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Review Paper

Unveiling The Secrets of Gum Karaya – An Excipient

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ABSTRACT

In the recent years, hydrocolloids particularly gums have gained a significant attention due to the need for incorporating new natural resources from plants. They are used for their excellent physical, chemical and biological properties, making them ideal components for development of better food and drugs. *Sterculia urens* is the primary source of Gum Karaya – a soft gum that is secreted when a tree is wounded naturally or artificially. It is also known as *Sterculia* or *Kadaya* belonging to the family 'Sterculiaceae'. Gum Karaya is a polysaccharide that has several applications in the pharmaceutical, food and environmental fields due to its binding, emulsifying, stabilizing and shelf life improving nature. It is obtained by drilling holes into the trunk or by the process of burning or scarring a trunk of a tree, further removing a section of bark. It has been successfully used in drug delivery, drug microencapsulation, nanotechnology applications – owing to a huge demand and high value, the karaya trees are being over exploited. Some states in India have banned the commercial production and marketing of the gum to reduce the threat to karaya trees. This article provides a comprehensive review of the commercially important gum karaya, outlines the properties, various methods of synthesis, industrial applications and its evaluation as an excipient.

INTRODUCTION

GENERAL DESCRIPTION

The gum produced from the trees of *sterculia* species are called as gum karaya. Gum Karaya are one of the cheapest and abundant raw materials, produced by the superior plants due to their

protection mechanism. These are complex polysaccharides made up of repeating units of simple sugars which are linked by glycosidic bonds to form large molecules. These polymers can form complexes with various metals, such as calcium, potassium, and magnesium, to form salts and more complex compounds known as

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polyuronides. Gum Karaya are highly soluble in water and they can form three dimensional networks, or gels further are classified as “hydrocolloids”. *Sterculia urens* is a medium to large sized trees which grows widely in deciduous forests with dry rocky hills lands, having tropical climate at elevations between 300-750 meters. The chemical composition of *Sterculia urens* seed has been found with variations from different places, with varied protein levels (11.5-30.8%) and oil content (24-29%). Each season 1-5 kilograms of gum can be obtained from a mature tree. The article discusses the origins, characteristics, effects and its uses in marketed products such as laxative, pharmaceuticals also cosmetics.

HISTORY

The gum karaya is produced from *Sterculia* species which includes *Sterculia urens*, *Sterculia setigera* and *Sterculia villosa*. *Sterculia urens* is the main biological source to produce Gum karaya. *Sterculia urens* belongs to the family of Malvaceae, however earlier it belonged to Sterculiaceae family. The *Sterculia* family is named after genus *Sterculia*. It is an angiosperm. The name has been derived from the Latin word *stercus*, meaning “manure” or “filth”, due to the stench the flowers of some species in the family produce. There are around 50 to 72 genera and between 1,200 to 1,500 plant species found in the family, mostly tropical and subtropical. *Sterculia urens* also known by names such as gulu, kadaya, kullo, India gum, ghost tree etc. It is also known as ‘Indian tragacanth’ and it has immense commercial importance. *Sterculia urens* are found in deciduous forest having crooked, short trunk, and white or greenish grey, smooth bark, which when shines give ghost like appearance. Its height may reach up to 15 meters. Gum karaya has been commercially used for nearly 100 years, as it became popular early in the 20th century because of the cheaper alternative to tragacanth gum.

Traditionally, India has been largest producer and exporter of this gum. The gum is found in countries such as South Africa, Australia, Pakistan, Panama, the Philippines, Indonesia, Senegal, Sudan and Vietnam. In India, there are 12 species of gum karaya trees, four of them found in Andhra Pradesh : *S. foetida*, *S. populiana*, *S. villosa*, and *S. urens*. From these, only *Sterculia urens* is tapped for gum extraction. It is mainly produced in the states of Andhra Pradesh, Maharashtra, Chhattisgarh, Odisha, Rajasthan, Karnataka, Bihar. Gum karaya is commercially harvested in the Dantewada forested region. However, a small quantity is found in the Kanker, Jagdalpur, Bijapur, Sukma, Korea, and Gariyaband regions. During the 2012-2013 period, Chhattisgarh total gum karaya production was about 19.9 tons. In India people living in tribal areas use *Sterculia urens* tree for different purposes which lead to overexploitation. In these areas people harvest maximum quantity of gum in a year, due to unavailability of other sources for livelihood. In the past the *Sterculia urens* tree, which produces gum karaya was abundant in Rajasthan, but it has become increasingly rare (Jain, 2005). India was once the global leader in both the production and export of gum karaya (Davidson, 1980). However, due to overexploitation, illegal harvesting, and limited distribution, this tree has been classified as endangered in the Aravalli hills (Nair, 1995; Nanadagopalan, 2015; Purohit and Dave, 1996; Reddy, 2008). In certain states, including Madhya Pradesh, gum harvesting was banned (Bhattacharya, 2003; Prasad and Bhatnagar, 1991). Scientists are currently researching methods to increase the production of gum karaya by conserving the tree, including developing improved gum tapping techniques and mass propagation methods.

