

# Blood Fruit (*Haematocarpus Validus*): An Integrative Review of Its Nutritional Composition and Health Benefits

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The modern age has seen a growing demand for fruits rich in nutrients, benefiting human health both nutritionally and metabolically. A variety of lesser-known crops, which are not extensively cultivated or traded commercially, are mainly consumed locally. These fruits, though lesser-known and underutilized, have advantages such as easy cultivation, resilience to climate change, and hardiness, which set them apart from major commercially grown crops. Moreover, they are rich in essential phytochemicals and possess medicinal properties. Therefore, including these crops in diets can help meet the nutritional needs of rural populations, especially those living in vulnerable arid and semi-arid regions worldwide. The blood fruit, a tropical liana, bears underutilized edible fruits belonging to the Menispermaceae family. It grows in the wild across India, Indonesia, Bangladesh, Pakistan, Thailand and Singapore. In India, the species is naturally found in the Tripura, Andaman and Nicobar Islands, Arunachal Pradesh, Meghalaya, Assam, Sikkim, and parts of West Bengal. Although the fruits are known to be a rich source of vitamin C, phenols, flavonoids, iron,  $\beta$ -carotene, and minerals, including anthocyanins such as Pelargonidin and Cyanidin, they are particularly valued for their positive effects on various physiological disorders. Tribes in northeastern India have long utilized extracts from these fruits to treat conditions such as blood purification, jaundice, anemia, itching, and heart diseases. Fruits. The blood fruit not only holds nutritional value but also plays a crucial role in contributing to the economic and livelihood security of farmers in its native distribution regions. Despite being rich in polyphenols with high antioxidant properties, the blood fruit remains underutilized and has not been commercialized. This underutilization is due to factors such as the fruit's perishable nature, a lack of postharvest technology, and limited processing knowledge. Improving the nutritional value of various

foods by incorporating blood fruits can lead to increased retention of phytochemicals, which can positively impact human health. This article provides a thorough analysis of the current understanding of the nutritional and physiological characteristics of blood fruit. It is essential to maintain its market presence and advance commercialization through effective value-added procedures that meet consumer demand for nutritional and functional benefits. The ultimate goals are to enhance livelihoods and achieve successful commercialization.

## Blood fruit

The plant species recognized as blood fruit (*Haematocarpus validus*) belongs to the Menispermaceae family and the *Haematocarpus* genus. The fruit is derived from dark crimson specimens, characterized by dense fibers and ripe with copious amounts of blood-red liquid. Etymologically, the genus name *Haematocarpus* signifies "blood fruit," with "haem" referring to iron-containing compounds and "carpus" denoting fruit. These fruits are becoming more and more well-liked for their traditional therapeutic uses due to their abundance in different alkaloids. The blood fruit, which has iron-rich characteristics and is used by some long-time villagers, is widely recognized for its relevance and ethno-medical values. Even with this acknowledgement, not much research has been done on how to identify and use these fruits properly, and what is known about them is still mostly lacking. The fruit goes by different names in various communities, including Blood fruit (English), Khoon phal (Hindi), Roktogula/Lalgula (Bengali), Rosco (Chakma), Thoyphal (Tripura), Te.pattang (Garos), Theichhung-sen (Mizo), Ranguichi (Marma), Raktaphal (Tamil/Telugu/Malayalam), and Sohsnam (Khasi & Pnar).

## Nutritive composition

Blood fruit's nutritional content suggests that it is high in a number of important vitamins and

minerals, including vitamin C, carotenoids, iron, copper, and potassium. Additionally, it has reasonable levels of fats, proteins, and carbohydrates, among other macronutrients. Nutritional value per 100 g of blood fruit is listed in Table 1. reported that blood fruit contain 90.12% moisture, 0.6% protein, 1.22% crude fiber, 1.23% ash, 1.44% fat, 6.99 % carbohydrate, 9.16 mg calcium, 39.50 mg phosphorus, 129.57 µg Copper, 0.14 µg Zinc, 152.04 µg Manganese, 6.86 mg Magnesium, 0.42 mg Sodium, 255.70 mg Potassium and 50 Kcal Energy.

**Table 1: Nutritional value per 100 g of blood fruit**

Parameter	Contents	Parameter	Contents
Moisture (gm)	90.12	Iron (mg)	0.57
Protein (gm)	0.6	Copper (µg)	129.57
Carbohydrate (gm)	6.99	Zinc (µg)	0.14
Fat (gm)	1.44	Manganese (µg)	152.04
Crude fiber (gm)	1.22	Calcium (mg)	9.16
Ash (gm)	1.23	Magnesium (mg)	6.86
Energy (Kcal)	50	Sodium (mg)	0.42
Vitamin C (mg)	13.15	Potassium (mg)	255.70
Carotenoids (µg)	1170	Phosphorus (mg)	39.50
		β-carotene (µg)	9.0

The fruit has an acidic pH of 2.77 and TSS (12.40%). Iron concentration in blood fruit is 0.57 mg/100 g, which is significantly higher than that of commercial fruit crops such as mango (0.2 mg/100 g), apple (0.1 mg/100 g), guava (0.3 mg/100 g), and cherry (0.3 mg/100 g) (Singh, 2013). Moreover, the seeds include 0.11 mg/100g. In order to treat iron deficiency and associated anemia diseases, blood fruit consumption may be helpful.

