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LS Khapare
Department of Post Harvest Management of Medicinal, Aromatic, Plantation, Spices and Forest Crops, Post Graduate Institute of Post Harvest Management, Killa- Roha, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

JH Kadam
Department of Post Harvest Management of Medicinal, Aromatic, Plantation, Spices and Forest Crops, Post Graduate Institute of Post Harvest Management, Killa- Roha, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

GD Shirke
Department of Post Harvest Management of Medicinal, Aromatic, Plantation, Spices and Forest Crops, Post Graduate Institute of Post Harvest Management, Killa- Roha, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

Corresponding Author:
LS Khapare
Department of Post Harvest Management of Medicinal, Aromatic, Plantation, Spices and Forest Crops, Post Graduate Institute of Post Harvest Management, Killa- Roha, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra, India

Garcinia a medicinally potential genus in Western Ghats

LS Khapare, JH Kadam and GD Shirke

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Abstract
The Western Ghats, is one of the hotspots of biodiversity, having plentiful economic as well as medicinal value. *Garcinia* is an important genus distributed in the Western Ghats having vast nutraceuticals potential. Its economic, medicinal and ecological potential make it ideally suited to the restoration of natural forests of Western Ghats. The different species comes under genus *Garcinia* abundant with bioactive compounds that possess antioxidant, anti-inflammatory, anticancer, antimicrobial, antiallergy, antiulcer, antiparasitic, and antihelminthic activities. The genus is represented by more than 200 species, among which 30 species are found in India. *Garcinia mangostana (mangosteen or purple mangosteen); G. cambogia (Malabar tamarind)* and *G. indica* (*kokum*) are the major commercially important species cultivated in tropical countries. The habitat, bioactive compounds especially phenolic acids and organic acids, therapeutic values and medicinal values of these species are reviewed so as to exploit its economic and medicinal potential.

Keywords: Diversity, garcinia, Hydroxycitric acid

Introduction
The genus *Garcinias* belongs to the botanical family Clusiaceae and naturally occurring in tropical region in Asia, Africa, South America, Australia, and Polynesia. Mangosteen (Botanical name; *Garcinia mangostana* L.), Brindle berry [Botanical name: *Garcinia gummigutta* (L.) N. Bobson. Syn. *G. cambogia* (Gaertn.) Desr.] and Kokum (Botanical name: *Garcinia indica* Choisy) are the commercial yielding fruit trees of Garcinia cultivated in Australia, Cuba, Dominica, Ecuador, Gabon, Ghana, Guatemala, Honduras, India, Jamaica, Liberia, Myanmar, Nepal, Philippines, Puerto Rico, Singapore, Sri Lanka, Thailand, Trinidad and Tobago, United States of America, Vietnam, and Zanzibar (Murthy *et al.*, 2019) [4]. There are more than 200 species in the genus about 30 are found in India. Malaysia and Africa with large number of endemic species appear to be the two main centres of development of the genus Garcinia. Andaman and Nicobar Islands, North East Hill region, West Bengal, Orissa, Bihar and Western Ghats prominently coastal belt of Maharashtra, Goa, Karnataka, Kerla and Nilgiri hills are potential areas in India. (Rema and Krishnamurthy, 2000) [13].

The genus Garcinia exhibited vast diversity regarding growth habit, genetic nature and secondary metabolites. Garcinia species contain structurally diverse secondary metabolites such as xanthones, benzophenones and bioflavonoids (Aravind *et al.*, 2016) [11]. The phytochemical present in the fruit proven itself as a plant drug that clearly shows its existence on biological activities in relation to human. (Murthy *et. al.*, 2019) [4] In Indian folk medicine and Ayurveda, Garcinia has been found important place as it is use to cure conditions like flatulence, oedema, chronic alcoholism, dysentery, diarrhea, obesity, bowel disorder etc. Besides its medicinal value the fruits can also use in food industry. The process rinds of Garcinia fruits are used as a condiment for flavoring various food preparations. The genus Garcinia provides valuable non wood forest products such as fats, oils, resins and coloring materials (Rameshkumar *et al.*, 2016) [11]. Distributions of Garcinia species in Western Ghats of India (Priya Devi and Thangam, 2015) [11] are as below

Table 1: Important species distribution economic value/remarks

Important Species	Distribution	Economic Value/Remarks
Garcinia indica	Western Ghats	Fruit rind is used as spice Seeds are used as oil culinary agent in food, pharmaceuticals and neutraceuticals industry HCA-7.43%
Garcinia mangostana	South India, Lower nilgiri hills	Dessert fruits, queen of tropical fruits, Fruit has medicinal value
Garcinia Gummi Gutta	Western Ghats, Nilgiris	Rich in HCA, Garcinol and Isogarcinol, Rind used in curries, tress gives yellow resin used as varnish HCA-15.48%
G. tinctoria	Eastern Himalayas, Western Ghats, Andaman islands	Fruit is edible and use for processing. Gamboge and fruit is used as dye. rootstock for Mangosteen
Garcinia spicata	Western Ghats	Wood & bark, timber, dye & medicinal value
G. morella	Assam, Khasi hills, Western ghats	Gamboge, water colors, varnishes, dye, seed fat

Garcinia cambogia

Garcinia cambogia (Malabar tamarind), is an indigenous tropical under-exploited semi-domesticated tree belongs to the family Clusiaceae and native to south eastern Asia. It is an evergreen tree grown in Western Ghats of Kerala and Maharashtra (Gopakumar and Kavita, 2014) [7]. This tee is tolerant to drought and fluctuating water tables **(**Abrahum *et. al.*, 2006) [1]. It is a polygamous tree and used in folk medicine from ancient times. Hydroxy cytric acid (HCA) is the major organic acid in rind of fruit. HCA exhibited antiobesitic property, reduced food intake and body fat gain by regulating the serotonin levels related to satiety, increased fat oxidation and decreased de novo lipogenesis. Many scientific studies on Garcinia Cambogia have demonstrated the biological properties such as anti-obesity, hypolipidaemic and anticancer activity (Semwal, *et al.*).

