

## **Garcinia indica (Kokum)**

Kokum (*Garcinia indica*) is an evergreen tree indigenous to India and found in Western Ghats from Konkan southwards and in Goa. It is cultivated in southern districts of Maharashtra and on lower slopes of Nilgiris. Kokum tree is also found in Assam and West Bengal. Kokum has culinary, medicinal and industrial uses.



Kokum fruit is dark purple in colour and weigh about 15-20 grams. The fruit contains substantial amount of malic acid but very less citric acid. Malic acid is acidic, reddish coloured and gives the pungent sour taste to fruits. The pulp of fruit is used to make Sherbet/sweet drink. Dried kokum fruit is known as amsul/aamsol and added as condiment in curries.

Seed's kernel are processed to obtain an edible fat, Kokum butter/kokum oil/kokum katel. Kokum butter is used as substitute for cocoa butter in chocolates. It is also used in the treatment of diarrhoea and dysentery.

### **MEDICINAL USES OF KOKUM**

- In Ayurveda Kokum fruit is used in the treatment of a variety of ailments. It is an appetizer and tonic for the liver and heart. The fruit infusion is used for treating skin diseases, like allergies, chaffed skin, rashes, burns and scalds. It is also given in heat stroke, dysentery, diarrhoea, piles and heart diseases.
- Kokum fruits are used for weight management. They help to reduce weight. Presence of Hydroxycitric acid in fruits makes it effective in weight-loss. This acid increases serotonin availability in the body, reduces weight and increases oxidation of fat.
- A poly isoprenylated benzophenone in fruit rind has an antioxidant anti-cancer and anti-ulcer properties.
- For purgative purpose a powder is prepared by mixing fried Hing/asafetida, Kokum fruit, fruits of bishop's weed (*Ptychotis ajowan*), rock salt, and fennel/Saunf. All are taken in equal parts. A dose of 2 to 6 g of the powder

with 5 ml of fresh lemon juice twice/day cleans excess Pitta and cleanses small intestine and colon.

- Kokum fruits are cooling in nature. A sherbet (known as Amrit kokum) prepared from the pulp is rich in antioxidants and quenches thirst. The fruits alone are useful in gas, fluid retention, alcoholism, weakness of digestive system, excessive thirst and oral diseases.
- Kokum fruit is also used in dried form to make dishes sour.
- Kokum fruit seeds contain an edible butter which is known as Kokum butter. Kokum butter is applied topically on ulceration, skin diseases, cracked lips, and dryness. In mucous diarrhea or dysentery, kokum butter is given in a dose of ten grams with a glass of milk, thrice a day. It can also be used as substitute for animal fat.

### **Biological activities of garcinol**

Garcinol, the major polyisoprenylated benzophenone isolated from *G. indica* exhibits potential antioxidant activity by scavenging DPPH radicals, hydroxyl radicals, suppressing superoxide anion, effective against peroxynitrite-induced lipid peroxidation and inhibiting xanthine oxidase activity. The strong antioxidant activity of garcinol is attributed to the presence of both the phenolic hydroxy groups and  $\beta$ -diketone moiety that shows keto enol tautomerism as in the case of curcumin. Garcinol plays an important role in the treatment of gastric ulcers caused by the hydroxyl radical or by a chronic infection with *Helicobacter pylori* as evident from its antiulcer activity in rats induced by indomethacin and acts as a good antioxidant when administered orally. It shows antibiotic activity against methicillin-resistant *Staphylococcus aureus* comparable to that of vancomycin and also proven to exhibit several anticancer activities. Garcinol is also able to suppress colonic aberrant crypt foci (ACF) formation in rats and inhibits topoisomerases I and II at concentrations comparable to that of etoposide. Garcinol decreases the cell viability, increases cell death and apoptosis in human leukemia HL-60 cells, HT-29 cells, HeLa cells and colon cancer cells.

### **VALUE ADDITION OF KOKUM**

Value addition of kokum into processed products will enhance the health benefits of consumers due to several bioactive components present. Kokum also has a great export potential as natural colorant. Further product formulations and process optimization of Kokum value added products can help explore the untapped potential of kokum. Rigorous efforts are needed to establish the commercial plantations, value addition, marketing, as well as development of suitable processing technologies. The value-addition initiative allows *Garcinia* farmer producers to gain better income by promoting utilization of underutilized

Garcinia. Hence Garcinia should be extensively promoted for development of various value added products etc. for income generation as well as to reduce post-harvest losses.

## **PRIMARY PROCESSING**

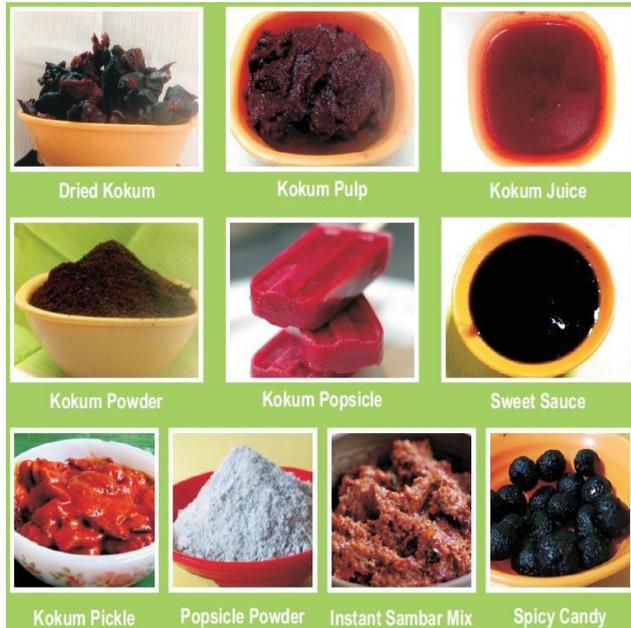
### **Washing, blanching and tray drying:**

