

Scope and Importance of Rambha Plant, *Pandanus amaryllifolius* in Shervaray hills

G. Malathi*, S. Gomathi

Horticultural Research Station, Tamil Nadu Agricultural University, Yercaud, Tamil Nadu, India.

*Corresponding author's e-mail: malathihort@gmail.com

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ABSTRACT

Pandanus amaryllifolius Roxb., commonly known as pandan, is a tropical aromatic spice crop belonging to the family Pandanaceae and is widely cultivated throughout Southeast Asia. Owing to its evolutionary sterility, the species is propagated exclusively through vegetative methods, making human intervention essential for its cultivation and distribution. The cool climate, humid conditions, fertile soils, and partial shade environment of the Shervaray hills provide highly favourable conditions for its cultivation. Pandan is highly valued for its characteristic aroma, primarily attributed to the volatile compound 2-acetyl-1-pyrroline (2AP), and is extensively used as a natural flavouring and colouring agent in the food industry. In addition to its culinary importance, the plant is a rich source of bioactive compounds, including phenolics, flavonoids, carotenoids, alkaloids, essential oils, and amino acids, which exhibit antioxidant, antimicrobial, anti-inflammatory, antiviral, and potential anticancer properties. This review summarizes the botanical characteristics, phytochemical composition, cultivation practices, and diverse applications of *Pandanus amaryllifolius* in the food, pharmaceutical, cosmetic, and other industrial sectors. The growing demand for natural products highlights the significant potential of pandan as a multifunctional crop for sustainable agriculture and value-added product development.

INTRODUCTION

Pandanus amaryllifolius, commonly known as pandan, is an aromatic tropical herb belonging to the family Pandanaceae. It is native to Southeast Asia and is widely cultivated in countries such as

Indonesia, Malaysia, Thailand, the Philippines, Singapore, Sri Lanka, and India. The plant is well known for its pleasant aroma and is extensively used as a natural flavouring and colouring agent in traditional cuisines.

A unique characteristic of *Pandanus amaryllifolius* is its evolutionary sterility. The plant rarely produces flowers and almost never sets seeds under either natural or cultivated conditions. Consequently, its survival and worldwide distribution depend entirely on vegetative propagation through human intervention.

The Shevaray hills in Tamil Nadu have a cool climate, moderate rainfall, rich organic soils and a humid environment, which are conducive for growing ornamental plants including cut foliages, aromatic and medicinal crops. The area is already rich in spice crops, coffee plantations, medicinal plants and horticulture crops. *Pandanus amaryllifolius* has immense potential as an alternative high-value spice crop appropriate for hill horticulture. Being easily adaptable to partial shade, relatively low maintenance and having a number of commercial applications makes it a desirable choice for the small and marginal farmers. The plant holds medicinal significance and also provides potential for producing essential oil, and development of herbal products and eco-friendly farming systems.

HISTORY OF THE PLANT

Pandanus amaryllifolius was first described by the Scottish botanist William Roxburgh in 1832. The species was later revised by the American botanist Benjamin C. Stone in 1978 based on a male flowering specimen collected from Maluku Island, Indonesia. Today, pandan is widely cultivated throughout tropical Asia.

The family Pandanaceae comprises approximately 600 species distributed across tropical and subtropical regions of the world. Of these, 19 species are reported from India.

TAXONOMIC DESCRIPTION

Kingdom: Plantae

Phylum: Tracheophyta

Class: Liliopsida

Order: Pandanales

Family: Pandanaceae

Genus: *Pandanus*

Species: *Pandanus amaryllifolius* Roxb.



Pandanus amaryllifolius is a monocotyledonous perennial shrub with long, simple, linear green leaves possessing entire margins and slightly spiny tips. The leaves may grow up to 4.5 m in length, while the entire plant typically reaches 1.2–1.5 m in height. Mature plants develop characteristic woody aerial roots that provide structural support.