SYNONYMS



There are various terms which are used alternatively for Gum Karaya. It includes the following: Sterculia gum, Indian tragacanth, Gum ladanum, Gum dragon, Gum elect, Gum ghatti, Balata gum, Chinese olive, Indian almond, Indian olive, Java olive, Javanese olive, Kola nut, Pangdahai, Arabic gum, Gellan gum, Kullo, Bassora, Katilo.

DIFFERENT BIOLOGICAL SOURCES OF GUM KARAYA

There are various trees used to produce Gum karaya. Sterculia trees are known for their rich acid polysaccharide properties. They also have high viscosity and gelling properties. These trees belong to the Sterculiaceae family which includes:

Sterculia Urens

Sterculia urens are the trees found in deciduous forest with crooked, short bole. It is peculiar white or greenish grey with a smooth bark, when it shines gives a moon like appearance. Yellowish-white colour, sticky semi solid gum exudes from the tree either due to injury or natural cracks. The bark is thick and powdery. Flowers are polygamous, greenish-yellow and without petals and hairy on both surfaces, flowers are bisexual. Fruits of *Sterculia urens* consist of five sessile, radiating, coriaceous carpels of about 7.5 cm long. In India the production starts in November and continues till June. *Sterculia urens* is most abundantly used in the tribal areas for their livelihood.

Sterculia Villosa

Sterculia Villosa Roxb, considered to be one of the fast-growing plant species which is abundantly available in the North Eastern Region of India. It is about 2.50-2.65 cm thick, medium in size and having a grey bark. A fully grown tree reaches a height of 15 to 18 meters. The average length of wood fibres is around 1.2mm. A high pulp yield of

55% is obtained from *sterculia villosa*. In Indian subcontinent, *sterculia villosa* is used as a traditional medicine for thousands of years to treat diseases such as leucorrhoea, menstrual cramp or pain, male sterility and weakness, rheumatism, urinary problems and kidney stones, cholera, heart diseases, jaundice, asthma. The local name of *sterculia villosa* includes Udhal (Hin); Bili dalay (Kan); Kummari puliki (Tel); Kodalo (Ori).

Sterculia Africana

Sterculia Africana is a solitary deciduous tree up to 8 meters tall, with a rounded trunk and crown-the smooth, fluttering bark of *S. Africana* is grey or pinkish-pink. Reserve leaves are crowded at the tips of ornamental branches 8-15 cm long and 8-15 cm wide. The bark fibre is used for making mats, string and cord, and for tying in house production. The wood is used for poles in house production, as an example for making frameworks of movable houses of pastoralists. The tree produces a gum, that is used as additive to drug treatments, but the quantities are too small for industrial exploitation. The species is sometimes called the "mopopaja tree". In Africa the roots, barks and leaves are boiled and the vapour is inhaled for the treatment of influenza and fever.

Sterculia foetida Linn

Sterculia foetida Linn, commonly known as wild Almond or Java olive, is a visually appealing tree with an umbrella shaped canopy. This species became first described by way of Carolus Linnaeus in 1753. The leaves and seeds of this tree have significant medicinal properties, primarily due to the presence of Sterculia acid (53%), which has demonstrated various pharmacological benefits, including anti-inflammatory, anti-diabetic, and antiobesity effects. The tree produces edible seeds that are high in fat (30-36%) and contain 11.4% protein. Traditionally, the leaves and bark have been utilized for their diaphoretic,



and diuretic properties, and they are also employed in treating conditions such as rheumatism, obesity, gonorrhea, dropsy, and skin diseases.