The fresh Kokum fruits were collected and washed thoroughly in fresh tap water, followed by double glass-distilled water to remove the adhering dust and drained completely. The cleaned kokum fruits were blanched in hot water ( $90 \pm 2$  °C) for 5 minutes with the ratio of kokum fruits to water at 1:2. The blanched kokum fruits were then immediately cooled in cold water at 4 °C equilibrium value. The kokum fruits were drained after cooling and the residual moisture was evaporated at room temperature, on a clean paper with constant turning over (Excess moisture was removed using dry muslin cloth. One set of fruits were ground after carefully removing the seed. The ground kokum pulp was stored at refrigerated temperature (-4 °C) in sterilized glass containers after adding preservative (sodium benzoate 250ppm) for further product development. Another set of kokum fruits were Gupta and Prakash, 2011) cut into halves, spread on stainless steel trays for drying at 70 °C for first 3 hours and 60 °C for the next 8 – 10 hours in a pre-heated tray drier. The dried kokum was deseeded and ground into fine powder using a grinder at a medium speed for 2 to 4 min. The powder was then sieved using a sieve analyzer to get a particle size of 150-430µm and was vacuum packed in a Metalized Polyethylene Terephthalate (MPET) package with OTR of 0.95cc/m<sup>2</sup>/day and WVTR of 1.2 g/m<sup>2</sup>/day and stored at room temperature i.e., 35 °C±4 until further use. The processed Kokum pulp and Kokum powder were used in preparation of various products.

### **Product development:**

The Kokum pulp and powder were used for formulating and standardizing five different products like Kokum Pickle (KP), Kokum Sauce (KS), Kokum Sambar Mix (KSM), Kokum Spice Candy (KSC) and Kokum Popsicles powder (Kpops). Kokum sauce was developed by using 46% of kokum pulp; Kokum pickle (KP) was standardized by using 43% deseeded fresh kokum fruit and 21.5% kokum pulp. Kokum Spice Candy (KSC) was formulated using 52% pulp and Kokum Sambar Mix (KSM) was developed by using 36% of kokum pulp. Kokum popsicles (Kpops) were formulated using 20% Kokum powder.

# VALUE ADDED PRODUCTS FROM KOKUM



## KOKUM SWEET SAUCE

- Kokum
- Cleaning
- Blanching (5 min, 1:2 ratio of water)
- Drying  
(Removing excess moisture with dry muslin cloth)
- Cutting, Deseeding and extraction of pulp
- Addition of water, sugar & jaggery and boil for 10 min.
- Addition of spices  
(Black Salt, Cumin, Coriander, Chilli, Garlic, Cinnamon and Fennel seed powders)
- Boiling (Till TSS reaches to 65% brix)
- Addition of Preservative (750 ppm Sodium Benzoate)
- Storing  
Store in a sterilized glass bottle

## KOKUM PICKLE

- Kokum
- Cleaning & Cutting in two halves
- Deseeding & Pulp extraction
- Marination for 30 min.  
(Sliced kokum, Pulp and Salt)
- Sauteing
- Addition of Spices  
(Chilli powder, Salt, Turmeric, Roasted cumin, Fenugreek seed powder)
- Addition of kachai lemon juice
- Seasoning  
(Mustard seeds, Garlic pods, Dry chilli and Curry leaves)
- Cooling
- Storing Store in a sterilized glass bottle

## KOKUM INSTANT SAMBAR MIX

- Kokum
- Cleaning
- Blanching (5 min, 1:2 ratio of water)
- Drying  
(Removing excess moisture with dry muslin cloth)
- Cutting, Deseeding and extraction of Pulp
- Addition of tamarind pulp and boil for 10 min.
- Addition of Spices  
(Roasted Coriander, Cumin, Roasted bengal gram, Pepper, Chilli, Curry leaf & Rice powders. Boil for 5 minutes)
- Addition of dry mango powder, Asafoetida, Turmeric, Kachai lemon juice, salt and oil. Mix well
- Grinding
- Storing  
Store in a sterilized glass bottle & Refrigerate

## KOKUM SPICY CANDY

- Kokum
- Cleaning
- Blanching (5 min, 1:2 ratio of water)
- Drying  
(Removing excess moisture with dry muslin cloth)
- Cutting, Deseeding and extraction of Pulp
- Addition of Spices  
(Black Salt, Cumin, Coriander, Chilli, Pepper, Sugar, Cinnamon and Fennel seeds powder)
- Boiling and mixing like a dough and refrigerate for 1 hour
- Making into small balls using Kachai lemon Juice
- Rolling into powdered sugar
- Storing  
Store in a sterilized glass bottle

## KOKUM POPSICLE

- Kokum
- Cleaning
- Blanching (5 min, 1:2 ratio of water)
- Drying  
(Removing excess moisture with dry muslin cloth)
- Cutting into two halves
- Tray Drying (55°C for 24 hours)
- Separation of seed
- Grinding & Sieving
- Addition of powdered sugar and flavour to popsicle powder
- Preparation of sugar syrup
- Addition of Popsicle powder & mix well
- Pour into moulds and Refrigerate for 8 hours

## REFERENCES

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