



A Review on Ornamental Plants And Their Multifunctional Uses: Aesthetic, Ecological, Health, And Socio-Economic Dimensions

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Abstract

Ornamental plants beautify landscapes while delivering ecological, economic, and health benefits (Elmqvist et al., 2019; Millennium Ecosystem Assessment, 2005). They regulate microclimate, filter air, support biodiversity, and improve wellbeing (Bowler et al., 2010; Nowak et al., 2014; Baldock et al., 2015; Ulrich, 1984). Risks include invasiveness, allergenicity, and high inputs (Reichard & White, 2001; Cariñanos & Casares-Porcel, 2011). Contemporary practice emphasizes native, low-input, climate-resilient palettes and nature-based solutions (Roloff, 2016; IPBES, 2019; Berland et al., 2017). We synthesize evidence and propose design and policy directions.

Keywords: Ornamental horticulture; biodiversity; ecosystem services; air purification; phytoremediation; indoor plants; cut flower industry; pollinators; sustainable landscape; human health.

1. Introduction

Ornamental plants—cultivated for color, fragrance, form, and foliage—span annuals, perennials, shrubs, trees, climbers, succulents, and aquatics (Hartmann et al., 2011; Dole & Wilkins, 2016). Their cultural roots track ancient gardens of Egypt, China, and India (Turner, 2005) and today they structure urban parks, streetscapes, and homes (Dole & Wilkins, 2016). The sector is economically significant via cut flowers and nursery stock (Van Uffelen & de Groot, 2017; OECD, 2012). Framed as ecosystem-service providers, ornamentals contribute to climate regulation, carbon storage, and wellbeing (Millennium Ecosystem Assessment, 2005; Elmqvist et al., 2019). Urban vegetation mitigates heat islands (Bowler et al., 2010) but poor choices can cause ecological issues through invasions, allergens, and resource overuse (Reichard & White, 2001; D'Amato et al., 2013). Hence, native, climate-ready, low-input palettes are prioritized (Roloff, 2016).

2. Diversity and Functional Classification

Common groups include **annuals** (*Tagetes*, *Zinnia*), **perennials** (*Rosa*, *Chrysanthemum*), **shrubs** (*Hibiscus*, *Bougainvillea*), **trees** (*Magnolia*, *Cassia fistula*), **climbers** (*Wisteria*), **succulents** (*Aloe*, *Echeveria*), and **aquatics** (*Nymphaea*, *Nelumbo*) (Randhawa & Mukhopadhyay, 2014; Hartmann et al., 2011; Dole & Wilkins, 2016). Functional traits guide placement—canopy density, leaf micromorphology,

root depth, and phenology determine shade, cooling, erosion control, and habitat functions (Pérez-Harguindeguy et al., 2013).

3. Major Uses and Ecosystem Benefits

3.1 Aesthetic and Cultural Value

Ornamentals enhance visual quality and cultural identity; festivals and rituals widely employ flowers such as marigold and lotus (Turner, 2005; Jain, 2011). Biophilic settings improve comfort and attachment to place (Kellert et al., 2008).

3.2 Urban Microclimate and Air Quality Improvement

Shade and evapotranspiration reduce urban heat and energy demand (Bowler et al., 2010; Coutts et al., 2015). Foliage intercepts particulates and sorbs gases (Nowak et al., 2014; Beckett et al., 2000). Green roofs/walls using ornamentals enhance insulation and near-source air quality (Perini & Rosasco, 2013; Berardi et al., 2014).

3.3 Biodiversity and Pollinator Support

Flower-rich plantings sustain bees, butterflies, and other beneficials (Salisbury et al., 2015; Potts et al., 2010). Urban gardens can act as refuges, supporting diverse pollinator communities (Baldock et al., 2015; Hall et al., 2017).

3.4 Health and Psychological Benefits

Nature exposure reduces stress and restores attention (Kaplan & Kaplan, 1989; Kellert et al., 2008). Clinical and quasi-experimental evidence links plants and views of nature to improved recovery and wellbeing (Ulrich, 1984; Bringslimark et al., 2009; Soga & Gaston, 2016).

3.5 Phytoremediation and Pollution Control

Ornamentals can stabilize, extract, or transform pollutants; vetiver, marigold, and pelargonium are notable options (Pilon-Smits, 2005; Yan et al., 2020; Ali et al., 2013).

