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## Rambai (*Baccaurea sapida*): A prospective lesser-known fruit with the potential to uplift the socio-economic conditions of rural communities in West Bengal

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### Abstract

Rambai (*Baccaurea sapida*) an underutilized fruit species, is grown in marginal lands of West Bengal. It is commonly known as lotka, lotkon or bugi in Bengali locally and commonly grown in Southern and Northern zone viz., Cooch Behar, Jalpaiguri, Darjeeling districts. Being a highly economical species for the local inhabitants and rural people, it is commercially grown by them in a large scale. Rambai fruits are rich in vitamins, minerals, fibers, and pharmacologically significant substances such as phenolic acids, flavonoids, and terpenes. They contain low amounts of carotenoids, making them effective in preventing malnutrition among rural populations. The fruit has been reported to be beneficial in heart disease, as its high potassium content is associated with lower stroke risk and reduced blood pressure. Rambai also aids in the treatment of constipation, while various parts of the plant are utilized to treat conditions like arthritis, abscesses, and injuries. Given its substantial importance, prioritizing the cultivation of this crop can contribute to nutritional security and improve the socio-economic conditions of impoverished rural communities. Therefore, comprehensive information on various aspects of this crop, including its medicinal properties, nutritional value, cultivation practices, etc., has been compiled to fully exploit the potential of this underutilized fruit crop.

**Keywords:** Rambai, underutilized fruit, nutritional security, socio-economic upliftment

### Introduction

Rambai (*Baccaurea sapida*), commonly known as Burmese grape, is a tropical underutilized fruit belonging to the Euphorbiaceae family ( $2n=26$ ). It is abundantly found in South-East Asia, with wide distribution in tropical countries such as Malaysia, Myanmar, Nepal, Bangladesh, India, and Southern China (Goyal, 2013) <sup>[1]</sup>. In West Bengal, particularly in the northern parts like Cooch Behar, the foothills of Darjeeling, Kalimpong, Uttar and Dakshin Dinajpur, Jalpaiguri, and some pockets of Southern Bengal, Rambai is highly popular, known locally as 'Lotkan' or 'Lotko.' The plant is evergreen, dioecious, and thrives in shaded conditions, often grown in homestead settings in this climatic region (Bhowmik, 2010) <sup>[2]</sup>. Rambai plants flower during March-April, and the fruits mature during the rainy season. The edible part of the fruit is the aril (3-4 arils per fruit), surrounded by a leathery rind. The cauliflorous bearing habit of the fruit is similar to Jackfruit and Cocoa. The fruits are round to oval, with a yellowish skin at maturity (Bhowmik, 2010) <sup>[2]</sup>. Despite being an underutilized crop, Rambai boasts significant nutritional and medicinal value. Various plant components are used to treat injuries, abscesses, and arthritis, while the fruit juice is primarily employed to alleviate constipation. The fruits exhibit promising physicochemical and medicinal properties, making them worthy of exploration and consideration.

### Nutritional and Physicochemical properties of Burmese grape

Based on its low iodine value, a result from gas chromatographic of the oil from the seeds of *Baccaurea sapida* revealed that more than 55% of the total fatty acids are composed of saturated fatty acids such as palmitic acid (23.57%), stearic acid (21.28%), and arachidonic acid (7.43%). The unsaturated fatty acids included in *Baccaurea (Sapida)* are oleic (25.45%) and 11-transecosenoic (11.45%) acids.