The species is completely sterile because it does not produce functional female flowers and therefore cannot produce seeds. As a result, commercial multiplication is achieved exclusively

through vegetative propagation using suckers or stem cuttings. The crop is well adapted to warm, humid tropical climates and grows best in moist sandy loam soils with good drainage. Pandan leaves are widely used as a natural flavouring and colouring agent in numerous dishes and desserts. They impart a vibrant green colour and a distinctive sweet, vanilla-like aroma due to the presence of the volatile compound 2-acetyl-1-pyrroline (2AP).

Beyond culinary uses, pandan has long been employed in traditional medicine. The leaves are used to refresh the body, reduce fever, relieve indigestion, and manage several minor ailments. Owing to its diverse phytochemical composition, the plant has attracted considerable scientific interest for its medicinal potential.

BIOACTIVE COMPOUNDS PRESENT IN *Pandanus amaryllifolius*

Pandan leaves are rich in aromatic compounds, phytochemicals, antioxidants, flavonoids, phenolics, and several other bioactive constituents responsible for their nutritional and medicinal properties.

The leaves contain essential oils, carotenoids, tocopherols, tocotrienols, quercetin, alkaloids, fatty acids, non-specific lipid transfer proteins, and unique alkaloids such as pandamarilactone-1, pandamarilactone-3, pandamarilactone-A, and pandamarilactone-B. They are also a good source of amino acids including glutamic acid, aspartic acid, threonine, and serine.

Phenolic compounds and flavonoids contribute significantly to the plant's antioxidant, antimicrobial, anti-inflammatory, and anticancer activities. Flavonoids are also reported to possess antibacterial properties and may help maintain oral health by regulating microbial growth.

The principal volatile compound, 2-acetyl-1-pyrroline (2AP), is responsible for the characteristic vanilla-like fragrance of pandan leaves.

MAJOR BIOACTIVE CONSTITUENTS INCLUDE

- **2-Acetyl-1-pyrroline (2AP):** Responsible for the characteristic aroma.
- **Phenolics and flavonoids:** Including catechin, rutin, and quercetin with strong antioxidant, antimicrobial, and anticancer properties.
- **Carotenoids and chlorophyll:** Provide natural pigments and antioxidant activity.
- **Essential amino acids:** Including glutamic acid, aspartic acid, threonine, and serine.
- **Alkaloids:** Including pandamarilactones that contribute to various biological activities.

Understanding these compounds provides valuable insights into the plant's nutritional and medicinal potential.

CULTIVATION TECHNIQUES

Pandanus amaryllifolius grows best in fertile, well-drained loamy or alluvial soils rich in organic matter with a slightly acidic to neutral pH of 5.5–7.0. The crop thrives under warm and humid tropical conditions with temperatures ranging from 20°C to 30°C. Partial shade or filtered sunlight is preferred because prolonged exposure to intense sunlight may scorch the leaves.

The soil should remain consistently moist through regular irrigation at intervals of 6–10 days, while avoiding waterlogging. High atmospheric humidity promotes vigorous vegetative growth. Since the plant is sterile, propagation is carried out exclusively through vegetative means. Healthy suckers, lateral shoots, or stem cuttings measuring 15–40 cm in length with well-developed aerial roots are detached from the mother plant and planted directly in nursery beds or rooting media.

The propagules should be maintained under 50–70% shade with adequate moisture until root establishment, which generally occurs within 4–6 weeks. The rooted plants are then transplanted to the main field.

A spacing of 45–60 cm between plants and 60 cm between rows is recommended for field cultivation. This spacing accommodates the development of aerial roots, facilitates intercultural operations, and allows the crop to be cultivated either as a monocrop or as an intercrop beneath plantation crops or sparse forest canopies. Pandan (*Pandanus amaryllifolius*) can be successfully cultivated as an intercrop in the coffee- and black pepper-based multi-tier cropping system of the Shervaroy Hills. The crop is relatively free from major pests and diseases that cause significant economic losses, making it a low-risk cultivation option. Consequently, pandan cultivation offers a reliable source of additional income for farmers in the Shervaroy Hills while efficiently utilizing the available growing space within the existing cropping system.

