



Review Article

Baccaurea ramiflora Lour.: Biochemical and ethnobotanical value with scope for bio-prospection

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Abstract: *Baccaurea ramiflora* Lour., a member of Euphorbiaceae family, is found in the tropical forests with wild distribution in India (Assam). The fruits are edible and the wood of the tree is use for making furniture. The present review work is an effort to revisit the scientific works done to evaluate the scope for bio-prospection of edible fruit of *B. ramiflora*. Research work has reported rich content of minerals and vitamin C in the fruit. The plant has ethno-botanical uses in different countries of the world. Though it has many valuable properties, the plant is still an underutilized plant as its economic potentialities are still untapped. Since time immemorial, humankind has quest for identification and utilization of biological resources, which is crucial to the survival, adaptation, and evolution of the human species. The search for new sources of chemical compounds, genes, proteins, microorganisms and other products that have economic potential and can be obtain from the biological resources around us is bioprospecting. Bioprospecting can be an element of conservation of bio-resources if it can contribute in the generation of wealth through research and development (R&D) and alleviating poverty in bio-diversity rich regions. If underexploited and underutilized natural resources can be transform into potential economically, valuable products it may help in leading subsistence lifestyles in the remote biodiversity rich regions.

Keywords: *Baccaurea ramiflora*; Bio-prospection; Edible fruit; Ethno-botanical; Euphorbiaceae; Vitamin C.

Introduction

Baccaurea ramiflora Lour., commonly known as “burmese grape” is a flowering plant belonging to the family Euphorbiaceae. ‘Baccaurea’ is a term derived from Latin, which refers golden yellow colour of the fruits [1]. It is one of the important underexploited fruit crop, as it has remained confined mainly to backyard plantation and as forest plant. The plant is native to Southeast Asia region distributed along the sub-Himalayan tract, mostly from Nepal to Sikkim, Darjeeling hills, Arunachal Pradesh, Tripura, Assam, Bhutan, Burma, Penninsular Malaysia, Tibet and Andaman Islands [2]. It is slow growing, evergreen, dioecious, short to medium height shade loving plant, which flowers during summer month, and fruits mature during rainy season. The whole plant has medicinal value, and research carried out on its different parts like leaves, roots, seeds, fruits have proven health benefits. The fruit has nutritional benefits because of its high content of vitamin C, protein and iron [3]. The plant also mentioned in different traditional system of medicine and reported in many ethno botanical uses.

Taxonomic Classification

Kingdom	-	Plantae
Division	-	Magnoliophyta
Class	-	Magnoliopsida
Order	-	Euphorbiales
Family	-	Euphorbiaceae
Genus	-	<i>Baccaurea</i>
Species	-	<i>B. ramiflora</i> Lour.

Synonyms

Baccaurea cauliflora Lour.
Baccaurea flaccida Müll.Arg.
Baccaurea oxycarpa Gagnep.
Baccaurea pierardi Wall.
Baccaurea propinqua Müll.Arg.
Baccaurea sapida (Roxb.) Müll.Arg.
Baccaurea wrayi King ex Hook.f.
Gatnaia annamica Gagnep.
Pierardia flaccida Wall.
Pierardia sapida Roxb.

Common name

Assamese	-	Leteku
Bengali	-	Bhubi, Latkan
English	-	Burmese grape
Hindi	-	Leteku
Thai	-	Mafai

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Habitat and Distribution

It is slow growing, evergreen, dioecious, short to medium height shade loving plant. It is native to South East Asia region and is found distributed in the sub-Himalayan tract, mainly from Nepal to Sikkim, Darjeeling hills, Arunachal Pradesh, Tripura, Assam, Bhutan, Burma, Peninsular Malaysia, Tibet and Andaman Islands.

Morphology

Stem grey-brown in colour, branchlets hispid while young and become glabrescent in maturity.

Leaves are 9-15x3-8 cm in dimension, leaf blade is obovate-oblong, oblanceolate or oblong in shape, papery, green in colour adaxially and yellowish green abaxially, glabrous on both surfaces, cuneate at base, margin is entire or shallowly repand, apex shortly acuminate to acute.