### Phyto-chemical composition

The phytochemical constituent of blood fruit crude extract includes phenol (0.51%) (Sangma, 2016; Rahim et al., 2015), titratable acidity (5.08%), reducing sugar (6.90%), Carotenoids (1170 µg/100g) total

sugars (27.232%), non-reducing sugar (26.67%), β-carotene (9.0 µg/100g), total polyphenol (400 GAE mg/100g), flavonoid (542 RE mg/100g), vitamin C (13.15 mg/100g) tannin (275.56 TAE mg/100g) and anthocyanin (203.77 C3GE mg/ 100g) as reported by Singh et al. (2014). The fruit's high carotenoid, β-carotene, and mineral content make it a natural antioxidant and a rich source of micronutrients like calcium, magnesium, potassium, and phosphorus.

### Health benefits of Blood Fruit

Wild edible fruits, recognized for their abundant nutritional value, have been consumed by rural and tribal communities since ancient times as a remedy for various diseases. Tender shoots extract is used as a jaundice cure by the Chakma and Marma tribes of Chittagong, Bangladesh. They also apply a mash of the roots to relieve itching, and use fruits and seeds as medicinal remedies for anemia. Blood fruit is rich in many different phytochemicals with medicinal qualities, and consuming it in a well-balanced diet may have several health advantages. Regular eating of this fruit rich in nutrients has the ability to reduce the risk of a number of illnesses, such as diabetes, cancer, heart disease, neurological conditions, and ageing. Ingesting blood fruit can help address issues related to iron deficiency and anemia. In addition, it provides a greater concentration of vitamin C than fruits that are sold commercially, exhibiting higher antioxidant activity.

### Food Uses

Blood fruit can be consumed both in its raw and ripened stages. The ripened fruit offers a sweet taste with a slightly acidic flavor, making it suitable for blending into beverages. The vibrant color of blood fruit serves as a natural coloring agent for processed foods, given its high content of anthocyanin pigment, making it a natural additive. The popularity of utilizing color extracted from blood fruit in soft drinks and desserts is increasing as a substitute for synthetic coloring agents, which pose health hazards. The Garo tribe in Meghalaya highly values the iron-rich blood fruit, which they use to heal blood-related diseases or anemia. They even consume the extract of ripe fruit slices that have been soaked overnight to obtain health benefits. Some tribes use ripening blood fruit to make

wine and other alcoholic drinks. These ripe fruits are used to create squash in Tripura, and the dye that is taken from them is used to color fabrics used in handicrafts. Blood fruit is processed domestically in several villages in northeastern India using methods including pickling and drying to produce chutneys, pickles, and dried fruits that can be consumed later.

### Future prospects

Underutilized fruit crops offer therapeutic advantages due to their high nutritional and medicinal value. Their potential to become significant horticultural assets could help ensure food security and nutrition in countries. These crops are also important for the environment, society, and recreation. Their ability to thrive in severe dry and semi-arid settings, such as waste areas, marginal or saline soil and water conditions, and rocky terrains, makes them suitable for enhancing sustainable agricultural revenue. The value and importance of wild edible plants and *H. validus* receive less attention at various levels. Many neglected and underutilized species play a role in maintaining cultural diversity associated with food habits, health practices, religious rituals, and social exchanges. Focusing on neglected and underutilized species is an effective way to promote a diverse and healthy diet and to combat micronutrient deficiencies, known as 'hidden hunger,' and other dietary deficiencies, particularly among the rural poor and more vulnerable social groups in developing countries. Emphasis should be placed on identifying more areas to explore the potential pockets for cultivation, which can bring more economic benefits to local communities if properly harnessed. Research on the utilization aspect will help identify new uses and improve production, promoting the welfare of the local community. Information and research concerning crop improvement, propagation, utilization, agro techniques, nutrition, and conservation aspects, especially on this particular fruit species, are extremely scarce and need attention. Efforts should be directed towards better maintenance of their resource base, both through ex situ and in situ

conservation methods, to ensure their development and sustainable use by present and future generations. To make the blood fruit more popular, it is important to morphologically screen populations from different geographical regions of the country. This endeavor can assist in identifying plants with edible and larger fruits, exhibiting wider adaptability, and tolerance to disease and insect pests, which can later be used for breeding purposes. Improving the acceptability and marketability of this fruit by making people aware of its nutritional qualities is also crucial. Improving the availability of information on underutilized crop species is one of the most important areas that demand immediate attention. Additionally, there is scope for studying the response of pruning, training, and other cultural practices. Standardization of harvesting and post-harvest techniques, including packaging and value addition, could also be pursued. Suitable procedures for the isolation of anthocyanins and their utilization as a natural colorant for preparing products also need to be standardized. Since traditional knowledge of this wild edible fruit is being eroded through acculturation and the loss of plant biodiversity along with indigenous people and their cultural background, promoting research on this wild fruit is crucial to safeguard this information for future generations and their conservation.

### References

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