Sterculia Setigera

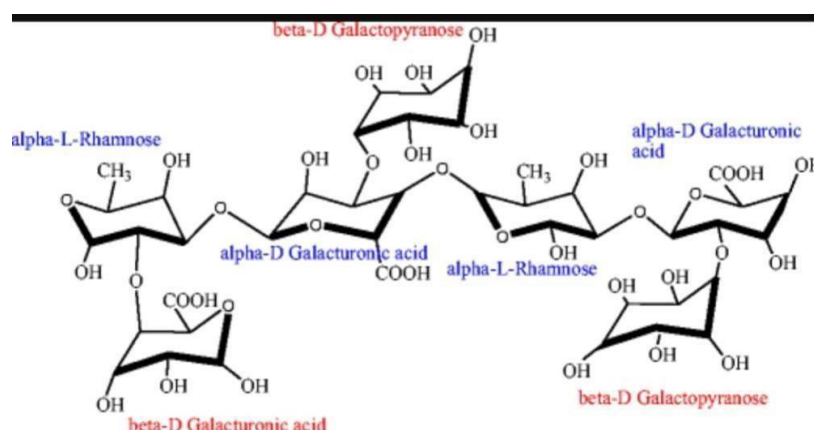
Sterculia setigera is a savanna tree. Its far huge unfold within the savanna place of tropical Africa; regularly function of stony hills. *S. setigera* is found in Senegal, inside the Sudan-Sahel, and within the Sudan-Guinea quarter, in Togo, eastward to Sudan and Somalia, East Africa. It is a deciduous tree, grows up to 12 m high and 15 m in girth. The colour of the bark appears to be pale purplish, with smooth thin scales, which peel off yellowish patches.

Structure of Gum Karaya:

Gum Karaya is also known as *Sterculia* Gum. It is extracted from the exudates of *S. urens* plant. It possesses partially acetylated polysaccharides and its features with three dissimilar chains.

The chain 1 consists 50% of the total gum with four repeating units of galacturonic acid, L-rhamnose at the reducing end as well as Beta-D-galactose. The chain 2 consists of 17% of total gum and it possesses an oligorhamnan structure with D-galacturonic acid and D-galactose. The chain 3 consists of 13% of the total gum and it possesses D-glucuronic acid with galactose, rhamnose and uronic acid.

PHYSICOCHEMICAL PROPERTIES:



Chemical Name of Gum Karaya:

The chemical name of Gum Karaya is *Sterculia* Gum. It is also known as the Indian Tragacanth. Its chemical name comes after it is extracted from

the dried exudates obtained from the trees of *Sterculia* species (by *Sterculia urens*).

Local Names of Gum Karaya

Hindi : Gulu, Kudaya, Karaya, Katilo
Telugu : Tapsi
Marathi : Kandol
Tamil : Kavalam Tam
Kannada : Kurdu
Gujarati : Kogdol

It is called as Indian Tragacanth due to its similarity in appearance and some properties to another natural gum, Tragacanth Gum.

Another name for Gum Karaya is Katira, a common name used in some regions of India.

IUPAC Name:

The IUPAC Name of Gum Karaya is Sterculia Gum.

Solubility of Gum Karaya:

Gum Karaya is considered poorly soluble in water. It does not dissolve in water completely but swells and forms a viscous gel-like mass due to high water absorption capacity. It has great water

absorption capacity but it does not dissolve in water and creates a mass (thick colloidal dispersion). It is also insoluble in other organic solvents like ethanol, acetone and chloroform. One of the major factors that affect the solubility of Gum Karaya is the degree of acetylation in its molecule, like higher levels of acetylation lead to reduced solubility. The solubility of Gum Karaya is found to be 17% in 30°C.

Solvents	Solubility of Gum Karaya
1. Ethanol	Does not dissolve
2. Water	Partially soluble
3. Acetone	Does not dissolve
4. Hydrochloric acid	Soluble in it
5. Methanol	Does not dissolve

Melting Point:

After several experiments, it was found that melting point of Gum Karaya is 237-241°C. It softens and degrades after being exposed to heat. Softening the gum karaya, as the temperature while heating reaches 50°C, gum karaya begins to become soft and more pliable. This is referred to as the “softening point”. Degradation of the gum, as it is further heated, above 120°C. It leads to the breakdown of the gum’s structure degrading it. This alters its physical properties and certain chemical properties.