Flowers are small, dioecious, apetalous, many flowered, compound into raceme panicles.

Fruit is yellowish and velvety, 2-3cm in diameter with leathery pericarp.

Seed embedded in pinkish white pulp.

Ethnobotanical Uses

Baccaurea ramiflora has been mention in the Chinese Dai medicine. It is use as an anti-inflammatory and painkiller in treatment of injuries, rheumatoid arthritis, cellulitis, abscesses etc. [4]. The fruit of the plant has religious importance as people used to pay their homage to Lord Jagannath during the Holy Chariot Procession by offering the fruits along with other rituals [5]. Young leaves of the plant used as vegetable or flavouring agent for curries and minced meat in Bangladesh [6]. The fresh bark of the plant chewed or juice taken orally for complaints of constipation in India [7]. The seeds of the plant produce a valuable dye called “annatto” which is used for colouring silk, cotton and other textile materials in orange [8].

Phytochemical Profile

Chemical profile of the fruit pulp of *Baccaurea ramiflora* has provided an insight into the nutritive value of the wild edible fruit (Table 1). If we look into the proximate values, it contains 35.6% water, carbohydrate 51.9%, protein, and fibre 5.58% and 20.4% respectively. If we see, the mineral value of the fruit it is abundant of magnesium (504mg), potassium (730mg), phosphorous (132mg), and iron (100mg) per 100gm of fruit pulp. It has a significant amount of ascorbic acid, which adds to the property of antioxidant [9, 10]. Vitamin C is an electron donor and this property makes it a potent water-soluble antioxidant for human [11]. While low potassium intake related to hypertension, cardiovascular diseases, chronic kidney stone formation and low mineral density, high sodium intake has also been associated with hypertension, and cardiovascular diseases [12, 13]. World health organization (WHO) suggest a potassium intake of at least 3510 mg/day and <2 g/day sodium for

adults [14, 15]. *Baccaurea ramiflora* fruit has the proper ratio of sodium and potassium, which can help in prevention of the non-communicable diseases significantly. The fruit is also rich in iron, which can help in alleviating the anaemic condition, which has high prevalence in India.

Table 1. Proximate Fruit Composition of Burmese grape, *Baccaurea ramiflora* per 100 gm of pulp [9, 10]

Proximate	%	Minerals	Mg	Vitamins	Mg
Water	35.6	Calcium	75	Ascorbic acid	273
Protein	5.58	Magnesium	504		
Lipid	0.73	Phosphorus	132		
Carbohydrate	51.9	Potassium	730		
Fibre	20.4	Sodium	35		
Ash	3.85	Iron	100		

The total soluble solids (TSS) has an average of 10.5° Brix, which shows the quality of the fruit juice in terms of dissolved solids (Table 2). Reducing and non-reducing sugar along with total sugar were recorded as 2.68%, 3.03% and 5.85% respectively which is balanced with acidity of 1.9% thus making the fruit neither to sour nor too sweet [16].

Table 2. Bio-chemical properties of Burmese grape fruits, *Baccaurea ramiflora* [16]

S. No.	Bio-chemical Parameters	Range	Average Value
1	Total soluble solids(TSS)	9.4-13.8° Brix	10.5° Brix
2	Total Sugar	4.14 - 6.05 %	5.85 %
3	Reducing Sugar	2.72- 3.15 %	3.03 %
4	Non-reducing sugar	1.35 - 2.76 %	2.68 %
5	Acidity	1.8-2.2 %	1.9 %