**Table 1:** Physiochemical components of Burmese grape

Sl. No.	Plant Part	Active Content	Remarks
1.	Leaf extract	Total polyphenol (79.06±0.03 mg GAE/g) Flavonoid (28.80±0.01 mg QE/g) Proanthocyanidin (29.42±0.01 µg catechin equivalent/g.) Rosmarinic acid (8 mg/kg), 6'-O-vanilloylisotachioside (newly found phenols) 6'-O-vanilloyltachioside	Usha, <i>et al.</i> , 2014 <sup>[9]</sup> Yang, <i>et al.</i> , 2007 <sup>[10]</sup>
2.	Stem	4'-O-(6-O-vanilloyl)-β-D-glucopyranosyl tachioside D, 6'-O-vanilloylpicraquassioside D, 6'-O-vanilloyllicaraside B5.	Yang <i>et al.</i> , 2010 <sup>[11]</sup>
3.		Total phenolic contents (TPC) (51.4 mg/g GAE) Flavonoids, polyphenols, tannins and phenolic terpenes (in hydromethanol extract of the fruit pericarp) Sesquiterpene glycoside ramifloside(2-one-6α-hydroxy-13-nor-11-picrotoxin-3(15β)-olide 10-O-β-d-glucopyranoside) Sapidolide A	Hasan <i>et al.</i> , 2009 <sup>[6]</sup> ; Rahman <i>et al.</i> , 2007 <sup>[8]</sup> , Prakash <i>et al.</i> , 2012 <sup>[7]</sup>
4.	Fruit peels	2,3,4-tri-O-Me xylose, 2,3-di-O-Me xylose 2-O-Me xylose (alkaline extraction of pretreated fruits Peels)	Haq <i>et al.</i> , 1994 <sup>[5]</sup>
5.	Wine and fruit juice	Total phenols (141.27-313.78 mg GAE/L) Flavonoids (149.2-531.2 mg QE/L) Flavonols (103.2-179.2 mg QE/L) Proanthocyanidins (1.46-8.45 µg catechin/L)	Goyal <i>et al.</i> , 2013 <sup>[13]</sup>
6.	Seed	Tetrahydrofurano-lactone meroisoprenoid	Bordolai <i>et al.</i> , 1996 <sup>[3]</sup>

In India, raw bark is chewed or juice is used internally used for constipation (Khan, 2008) <sup>[12]</sup>. The locals use of the fruit liberally for ceremonial purposes during the Holy Chariot Lord Jagannath's procession. People honor God by performing other ceremonies and hurling the latka fruit (Goyal, 2013) <sup>[14]</sup>. In Bangladesh, in addition to fresh food consumption, it mostly grown for the manufacturing of the important dye annatto seeds. 4.8-6% of the annatto dye is present in seeds.

#### Flowering and fruit set

The growth cycle of Burmese grape begins with the flowering stage. The tree produces small, inconspicuous flowers on its branches. These flowers contain both male and female reproductive parts and are usually pollinated by insects, particularly bees. Successful pollination is necessary for fruit formation. After successful pollination, the flowers develop into small, green fruits. These fruits initially appear as tiny, round structures, and they start to grow in size over time. As they develop, the fruits may be green or yellowish-green, and they gradually increase in size.

#### Fruit growth and development

The fruit exhibited rapid growth between days 21 and 28 after fruit set (DAFS). Fruit growth is believed to be influenced by endogenous auxins, gibberellins, and cytokinins. Younger fruits release a higher proportion of hormones, and this proportion decreases with maturity. Fruit weight showed a steady increase until maturity, with a significant spike between 21 and 77 DAFS. The initial slow increase in weight may be attributed to cell division, while the rapid increase is likely due to both active cell enlargement and the accumulation of food resources in fruit flesh cells (Barker and Davis, 1951) <sup>[1]</sup>. Various parameters such as fruit length, width, weight, peel weight, seed weight, and pulp percentage experienced significant increases during fruit growth and development until reaching maturity. To enhance yield, careful attention to plant care, including packaging and methods, is crucial during this stage, particularly between the 14<sup>th</sup> and 28<sup>th</sup> DAFS, where there is notable growth in fruit length, breadth, and weight. This stage is pivotal in horticulture due to the high percentage of fruit drop observed between the 21<sup>st</sup> and 35<sup>th</sup> DAFS, correlating with elevated fruit growth rates. Applying manures, fertilizers, and irrigation may enhance fruit quality and productivity, especially considering that Burmese grapes are often cultivated with minimal or no

fertilizer and manure. Biochemical characteristics, including TSS (Total soluble solids), total sugar, and reducing sugar, showed a significant increase, while pH and acidity decreased.