The molecular weight of Gum Karaya is up to 16 million Daltons or 120.28. The molecular formula constitutes of L-rhamnose, D-galactose and D-galacturonic acid units.

Taste:

Gum Karaya has a slightly acetic acid and type of sour and pungent odour. The powder form of gum karaya is light grey to pinkish grey in colour.

Density:

The bulk density of gum karaya is typically around 0.78g/cm³ with a true density of approx. 1.50g/cm³.

Molecular weight and Molecular Formula:**Summary of Physicochemical Properties:**

Physical Parameters	Results
1. Moisture content (%wb)	17.47
2. Density (g/ml)	0.78



3. True density(g/ml)	1.50
4. Bulkiness	1.26
5. Porosity	46.76
6. Ash content (%)	4.62
7. pH	4.26
8. Refractive Index	1.336
9. Solubility (per 100 ml) Hot water Cold water Ethanol	27.22 9.84 0.00
10. Water holding capacity (per 100 ml)	84.76

MATERIALS AND METHODS:

Materials used: Ethanol, Trichloroacetic acid, Acetone, Sulphuric acid, Phenol, Sodium, Tri Meta Phosphate, Iodine, Potassium Iodide, Picric acid, Chloroform, Ferric Chloride, Sodium Hydroxide, Ninhydrin reagent, Iodine Crystals, Nutrient Agar, Nutrient broth, DPPH reagent, Methanol, Hydrochloric acid, E. coli, S. aureus, Centrifuge, Weighing balance, UV- Vis spectrophotometer and FTIR.

Natural collection process and procurement of *Sterculia urens* gum exudates:

Gum Karaya was obtained from *Sterculia urens* trees found in the highlands of central and northern India. The gum granules were completely dried and powdered using pestle and mortar. The trees chosen should be mature and healthy *Sterculia urens* timber are selected for tapping. Incisions are made in the bark of the *Sterculia urens* tree. The gum exudes from the tree and solidifies into tears. The solidified gum is collected and graded. The gum is then processed and packaged for various uses. Shallow incisions are made on the bark of

the tree with the help of a sharp tool. The intensity and spacing of the incisions are crucial to maximize gum exudation even as minimizing tree cutting and harming. Tapping is typically finished all through the dry season when the sap flow is higher. After the incisions are made, the tree starts exuding a viscous fluid that steadily solidifies upon touch with air, forming gum karaya tears. The solidified gum is cautiously amassed from the tree bark manually, that is regularly done by local villagers or tribal communities. The gum accumulated may additionally comprise of impurities including bark fragments, dirt and other dust can be counted. These impurities are removed by handpicking and sieving. The cleaned gum is then graded based totally on its excellent yield, that is determined by means of elements like shade, size, and purity, better and fine the yield, better the rate for it. The cleaned gum is then dried to reduce or remove its moisture content, and it is performed via drying under the sun or in shade to prevent speed drying that may lead to cracking of the gum. Traditional strategies of drying include-drying gum on the mats or racks inside the solar equipment's or modern techniques may involve



mechanical dryers to dry the product. The dried gum is often in the granular form that gets crushed to form powder of it. This makes it simpler to handle, ship and use the gum in diverse formulations and industries. First the Gum Karaya granules were crushed into a powder by using pestle and mortar, then the powder was soaked in 100% ethanol overnight and dried using the hot air oven at 55-60°C to obtain a defatted gum. 6 gm of the defatted gum powder was dissolved in 300 ml of water and stirred continuously for 2 hours using the magnetic stirrer, later the viscous solution was filtered by passing it through a cotton gauze to remove all the mucilage. A novel approach was used to synthesize gum karaya –Copper, Nickel 0 nanoparticles-based bio nanocomposite by microwave irradiation method. The particle size of the powder may be adjusted depending on the requirements of the end-use enterprise. Sustainable harvesting practices are crucial to make certain that gum karaya production is viable for long-term. This includes right tree care, managed tapping and avoiding or averting immoderate harvesting. Honest exchange practices are increasingly more essential to make sure that gum karaya manufacturers and acquires a truthful price for their product and that their livelihoods are protected. This special method highlights the traditional and herbal strategies worried in obtaining the gum karaya from the *Sterculia urens* tree.

