

The Ignored Green Gold Called As Betel Leaf

^{1*} Harikumar Pallathadka, ²Manoharmayum DD

^{1*,2} Manipur International University, Imphal, Manipur, India

Email: ^{1*}harikumar@miu.edu.in, ²dolpriya@miu.edu.in

ABSTRACT

This study discusses betel leaf export and import, nutraceutical characteristics, development, and usage (waste minimization) in many businesses, particularly the food industry. Piper betel L. is the scientific name for the betel plant, which is also known as paan in India. Bangla & Satchi, Mitha, and other species are cultivated in West Bengal. In India, traditional methods are used to cultivate betel leaves on 50,000 acres, with an annual production worth Rs. 9000 million. Betel leaves are nutrient-dense, with a high concentration of vitamins and minerals. Diastase and catalase are among the enzymes found in the leaves. It has a substantial amount of all of the essential amino acids. Numerous antioxidants, flavonoids, tannins, alkaloids, saponins, and other compounds can be found in these leaves. Color or betel oil extraction has been shown to be extremely advantageous to one's health. It can even be considered a nutraceutical. Betel leaves as a whole are an excellent food item; however, betel bioactive has the potential to expand its application in a variety of meals because to its numerous health advantages. Betel leaves worth millions of rupees are either sold for a low price or go unused. Betel leaves have been used in a variety of culinary products due to their health benefits, and the goods are chemically stable and taste good. As a result, a well-coordinated effort by farmers, dealers, scientists, innovators, bureaucrats, and policymakers is needed to strengthen the national economy and create jobs by properly exploiting this green gold.

Keywords: betel leaf, production, utilization, market size, storage, green gold

1. INTRODUCTION

The scientific name of the betel plant is Piper betel L., popularly known as paan in India, has a place with the family Piperaceae; for example, the Black Pepper family comprises over 2000 species. Betel leaf is often referred to as 'Green Gold.' It is an ancient asset of Indian medicine (Ayurveda), and its use in India dates back to 400 BC. There are about 100 varieties of this evergreen, perennial creeper globally, of which nearly 40 are found in India[1]. The species which are cultivated in West Bengal are Bangla and Satchi, Mitha. These deep green heart-shaped leaves are native to Malaysia and cultivated in India, Sri Lanka, Bangladesh, Burma, and Nepal [2]. It is referred to by different names such as Nagaballi, Nagurvel, Patra, Saptaseera, Sompatra, Tamalapaku, Tambul, Tambuli, Vaksha Vettilai, Voojungalata, etc. in many parts of India. Appealingly, the annual yield of a good crop is about 60-70 leaves/ plant and 6-7million leaves/ ha. Consumed by 15- 20 million in the country, Betel leaves are cultivated on 50,000 ha with an annual production worth Rs. 9000 million in India [3] using traditional methods. West Bengal contributes to about 66% of such production on average. In West Bengal, Betel leaves are cultivated on about 20,000 ha of land encircling about 4-5 lakh Boroj utilizing the same number of agricultural families.[4]

Following the report by IIT Kharagpur, 30% contribution to the total production of West Bengal is made from the Midnapore District of the state. From ancient times, Betel leaves are renowned for acting as stimulus- carminative and astringent. These leaves are a rich wellspring of numerous antioxidants viz. flavonoids, terpenoids, tannins, alkaloids, saponins, and so forth. They are generally known to be helpful for the treatment of different ailments like abscesses and boils, bad breath, conjunctivitis, hysteria, itches, leucorrhoea, mastitis, mastoiditis, migraine, obstruction, otorrhoea, ringworm, and so forth [5]. Pharmacological impacts of betel chewing incorporate the bountiful flow of spit, impermanent dulled of taste discernment, incitement of muscular and mental efficiency. Further, the essential oil contained in the betel leaves possesses antibacterial, anti-protozoan, antiviral, and antifungal properties. Along with these, the oil kills or inhibits the development of horrendous microorganisms causing typhoid, cholera, tuberculosis, and so on that need legitimate assessment and exploitation. The chewing of betel leaves produces a feeling of prosperity, expanded vigilance, perspiring, salivation, hot sensation, and energetic feeling with exaltation. Further, the leaves are exceptionally nutritive and contain a considerable measure of nutrients and minerals (Table 1). So, six leaves with a bit of slaked lime are said to be comparable to around 300 ml of dairy animals milk, especially for nutrient and mineral nutrition. Aside from arginine, lysine, and histidine which are found only in traces, the leaves contain a considerable measure of all the essential amino acids along with the enzymes diastase and catalase [6]. This paper sheds light on export & import, nutraceuticals, properties of betel leaves, the present and future trends in food applications, and says that the development and utilization of betel leaves should be expanded to fix the sickness.

Chemical Composition:

Flautist betel leaf has been depicted to have piperonal-A, piperonal-B, methyl flute player betol, and they likewise have been isolated. Flautist betel leaves have a fundamental oil making out of terpinene-4-ol, safrole, allyl pyrocatechol monoacetate, eugenol acetic acid derivation, eugenol, hydroxyl chavicol, flautist betol, and the betel oil contains cadinene carvacrol, allyl catechol, chavicol, p-cymene, chavibetol, caryophyllene, cineole which is more, estragole as the significant segments.

Phytochemicals:

Flute player betel contains a wide assortment of organically dynamic mixes whose focus relies upon the assortment of the plant, season, and atmosphere. Substance synthesis of essential oil comprises safrole present in the leaf, tail, stem, root also, β -phellandrene present in the natural product. The presence of hydroxychavicol acetic acid derivation, allylpyrocatechol piper betel, isoeugenol, stearic corrosive, methyl eugenol, carvacrol, anethole, alkaloids, saponin, tannin, steroids, polyphenol, and different mixes are additionally found in Piper betel. The smell of betel leaf is because of essential oils, comprising phenols and terpenes¹². The dynamic element of flute player betel oil, which is gotten from the leaves, is essential for allyl benzene mixes, chavibetol, chavicol, estragole, eugenol methyl eugenol, and hydroxyl catechol.

PRODUCTION

Somewhere in the range of 40 of the 100-odd varieties of betel leaf found globally are developed in India. Over 25,000 million leaves are produced each year on 40,000 ha of farms across the country, except a couple of northern and northeastern states. The initial speculation of betel leaf cultivation, including developing an artificial rectangular structure (Bereja), might associate with Rs. 1-2 Lakhs/ha at the minimum during the principal year may come down to about Rs. 0.5-0.6 Lakhs/ha in the ensuing years and the minimum net benefit of

rupees of 0.5-1.0 Lakhs/ha/year or more up to Rs. 5 Lakhs/ha/year is not an unexpected incentive from a well-established betel leaves plantation. These figures may differ because of a few variables like the location of the farm, agro-climatic condition, variety of betel leaves, current demand and supply, kind of season, variety in the cost of the leaves in the market, inflation, and so forth. Such alternations in the betel leaves costs in the market may dishearten farmers from going for betel leaf farming. This can be survived and safeguarded effectively by developing a very much controlled market framework pertinent to the yield. Paan products have a penetration of more than 16.8% in India, almost equally distributed in rural and urban areas.