The tree comes into flowering into the month of summer season and takes 3 to 4 months for fruiting (Martin *et. al.*, 1987) [3]. The fruits are small, about 5 cm in diameter with 6–8 grooves yellow on its surface (Murthy *et al.*) and can be yellow, orange or red when ripe with 6 to 8 seeds (Martin *et. al.*, 1987) [3]. The tree showed pendulous drooping branching habit and have yellow bark exudates (Shameer *et al*., 2016). The resin of the tree is used as a pigment in miniature paintings and watercolours (Abrahum, *et al.*, 2006) [1]. In central Western Ghats of India Garcinia Cambogia is help to maintain the forest ecosystem stability (Nagaraja *et al.*, 2011) [5]. G. cambogia leaf contain bioflavonoids Fukugicide, GB-1, and amentoflavone. Garcinol and guttiferones are the Benzophenones reported in fruit (Pandey *et al.*, 2015) [10].

Garcinia indica

Garcinia indica is multipurpose spice tree naturally found in the peninsular coastal regions i.e., Western Ghats, Eastern Ghats and North-eastern regions of India. It is popularly known as Kokum in Maharashtra. It is endemic to the evergreen forests of Western Ghats, Mainly to Konkan region of Maharashtra. It is a polygamodioecious, evergreen tree. The tree showed crown shaped canopy ending with horizontal branching habit and have white bark exudates.

It can be used as culinary agent in food, pharmaceuticals and neutraceuticals industry. The fresh rind of kokum contains 80% moisture, 1% protein, 1.7% tannin, 0.9% pectin, 4.1% total sugar and 1.4% fat. The anthocyanin's (2.4%) cyanidin-3-glycoside and cyanidin-3-sambubioside are the major pigment present in kokum and is reported to occur in the ratio of 4:1. Anthocyanin is responsible for scavenge free radicle activity and antioxidant activity (Nayak *et al.*, 2010) [6]. The rind also contains hydroxy citric acid (10.3-12.7%) which is an anti-obesity agent and yellow crystalline compound named as garcinol (1.5%) acted as an anticancer agent (Yamaguchi *et. al.*, 2000) [14]. The fruit has many medicinal applications such as it is useful against piles, dysentery, heart diseases and anti-obesity agent. Considering the increasing importance of its antioxidant activities and other functional components, the crop has been identified for consumption and development. It provides more nutrition than simple nutrition hence foods rich in preparation from kokum and its syrup can be considered as functional foods.

Apart from the medicinal values different value added products are prepared from of kokum e.g. kokum RTS, kokum *solkadhi*, *agal*, *amsul*, butter etc. Dried kokum rind have many applications *viz.* preparation of kokum powder, kokum RTS mixes, kokum *solkadhi* mixes, kokum liquid concentrate, kokum syrup, kokum *Agal*, kokum *Amsul*. Kokum seeds are solid wastes obtained from kokum processing industry and contain about 40–50% fat. It is used as confectionery butter and also for candle and soap manufacture. It is edible, nutritive, demulcent, astringent and emollient, which is a good replacer for cocoa butter fat used in confectionary industry.

This crop is gaining increasing importance, as it have multifarious utilities ranging from food processing, pharmaceuticals and Medicinal uses which attract the health conscious people. It is a commercial crop for economic and social development of coastal region of Western Ghats with vast potential.

***Garcinia mangostana*:** *Garcinia mangostana* L. (Mangosteen or purple Mangosteen) is congenitally occurs in Southeast Asia specially Indonesia and Malaysia and it has been cultivated in tropical regions such as Australia, Cuba, Dominica, Ecuador, Gabon, Ghana, Guatemala, Honduras, India, Jamaica, Liberia, Myanmar, The Philippines, Puerto Rico, Singapore, Sri Lanka, Thailand, Trinidad and Tobago, USA, Vietnam and Zanzibar (Lim 2012; Orwa *et al*. 2009) [8, 9]. The tree is indigenous to the Malay Archipelago and considered to be originated through hybridization between G. malaciensis and G. hombroniana (Richards, 1990b) [14]. It is known as Queen of tropical fruit because of sweet flavor and pleasant aroma of the fruit (Murthy, *et. al*., 2019) [4]. Mangosteen tree is evergreen, slow growing, erect, with a py ramidal crown and flowers are born in clusters of 3-9 at branch tips. The hull of *Garcinia mangostana* has free radicle radical scavenging activity which makes it suitable for used as foodstuff as well as traditional medicine (Yu *et al*., 2007) [15].

A B C

Fig 1: Fruit morphology of Garcinia indica (A), Garcinia Gummigutta (B), Garcinia mangostana (C)

Conclusion

Garcinia is the genus of potential nutraceuticls property which helps to maintain the forest ecosystem stability in Western Ghats.

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