Functions and Uses:

Food Industry

Thickener and Stabilizer: Gum Karaya is used to increase the viscosity of various food products, such as sauces, dressings, and dairy products. It helps to stabilize emulsions, preventing separation of ingredients. (Typical concentration: 0.1- 0.5%). It is used as an additive in candies and chewing gums. (Typical concentration: 0.1- 0.5%). As a

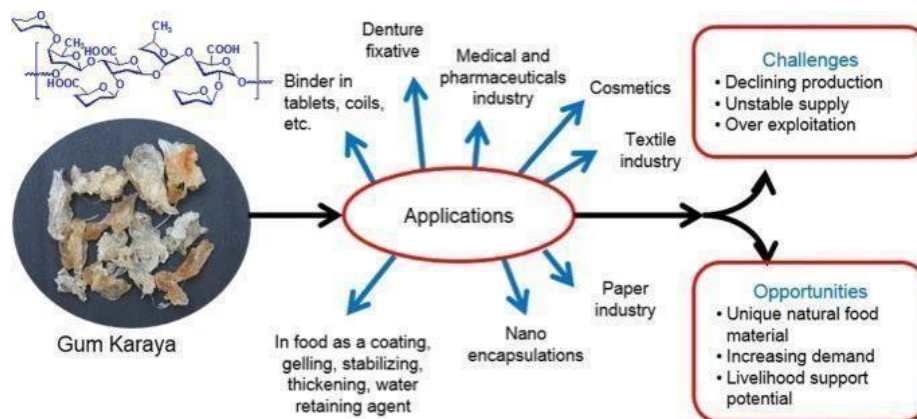
binder as it acts as a binding agent in processed meats, baked goods, and confectionery. (Typical concentration: 0.5 – 2%). It stabilizes ice-cream and prevents ice crystals from growing too large. It acts as a fat replacer in low – fat foods, gum karaya can mimic the texture and mouthfeel of fat. (Typical concentration: 0.1 – 0.3%). Weight loss diets contain gum karaya that provides satiety. At low pH it is stable that make it an ingredient in salad dressing

Pharmaceutical Industry

Laxative: Gum Karaya is a bulk forming laxative that relieves constipation by absorbing water in the intestines and forming stool bulk. As it meets water within the intestines, it absorbs water and swells, increasing the majority of stool and stimulating bowel movements. This makes it useful for treating constipation (Typical concentration: As per medical advice). It is used as a tablet binder it is used in the formulation of tablets to bind the active ingredients together. (Typical concentration: 1 -5%). In sustained release tablets or doses, gum karaya can be used to create sustained- release formulations of drugs. (Typical concentration: varies depending on the drug and desired release profile). For dental procedures, it has been used as an adhesive for dental fixtures and ostomy equipment, and a base for salicylic acid patches. It has soothing properties that makes it a valuable ingredient in the production of lozenges used to relieve sore throat problems. For protection, a protective coating of gum karaya is applied to dentures has been shown to reduce bacterial adhesion by 98%. As an aphrodisiac, there are certain properties of Gum karaya that indicate it as an aphrodisiac but still strong evidences supporting this are not found. Extracts and barks of *Sterculia* species are currently being investigated for more hypocholesterolaemia and anti- inflammatory properties. **Cosmetic Industry-** As a thickener, it

is used in creams, lotions, and gels to provide viscosity and stability. (Typical concentration 0.1-0.5%). As an emulsifier it helps to mix oil and water in cosmetic formulations. (Typical concentration: 0.5- 1%). It is used as an adhesive in hair sprays. It is in all these cosmetic formulations to provide an easy, creamy texture.

Other industries - It is used in textile printing as a thickening agent for dyes in textile printing. It shows



PRECAUTIONS WHILE HANDLING GUM KARAYA:

Respiratory safety: N95 masks or better rated disposable masks should be worn to provide basic protection towards airborne particles. For better and higher stages of safety, specifically at some stage in extended public or in areas with high- dirt concentrations, use powdered air- purifying respirators (PAPRs) or provided air respirators. Normal match tests are conducted to ensure right fit of respiration protection is there in industries and maximise its effectiveness in the industries.

Pores and skin protection: Chemical – resistant gloves should be worn to prevent chemicals like nitrile or butyl or other harmful chemical to penetrate your skin pores. Long- sleeved shirts and long pants to be worn to provide a barrier against skin contact. Hands and arms should be thoroughly washed with cleaning soap and water after handling gum karaya and before eating or

Antiviral activity in the microbiology field in in-vitro study, all microbial stains tested (*Candida albicans*, *Staphylococcus aureus*) are completely or substantially inhibited by *S. urens* at a concentration of 1% and weakly inhibited at 0.5%. Anti-inflammatory activity is shown by the extracts of *S. urens* bark as they are effective in reducing ear and paw edema and writhing in mice.

ingesting something. put on safety glasses to protect eyes from dust particles.

