



Cultivation Practices and Sustainable Production of Periwinkle (*Catharanthus roseus*) Under Indian Conditions

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Periwinkle (*Catharanthus roseus*), an important medicinal and ornamental plant, has gained significant attention due to its production of vital alkaloids like vincristine and vinblastine, extensively used in cancer treatment. India, with its diverse agro-climatic conditions, offers a favourable environment for its cultivation. This review focuses on standard cultivation practices, environmental requirements, medicinal uses, and sustainable production techniques of periwinkle under Indian conditions, emphasizing its role in agriculture, pharmaceutical industries, and rural economies. Further research and improved agronomic management are essential to ensure sustainable growth and higher yields.

Introduction

Periwinkle (*Catharanthus roseus*), belonging to the family Apocynaceae, is a tropical plant renowned for its ornamental beauty and medicinal value. Native to Madagascar, it has adapted widely across tropical and subtropical regions, including India. The plant is a natural source of important alkaloids used in the treatment of cancers, hypertension, and diabetes. With increasing demand for herbal medicines and plant-based pharmaceuticals, the cultivation of periwinkle has gained commercial importance. This article reviews the standard agronomic practices for periwinkle cultivation in India and discusses strategies for sustainable production.

Botanical Description

Periwinkle is a perennial herb or subshrub that grows up to 30–100 cm in height. It has glossy, dark green leaves arranged oppositely and attractive flowers that are pink, white, or purple. The plant thrives in warm climates and requires minimal maintenance, making it ideal for commercial cultivation in India's varied agro-ecological zones.

Climate and Soil Requirements

Periwinkle prefers a warm and humid climate.

Temperature: Ideal temperature ranges between 20°C to 30°C.

Rainfall: Annual rainfall of 100–200 cm is favourable.

Soil: Well-drained sandy loam to loamy soil with pH between 6.0 and 7.5 is best suited.

It can tolerate a range of soil types but waterlogging should be avoided, as it affects root health and alkaloid synthesis.

Varieties Grown in India

Some improved varieties suitable for Indian conditions include:

Nirmal: High leaf yield and alkaloid content.

Dhawal: White-flowered type with good adaptability.

Lochan: Pink-flowered, rich in vinblastine.

Prabal: High vincristine content, suitable for pharmaceutical extraction.

Propagation Methods

Periwinkle is propagated both by seeds and vegetative cuttings.

Seed Propagation: Fresh seeds are sown in nurseries and transplanted after 4–6 weeks.

Cuttings: Stem cuttings of 8–10 cm length are rooted under mist conditions for quick establishment.

Seed propagation is most common for large-scale cultivation due to ease and cost-effectiveness.

Land Preparation and Sowing

Land Preparation: Deep ploughing followed by harrowing ensures a fine tilth. Well-rotted FYM (farmyard manure) @ 10–12 tons/ha should be incorporated.

Sowing Time: In North India, sowing is done in February–March and again in July–August. In South India, year-round cultivation is possible.

Spacing: 30 cm × 30 cm is ideal for better canopy development and root expansion.

Seed Rate: 1–1.5 kg seeds per hectare.

Nutrient Management

Organic Manure: Application of 8–10 tons of compost/FYM ensures good plant health.

Chemical Fertilizers: A basal dose of NPK (40:20:20 kg/ha) should be applied, followed by top dressing with nitrogen (40 kg/ha) after 45 days of planting.

Biofertilizers like Azospirillum and Phosphate Solubilizing Bacteria (PSB) can enhance sustainable production by reducing chemical inputs.

Irrigation Management

- Periwinkle requires moderate irrigation.
- Irrigate once every 7–10 days during dry periods.
- Avoid overwatering as it may cause root rot.
- Efficient drip irrigation systems can improve water use efficiency and reduce weed growth.

Weed Management

Manual weeding is recommended during the early stages of growth (first 2–3 months).

Mulching with organic materials can suppress weeds and conserve soil moisture.

Pest and Disease Management

Periwinkle is relatively hardy but can be affected by:

Pests: Aphids, mealy bugs, and caterpillars.

Diseases: Leaf spot, damping-off, and root rot.

Use of neem-based biopesticides and Trichoderma spp. for biological control promotes sustainable crop protection.

Important Compounds of Periwinkle

Periwinkle is a rich source of valuable bioactive compounds, mainly alkaloids, which contribute to its medicinal properties.

Key compounds include:

- **Vincristine:** Used in chemotherapy for leukemia and Hodgkin's lymphoma.
- **Vinblastine:** Effective against breast cancer and lymphomas.
- **Ajmalicine:** Used for blood pressure control and improving cerebral blood flow.
- **Serpentine and Locherine:** Possess antimicrobial and sedative properties.

These compounds are primarily extracted from leaves, stems, and roots, and their concentration can vary based on variety, environment, and cultivation practices.

Medicinal Uses of Periwinkle

- Periwinkle has a long history of use in traditional and modern medicine:
- Cancer Treatment: Vincristine and vinblastine are vital chemotherapy agents.

- Diabetes Management: Leaf extracts help reduce blood sugar levels.
- Blood Pressure Regulation: Root alkaloids like ajmalicine assist in lowering hypertension.
- Antimicrobial Activity: Extracts show activity against a range of bacterial and fungal pathogens.
- Wound Healing: Topical applications help in faster healing of wounds.
- Neuroprotective Effects: Some compounds offer potential benefits for neurodegenerative diseases.
- Thus, periwinkle serves both as a curative and preventive medicinal plant globally.

Harvesting and Yield

- Harvesting is done after 6–8 months of planting when plants are fully matured.
- Leaves and roots are separately collected, dried under shade, and processed for alkaloid extraction.
- **Average Yield:** 3–5 tons of dry leaves and 0.5–1 ton of roots per hectare under good management practices.

Sustainable Production Practices

- To achieve sustainable production:
- Use of organic manures and biofertilizers.
- Conservation of soil and water through mulching and drip irrigation.
- Integrated pest and nutrient management.
- Adoption of Good Agricultural Practices (GAP).
- Sustainable practices not only ensure environmental protection but also enhance the medicinal quality of the produce.

Conclusion

Periwinkle (*Catharanthus roseus*) holds immense promise as a commercial and medicinal crop under Indian conditions. Adoption of proper agronomic practices, organic farming techniques, and sustainable resource management can significantly boost its productivity and quality. The incorporation of medicinal value and sustainable cultivation strategies makes periwinkle a lucrative crop for farmers and industries alike. Future efforts should focus on developing high-yielding, disease-resistant varieties and strengthening value chains for periwinkle-based products to benefit both agriculture and healthcare sectors.