CLIMATIC REQUIREMENTS

Heat and humidity, high precipitation, and an obscure spot are best for the fiery development of the betel vine. Although betel is a sun-loving plant it, however, delivers better quality leaves in the wet zone and the intermediate zones instead of in the arid zones. Significant shade levels and irrigation systems are fundamental for the effective development of the yield. Hot, dry winds are harmful and hinder the development of plants.

Planting Season:

Planting season in various Betel Leaves developing states are as per the following.

SEASON OF PLANTATION IN DIFFERENT STATES

1. Assam: April to May and August to September.
2. Andhra Pradesh: September to October.
3. Bihar: May to July and September.
4. Karnataka: July to August.
5. Maharashtra: July to August and October to November.
6. Madhya Pradesh: January to March and September to November.
7. Odisha: May to June and September to November.
8. West Bengal: June to July and September to October.

Soil Requirements:

Soil containing a good amount of organic matter (for example, C/N ratio) and sewage framework is most appropriate for betel plant development. Betel vine, in any case, can be cultivated on various kinds of soils, for example, heavy clayey topsoil and sandy, loamy soils.

Soil Preparation:

The soil ought to be arranged well by 4–5 ploughings, and land ought to be raised by 5–10cm from the adjacent territories, giving an appropriate angle on the two sides for quick drainage. Afterwards, field beds of appropriate size (15cm high and 30cm expansive) are arranged. Before planting the cuttings, the soil ought to be disinfected thoroughly.

Soil Sterilization:

During the blistering summer months (March-May), when the soil temperature rises adequately, the soil is covered utilizing a polyethene sheet to destroy the inoculum of soil-borne microbes. For new estates, utilization of Carbofuran 3G @ 1.5 kg/ha or neem cake (0.5 tons/ha) and Carbofuran (0.75kg/ha) is likewise prescribed to limit the initial soil nematode population. However, Carbofuran ought not to be recommended in established gardens at any stage on the grounds. A safe waiting period of 65–70 days is required for the application and harvesting of leaves.

Propagation:

Stem cuttings having 3-5 nodes are utilized for propagation, and these are planted so that 2-3 nodes are buried under the soil. A solitary node cutting with a mother leaf is likewise planted. Cuttings of the apical and centre parts of the plant are utilized for planting. The betel plant is to be planted 4-5 months earlier. The seed rate per hectare of land ought to be 1,20,000 – 1,60,000.[7]

WASTAGE SCENARIO OF BETEL LEAVES:

The betel vine is cultivated generally in South and Southeast Asia, from Pakistan [8] to Papua New Guinea.[9][10] It needs a viable tree or a long pole for support. Well-drained fertile soil is a necessity for its growth. Waterlogged, saline and alkaline soils are unacceptable for their cultivation [11]. Being extremely perishable, betel leaves produce a significant amount of wastage if they are not stored appropriately due to dehydration, fungal infection, and de-chlorophyllin. A post-harvest loss which ranges between 35% to 70%, is caused during transport and storage [12]. Sukanta K. Sen et al. [13] studied the anti-microbial activity of betel leaf agro-waste.

Minimization of Waste:

In his paper, Guha [14] has brought to the front that endeavours have been made to limit the wastage of leaves by chemical treatments, manipulating storage temperature, adopting better packaging materials and strategies [15]. Guha has additionally brought up that such wastage may likewise be limited by extracting essential oil from unsold, loaded-up leaves. He found that Mitha, Bangla, and Sanchi varieties of leaves contained 2.0%, 1.7% and 0.8% essential oil, of which the prime ingredient was eugenol (which is a colourless or pale yellow liquid compound present in the oil of cloves and other essential oils and used in perfumery) which framed 29% of essential oil [16]. Likewise, when the leaves are utilized, their petioles are eliminated, and they are transferred to waste hectare with an annual production of worth around Rs. 9000 million in India. (Mazumder et al., Fresh dark green leaves of betel vine (*Piper betel* L.), popularly known as Paan in India, are utilized for chewing alongside numerous different types of ingredients, principally for mouth refreshing, gastrointestinal, and stimulating impacts. India is the largest producer of betel leaf globally, delivering a harvest of about Rs. 9,000 million consistently on around 700,000 "Borozes" (little huts wherein plants are filled in rural territories).

More than 10 % of the production of betel leaves are found to be in excess and are exposed to wastage every year, especially during the monsoon season. This demands the advancement of a suitable rural innovation in technology for limiting wastage.

Taking into account of the above discussion, endeavors were made for the extraction of the essential oil from five significant varieties of betel leaves with the aid of a Betel leaf oil extractor. The outcomes demonstrate that the average oil content in the Bangla varieties was 1.7 %, and in the Mitha varieties, it was 2.0 %, though, in the Sanchi varieties, it was just 0.8 % on a dry weight basis. This oil, which is a significant ingredient for imparting specific fragrance and medicinal properties to the betel leaves, can be stored for over three years. The oil has a multidimensional expected use in the cottage industry for manufacturing various commercial items like medication, Gutkha (chewable mouth purifier), incense sticks, fragrant and seasoning agent, etc. Establishment of the rural industry to extract essential oil from betel leaves at an exceptionally sensible initial investment of Rs. 10,000-20,000/- alongside the reasonable "Borozes" is imagined to limit the wastage of surplus betel leaves and expand the

agricultural and industrial employment opportunities in India's betel leaf developing zones and different nations.[17]

BETEL LEAVES EXPORT FROM INDIA:

In 2019-20 India exported 10,386.52 MT of Betel Leaves to the world for the value of Rs.37.60 crores/ 5.22 USD Millions. In October 2019, the total export value of Betel Leaves was 0.46 USD Million. Bangladesh(0.29 USD Million), Sri Lanka(0.08 USD Million), Australia(0.04 USD Million), Malaysia(0.03 USD Million), Canada(0.01 USD Million), Saudi Arabia(0.01 USD Million) are the major countries where Betel Leaves is exported from India in October 2019. In 2018 Betel Leaves information was accounted for at 277.392 INR mn. This records a diminishing from the past number of 451.357 INR mn for 2017. The betel leaves information is refreshed yearly, averaging 83.772 INR mn from March 2004 to 2018. The information reached a new high of 470.348 INR mn in 2016 and a record low of 30.635 INR mn in 2006. While computing the percent distinction for betel leaves from India over 10 years, there is an expansion of 341.45% from 2009 to 2018. The fare esteem reflects 7.53% from 2014 to 2018, and from 2017 to 2018, the estimation of Indian Betel Leaves sends out went 56.41% more noteworthy.