Hygiene practices: Designate special areas for handling the gum to limit contamination of other work regions. Drinking, eating or other activities should be strictly prohibited and avoided in these areas. Install exhaust air flow equipment to capture and cast-off airborne debris. Consider using moist practices to suppress movement of dust in the air.

Emergency services: Eyewash stations should be there in case of unintentional sprinkling of the gum in the eyes. Emergency showers for fast decontamination in case of skin contact.

Clinical surveillance: Regular check-ups of the personnel who works daily with the gum to monitor health problems if any. A session with professionals should be conducted to assess administer centre hazards and expand suitable measures. Workers should be educated and training should be given to them on handling procedures, protective device uses and emergency reaction protocols.

STORAGE CONDITIONS:

The floor gum karaya powder is generally packaged in luggage or drums for storage and transportation. To properly store gum karaya, keep it in a cool, dry place in airtight containers, preferably in a sealed polyethylene lined container, as exposure to moisture and high temperatures can cause it to agglomerate and lose its viscosity. For extended storage, consider cold storage to minimize quality degradation, especially for powdered Gum karaya. Store Gum karaya in a cool environment, ideally at lower temperature to prevent deacetylation which impacts its functionality. Keep in airtight containers to avoid moisture exposure, which can lead to clumping. Powdered gum karaya tends to lose viscosity faster than granules, so extra care should be taken when storing it.

Proper and absolute labels should be there on the boxes with their contents, handling information and any other applicable information for the patient's safety. Appropriate, safe containers and transportation techniques should be carried out to prevent spillage and dirt release during transport.

ADVERSE EFFECTS

There are limited adverse effects of gum karaya but long-term use with inadequate fluid leads to various discomfort.

Diarrhoea – Gum karaya particles absorb water and swell up 60 to 100 times than their original volume. This makes it a bulk laxative. Excessive doses as a laxative can lead to diarrhoea.

Intestinal obstruction - If inadequate water is consumed, gum karaya can swell in the intestines and cause an intestinal obstruction. This leads to a serious condition which may need medical attention.

Oesophageal obstruction – Dry gum karaya in the powder form can cause obstruction in the

oesophagus if adequate amount of fluid is not taken.

Some of the adverse effects can also be due to:

Allergic conditions – Due to some other plant gums, individuals suffering from allergic conditions are also susceptible to allergic responses to gum karaya.

Interaction of medicines – Gum karaya should always be taken at least one hour before or after taking other medications. Because it interacts with the constituents of some drugs.

Pregnancy and Lactation – Gum karaya should be avoided during pregnancy or lactation period.

Evaluation of Gum Karaya:

Gum karaya has been evaluated on various parameters after its production for its safe pharmaceutical use.

pH stability: pH has an important role in karaya gum dispersion stability. These preparations are relatively stable at acid pH values. 1% dispersion is stable at pH range of 4.5-4.7. Viscosity is diminished when an acid or an alkali is added to the dispersion and it can be raised if gum is totally hydrated before making any pH adjustments. At pH values above 8, karaya gum can suffer irreversible conversions, dispersion characteristics are damaged because the gum loses its acetyl groups. Due to its high concentration of uronic acid, karaya gum dispersion are resistant to acidic conditions and it can resist hydrolytic activity of a concentration of 10% of hydrochloric acid.

Heat stability: Dispersion of karaya gum is thermolabile. During heating, polymer conformation changes, resulting in an increased solubility and a permanently decreased viscosity. In cold water, dispersions can be concentrated as 5% while in hot water and low-pressure concentrations about 18 and 20% can be reached.

Behaviour in water: Gum karaya has a strong capacity to fix with water molecules, gum particles are not fully solubilised, instead it presents a phenomenon called swelling that consists of an



increment in total volume with relation to dry mass that can be about 60 times the original volume.