APPLICATIONS OF *Pandanus amaryllifolius*

FOOD INDUSTRY

Pandan leaves are widely used as natural colouring and flavouring agents in the food industry because of their high chlorophyll content and pleasant aroma. The characteristic fragrance produced by 2-acetyl-1-pyrroline (2AP) enhances the sensory quality of various foods. The leaves are commonly used to enhance the aroma of non aromatic rice varieties by absorption of 2AP by grains. It is also used to flavour value added products including cakes, pastries, puddings, jellies, jams, beverages, tea, and confectionery products. Pandan leaves also serve as a natural alternative to synthetic flavouring agents and vanilla essence in several traditional and modern food products.

MEDICINAL APPLICATIONS

Pandan has been used extensively in traditional medicine for treating toothache, rheumatism, inflammation, fever, and digestive disorders. Fresh tender shoots are traditionally consumed for the management of jaundice, while the roots are used in folk medicine to reduce high fever and manage thyroid-related disorders.

Scientific studies have demonstrated that pandan extracts possess antibacterial activity against *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa*. Antiviral activity against influenza viruses and several other human pathogenic viruses has also been reported.

The leaves contain dietary fibre that may help regulate blood glucose levels, making them potentially beneficial for diabetic patients. Flavonoids such as quercetin and catechin exhibit strong antioxidant activity and have shown promising anticancer potential by neutralizing free radicals and inhibiting cancer cell proliferation.

OTHER INDUSTRIAL APPLICATIONS

Pandan leaves are increasingly utilized in the cosmetic and fragrance industries because of their pleasant natural aroma. Essential oils extracted from the leaves are incorporated into perfumes, skin-care products, anti-ageing serums, luxury hair-care formulations, and aromatherapy products. Certain alkaloids and volatile compounds present in the plant also exhibit insect-repellent properties and are being explored for the development of eco-friendly mosquito and cockroach repellents. Some studies have also reported repellent effects against rodents.

CONCLUSION

Pandanus amaryllifolius has evolved from a traditional Southeast Asian crop into a globally important aromatic spice crop despite its complete dependence on vegetative propagation. Its unique aromatic compound, 2-acetyl-1-pyrroline (2AP), makes it an invaluable natural flavouring and colouring agent in the food industry. In addition, the plant is rich in bioactive compounds such as phenolics, flavonoids, carotenoids, alkaloids, and essential amino acids, which contribute to its antioxidant, antimicrobial, anti-inflammatory, antiviral, and potential anticancer activities.

With increasing consumer preference for natural food ingredients, herbal medicines, and eco-friendly products, *Pandanus amaryllifolius* holds considerable promise for future applications in the food, pharmaceutical, cosmetic, and agricultural industries. Further research on its phytochemistry, pharmacological properties, and commercial cultivation will enhance its utilization as a valuable multifunctional crop.

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REFERENCES

- Bhuyan, B., & Sonowal, R. (2021). An overview of *Pandanus amaryllifolius* Roxb. ex Lindl. and its potential impact on health. *Current Trends in Pharmaceutical Research*, 8(1), 138–157.
- Malathi, G., & Praveen Kumar, K. (2026). *Alpinia zerumbet*: A promising ornamental, aromatic and medicinal tree crop for Yercaud Hills. *Agroscience Today*, 7(6), 1273.
- Malathi, G., Praveen Kumar, K., & Aravind, M. (2026). Cut foliage industry: Scope, importance and cultivation. *Agroscience Today*, 7(4), 1227.
- Nurashid, H. N. H. H., Baharuddin, A. S., Amin, N. A. M., Nordin, M. F. M., & Hafid, H. S. (2025). Progress on the studies of *Pandanus amaryllifolius*, its cultivation in Malaysia, and its application in various fields. *Advances in Agricultural and Food Research Journal*, 6(2).
- Wahyuni, D. K., Nuha, G. A., Atere, T. G., Kharisma, V. D., Tari, V. S., Rahmawati, C. T., & Purnobasuki, H. (2024). Antimicrobial potentials of *Pandanus amaryllifolius* Roxb.: Phytochemical profiling, antioxidant, and molecular docking studies. *PLoS ONE*, 19(8), e0305348. <https://doi.org/10.1371/journal.pone.0305348>