Over 1.5 million farmers involved in the betel leaves the business in Bengal. More than one lakh families are assessed to be engaged with betel leaf development in Purba Medinipur. In South 24 Parganas, almost 40,000 families are included. This cultivating is additionally stylish, to a shifting degree, in the Paschim Medinipur, Hooghly, Nadia, Bankura, Jalpaiguri, Cooch Behar, Murshidabad, and Uttar Dinajpur locale of the state. As indicated by PBRPS secretary Pal, more than four lakh individuals are legitimately or implied subject to this movement in West Bengal. The famous assortments are Mitha, Bangla, Sanchi, Kali Bangla, and Simurali Bangla. In 2018-19, sends out remained at 13,195.43 tons esteemed at Rs 46.75crore. According to the official information, betel leaves trades multiplied in a long time from about 3.4 million dollars in 2011-12 to nearly 46.8 million dollars in 2015-16. The fare objections additionally expanded from 22 nations to 36 nations during the period. PETRAPOLE ROAD, KOLKATA AIR CARGO, BOMBAY AIR CARGO are the essential ports in India from where Betel Leaves is being sent out.[18]

Betel Leaves Import To India:

India has imported Betel Leaves items worth 0.72 USD Million in the most recent 10 years. In this span, 2015 was the year when India imported Betel Leaves items with 0.72 USD Million import esteem; the most minimal incentive for Betel Leaves import to India was recorded at 0.0 USD Million in 2009.

In the most recent year, 2018, the total import of Betel Leaves in India was USD Million, and Thailand (0.0 USD Million) were the primary sending out countries for Betel Leaves to India. While figuring the percent change for Betel Leaves import in India, there is an expansion of 341.45% from 2009 to 2018 over 10 years. Further, the import an incentive for Betel Leaves mirrors a 7.53% in the course of the most recent long term time frame, from 2014 to 2018, when the Indian imports of Betel Leaves were worth 6.24 USD Million. Additionally, the estimation of Betel Leaves import to Indian went 56.41% more prominent for the most the recent year 2017 - 2018.

*COMMON INFESTATION OF BETEL LEAVES:**Sclerotium footrot and wither*

Common organism: *Sclerotium rolfsii*

Side Effects:

All phases of the plant are vulnerable to illness. The disease begins at the collar area related to whitish cottony mycelium on the stem and roots. The stem partition shows spoiling tissues for the purpose of assault, and the plants show dropping of leaves and kick the bucket.

Treatment:

1. Removal and devastation of the influenced plants alongside the roots and ought to be scorched.
2. Apply mustard cake or farmstead compost to the soil.
3. Drench the dirt with Carbendazim.0.1%

Footrot or Leaf rot or shrink

Common Organism: *Phytophthora parasitica* var. *piperina*

Side effects

Plants are tainted at all the phases of yield development. At first, side effects are related to abrupt shrivelling. Yellowing and hanging of the leaves from the tip downwards are seen on the influenced plants. The leaves become dull because of a loss of radiance. The influenced plants evaporate within 2 or 3 days. Stems become earthy coloured, fragile, and dry as a stick. The lower segment of the stem close to the dirt level presents unpredictable dark injuries. Later sick internodes become delicate and go through „wet rot“, a foul emanating fishy scent. The underlying foundations of the tainted plants additionally show decaying. In the youthful yield, the parasite produces “Leaf rot” manifestations. The leaves inside the 2-3 feet tallness of the plant show the leaf decay manifestation.

Treatment

1. Soak the seed plants in Streptocycline* 500 mg/L + Bordeaux mixture *0.05% answer for 30 minutes.
2. Collect and demolish the tainted plants and leaves.
3. Regulate the water system during the cold climate time frame.
4. Drench the dirt with 0.5 percent Bordeaux blend at 500 ml/slope during the cool climate period (October-January) at month-to-month stretches.

Bacterial leaf spot or stem decay

Common organism: *Xanthomonas campestris* pv. *betlicola*

Side effects:

The illness starts as minuscule, earthy-coloured water splashed spots on the leaves encompassed by a yellow corona, which grow later and get necrotic and rakish, generally bound to interveinal regions. Under ideal conditions, contamination spreads to the stem causing the darkening of hubs and multi-purpose locale eventually prompts the shrinking and drying of plants. Finally, the tainted leaves lose their gloss, turn yellow, show shrivelling and tumble off.

Treatment:

1. Remove and consume the contaminated plants and stubbles in the field.
2. Regulate the water system during the chilly climate season.
3. Spray Streptocycline* 400g/L +Bordeaux mixture* 0.25 % at 20 days stretches, subsequent to culling the leaves.

Anthraco nose

Common organism: *Colletotrichum piperis*

Side effects:

Leaves show little round dark spots at first, which later create, amplify with concentric nature, and are covered with a yellow radiance to a size of 2 cm. Finally, the influenced leaves turn light yellow and evaporate with enormous dark dabs in the focal point of the spots. Comparative spots were seen on the stem partition, and as the illness progress, prompts supporting o stem at long last bringing about shrivelling and drying of the whole plant.

Treatment:

1. Collect and decimate the tainted plants and leaves.
2. Spray Ziram* 0.2 % or Bordeaux mixture* 0.5% after culling the leaves.

Powdery mildew

Common organism: *Oidium piperis*

Side effect:

The illness influences the yield at all phases of its development, and disease is chiefly noted on delicate shoots and leaves. First, fine whitish development is seen on both the outside of leaves, which later amplifies and covers the significant part of the leaves at long last winds up in defoliation.

Treatment:

1. Collect and consume the contaminated leaves.
2. Spray 0.2 percent Wettable Sulfur or residue Sulfur at 25 kg/ha after culling the leaves.

Insect Pests

Scale bug (*Lepidosaphes cornutus*)

Recognizing characters - Sometimes achieves pest status in betel plant. They are generally seen on the base part of stems/leaves. The scale bugs are either light earthy coloured or dim earthy coloured in shading.

Side effect- Both the sprites (crawlers) and grown-ups suck the sap, and the invaded leaves lose their shading, power and display a waxy appearance. If there should be an occurrence of extreme harm, the tainted leaves become crease and evaporate at last and influenced leaves to lose their reasonable worth.

Treatment–

1. Spraying of NSKE 5% at the swarmed divide is gainful. However, before splashing, developed/attractive leaves ought to be gathered.

Mealybugs (Ferrisia virgata)

Recognizing characters – Immature stages or crawlers are yellowish to pale white in shading, while grown-up females are apterous, long, slim covered with white waxy emission.

Side effects: Presence of white, cottony coarse bugs on the leaves and twigs. They suck the sap from the leaves and developing pints coming about devitalization of the leaves and hindered the development of the plants.

Treatment:

1. Collection and devastation of the harmed plant parts.

2. Conservation of the hunters viz., *Chrysoperla zastrowi sillemi*, *Coccinella septempunctata*, *Menochilus sexmaculatus*, *Cryptolaemus montrouzieri*.

