Ornamental plants play an important role in indoor air purification

[1]Manikandan R and [2]Naveen M

[1]PG Scholar, Department of Floriculture and Landscape Architecture, SRM College of agricultural Sciences, Chengalpattu

[2]Soil Analyst, Vellore Institute of Technology, Vellore - 632014.

Corresponding Author: mk6379590@gmail.com

Abstract

Rapid urban growth, changing lifestyles, and reduced natural ventilation in buildings have led to increased indoor air pollution. Everyday sources such as dust particles, cigarette smoke, cooking vapors, wall paints, and furniture containing volatile organic compounds (VOCs) can seriously affect human health. Ornamental plants not only enhance indoor aesthetics but also help clean the air by absorbing pollutants, releasing oxygen, and maintaining moisture levels. By reducing harmful substances like benzene, carbon monoxide, and formaldehyde, these plants serve as an affordable and eco-friendly option for creating healthier indoor spaces.

Key words : Ornamental plants, Air purification, Volatile organic compounds (VOCs), Formaldehyde removal, Benzene absorption.

Introduction

Indoor environments often contain pollutants such as fine dust, carbon dioxide, benzene, and formaldehyde, which can harm human health. Ornamental plants function as natural purifiers by absorbing these harmful substances and releasing oxygen. They also help maintain healthy humidity levels, making indoor spaces more comfortable. Plants like snake plant, spider plant, peace lily, and areca palm are particularly effective at improving air quality, making them excellent choices for homes, offices, and educational environments.

Sources of Indoor Air Pollution

Indoor air pollution has become a major issue as contaminants from both outdoor and indoor sources tend to accumulate in closed environments. Everyday tasks like cooking, heating, and smoking can release gases such as carbon monoxide and nitrogen dioxide, along with fine particulate matter. Additionally, items like paints, synthetic furnishings, adhesives, building materials, and cleaning supplies emit volatile organic compounds (VOCs), including benzene and formaldehyde, especially in spaces with poor airflow. Biological pollutants—such as mold spores, dust mites, bacteria, and pollen—along with emissions from electronics and tobacco smoke, further degrade indoor air quality.

Many modern energy-efficient buildings are tightly sealed to reduce energy loss, but this limited ventilation often allows pollutants to concentrate indoors, sometimes making indoor air more harmful than outdoor air. Prolonged exposure to these pollutants can lead to respiratory illnesses, allergies, asthma, heart-related diseases, and increased discomfort. It can also facilitate the spread of airborne pathogens, emphasizing the importance of clean indoor air for maintaining good health.

Mechanism of Air Purification by Plants

Ornamental plants improve indoor air quality through several natural mechanisms. The most fundamental process is photosynthesis, where plants take in carbon dioxide and release oxygen, helping maintain a healthy air balance. Their leaves also absorb harmful gases and volatile organic compounds (VOCs) through tiny openings called stomata and waxy surfaces, capturing pollutants like formaldehyde and benzene commonly found indoors.

Beyond leaf-level filtration, plant roots and the microorganisms living in the soil break down toxic chemicals that accumulate around them, acting like a natural purification system. Plants also release moisture through transpiration, which helps regulate indoor humidity and reduces problems associated with dry air. Additionally, their leaf surfaces trap dust and other fine particles, preventing them from circulating in the indoor environment.

Through these combined natural processes—photosynthesis, pollutant absorption, microbial detoxification, humidity regulation, and dust trapping—ornamental plants provide an eco-friendly and sustainable way to purify indoor air.

Ornamental Plants with High Air-Purifying Capacity

Several ornamental indoor plants are well-known for their ability to naturally purify the air and enhance indoor environments. NASA's Clean Air Research highlighted that specific species can absorb harmful pollutants such as benzene, formaldehyde, ammonia, xylene, and trichloroethylene commonly found in enclosed spaces. Popular air-cleaning plants include *Chlorophytum comosum* (spider plant), *Epipremnum aureum* (golden pothos), *Spathiphyllum wallisii* (peace lily), *Ficus benjamina* (weeping fig), and *Dracaena fragrans*. These plants filter toxins through their leaves and root-microbe systems, while simultaneously releasing oxygen and adding refreshing greenery to interiors.

Hedera helix (English ivy), *Chrysanthemum morifolium* (florist's chrysanthemum), *Dieffenbachia compacta*, *Chrysalidocarpus lutescens* (areca palm), and *Syngonium podophyllum* (arrowhead vine). Beyond pollutant removal, many indoor plants help regulate humidity, support mental wellness, and reduce stress. With their combined benefits and ease of growing, ornamental indoor plants serve as a cost-effective and eco-friendly approach to creating healthier, more pleasant living and working spaces.

