

THE UNTAPPED BENEFITS OF NATIVE *Phyllanthus acidus*, A LESS POPULAR GEM

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ABSTRACT

Phyllanthus acidus, a species belonging to the family Phyllanthaceae is native to Madagascar and found in many parts of Asia. Despite its name, it doesn't resemble gooseberry. It is one of the unknown and under-utilized fruit in terms of commercialization and processing. The fruit has a greenish yellow skin and a white to cream colored fleshy interior that covers a pit of seeds. It has a tangy taste. Plant extracts offer therapeutic qualities, according to studies. It harbors a high anti-oxidant potential and other minerals like iron, calcium, manganese and can be taken as a liver tonic. This essay examines the plant's therapeutic and nutritional qualities as well as its commercial uses.



INTRODUCTION

Phyllanthus acidus is a tropical tree in the Phyllanthaceae family. The tree can grow to a height of 10 meters and is occasionally categorized as an ornamental shrub. The small, thick, pink blossoms are produced by the rough, gray bark. Within 90–100 days, the three different flower types—male, female, and hermaphrodite—mature into hard, sour, oblate, and drupaceous fruits. (Morton, 1987). This species is tropical or subtropical and can be found in South America, Central America, the Caribbean, and all throughout Asia. It is referred to as "Grosella" in Puerto Rico. (Jules J and Paull. R. E, 2008)

The fruit is called Karmay in the Philippines, Jimbelin in Jamaica, Otaheite gooseberry in India, Lao in Tibet, Grosella in Puerto Rico and Belize, damsel in Grenada, chellomello in the Cayman Islands, sour cherry in Trinidad, mayom in Thailand, kantuet in Cambodia, or gooseberry, depending on the region in which it grows. (Afrin et al., 2016 and Orwa et al., 2009).

GROWTH CONDITIONS

The tree's ability to grow and adapt to a wide range of soil types accounts for its widespread distribution. However, moist soil types are favoured. *P. acidus* is mostly grown from fruit seeds. Budding or air layers

are alternate methods by which the plant may be cultivated. The main pest known to harm the cultivation of these fruit trees and causes total defoliation is the *Phyllanthus* caterpillar. The tree can be found growing between 0 and 1000 meters above sea level. Recorded growth at 914 m has been documented in El Salvador (Morton, 1987, Orwa et al., 2009).

Moist soil is preferred by Otaheite gooseberries. In addition to standard seed growth, it can be cultivated via air-layering, cutting, and budding. The tree is grown for food and medicine in addition to its aesthetic value. Although it yields fruit all year round, the majority of the harvest occurs in January, with the exception of South India, where it bears fruit in April–May and again in August–September. When the fruit starts to fall, it is harvested since it does not soften when it is ripe (Morton and Julia, 1963).



Figure 1. *Phyllanthus acidus* fruit and tree

THE FRUIT

Fruits have a 2 cm diameter and are tightly packed. (Afrin et al. 2016 and Orwa et al., 2009). When the fruit reaches maturity, its colour changes from yellowish green to yellow. Because of their high acid content, mature fruits are typically acidic and sour. Although it can be eaten raw, the fruit is typically eaten with salt. The fruit is prepared for commercial sale in Thailand. The fruit has been adapted in many cuisines across its diverse geographic locations, where it is used to make pickles, syrups, sweetened dried fruit, or preserves when combined with other fruits. Drinks are made with fruit juice and vinegar. (Orwa et al., 2009).

THE FLOWER

They are tiny, pinkish, and grouped together in panicles that are 5 to 12.5 cm long. At the top of the tree, in the leafless sections of the main branches, flowers develop. The fruits are many, oblate, tightly grouped, and have six to eight ribs. They are quite sour, crisp and juicy, waxy, pale yellow or white, and juicy. Every fruit has a stone in the middle that holds four to six seeds. (Morton, 1987).