3. Spray Fish oil pitch cleanser (FORS) @ 25g/lit or neem oil 0.5% alongside teepol 1 ml/lit of water. Before showering, developed/attractive leaves ought to be collected. [19]

BETEL LEAF NOURISHMENT REALITIES AND HEALTH BENEFITS:

Betel leaf is stacked with supplements and is excellent. It contains reasonable measures of fundamental supplements. Let look at sustenance realities of betel leaf per 100 grams; there is 1.3 micrograms of iodine, 1.1-4.6 micrograms of potassium, 1.9-2.9 micrograms of nutrient A, 13-0 micrograms of nutrient B-1, 1.9-30 micrograms of nutrient B-2, and 0.63-0.89 micrograms of nicotinic corrosive. These supplements present in betel leaves are helpful for health.

Wellspring of Beneficial Nutrients:

Giving tannins, chavicol, phenyl, propane, sesquiterpene, cineole, alkaloid, and sugar makes betel leaf an extraordinary possibility of treating medical conditions. Additionally, it assists with advancing the body, working just as keeping up the general well-being with incredible supplements contained.

Assists With Cough:

Betel leaves are known to help with hack and forestall mucus arrangement. Aggravation because of the consistent hacking will go down too once you begin taking them.

Betel Leaf lessens cholesterol level:

Having elevated cholesterol in your blood can build the odds of getting a stroke. Betel leaves have eugenol in them because of which they help in bringing down your cholesterol levels.

Betel leaf benefits malignancy (cancer) patients:

Although betel nuts can expand the danger of tobacco, betel leaves have hostile to malignant growth mixes in them. In addition, betel leaves have phenolic mixes that contain a scope of properties, for example, against bacterial, hostile to mutagenic, cell reinforcement, and against proliferative.

Facilitates Constipation:

Betel leaves are a force to be reckoned with of cell reinforcements that apparent extremists from the body. It re-establishes ordinary PH levels in the body and helps a furious stomach.

Improves Digestion:

Betel leaves increment digestion setting off the flow and invigorating the digestion tracts to retain crucial nutrients and supplements.

Decreases respiratory issues:

Betel leaf generally helps in treating issues identified with hack and cold. In addition, it is a brilliant remedy for those experiencing chest, lung clog, and asthma.

Disinfectant and against parasitic properties:

Betel leaves have remarkable germicide properties as they are rich in polyphenols, particularly chavicol offering double insurance from germs. It is likewise utilized widely in treating joint pain and orchitis.

Keeps up Oral Health:

Betel leaves are offered with various antimicrobial specialists that adequately battle a large group of microscopic organisms abiding in the mouth, which trigger an unmistakably awful stench, just as issues of holes, plaque, and tooth rot.

Treats Water Retention And Urination:

Betel leaf is an extraordinary diuretic.

SIDE EFFECTS OF BETEL LEAF:

Even though betel leaf is useful for wellbeing, it accompanies its rundown of results as well. So here are some betel leaf impacts you should think about:

1. May cause oral malignant growth when overeaten, so truly, betel leaf disease is a genuine article.
2. May prompt unfavourably susceptible responses.
3. Betel leaf is likewise known to be decently addictive for biting on.
4. Another sweet betel result is that it might aggravate your gums and solidify up your jaw when you bite excessively.[20]

1. *THE PERIOD OF USABILITY OF BETEL LEAF BY VARIOUS DRYING TECHNIQUES:*

The period of usability of the betel leaves is 3-5 days in summer and 5- 7 days in winter after gathering time. It has a place with transient items around 35-70% of post gather misfortunes assessed absolutely of gross creation consistently [21]. Betel leaf was dried under the sun (28-38 °C), conceal (25-32 °C), and sun oriented (40 to 47 °C) and According to [22], there were apparent misfortunes of unstable oil 30-35% during sun drying than a new one. [23] found during mechanical and microwave drying, the deficiency of unpredictable oil and chlorophyll was roughly half and 70% individually.[24]streamlined the temperature (30, 40, 70 °C) and vacuum pressure (1.0, 0.5 atm.) and advanced 50 °C best state of drying regardless of vacuum pressure. [25] examined the changed climate bundling for betel leaves. It was compelling to keep up the chlorophyll content, phenolic content, and β carotene content in polypropylene film bundling with fractional weights of 2.5 kPa for O₂ and 6.2 kPa for CO₂.

2. *APPLICATIONS OF BETEL LEAVES IN VARIOUS FOOD PRODUCTS:*

The worldwide functional food and beverages market esteem was 129.39 billion US Dollar in 2015 and is developing at a rate of about 8.6% every year. Different specialists have explored the food applications of betel because of the established impact of their antimicrobial, antioxidant, colour, flavour, and dietary perspective.

Whey based mango beverages:

Beverages are prevalent globally, and people from all age groups regularly drink hot or cold beverages. Whey beverages which are also having good nutritional value are obtained from paneer or cheese after pressing them. Researches are being done on the whey beverage with the addition of herbs. Herbal roots, flowers, extracts or distillates, play a critical role in beverages. Whey-based mango beverages prepared from mango juice, sugar, betel leaf distillate, and whey proved to be quite acceptable to the consumer. Whey is made up of around half of the milk solids, which contain nutrients like lactose, protein, and mineral and a high amount of antioxidants in mango increase the deliciousness and nutritional value of the

product. The Addition of betel leaf distillate, which contains active ingredients like chavicol and eugenol, provides preventive and curative properties to the product and its extended shelflife.

Laddu, namkeen and cutlets:

Betel and mint leaves are high in nutrients and can aid with malnutrition, decreasing morbidity and positively impacting human growth and development. Mint leaves (Pudina) are often used in cooking, while betel leaves (Pan) are still not included. Some meals, such as Laddu, Namkeen, and cutlet, were made with these leaves, and their acceptability among the population was determined through sensory evaluation. The use of betel leaf in everyday food products has shown that it can help overcome micronutrient deficits such as iron and calcium. According to research conducted at the University of Calcutta's Pharmacognosy Research Laboratory, the betel leaf reduces cell degeneration. The results found that cutlets containing both betel and mint leaves were equally well-received, with the people preferring betel leaves Laddu and Namkeen over mint leaves Ladoo and Namkeen.

Noodle:

Noodles are a good source of critical nutrients and fibre. The effects of varying quantities of betel leaf extract on the quality and sensory acceptance of Hokkien noodles were investigated in this study. The evaluation was made based on sensory categories, including colour, aroma/odour, hardness, chewiness/elongation, taste, and overall acceptance of the cooked noodle strands. The findings of this study proved highly acceptable. They showed that incorporating betel leaf extracts at various levels results in the structural modification of the noodles, resulting in a softer product. The extract at 15% yields the highest quality product, wherein the beneficial health effects of betel leaf polyphenols can be utilized. [26]

Spray drying of whey protein and betel leaves:

Betel leaf has antibacterial, anti-carcinogenic, antiviral, and antioxidant effects, as we all know. This study aimed to see how adding whey protein isolate to the powder qualities of spray-dried P.betle leaves extract affected the powder qualities. In terms of moisture content, powder yield, and hygroscopicity, the qualities of the dried powder were studied. Due to the usage of whey protein isolate, the powder production rose as the whey protein concentration increased. This boosted the particle's surface protein coverage. As a result, according to the study of employing whey protein isolate in bayberry juice, the stickiness between the particles and between the particle and the dryer wall has decreased, and the yield of the powder has increased.