Moisture and Ash content: The moisture content of gum karaya can affect its viscosity, stability, dispersion, and microbial growth. More moisture content makes it more vulnerable to microbial attack and more moisture content also does not

allow it to develop properly and the adequate therapeutic properties are not shown or executed by it. Ash content is the measure of the inorganic nutrients in the gum. High ash content can affect the gum's physicochemical properties.

MARKETED PRODUCTS

Brand Name	Company name	Dose	Price
Neelkanth's Food Grade Karaya Gum Powder	Neelkanth Finchem LLP	Dose as per advised by the doctor	Rs. 220/ kilogram
Otto Kemi Gum Karaya powder	Otto Chemie Pvt Ltd	As per advised by the doctor	Rs. 2790/500 gm
Attar Ayurveda Gond Katira Pure	Attar Ayurveda	Required amount	Rs. 205/200 gm
Evacuol	Franco Indian Research Pvt Ltd	For adults: one- or twolevel measurements after meal For children: half of the adult dosage as prescribed by physician	Rs. 162/75 gm
Kaya boost Gond Katira	Tekzon Industries	Required amount	Rs. 250/150 gm



MARKET TRENDS

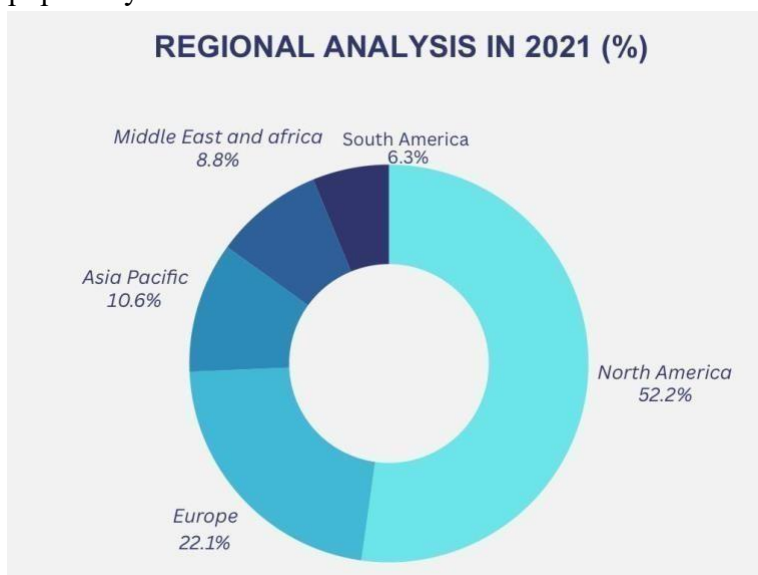
Gum karaya is a sap-like substance derived from the Sterculia genus. The sugars galactose, rhamnose, and galacturonic acid make up this acid polysaccharide. In food, laxatives, denature

adhesives, and cosmetics, gum karaya is used as a thickening and emulsifier. It continues its consistency even in low pH environments and is incredibly crucial factor of beverages. In water and different beverages, it has lower viscosity and does not modify the feel or flavour of the unique



beverage. India is the goal region for gum karaya in the international market due to the easy availability of resources and the ever-growing call for prescribed drugs, foods, and drinks inside the international industry. During the forecast duration, the worldwide karaya gum marketplace would become greater due to the demand for natural gums in the food and beverage industry. The growing use of gum karaya as an emulsifier in an expansion of product programs is expected to enhance the products popularity within the meals

and beverage industry. It is expected to be a promising candidate and postponing agent for the advent of recent drug transport methods and items on the biotechnological technology. In the future years, the gum karaya market is probably to see a sensitivity to food additives. Because of its specific adhesive characteristics, the private care merchandise enterprise will further help the growth of the gum karaya market with accelerated intake of the product.



CONCLUSION

Gum karaya is a natural plant with the ability to act as a thickener, binder, stabilizer, making it suitable for various drug delivery systems. Because of which it has various applications in pharmaceutical industries. It is used as an excipient in many products. It is considered to be safe and versatile excipient. It is used in tablets, capsules, gels. In conclusion, the quality and applicability of well characterized materials are directly related to their physical and chemical properties and its handling and the effects it has. The results of this study support the gum suitability for industrial application, especially in areas where commercial Karaya gum is traditionally used. The results to conclude from the physicochemical properties profile and applications in the industry

indicate the fundamental characteristics and the future prospects of Gum Karaya. The present article, investigations and evidences provide a primary platform to indicate the suitability of Gum Karaya as one of the best binding agents.

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