#### Maturation and harvesting

The maturation process of Burmese grapes involves changes in color, size, and flavor. The fruits transition from green to yellowish-brown or reddish-brown as they ripen. The pulp inside the fruit also changes in texture and flavor, becoming sweeter as it matures. The outer skin of the fruit may become thinner and easier to peel as it ripens. Burmese grapes are typically harvested when they are fully ripe. This is important because they are best enjoyed when their sweet and sour flavor is at its peak. The harvesting season can vary depending on the region and climate but generally occurs when the fruits have reached their desired color and flavor.

In cultivation, proper care, including adequate watering and nutrient management, can promote healthy fruit development. Additionally, pruning and shaping the tree can help improve fruit production and make harvesting easier. Overall, the growth and development of Burmese grape follow a natural cycle that results in delicious and unique tropical fruit ready for consumption when fully ripe.

#### Commercial value of Burmese grape

The commercial value of Burmese grape in West Bengal, or any region, can vary depending on several factors. Here are some considerations that can influence the commercial value of Burmese grape cultivation in West Bengal: a) Market Demand: The commercial value of Burmese grapes depends significantly on the demand for the fruit in local, regional, and potentially, international markets. Assessing the current and potential future demand for Burmese grapes is crucial. If there is a strong market demand, it can drive up prices and make cultivation more economically viable. b) Quality and Flavor: The quality and flavor of Burmese grapes play a pivotal role in determining their commercial value. Consumers prefer fruits that are sweet, juicy, and have good texture. Ensuring consistent quality and flavor through proper cultivation practices can enhance the market value of the fruit. c) Yield and Productivity: The yield per acre and overall productivity of Burmese grape plants are important factors for commercial viability. High-yielding varieties and efficient cultivation practices can lead to increased production and revenue for farmers. d) Value Addition: Adding value to Burmese grapes by processing

them into products like jams, juices, or dried fruits can increase their commercial value. These processed products may have a longer shelf life and can be sold at higher prices. e) Market Promotion: Effective marketing and promotion of Burmese grapes can create awareness and increase consumer demand. This can be done through advertising, participating in agricultural fairs, and collaboration with marketing agencies.

It's important to note that the commercial value of any crop can fluctuate over time and may be influenced by various external factors, including global market conditions and competition from other fruit producers. Conducting a thorough market analysis and developing a strategic plan for Burmese grape cultivation in West Bengal can help maximize its commercial potential.

#### Future scope of commercial cultivation of West Bengal

The future scope of Burmese grape production in West Bengal, or any region for that matter, depends on several factors including climate suitability, market demand, and agricultural practices. Here are some considerations for the potential future scope of Burmese grape production in West Bengal.

- **Climate Suitability:** The success of Burmese grape cultivation in West Bengal will depend on the suitability of the region's climate. Burmese grapes thrive in tropical and subtropical climates with warm temperatures and high humidity. West Bengal has a diverse climate, with some areas that may be suitable for this fruit. Climate assessment and selection of suitable locations for cultivation will be crucial.
- **Varietal Selection:** Choosing the right varieties of Burmese grapes that are well-suited to the local conditions is essential. Some varieties may perform better in West Bengal's climate and soil types than others. Local research and experimentation can help identify the most suitable varieties.
- **Agricultural Practices:** Implementing good agricultural practices, including proper soil preparation, irrigation, pest and disease management, and pruning, will be crucial for successful Burmese grape cultivation. Training and support for local farmers in these practices will contribute to increased production.
- **Market Demand:** Assessing the market demand for Burmese grapes, both within West Bengal and in neighboring regions, is essential. Understanding consumer preferences and the potential for value addition (Such as processing into juices, jams, or dried fruits) can help determine the viability of production.
- **Export Opportunities:** If the quality of Burmese grapes produced in West Bengal meets international standards, there may be opportunities for export. Exporting to countries with a significant demand for tropical fruits can be financially rewarding.
- **Research and Development:** Investing in research and development related to Burmese grape cultivation, including disease-resistant varieties and improved cultivation techniques, can enhance productivity and quality.

#### Conclusion

The future scope of Burmese grape production in West Bengal depends on a combination of factors, including climate suitability, market dynamics, and the commitment

of local farmers and authorities. Conducting feasibility studies, pilot projects, and collaborating with agricultural experts and researchers can help determine the potential for successful cultivation and commercialization of Burmese grapes in the region.

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