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Kokum: A Nutrient-Rich Fruit with High Value Addition Potential

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SUMMARY

Kokum (*Garcinia indica*) is a nutritionally and medicinally valuable fruit with antioxidant, antimicrobial, digestive, and fat-reducing properties. Its rind, seeds, and pulp are used to prepare diverse value-added products such as syrups, jams, preserves, agal, and butter, enhancing both flavor and health benefits. These products support local livelihoods and small-scale industries while contributing to functional foods and natural remedies. Kokum's adaptability to tropical climates and rich bioactive composition make it suitable for wider cultivation and commercialization. Promoting its cultivation and processing can improve nutrition, health, and economic opportunities.

INTRODUCTION

Kokum (*Garcinia indica*) is also known as 'cool king' of Indian foods, belongs to the botanical family Clusiaceae. It is an important minor fruit crop predominantly found in the Konkan region of Maharashtra, as well as in parts of Goa, coastal Karnataka, Kerala and the Western Ghats. The species thrives in the region's evergreen and semi-evergreen forests and is also cultivated in home gardens and small-scale orchards under rainfed conditions. Known by a variety of local names, including Bindin, Biran, Bhinda, Katambi, Panarpuli, Ratamba and Amsol, kokum is valued for both its culinary and medicinal applications. The fruit is a small to medium-sized drupe, typically weighing between 21–85 g, with a round to oval shape. Ripe fruits are dark purple to red with yellow tinges and contain three to eight large seeds embedded in red acidic pulp, separated by white fibrous partitions. Due to its short shelf life of about one-week, traditional preservation methods such as sun-drying (6–8 days) are commonly used. Dried kokum rinds are widely utilized as natural acidulents in food preparation, beverages, and cosmetic products. Kokum fruit and its derived products, including kokum butter extracted from seeds, syrups and dried rinds, have considerable economic potential. Kokum butter is nutritionally rich, demulcent, astringent and emollient, making it suitable for pharmaceutical applications such as ointments and suppositories, as well as for local treatments of ulcers and fissures. Additionally, the residual seed cake serves as cattle feed, while processed products like syrups and dried rinds contribute to the growing cottage and small-scale processing industries in the Konkan region. These products also have promising export potential in international markets such as Japan, the Netherlands, Italy, the U.K., Singapore, and Malaysia. Medicinally, kokum is recognized for its therapeutic properties. The fruit, rind, and seeds are traditionally used to manage piles, dysentery, digestive disorders, heart conditions, and other ailments. Its culinary applications are equally diverse; kokum is a key ingredient in regional foods, beverages like 'solkadhi,' and acidulous preparations, owing to its sweet-sour taste and pleasant flavor. The species exhibits considerable diversity in fruit quality due to its dioecious nature and cross-pollination, further underscoring its potential as a versatile fruit crop with nutritional, medicinal, and economic significance in India (Deorukhakar *et al*., 2007; Swami *et al.*, 2014).

Nutritional and Chemical Composition of Kokum

Kokum is a nutritionally and medicinally valuable fruit, containing protein, tannins, starch, crude fat and citric acid, which contribute to its health-promoting effects. The rind is rich in bioactive compounds such as anthocyanins, hydroxycitric acid (HCA) and garcinol. Its primary anthocyanins, cyanidin-3-glucoside and cyanidin-3-sambubioside, have been identified using HPLC and NMR spectroscopy and account for about (2.4%) of the fruit's biomass. These water-soluble pigments, a subclass of flavonoids, are responsible for the red to purplish coloration of the fruit and exhibit strong antioxidant activity (Vasundhara *et al*., 2016). Hydroxycitric acid (HCA), present mainly in the leaves and rind at concentrations up to 23% on a dry basis and garcinol, a yellow-orange fat-soluble pigment constituting (1.5–3%) of the rind, are key bioactive components. These compounds can be extracted using ethanol or hexane (Waghmare *et al*., 2019). Other bioactive substances, including furfural derivatives and cyanidin-3-glucoside, possess significant antimicrobial properties, and their effectiveness depends on the type of solvent used for extraction. Kokum fruit extracts, harvested mainly during April–May, are employed in culinary practices and act as natural bio-preservatives due to their antifungal and antibacterial properties (Sharath *et al*., 2015). The HCA in the rind is also known for its fat-reducing properties, helping manage obesity by inhibiting

citrate lyase, the enzyme responsible for converting carbohydrates into fat (Jagtap *et al*., 2015). The kokum fruit consists of different chemical constituents : Moisture (%) 80.00 , Protein (%) 1.92, Crude Fat (%) 10.00, Crude Fibre (%) 14.28, Total Ash 2.57 ,Carbohydrates by Difference (%) 35.00, Starch (%) 1.00, Pigments (%) 2.40, Tannin (%) 2.85, Pectin (%) 5.71, Ascorbic Acid (%) 0.06 , Acid (as Hydroxyl Citric acid) 22.80 (Swami *et al*., 2014).