Benefits Beyond Air Purification

Ornamental plants provide much more than air purification; they also significantly enhance physical and psychological well-being. Their attractive appearance adds vibrancy to homes, schools, and offices, creating inviting and aesthetically pleasing spaces. Research indicates that indoor greenery can help reduce stress, lower anxiety, uplift mood, and improve focus and productivity, making plants especially beneficial in work and learning environments.

Certain aromatic plants, such as lavender and lemon balm, offer soothing fragrances that may ease cold symptoms, support better sleep, and promote relaxation. Beyond removing pollutants, many indoor plants help regulate humidity, reduce noise, and create a comfortable microclimate, contributing to better respiratory comfort and reduced fatigue.

Common Name	Botanical Name	Pollutants Removed	Care Requirements
Spider Plant	Chlorophytum comosum	Formaldehyde, Xylene, Toluene	Easy care, indirect sunlight, tolerates temperature variations
Snake Plant	Sansevieria trifasciata	Formaldehyde, Benzene, Xylene, Toluene, Nitrogen oxides	Low-maintenance, low light tolerant, infrequent watering
Peace Lilly	Spathiphyllum	Formaldehyde, Benzene, Trichloroethylene, Xylene, Ammonia	Indirect light, moist soil
Boston Fern	Nephrolepis exaltata	Formaldehyde, Xylene	High humidity, indirect light, regular watering
English Ivy	Hedera helix	Formaldehyde, Benzene, Xylene, Toluene	Moderate light, moist soil
Rubber Plant	Ficus elastica	Formaldehyde	Bright indirect light, moderate watering
Golden Pothos	Epipremnum aureum	Formaldehyde, Benzene, Xylene, Toluene	Very easy care, low light tolerant
Bamboo Palm	Chamaedorea seifrizii	Formaldehyde, Benzene, Trichloroethylene, Xylene	Indirect light, regular watering
Dracaena	Dracaena spp.	Formaldehyde, Benzene, Trichloroethylene, Xylene, Toluene	Bright indirect light, moist soil
Areca Palm	Dypsis lutescens	Formaldehyde, Xylene, Toluene	Bright indirect light, regular watering

Conclusion

Ornamental plants play a valuable role in creating healthier indoor spaces by naturally improving air quality. They absorb harmful pollutants, release oxygen, regulate humidity, and trap dust particles, helping reduce respiratory irritants and creating fresher indoor environments. Beyond purification, these plants offer several additional benefits: they enhance interior aesthetics, reduce stress, boost mood, and support mental well-being. Their presence can promote relaxation, increase productivity, and contribute to a more refreshing and pleasant atmosphere in homes, offices, and public buildings.

References

Travaglini, A., Della Giustina, A., di Bucchianico, A. D. M., De Franco, D., Brighetti, M. A., Gori, A., ... & Tripodi, S. (2025). The The role of plants in improving indoor air quality. *Italian Journal of Pediatric Allergy and Immunology*.

Susanto, A. D., Winardi, W., Hidayat, M., & Wirawan, A. (2021). The use of indoor plant as an alternative strategy to improve indoor air quality in Indonesia. *Reviews on Environmental health*, *36*(1), 95-99.

Hörmann, V. (2018). *Biofiltration of indoor pollutants by ornamental plants* (Vol. 45). Cuvillier Verlag.

Gong, Y., Zhou, T., Wang, P., Lin, Y., Zheng, R., Zhao, Y., & Xu, B. (2019). Fundamentals of ornamental plants in removing benzene in indoor air. *Atmosphere*, *10*(4), 221.

Bandehali, S., Miri, T., Onyeaka, H., & Kumar, P. (2021). Current state of indoor air phytoremediation using potted plants and green walls. *Atmosphere*, *12*(4), 473.

Dela Cruz, M., Christensen, J. H., Thomsen, J. D., & Müller, R. (2014). Can ornamental potted plants remove volatile organic compounds from indoor air—a review. *Environmental Science and Pollution Research*, *21*(24), 13909-13928.

Mata, T. M., Martins, A. A., Calheiros, C. S., Villanueva, F., Alonso-Cuevilla, N. P., Gabriel, M. F., & Silva, G. V. (2022). Indoor air quality: a review of cleaning technologies. *Environments*, *9*(9), 118.

El-Tanbouly, R., Hassan, Z., & El-Messeiry, S. (2021). The role of indoor plants in air purification and human health in the context of COVID-19 pandemic: a proposal for a novel line of inquiry. *Frontiers in Molecular Biosciences*, *8*, 709395.

* * * * * * * * *