NUTRITIONAL PROFILING

The fruit yields high moisture content despite some sugars, phenolics and acids in it. Some notable minerals present are calcium, iron, manganese, potassium and zinc. It also contains trace amounts of vitamin B (thiamine, 0.01 mg/100 g, and riboflavin, 0.05 mg/100 g), ascorbic acid (36.7 mg/100 g), and other nutrients. (Shilali, 2015). *P. acidus* also contains hypogallic acid, kaempferol, adenosine, caffeic acid, and 4-hydroxybenzoic acid.

Table 1. Nutritional composition of *Phyllanthus acidus* fruits (Brooks et al., 2020)

Nutrient	(Thailand)	% (India)
Moisture (%)	91.7	86.7
Carbohydrates (%)	6.4	4.8
Protein (%)	0.7	0.25
Fat (%)	0.52	Not determined
Fibre (%)	0.51	Not determined

Table 2. Chemical constituents in *Phyllanthus acidus* fruits (Mahapatra et al., 2012)

Constituents	Percentage (%)
Reducing sugar	0.04
Non-reducing sugar	4.46
Phenol	0.6
Acid	0.45

ANTI-OXIDANT PROPERTIES

High amounts of antioxidant activity are seen in *P. acidus* fruit and leaf extracts, which is important for cardiovascular health. (Nisar et al., 2018). The 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay was used to evaluate fruit aqueous extracts in vitro. The results showed that water extracts had higher levels of antioxidant activity than ethanolic extracts. The antioxidant activity of pulp and seed

extracts is strong, with IC50 values of 5.96 µg/mL and 6.79 µg/mL, respectively. Compared to the seed (16.2 gallic acid equivalents/g of dried sample), the fruit pulp (25.6 mg gallic acid equivalents/g of plant extract) had a higher overall phenolic content. (Foyzun et al., 2016).

Table 3. Minerals and vitamins composition of *Phyllanthus acidus* fruits (Mahapatra et al., 2012)

Constituents	mg/100g
Potassium	223.44
Calcium	163.22
Sodium	17.5
Iron	2.43
Zinc	1.63
Manganese	1.31
Copper	0.20
Carotenoids	2.43
Ascorbic acid	36.7

FOOD INDUSTRY APPLICATIONS

Commercial exploitation of agricultural products of these fruits rises when value-added products (beverages, candies, jams, pulps, sorbets, etc.) with substantial nutritional and therapeutic value are produced from them. Raw *P. acidus* pickles having a good shelf-life is a notable fermented product.

There are several components of the plant that are edible. The cooked leaves are consumed in Indonesia, Bangladesh, and India. Although the fruit is consumed raw in Indonesia and occasionally added to other foods as a flavouring, it is usually thought to be too sour to be consumed unprocessed. It is used to make chutney, relish, or preserves after being candied in sugar or pickled in salt. (National Geographic, 2008)

It is consumed raw, soaking in salt or vinegar-salt solution, and sold by the roadside in the Philippines, where it is also used to produce vinegar. It is also candied and is typically kept in syrup-filled jars. In Malaysia, these are turned into syrup. It is also used to make fruit juice, which is heavily sweetened. It is a common component in Thai recipes for Som Tam, pickles, and boil-in-syrup (Ma-Yom Chuam). (Janick et al., 2008). The tree is rarely harvested for wood and utensils can be made out of it.

(a) Pickle



(b) Amla ginger candy



Figure 2. Food products made from *P. acidus*

THERAPEUTIC QUALITIES

Every portion of the tree is thought to have unique therapeutic qualities in Indonesia. The fruits have laxative, astringent, and ulcer-healing properties. The leaves have been used to cure scurvy, cough, asthma, cancer, hepatic diseases, inflammation, rheumatism and weight loss. The bark is applied on rashes and asthma. The fruit is eaten raw by locals or used as a pickle ingredient. 200 mL of water is combined with 25 g of plant material to make medicine. (Dalimartha, 2008). Fruit extracts provide analgesic, anaesthetic, hypoglycaemic, and antidiarrheal effects. (Afrin et al., 2016). Infusions of roots have been used to treat foot psoriasis too.

