

GUM YIELDING TREES, THEIR EXUDATES AND USES

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Introduction:-

Natural gums are a group of plant products, formed due to the gummosis process in plant cellulose. Gums exudates from plants obtained in a liquid form. Gums obtained from plants (natural gums) are mainly composed of monosaccharide units joined by glucosidic bonds and it contains hydrophilic carbohydrate polymers of high molecular weights (Davison, 1980). The main chemical constituents of gum yield arabinose, galactose, mannose and glucuronic acid. Researchers found that, gums are generally insoluble in organic solvents such as hydrocarbons, ether, or alcohols. They are either water soluble or can absorb water and also when swell up or disperse in cold water to must be give a viscous solution or jelly. After different type processing of plant exudates a commercial gum occurs in the market, in the form of dried exudations. Now a day's uses of natural gum widely employed by a large number of manufacturing, printing, textiles, paint, candy, including food and pharmaceutical industries.

Gums are produced by members of numerous families but tapping of selected few tree species such as Combretaceae Leguminosae, and Sterculiaceae, are restricted for a commercial exploitation. Gum is also extracted from seeds (*Cyamopsis tetragonolobus*, *Tamarindus indica*, *Cassia tora* etc), seaweeds (plant names; Red Algae and Rhodophyceae), microorganisms (from selected yeast and fungus), and another source such as wood chips of *Larix occidentalis* (the stractan), *Aloe barbadensis* (the aloe gum) barns of corn or seed coats, rice, wheat, soybean oats, and barley (Hemicellulose). Guar gum is the highly prominent seed based a natural gum. Some

important commercial gum yielding trees are the Dhawara gum/gum Ghati, Desi gum or Babul gum, karaya gum, Moringa gum, Bahera gum etc. Some natural gums yielding a tree, and their commercial importance is presented here.

Acacia nilotica (family: Legumes):- The gum Arabic (also known as Desi gum or Babul gum), in India which is extracted from the plant *Acacia nilotica* (family Legumes) and related acacias. *Acacia nilotica* (Fig. 1) is a multipurpose tree that is widely used in food, fuel, fodder, fiber, medicine, apiculture, and plant protection. Almost all the parts of the tree such as leaf seed, branches are utilized for various purposes. The most important product from this tree is the babul gum which is highly valued. It is composed of galactoaraban which gives on hydrolysis L-arabinose, D-galactose, L-rhamnose, D-glucuronic acid and 4-O-methyl-Dglucuronic acid. The gum which initially varies in colour from very pale yellowish brown to dark reddish brown depending on the quantity of tannins in the exudates sample. The obtained gum from this tree in form of lighter, very viscous, and more highly valued gums which are soluble in water and; the tannins in the darker gum reduce the solubility. Most has been used in textile, cosmetic, ink, mucilage, paste, polish medicines, and confectionery industries and as a glaze in painting.

Anogeissus latifolia (family: Combretaceae):- Natural exudates obtained from *Anogeissus latifolia* (Fig. 2) known as gum ghati. Ghatti is an amorphous, translucent, water-soluble gum. The main chemical constituents of Gum ghatti (Indian gum) consist of L-arabinose, D-galactose, D-mannose and D-glucuronic acid residues. The morphological characteristic of gum occurs as the colour of exudates varies from light to dark brown. It is used as an emulsifier, stabilizer, and thickener in the foods industry, ceramics industry, and pharmaceuticals industry. Ghatti has been used with polyacrylamide to aid in the polymerization and formation of polystyrene. It also prevents fluid loss, used in the acidizing of oil wells in combination with a water-insoluble non-aqueous liquid that is inert to both the gum and acid. It also finds application in the emulsification of petroleum and nonpetroleum waxes to form liquid and wax paste emulsions.

*Acacia nilotica*

Babul Gum

Fig. 1:- *Acacia nilotica* and their exudates*Anogeissus latifolia*

Gum Ghati

Fig. 2:- *Anogeissus latifolia* and their exudates

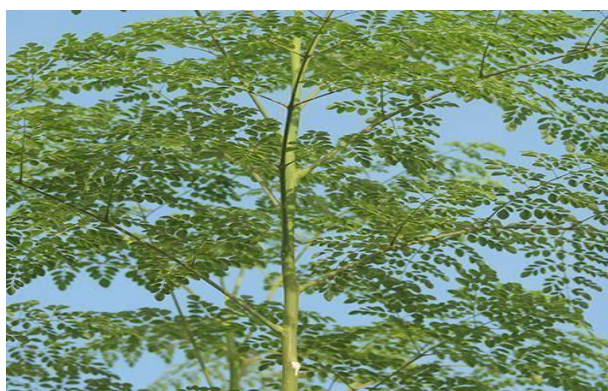
***Sterculia urens* (family: Malvaceae):-** Gum karaya shall exudation obtained from the incised trunk of the stems, and branches of *Sterculia* (Fig. 3) species (mostly from *Sterculia urens*), a large tree in central India. Gum karaya is an acid polysaccharide, and It comprises composed of the sugar's galactose, the rhamnose and galacturonic acid. The morphological characteristic of the gum karaya exudates shall be white to the amber color in the form of tears of variable size or in broken irregular pieces. It shall possess a slightly acetous odor and a mucilaginous and slightly acetous taste. It is one of the least's soluble gums used widely in the petroleum and gas industry, textiles industry, paper industry, pharmaceuticals industry and also used in several other products. Due to its acid stability, high viscosity, and suspension properties. The gum karaya is well suited for stabilizing low pH emulsions, in sauces and dressings.