Dahi:

Milk is a nutrient-dense beverage that is perhaps a human's most essential food. In India, fermented milk products account for about 9% of total milk production. Because of the lactic acid bacteria present in fermented milk products, they have been linked to various human health advantages. Dahi is the most widely consumed fermented dairy product on the Indian subcontinent, with the majority of people eating it with their daily meals. Herbal extracts are becoming increasingly popular as a way to extend the shelf life of dairy products. Betel leaves are one such material that has preservation properties due to their antibacterial and antioxidant content.

Furthermore, these chemicals are widely available at all times of the year, are inexpensive, and are used by individuals for various purposes. As a result, a study was conducted to develop a dahi with good flavour, texture, appearance, palatability, and acceptance that

included betel leaf extract. pH, titratable acidity, textural qualities (firmness and consistency), and sensory analysis are among the variables investigated. On the seventh day of storage at refrigerated temperature, dahi with a 0.5 percent aqueous betel leaf extract was superior to standard dahi.

Preservation of milk:

Milk is a highly nutritious and complete food that provides almost all the nutrients for the growth and maintenance of the human body. On the other hand, it is a suitable medium for the growth of almost all spoilage and pathogenic organisms. Since milk is perishable, special measures and considerations are necessary to ensure that it reaches the market in an acceptable condition. Currently, there is a growing interest in using natural antibacterial compounds like extracts of herbs and spices to preserve food. Phenols and polyphenols are water-soluble compounds that can be easily mixed with milk. An experiment was carried out to study the use of betel leaf extract to extend the shelf life of raw milk. It was found that the addition of 0.5 percent betel leaf extract (v/v) to raw milk remained acceptable up to 11 hours of storage at 37°C.

Khakhra:

Khakhra is also referred to as crispy chapatti or roti. It is a typical Gujarati Indian bread, or snack item served during breakfast or snack time. Betel leaves can be easily dehydrated and added to various food products to increase their nutritive value. So a study was undertaken to develop Khakhra from dehydrated (powder) both Kari yele and Ambadi yele betel leaves. Shelf life study based on sensory evaluation, microbial load, and moisture content revealed that both khakhras were acceptable up to 60 days of storage under ambient temperature. It was concluded from the results that the shelf-stable and acceptable value-added products could be developed by incorporating dry betel leaves (Kari yele and Ambadi yele) in conventional food items and can enrich the nutritional quality of the products as well as it adds variety to the diet.

Shrikhand:

Shrikhand is a nutritious indigenous fermented dairy product from western India that is semi-solid and sweetish-sour. It is well-known for its flavour, taste, pleasant quality, and therapeutic properties. Sapota is one of the most important fruits to have on hand throughout the year because it is healthful and delicious. Sapota helps the eyes, provides energy, is antiviral and antibacterial, aids in weight loss, mental health, cancer prevention, and is an anti-inflammatory agent, among other things. [27]

A study was made with an attempt to develop a Goat milk shrikhand blended with sapota pulp and betel leaf extract. Sensory properties such as colour and appearance, flavour and taste, consistency were studied. It was concluded that the Goat milk shrikhand blended with sapota pulp and betel leaf extract could be successfully prepared by using standardized milk, sapota fruit pulp, sugar, and betel leaf extract.

Tomato paste:

A study was attempted with two objectives: (1) to find an acceptable concentration of betel leaf essential oil (BLEO) based on the sensory evaluation that can be employed in tomato paste and (2) to evaluate the effect of the acceptable concentration of BLEO in the paste during accelerated storage. BLEO comes with a tag contributing to green consumerism, and its application as a food preservative is no less than a value addition to the product. Therefore, the essential oil is considered to have promising potential as an alternative food

preservative. Its use is practically possible if it could overcome the sensory barrier while retaining the preservative potency. It was found that the BLEO treated paste efficiently extended the shelf life by 14 days concerning untreated paste samples under accelerated storage conditions.

Papad from dehydrated (dry) betel leaves:

A study was undertaken to develop value-added papads to increase the consumption of betel leaves to exploit their nutritional benefits. Papads were prepared by incorporating dehydrated betel leaves powder at different levels and evaluated organoleptically. All the papads were found to be acceptable. Shelf life study based on sensory evaluation, microbial load, and moisture content revealed that the papads were acceptable up to 60 days of storage under ambient temperature.[28]

BETEL LEAF OIL:

Extraction Method: Steam distillation is the most frequent method of extracting the oil. The best yield comes from young betel leaves. To obtain the oil, fresh betel leaves are steam distilled.

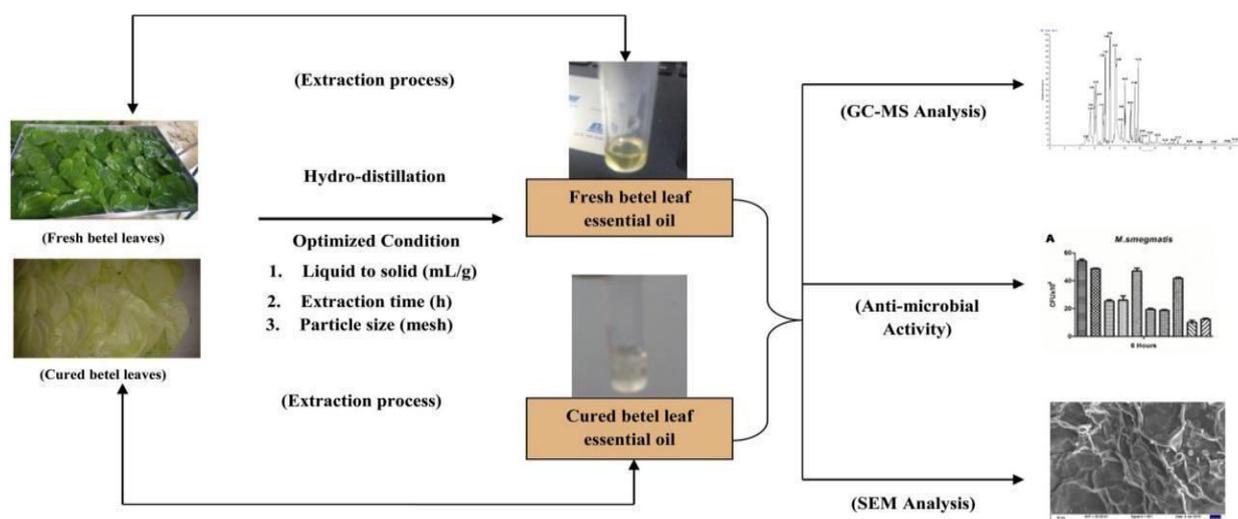
Components: Leafs

Aroma: The betel leaf oil has a strong scent and a bitter taste. The oil is a vivid brown to golden tint. The colour of the distilled leaf is determined on the type of leaf used.

Properties: The country that produces the most betel leaf oil is India.