Value Addition of Kokum

The value addition of kokum has gained importance due to its wide-ranging culinary and health benefits. Scientific studies on kokum-derived products have highlighted their nutritional significance and potential therapeutic effects. Traditionally, kokum is recognized for its digestive properties. Products such as kokum syrup (also called kokum amrut or kokum sharbat), kokum agal, and kokum tea are popularly consumed to aid digestion, reduce acidity, and provide a natural cooling effect on the body (Chate *et al*., 2019). These preparations have been used for generations to support gastrointestinal health. Beyond digestion, kokum's value-added products are associated with notable health benefits. Their medicinal properties are primarily attributed to antioxidants and bioactive compounds like garcinol. Antioxidants present in kokum help neutralize free radicals, thereby combating oxidative stress and lowering the risk of chronic diseases. Regular, moderate consumption of these products can contribute to overall antioxidant intake and promote general well-being. From a culinary standpoint, kokum value-added products enhance flavors and create distinctive taste profiles. Kokum syrup, with its tangy, slightly sweet taste, serves as a natural flavoring agent and sweetener in beverages, desserts, and various culinary preparations. Its deep purple color and refreshing flavor also add visual appeal to dishes. Similarly, kokum agal, or dried kokum rind (sola), is used as a potent souring agent in cooking, often substituting tamarind or lemon juice in curries. In addition to culinary uses, kokum products are also applied in skincare, reflecting their holistic contribution to health and well-being (Khanashyam *et al*., 2023).

Value-added products of kokum

Kokum Agal and Syrup

Kokum agal is produced by osmotic dehydration of kokum fruit pulp along with seeds, preserved with salt. It is valued for its tangy, sour flavor, making it a versatile ingredient in various dishes. Kokum syrup, on the other hand, is prepared by osmotic dehydration of kokum rinds in sugar syrup. This syrup is widely used as a natural sweetener and flavor enhancer in beverages, desserts, and culinary recipes. Its vibrant purple hue and refreshing taste make it particularly popular for drinks such as mocktails, cocktails, and smoothies (ICAR-CCARI, 2023).

Kokum Jam and Preserves

Kokum jam is a flavorful spread prepared from kokum pulp, sugar, and a touch of spices (Ramya and Anitha, 2021). This value-added product blends the natural tartness of kokum with the sweetness of the jam, creating a unique and appealing taste. It can be enjoyed on bread or toast, or used as a topping for desserts, providing a burst of tangy flavor. Its rich color and distinctive taste make kokum jam a popular gourmet item. Similarly, kokum preserve is made by cooking kokum fruit in sugar syrup, sometimes with added spices or herbs to enhance the aroma and flavor (Ramya and Anitha, 2021). The resulting preserve offers a harmonious combination of sweetness and the characteristic sourness of kokum. It can be used as a spread on bread or toast, as a topping for desserts, or incorporated into recipes to impart a tangy flavour. The sweet-and-sour balance makes kokum preserves a favored choice for culinary applications among food enthusiasts.

Dried kokum rind

Dried kokum rind is prized for its strong sour and tangy flavor, making it a popular souring agent in Indian cooking. It can be added to curries, dals, soups, and other dishes to enhance their taste. Besides culinary use, it is traditionally used in herbal remedies to aid digestion and relieve acidity or indigestion (Khanashyam *et al*., 2023).

Kokum tea

Kokum tea is a refreshing beverage made by infusing dried kokum rinds in hot water. It provides a distinctive drinking experience with a mild tang and pleasant aroma. Often appreciated for its digestive benefits, kokum tea is also thought to have a soothing effect and can be enjoyed plain or sweetened with honey or blended with other herbal infusions (Khanashyam *et al*., 2023).

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