*Sterculia urens*

Gum Karaya

Fig 3.-: *Sterculia urens* and their exudates

***Moringa oleifera* (family: Moringaceae):-** Moringa gum is one of the newly recognized gums. With a huge demand of natural gums in various industries, it is going to be a promising natural gum. Moringa gum is the exudate from the stem bark of *Moringa oleifera* (Fig. 4). The chemical constituents of the gum exudate contain L-arabinose, D-galactose, D-glucuronic acid, L-rhamnose, D-mannose, and D-xylose. *Moringa oleifera* are a small genus of quick growing tree distributed in India. The bark of moringa tree is thick, soft, fissured, and corky, becoming rough. When a drumstick tree (*Moringa oleifera*) is injured, its stem exudes a Moringa gum with a bland taste, which is initially whitish-grey in color but changes to reddish-brown to brownish black on the exposure to the atmosphere. Almost all the parts of the moringa tree such as a leaf, a fruit, a bark, stem and roots are used for different purposes like food, fibre, medicine. Fresh pods, as well as leaves of the moringa, are used as vegetables, while the mature seeds are used for the extraction of oils.

*Moringa oleifera*

Moringa gum

Fig 4:- *Moringa oleifera* and their exudates

***Terminalia belerica* (family: Combretaceae):-** Bahera gum is a dried exudate which is naturally obtained from the plant bahera (Fig. 5). Bahera gum is a type of natural gum of inferior quality. The harvested gum is usually dark and is inferior in thickening and adhesive qualities. Main constituents of the Bahera gum consist tannins which mainly include β -sitosterol, chebulagic acid gallic acid, ellagic acid, galloy glucose and ethyl gallate. In India, it is reported that bahera gum to be eaten by the Santhals communities of India. Various research works was carried out to use this gum in drug delivery system, and also tried to use the gum for the development of green adhesive.



Terminalia belerica

Bahera gum

Fig. 5:- *Terminalia belerica* and their exudates

Applications of seed based obtained gum

***Cyamopsis tetragonoloba* (family: Fabaceae):-** Guar gum (also called guaran) is extracted from the seed (Fig. 6) of the guar plant (*Cyamopsis tetragonoloba*). It is an annual leguminous plant originating from India and Pakistan. It is also cultivated in the United States. Its major constituent is the polysaccharide (Galactomannans), the germ, rich in protein. Guar Gum is known for its thickening properties. It Guar fruit is a pod; its seeds have an average diameter of about 5 mm. They contain a reserve substance, the albumen. From the outside to the interior, we have: the hull, the albumen or endosperm, which is light cream in colour. It is made up of two hemispherical segments (splits), which surround the germ. The largest market for guar gum is in the food industry, where it is used as a thickener and binder of free water. Guar gum also finds extensive use in many industrial applications.

Fig.:- *Cyamopsis tetragonoloba* seeds

Fig.:- Guar gum powder

Fig. 6:- *Cyamopsis tetragonoloba* seeds and their product

Tamarind kernel (family: Fabaceae):- The biological source of this tamarind gum is tamarind kernel which is obtained from the endosperm of seed (Fig. 7), (family: Leguminosae or Fabaceae). Tamarind gum powder has various applications in the food processing Industry, pharmaceutical industry, textile industry, mining industry and pet food used as an additive or souring agents; as a binder for making bioadhesive tablets; as a thickening agent used as a stabilizer and for soil, used as viscosifier.



Fig.:- Tamarind kernel seed



Fig.:- Tamarind kernel seed powder

Fig. 7:- Tamarind kernel seed and their product

***Parkia biglobosa* (family: Fabaceae):-** Locust bean gum is obtained from the seeds (Fig. 8) of *Parkia biglobosa* plant (family: Fabaceae). It is preferred as texturizer for variety of food applications due to its natural image, the neutral taste and the very creamy texture it provides. It has a positive impact on the protein stability and not interacts with other ingredients in the food due to its neutral behavior. Used in the manufacture of especially confectionary

product, pet foods, Paper making, Mining products, cosmetics, thickened textiles and Increase the cigarette flavor. Not only is that gum powder also used as an additive in shoe polish and insecticide.



Fig.:- *Parkia biglobosa* seeds



Fig.:- Locust bean gum powder

Fig. 8:- *Parkia biglobosa* seeds and their product

Conclusion- It is concluded that only few major plant exudates commercial gum. NRGs based products are widely used in food sector, pharmaceutical industry, paints & varnishes industry, lacquers, flavors, fragrances and miscellaneous technical purposes. There is a need for extensive research and development programmed for the value addition of the NRGs based commercial product development such as guar gum, moringa gum, and gum Arabic, which mostly used in day to day use product. Therefore, there is a need for cultivation and conservation of NRGs producing tree, their value addition, product development from NRGs, which have an enormous potential in present scenario.