Baccaurea ramiflora oil content of seed is of 25-wt percentage (Table 3). The seed oil has a low moisture content (0.103) which is a sign of good quality and its ability to resist contamination or rancidity [17]. Moisture plays significant role in the process transesterification of glyceride with alcohol in presence of catalyst [18]. Acid value is the weight of KOH in mg needed to neutralize the organic acids present in 1g of seed oil. It is a measure of the free fatty acids present in it and the value (1.127) here reflects high fatty acid content in contrast to canola and soya oil whose acid value are 0.071 and 0.60 respectively [19]. Iodine value is a measure of the unsaturation of the fats and oils besides an indication of the oils stability and health properties. The higher the value, the greater amount of unsaturation. *Baccaurea ramiflora* iodine value found to be 80.32 whereas coconut oil, olive oil, has 10 and 81 respectively. The refractive index of the oil (1.4672) is greater than that of water (1.330) at room temperature and is in close range with palm kernel oil (1.449-1.451) and soyabean oil (1.466-1470) which suggests the utility of the oil in studies relating to optics [20].

Table 3. Some physicochemical properties of *Baccaurea ramiflora* seed oil [20]

S. No.	Parameters	Observed values
1	Colour	Light brown
2	Oil content (wt %)	25
3	Density (g/cm ³)	0.8674
4	Acid value (mg KOH/g)	1.127
5	Iodine value (gI ₂ /100 g)	80.32
6	Refractive index	1.4672
7	Moisture (%)	0.103

Characterisation of the fatty acids composition in percentage of total methylester of fatty acids (FAMES) of *Baccaurea ramiflora* seed oil determined by gas chromatography analysis shows saturated fatty acids to be more than 60 % viz. palmitic acid (33.67%), stearic acid (19.38%), and arachidic acid (9.69%). Oleic (24.48) and 11-transeicoseic (12.75) are the two unsaturated fatty acids recorded (**Table 4**). Most of these saturated fatty acids has commercial value in soap, detergent, cosmetic industries. Oleic and 11-transeicosenoic acid are monounsaturated omega-9 fatty acids. Hypotensive effect of olive oil may be due to oleic acid [21]. Omega-9 fatty acids can help reduce the risk of cardiovascular disease and stroke by increasing high-density lipids (HDL) cholesterol and decreasing low-density lipids (LDL) cholesterol which help eliminating building up of plaques in arteries, which cause heart attack or stroke [22].

Table 4: Fatty acid Profile of *Baccaurea ramiflora* seed oil [20]

Saturated Fatty Acid	% Composition
Palmitic Acid	33.67
Stearic Acid	19.38
Arachidic Acid	9.69
Unsaturated Fatty Acid	
Oleic Acid	24.48
11-transeicosenoic	12.75

Bioprospection

Bioprospecting term indicate the search for new sources of chemical compounds, genes, proteins, microorganisms, and other products that have economic potential and that can be obtained from the biological resources around us.

The chemical profile of the fruit shows the nutritive value of this underutilized fruit, which can used to disseminate awareness about the fruit and will help in marketing. According to WHO non-communicable diseases (NCDs) are the prime cause of mortality and morbidity globally, and prevention of NCDs are highly cost-effective. This fruit, which has a balance amount of minerals and vitamins, if commercially exploited following scientific principles can be a golden fruit for the economy and health of the people.

Total soluble solid and sugar content improved through application of molecular biology or breeding techniques will make it more attractive for

the food processing and brewing industry. The oil content of the seed is also significant. The saturated fatty acid and omega-9 fatty acids can be utilised in health, cosmetics and other industries.

Conclusion

Baccaurea ramiflora, mostly found in tropical forests with wild distribution, can be a prized fruit because of its nutritive value and its scope for bioprospection. The plant has numerous ethno botanical uses in different countries of the world. From being a rich source of vitamin C, which has established antioxidant property, the fruit is rich in minerals, which can help eradicating many of the non-communicable diseases at a very cost-effective way. Fruit pulp has the blend of sweet and sour, which can be commercialize by the food processing and brewing industry. Seed oil can also be extracted and commercially exploited, as it has shown presence of omega-9 fatty acids and other fatty acids of commercial importance in it.

Thus, this review attempted to highlight the economic potential of this underutilized fruit for bio prospection, which will help in conservation of the bio resources if it can contribute in the generation of wealth through R&D and alleviation of poverty in the biodiversity rich regions.

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