Betel leaf oil contains a wide range of therapeutic benefits. It has antibacterial, aphrodisiac, stimulant, and fragrant properties. It acts as a breath refresher and can also be used to treat worms. Unfortunately, betel quid has a high carcinogenic potential. It provides a variety of health benefits as well as numerous healing abilities. Calcium, vitamin C, carotene, riboflavin, niacin, and thiamine are all present. Ear ache, boils, and a sore throat are all treated with this oil. It can be used to treat orchitis and arthritis inflammation. Urinary infection, constipation, headache, nerve pain, lumbago, sores, and debility can all be treated with this oil. It is an antibacterial, anti-spasm, and pain reliever with the ability to manage blood sugar.

Betel leaf oil can protect teeth while also hardening gums. When combined with honey, it makes a good tonic. It is used to treat worms in Ayurveda. The oil of betel leaves is beneficial for stomach and gastrointestinal ailments. Lower back pain might be relieved by combining betel leaf with coconut oil. Aromatherapy makes use of the oil. In some parts of India, the betel leaf is eaten as a digestive. The application of the oil ensures that pimples and other skin-related issues are treated.



Source: aramacs.com

Tea Biscuit Using Betel Leaf Oil:

A biscuit is a baked, regularly flour-based food item. Ingredients to make biscuits are wheat flour, sugar, butter, oil, eggs, and baking powder. However, the essential oil of betel leaf has not yet been utilized as an element of any bakery shop item, which could help limit wastage ranging from 10-70% and could also be a wellspring of a novel food item. Therefore, a research was carried out at the Agricultural and Food Engineering Department, IIT Kharagpur, West Bengal. [29] In this present study, a novel tea-biscuit was created by fusing betel leaf oil as an essential oil in the plan of the bread roll. Essential oils are, for the most part, considered as GRAS materials.

The evaluation was made based on sensory categories and structural modification, including colour, aroma/odour, hardness, elongation, taste, and overall acceptance of the baked tea biscuit. As a result, the energy of the developed tea biscuit was highest among all samples, which were about 478.65Kcal/100g.

Teen Paan Tea:

It adjusts the internal heat level as well as is inalienably cool. Thus, it accompanies a gold mine of recuperating capacities and all-encompassing wellbeing. Paan tea is precious as it contains antioxidants that lessen the pH level of the body. Adolescent Paan tea can likewise help you treat typical cold and influenza. Paan leaves contain a super heap of anti-infection agents. This tea is mitigating, hepato protective, and immune modulatory. It eliminates microscopic organisms and free extremists. It supplies you with proteins to separate food, like paan clove tea, ginger teen paan tea.

Betel Leaf Wine:

Wine is a psychoactive drug, like all alcoholic beverages, commonly used for its intoxicating effects today and throughout history. Wines made from products besides grapes are usually named after the product they produce and are generically called fruit wine. Wines are also made from some leaf such as an oak leaf, whereas in the Kodagu district, which is located in Karnataka, India, wines are made from betel leaves, ginger, pineapple, passion fruit, rice, and banana. Piper betel crop is widely filled in India. Betel leaf wine was prepared to utilize wild

yeast and industrially available yeast. Wild yeast was separated in the research facility utilizing spoiled grapes.

Analysis of Betel Leaf Wine:

A detailed study was conducted in betel leaf wine to estimate various phytochemical compounds found in betel leaf wine such as alcohol, total sugar, total polyphenols, protein, and glucose.

A portion of the phytochemical segments was assessed using both wild yeast and economically accessible yeast in the betel leaf wine. The alcohol level of betel leaf wine was expanded by 15-21% on the last day of fermentation. Total sugar levels in all the examples were bit by bit diminished, demonstrating the usage of total sugar by yeasts. Polyphenols were available in all the examples in a brief amount at first, and as the days passed, the levels were increased. pH was diminished in all the examples from the initial day of fermentation, and there was a slight increase in antioxidant activity when compared with the initial day level. There was a decrease in protein level in the example containing more betel leaf.

Glucose levels were diminished in all the examples. Therefore, it was concluded that commercially available yeast yields better phytochemicals over wild yeast in betel leaf wine preparation. Further, it was concluded that betel leaf wine is appropriate for consumption.

3. PACKAGING:

The method of packing betel vine leaves and packing materials used for it varied from region to region. The quality of betel vine leaves, the seasons, and the availability of packing materials all influence how they are packed. The chewing quality of the betel leaves was determined by their size, colour, texture, and maturity. Grading was done in a variety of ways in various places. The betel leaves' grading depended on their position on the betel leaves on the vine, their maturity and production quality of betel leaves. The branches of mulberry were used for packing betel vine leaves. Banana fibre and leaves were also used as a packing material. Bamboo baskets were also used to pack minor amounts of leaves, which may total up to three thousand. This package was known as a Karandi in the area. With the help of mulberry branches, almost 6,000 leaves were packed into the banana fibre. They were referred to as Dappas. Kalli variety betel leaves were packed in Dappa and Karandi. Fapada leaves had a large size and were packed in Dag containing twelve thousand leaves. The bottom and top of the Dag are made up by using a ring of mulberry branches. The betel leaves were marketed in local markets or sent to noted city markets. The betel leaves were distributed to the merchant by the local commission agents. By spraying water on the leaves, the pan shopkeepers preserved them for their function. The leaves were to be kept in a cool, dry place.

It is kept by splashing water repeatedly and wrapping the leaves in a moist cloth for five to six days. The pricing was established in stone based on the quality of the samples. String or plastic rope was used to tie the dag, dappa, and karandi. Fresh banana leaves and moist sugarcane leaves were used to cushion the container on top and bottom. In the Dag, the betel vine leaves were arranged in round rows. The rows in the dag were organised from the periphery inwards, closing in on the centre. As a result, rows upon rows were created. In the instance of fapada dag, a hole in the centre with a diameter of 10 to 15 cm allowed for free aeration. Six to ten times a year, each betel vine was harvested.

Pickings were timed such that not all vines were picked at the same time. Pickings were practised in three different ways. The main stem's leaves were known as fabada. Kalli was the name given to the leaves that grew on the vine's branches. Hakkal or Gabal were the leaves with the lowest parts of the vine and one betel vine coil. Fapada leaves were more expensive than kalli leaves because they were older, thicker, raped, and dark green. A single labourer can cut one or two dags per day, on average (12,000 leaves).

4. STORAGE:

Betel leaves are perishable as they have high moisture content. Therefore, maintenance of the freshness of the green leaves for a few more days would prove to be highly beneficial to the farmers. So, a study was conducted to increase the shelf life of the fresh betel leaves using low-cost methods, which a producer can afford. Storage experiments for betel leaves were carried out using wet cloth wrapping, polyethene pouches, and ventilated polyethene packaging. All these types of packages were stored at room temperature as well as in a zero-energy cool chamber. The stored leaves were subjected to physical examination (rotten leaves), sensory evaluation (freshness and taste), and biochemical estimation (moisture content, chlorophyll content, total soluble solids, ascorbic acid, and pH) at an interval of three days. The environmental conditions that prevailed in the zero cool chambers were measured and compared to those of ambient conditions. The temperature remained less by 3 to 5°C, and the relative humidity was higher by 8 to 10 % than the ambient conditions during the storage period.

