apple-shaped fruits weighing 30–35 g with approximately 5% acidity. Mature trees (10 years old) yield about 40 kg per tree.
- **Konkan Hatis:** A mid to late-maturing, high-yielding variety characterized by large fruits (average 90 g), brick-red thick rind, and an average yield of 150 kg per tree after 10 years.

Value-addition

The diverse culinary, nutritional, and medicinal applications of *kokum* highlight the importance of value addition. In the Konkan region of Maharashtra and Goa, traditional value-added products such as *amrut kokum* (*kokum* syrup), *kokum* agal (salted juice), and *amsul* (dried rind) are widely prepared. Seeds are used to extract *kokum* butter. Modern processing has also introduced new beverage formulations like squash and ready-to-serve (RTS) drinks.

Traditional products

- **Kokum agal:** Prepared through osmotic dehydration of whole fruits with salt, imparting a tangy, sour flavour to culinary dishes.
- **Kokum syrup:** Made by steeping fruit rinds in sugar syrup, serving as a natural sweetener and flavour enhancer in beverages and desserts.
- **Kokum jam and preserve:** Thickened with sugar and spices, these products balance tartness and sweetness

and are used as spreads or dessert toppings.

- **Kokum tea:** A decoction of dried rinds, valued for its digestive and calming properties.

Kokum butter

Kokum seeds contain 23–26% edible oil, commonly known as *kokum* butter, which remains solid at room temperature. This fat, ranging in white to creamish yellow colour, is traditionally extracted using manual methods involving seed decortication, kernel crushing, boiling, and skimming. The resulting butter is widely used in cosmetics, including lotions, lip balms, and soaps. However, inefficient extraction processes limit its broader commercial potential. The residual de-oiled cake is utilized as cattle feed. *Kokum* butter also shows promise as an alternative edible fat in the food industry, particularly in confectionery.

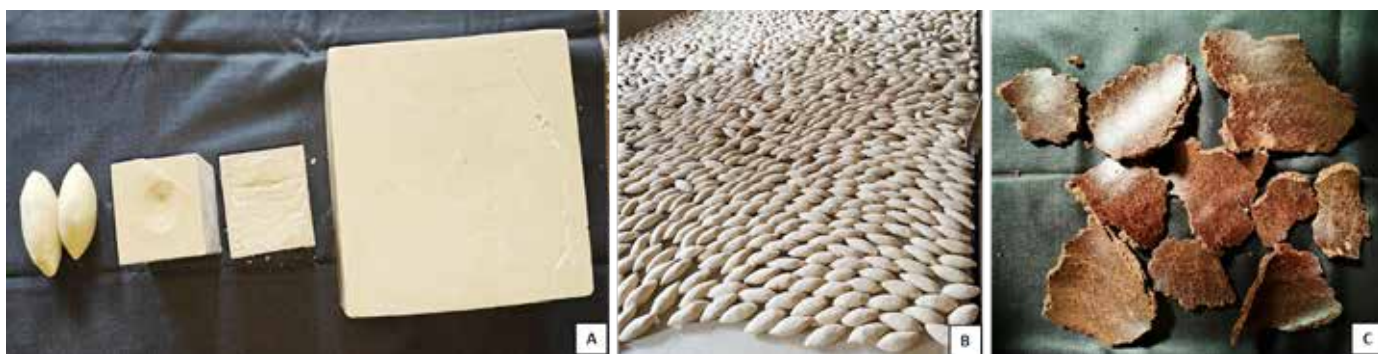
Novel value-added products

Ongoing innovations have led to the development of several novel *kokum*-based products with commercial potential:

- **Kokum solkadhi mix:** A dehydrated, ready-to-use mix containing *kokum* powder, coconut milk powder, spices, sugar, and salt.
- **Kokum wine:** Produced through the fermentation of juice extracted from ripe *kokum* fruits with added sugar and yeast; traditionally practiced in Goa.
- **Kokum honey:** Potentially derived from apiculture units in *kokum* orchards, offering medicinally rich, specialty honey.
- **Anthocyanin pigment:** *Kokum* rind is a potent source of anthocyanins (1,000–2,400 mg/100 g), making it a natural substitute for synthetic colorants in food and beverages due to its high water solubility and vibrant hue.

Economic prospects

The *kokum* value chain offers significant livelihood opportunities for smallholder farmers, women, and rural youth in the Western Ghats. Numerous Self-Help Groups (SHGs) are engaged in small-scale processing, supplying raw materials to cottage and medium-scale industries. However, inconsistent supply and inadequate production of high-demand products, such as *amrut kokum*, *amsul*, and *agal*, limit the industry's growth. Organized cultivation,



Garcinia indica seed fat (*kokum* butter) and its by-products: (A) Solidified *kokum* butter blocks; (B) Large-scale *kokum* butter extraction; and (C) De-oiled seed cake, a by-product used as cattle feed



Kokum butter processing traditional equipment for (A) Seed decortication, (B) Oil extraction, and (C) Butter clarification

standardized postharvest handling, and market integration are imperative to meet rising domestic and international demand.

Future thrust

Despite the extensive documentation of its medicinal, nutritional, and industrial properties, *Garcinia indica* (*kokum*) remains significantly underutilized in commercial agriculture and value-added sectors. To realize its full potential, there is a pressing need to establish a robust, integrated value chain encompassing improved postharvest handling, efficient processing technologies, market linkages, and farmer-centric enterprise models. Addressing postharvest losses through the development of low-cost storage, drying, and packaging solutions can substantially enhance the shelf-life and marketability of *kokum*-based products. One of the most promising yet underexplored avenues lies in the utilization of *kokum* butter as a plant-based alternative to dairy fats. Given its high content of stearic and oleic acids, *kokum* butter could be positioned as a functional fat in vegan confectionery, bakery, and nutraceutical formulations.

To ensure long-term sustainability and commercial viability, a comprehensive characterization of *kokum* genetic diversity across its native range is imperative. This

includes agro-morphological, biochemical, and molecular profiling aimed at identifying elite genotypes with superior yield, phytochemical content (e.g., hydroxycitric acid, garcinol, anthocyanins), and adaptability to diverse agro-climatic zones. Such efforts will support the development of high-performing cultivars for targeted end-use applications.

Collectively, these strategic interventions—ranging from value chain development and crop improvement to novel product innovation—are essential for transforming *kokum* from a regional niche crop into a commercially viable, globally relevant functional food resource.

For further interaction, please contact:

¹Ph D Scholar, Division of Fruits and Horticultural Technology, ICAR-IARI, New Delhi; ²Principal Scientist, Division of Fruits and Horticultural Technology, ICAR-IARI, New Delhi; ³M Sc, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra; ⁴Principal Scientist, Germplasm Exchange & Policy Unit, ICAR-NBPGR, New Delhi; ⁵Senior Scientist, Division of Germplasm Conservation, ICAR-NBPGR, New Delhi; *Corresponding author's email: vartika0906@gmail.com

Share your experiences with

Indian Horticulture

write to:

Editor

INDIAN HORTICULTURE

Directorate of Knowledge Management in Agriculture
Indian Council of Agricultural Research, Krishi Anusandhan Bhavan 1,
Pusa, New Delhi 110012
editor.indianhorticulture@gmail.com