CONCLUSION

The *Phyllanthus Acidus* is reported to be one of the under-rated fruits in terms of its utilization despite it holding numerous health benefits. Traditional medicine uses *P. acidus* preparations to treat a variety of illnesses. Research has validated the plant's antioxidant and nutraceutical characteristics. The fruits are a source of vitamins and minerals and is utilized in the manufacturing of value-added products such as jams and drinks. Studies demonstrated that, the greatest potential for antioxidant and cytotoxic effects is seen in *P. acidus* water extract. It is abundant in phyto-constituents, including phytosterols, tannin, gallic acid, tartaric acid, and ascorbic acid. In Ayurveda, the majority of these species are helpful in treating skin, respiratory, and digestive disorders.

REFERENCES

Afrin, F., S. Banik, and M.S. Hossain. 2016. Pharmacological activities of methanol extract of *Phyllanthus acidus* pulp. *Journal of Medicinal Plants Research* 10(43):790–795. doi:10.5897/JMPR2015.5806.

- Brooks. R., Goldson-Barnaby. A. and Bailey. D (2020). Nutritional and Medicinal Properties of *Phyllanthus Acidus* L. (Jimbilin), *International Journal of Fruit Science* (1706-1710) <https://doi.org/10.1080/15538362.2020.1830013>
- D Andrianto et al 2017. Anti-oxidant and cytotoxic activity of *Phyllanthus acidus* fruit extracts. *IOP Conference Series: Earth and Environmental Science*, 58 (2017) 01, 2022. doi:10.1088/1755-1315/58/1/012022
- Dalimartha S 2008 *Atlas Tumbuhan Obat Indonesia Jilid 1* (Jakarta: Trubus Agriwidya)
- Foyzun, T., K. Aktar, and M.A. Uddin. 2016. Evaluation of antioxidant, cytotoxic and antimicrobial activity of *Phyllanthus acidus*. *International Journal of Pharmacognosy and Phytochemical Research*. (11:1751–1758.)
- Gupta, I. C.; S. K. Gupta (1 January 1992). *Concept S Dictionary of Agricultural Sciences*. Concept Publishing Company. pp. 346–347. ISBN 978-81-7022-301-6. Retrieved 30 October 2011.
- Janick, Jules; Robert E. Paull (12 April 2008). *The Encyclopedia of Fruit & Nuts*. CABI. p. 373. ISBN 978-0-85199-638-7. Retrieved 30 October 2011.
- Mahapatra, A.K., S. Mishra, U.C. Basak, and P.C. Panda. 2012. Nutrient analysis of some selected wild edible fruits of deciduous forests of India: An explorative study towards non-conventional bio-nutrition. *Advanced Journal of Food Science and Technology*.1 (15–21).
- Morton, J. 1987. Otaheite Gooseberry, p. 217–219. In: C.F. Dowling (ed.). *Fruits of warm climates*. Original from The University of Michigan, USA: Julia F. Morton, Miami, Fla
- National Geographic (18 November 2008). *Edible: an Illustrated Guide to the World's Food Plants*. National Geographic Books. p. 110. ISBN 978-1-4262-0372-5. Retrieved 30 October 2011.
- Nisar, M., J. He, A. Ahmed, Y. Yang, M. Li, and C. Wan. 2018. Chemical components and biological activities of the genus *Phyllanthus*: A review of the recent literature. *Molecules* 23(10):2567. doi: 10.3390/molecules23102567.
- Orwa, C., A. Mutua, R. Kindt, R. Jamnadass, and S. Anthony. 2009. *Agro forestree database: A tree reference and selection guide version 4.0*
- Shilali, K. 2015. Screening of phytochemical and their pharmacological properties of *Phyllanthus acidus*. Kuvempu University, Doctoral Thesis.



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