The overall analysis of the quality characteristics of the stored betel leaves showed that the zero-energy cool chamber performed better than ambient conditions in respect of the storage of fresh betel leaves. Thus, the betel leaves could be stored in a zero-energy cool chamber with acceptable qualities 2 to 5 days more than the leaves stored under ambient conditions, depending on the packaging system.

5. CONCLUSION:

The Betel leaves are very nutritive and contain a considerable amount of vitamins and minerals. The leaves also contain enzymes like diastase and catalase. It is a source of a significant amount of all the essential amino acids except lysine, histidine, and Arginine. It has significant health benefits due to antioxidant activity, antiulcer, antidiabetic, immunomodulatory, cardiovascular, and anticancer. Due to these health benefits, betel leaves have been utilized in various food products, and products are well chemically stable and sensory acceptable. Betel leaves as a whole are a perfect ingredient in a food, as well as the extraction of colour or betel oil has proven to be highly beneficial to health. It can even be said to act as a nutraceutical. However, such food application is limited to available, but betel bioactive would potentially enlarge its use in various foods by its considerable health benefits. Despite such tremendous economic potentiality of the crop, it remains neglected, particularly by scientists, technologists, administrators, and policymakers as well.

Consequently, statistical data of betel leaf is still scattered and messy while its agronomy remains to be a matter of personal experience gained through traditional farming practised generation after generation. This is why it is termed the "Neglected Green Gold Of India". Betel leaves worth millions of rupees are sold at a throwaway price and sometimes remain even completely unsold and get wasted. This again indicates that many folds may increase the present level of revenue generated by the crop if appropriate post-harvest technologies are

made available to the betel leaf growers and traders. Therefore, a well-coordinated effort by the farmers, traders, scientists, technologists, extension workers, physicians, administrators, and policymakers must be initiated to boost the national economy and the national employment generation through proper exploitation of this green gold.

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Table 1: Varieties of betel leaf cultivated:

States	Popular varieties
Andhra Pradesh	Bangla, Chennor, Kalli Patti, Karapaku, and Tellaku.
Assam	Assam Patti, Awani pan, Bangla, and Khasi pan.
Bihar	Bangla, Calcutta, Desi pan, Maghai, and Paton.
Karnataka	Ambadiaale, Kariyale, and Mysoreale.
Odisha	Birkoli, Godi Bangla, Nova Cuttak, and Sanchi.
Madhya Pradesh	Calcutta, Desi Bangla, and Deswari.
Maharashtra	Bangla (Ramtek), Kallipatti, and Kapoori.
West Bengal	Bangla, Kali Bangla, Mitha, Sanchi, and Simurali Bangla.
Kerala	Kalkodo, Nadan, and Puthukodi.
Tamil Nadu	Pacha kodi, and Vellaikodi.
Uttar Pradesh	Bangla, Deswari, Kapoori, and Magha.
Malayalam	Vettila
Indonesia	Bakik serasa, Daun sirih, Serassa and, Sirih.
German	Betelpfeffer, Betel-Pfeffer.

Table 1.1: Varieties of betel leaf cultivated

Source: apeda.gov.in, Agriculture & processed food products export development authority

TABLE 2: Chemical compounds present in betel leaf and its uses

Source: Das et al. (2016), www.thepharmajournal.com

Betel leaf bio-actives	Uses
A-Pinene	Anti-inflammatory and antibiotic
A-Terpinene	Cosmetics and food
Camphene	fragrances and food additive for flavouring use
B-Bourbonene	Flavour and fragrance agents
Caryophyllene	Antioxidant, anti-inflammatory, anti-cancerous
B-Elemene	The antiproliferative effect, chemotherapy for cancer treatment

Sabinene	Antimicrobial properties
B-Phellandrene	Cosmetics and personal care
Cis-sabinene	Anti-Infective Agents
Safrole	Beverages and candy preparation
Eugenol	Antiseptic and anaesthetic
Hydroxychavicol	Antimutagenic effect
Germacerene-B	Antimicrobial and insecticidal properties
Chavibetol	Aromatic compound with a spicy odour
Aromadendrene	Antioxidants and anti-ageing
Terpineol-4	disinfectants
B-Farnesene	natural insect repellent
A-humulene	Anti-inflammatory, effective in reducing platelet-activating factor
Globulol	Antimicrobial activity
Eugenyl acetate	Anti-virulence significance
Germacerene-D	Analgesic and anti-inflammatory properties
Myrcene	fragrances and food additive
Terpinolene	Perfumes and food additive
B-Ocimene	Perfume
B-Selinene	Antibacterial characteristics
A-Selinene	Aroma
A-Farnesene	Plant defence
E-Nerolidol	Flavouring property
Spathulenol	Antibacterial activity
Iso-safrole	Fragrance
A-Cadinene	Anticancer activity
Allylpyrocatechol Diacetate	Antimicrobial activity
1,8-Cineol	treatment of inflammatory diseases
Methyl isoeugenol	Flavour and fragrance agents
Methyl Eugenol	Fragrance ingredient

TABLE 3: Chemical constituents of Piper betel leaf

Source: www.researchgate.net

Component	Percentage of component
Chavibetol	53.1
Caryophyllene	3.71
Chavibetol acetate	15.5
Allylpyrocatechol Diacetate	0.71
Chavibetol methyl ether	0.48
Camphene	0.48
f-Pinene	0.21

Eugenol	0.32
α-Limonene	0.14
α-Pinene	0.21
1,8-Cineol	0.04
Saprobe	0.11
Allylpyrocatechol Monoacetate	0.23

TABLE 4: STATEWISE VALUE OUTPUT OF BETEL LEAVES(2011-2017)

A. Serial No.	B. 2011-12	C. 2012-13	D. 2013-14	E. 2014-15	F. 2015-16	G. 2016-17	H. State/U.Ts
I.	J.	K.	L.	M.	N.	O.	P.
1.	87437	102221	123210	140720	48240	62130	Andhra Pradesh
2.	0	0	0	0	0	0	Arunachal Pradesh
3.	37133	40528	40390	40390	40390	29177	Assam
4.	0	0	0	0	0	0	Bihar
5.	0	0	0	0	0	0	Chhattisgarh
6.	0	0	0	0	0	0	Goa
7.	0	0	0	0	0	0	Gujarat
8.	0	0	0	0	0	0	Haryana
9.	0	0	0	0	0	0	Himachal Pradesh
10.	0	0	0	0	0	0	Jammu & Kashmir
11.	0	0	0	0	0	0	Jharkhand
12.	0	0	0	0	0	0	Karnataka
13.	36787	21961	22042	21008	22141	18700	Kerala
14.	0	0	0	0	0	0	Madhya Pradesh
15.	0	0	0	0	0	0	Maharashtra
16.	26	178	58	30	28	70	Manipur
17.	325	349	375	407	425	425	Meghalaya
18.	0	0	0	0	0	0	Mizoram

19.	0	0	0	0	0	0	Nagaland
20.	0	0	0	77361	77924	78387	Odisha
21.	0	0	0	0	0	0	Punjab
22.	0	0	0	0	0	0	Rajasthan
23.	0	0	0	0	0	0	Sikkim
24.	0	0	0	0	0	0	Tamil Nadu
25.	585	470	5	2	0	0	Telangana
26.	1749	1749	2464	1849	1849	1976	Tripura
27.	0	0	0	0	0	0	Uttar Pradesh
28.	0	0	0	0	0	0	Uttarakhand
29.	584379	588302	591988	593675	598185	598891	West Bengal
30.	0	0	0	0	0	0	A & N Islands
31.	0	0	0	0	0	0	Chandigarh
32.	0	0	0	0	0	0	Dadra & Nagar Haveli
33.	0	0	0	0	0	0	Daman & Diu
34.	0	0	0	0	0	0	Delhi
35.	1	0	1	1	1	1	Lakshadweep
36.	9	9	17	20	10	13	Puducherry
	748432	755767	780550	875462	789193	789770	All India

Source: Agriculture and Allied Sector

TABLE 5: Betel Leaf Country Wise Export Data (Value in Rs. Lacs, Qty in MT)
Source: DGCIS Annual Export

COUNTRY	2017-18		2018-19		2019-20	
	Qty	Rs. Lacs	Qty	Rs. Lacs	Qty	Rs. Lacs
Bangladesh Pr	7,463.35	1,568.67	12,255.56	3,254.52	9,401.17	2,382.99
Sri Lanka Dsr	107.73	138.04	266.95	553.09	255.14	618.92
Malaysia	234.44	352.46	341.29	488.07	184.08	247.38
Australia	12.77	83.58	19.78	132.34	28.96	199.50
Canada	60.70	80.35	61.20	73.37	69.78	92.75

Saudi Arab	0.95	0.68	27.55	44.79	29.28	44.43
Nepal	29.92	14.11	142.67	21.71	320.53	38.66
Lebanon	31.27	14.53	33.04	17.88	28.71	26.91
Russia	0.00	0.00	0.00	0.00	9.62	23.14
France	2.75	3.09	3.91	4.94	18.71	21.39
Kenya	14.38	38.33	11.75	37.08	5.72	17.02
Yemen Republic	5.92	10.99	1.52	2.37	8.53	16.16
U Arab EMTs	17.77	36.96	21.32	35.50	9.09	15.67
Thailand	0.00	0.00	0.48	0.29	1.93	4.19
USA	0.00	0.00	0.13	0.54	0.66	2.95
Singapore	6.64	10.02	5.36	3.00	7.44	2.63
UK	148.53	320.41	0.27	0.28	2.24	1.88
Jordan	0.00	0.00	0.31	1.31	0.50	1.15
Afghanistan Tis	0.68	0.61	0.00	0.00	0.36	1.02
Germany	0.19	0.21	0.05	0.08	0.26	0.82
Oman	0.00	0.00	0.00	0.00	2.75	0.48
Italy	0.00	0.00	0.00	0.00	0.34	0.45
Hong Kong	0.07	0.11	0.07	0.27	0.17	0.39
New Zealand	0.00	0.00	0.00	0.00	0.12	0.33
Maldives	1.06	0.48	0.09	0.20	0.37	0.30
Japan	0.11	0.11	0.61	0.33	0.04	0.05
Sweden	0.07	0.11	0.03	0.09	0.02	0.04
Baharain Is	0.01	0.00	0.00	0.00	0.00	0.00
Brunei	0.00	0.00	0.10	0.08	0.00	0.00
China P Rp	0.09	0.23	0.00	0.00	0.00	0.00
Denmark	0.00	0.00	0.80	2.13	0.00	0.00
Fiji Is	0.00	0.00	0.05	0.06	0.00	0.00
Ghana	0.00	0.00	0.04	0.04	0.00	0.00
Kuwait	0.18	0.41	0.00	0.00	0.00	0.00
Netherland	0.20	0.27	0.00	0.00	0.00	0.00
Norway	0.01	0.01	0.00	0.00	0.00	0.00

Qatar	0.00	0.00	0.12	0.12	0.00	0.00
South Africa	0.50	0.63	0.31	0.79	0.00	0.00
Spain	0.00	0.00	0.05	0.14	0.00	0.00
Switzerland	0.02	0.02	0.00	0.00	0.00	0.00
Total	8,140.31	2,675.42	13,195.41	4,675.41	10,386.52	3,761.60

TABLE 6: Import Trend Analysis for Betel Leaves:

Source: connect2india.com, agriexchange.apeda.gov.in

Sl.No	Country	Qty	Value(USD Million)	Month	Year
1.	Bangladesh	718020	0.29	October	2019
2.	Sri Lanka	24080	0.08	October	2019
3.	Australia	6110	0.04	October	2019
4.	Malaysia	18140	0.03	October	2019
5.	Canada	5040	0.01	October	2019
6.	Saudi Arabia	5190	0.01	October	2019

TABLE 7: India Import Statistics of Betel Leaves (Qty in MT, Value in Rs. Lacs)

Source: DGCIS

Country	2017-18		2018-19		2019-20	
	Qty	Rs.Lacs	Qty	Rs.Lacs	Qty	Rs.Lacs
Sri Lanka Dsr	11839.41	30408.73	10998.05	29072.50	9554.51	25571.51
Indonesia	6514.82	10512.58	9508.60	18484.20	7107.14	8534.75
USA	0.00	0.00	11.09	30.47	5.44	15.54
Afghanistan Tis	0.00	0.00	59.64	254.48	85.55	374.20
Unspecified	0.00	0.00	0.00	0.00	0.00	0.00
Vietnam Soc Rep	86.00	115.64	32.00	56.54	98.00	145.16
Nepal	26.18	67.02	0.00	0.00	0.00	0.00
Pakistan Ir	1.80	4.59	0.00	0.00	0.00	0.00
Australia	0.00	0.00	0.40	1.88	0.00	0.00
Bangladesh Pr	699.38	1776.77	72.00	187.13	0.00	0.00
Canada	0.00	0.00	0.00	0.00	1.13	5.00
Thailand	0.00	0.00	0.00	0.00	0.04	0.20
Timor- Leste	18.00	45.67	0.00	0.00	0.00	0.00
Turkey	0.00	0.00	0.00	0.00	34.00	32.29
Total	19,185.59	42,931.00	20,681.79	48,087.20	16,885.81	34,678.65

TABLE 8: Classification of Respondents According to Packaging Material Used:

Serial No.	Types of Packaging Materials	No. of Respondents	Percentage to Total Respondents
1	Banana Fibers and Leaves	51	85.00
2	Sugarcane Leaves	60	100.00
3	Branches of Mulberry Tree	60	100.00
4	Jute String	36	43.33
5	Plastic Rope	24	40.00
6	Bambu Basket	NA	NA