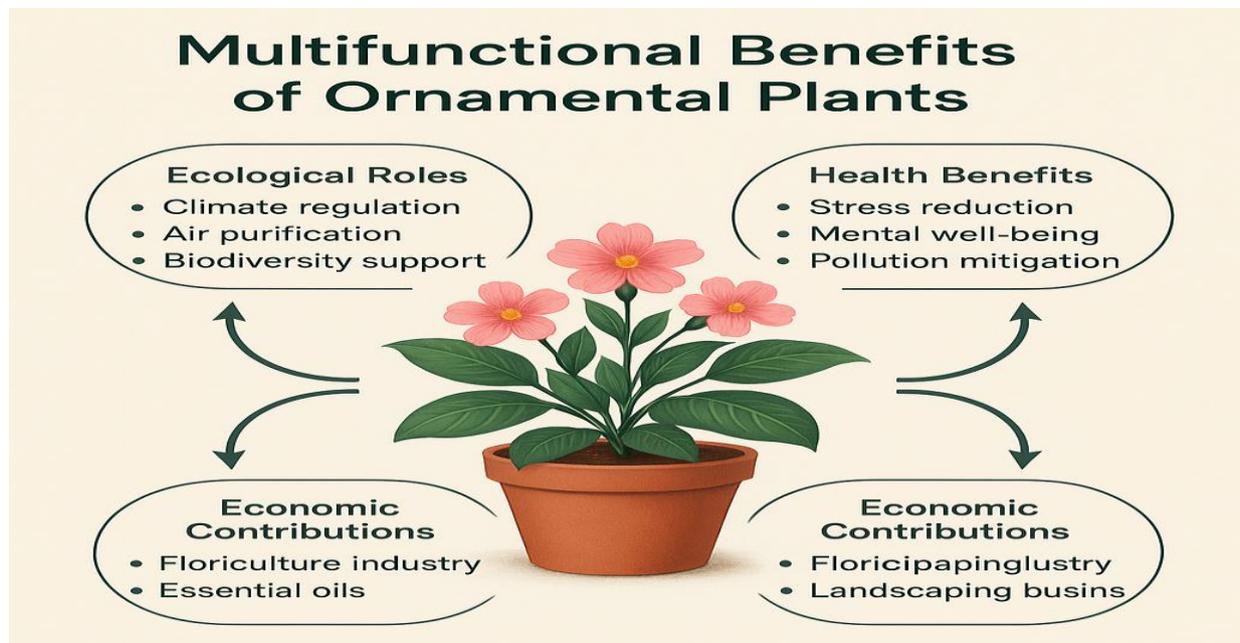
3.6 Economic Importance

Floriculture and nursery trades support livelihoods and exports (Van Uffelen & de Groot, 2017; De LC, 2019). Essential oils and natural products from ornamentals add value (Bakkali et al., 2008).

Table 1. Multifunctional Roles and Applications of Ornamental Plants

Category	Examples of Ornamental Plants	Key Functions/Benefits	Supporting References
Aesthetic & Cultural	<i>Rosa spp.</i> , <i>Tagetes erecta</i> , <i>Nelumbo nucifera</i>	Enhance beauty, symbolism in rituals and festivals, improve visual comfort	Turner (2005); Jain (2011); Kellert et al. (2008)
Microclimate Regulation	<i>Ficus benjamina</i> , <i>Polyalthia longifolia</i> , <i>Cassia fistula</i>	Reduce heat through shading and evapotranspiration, regulate temperature	Bowler et al. (2010); Coutts et al. (2015)

Air Purification	<i>Epipremnum aureum, Tradescantia zebrina, Bougainvillea spectabilis</i>	Trap particulate matter and absorb gaseous pollutants	Nowak et al. (2014); Beckett et al. (2000); Perini & Rosasco (2013)
Pollinator Support	<i>Hibiscus rosa-sinensis, Zinnia elegans, Helianthus annuus</i>	Provide nectar/pollen, attract bees and butterflies	Salisbury et al. (2015); Potts et al. (2010); Baldock et al. (2015)
Phytoremediation	<i>Chrysopogon zizanioides, Tagetes erecta, Pelargonium graveolens</i>	Absorb heavy metals, remove organic pollutants from soil and air	Pilon-Smits (2005); Yan et al. (2020); Ali et al. (2013)
Health & Psychological Benefits	<i>Dracaena spp., Spathiphyllum spp., Aloe vera</i>	Stress reduction, mental relaxation, improved recovery and productivity	Kaplan & Kaplan (1989); Ulrich (1984); Bringslimark et al. (2009); Soga & Gaston (2016)
Economic Importance	<i>Rosa spp., Chrysanthemum spp., Jasminum sambac</i>	Floriculture industry, perfume, and essential oil production	Van Uffelen & de Groot (2017); De LC (2019); Bakkali et al. (2008)
Sustainable Landscaping	<i>Bougainvillea, Aloe vera, Tecoma stans</i>	Low water demand, pollution control, and biodiversity enhancement	Tanaka et al. (2015); Roloff (2016); Chahal & Van Eerd (2018)



4. Sustainable Ornamental Horticulture

Sustainability relies on efficient irrigation, organic amendments, and IPM, paired with native/drought-tolerant selections (Roloff, 2016; Bethke & Cloyd, 2009; Chahal & Van Eerd, 2018).

Micropropagation/hydroponics enable uniform, disease-free planting material (Prakash et al., 2020). Compost and bio-inputs improve soils and resilience (Chahal & Van Eerd, 2018).

5. Risks and Challenges

5.1 Invasiveness

Horticulture has historically introduced species that later naturalized or invaded (Reichard & White, 2001). High-risk ornamentals (e.g., *Lantana camara*) require screening and management (Shackleton et al., 2017).

5.2 Allergenicity and Human Health

Male-biased, high-pollen plantings can elevate aeroallergens (D'Amato et al., 2013). Site-specific species choice can reduce exposure (Cariñanos & Casares-Porcel, 2011).

5.3 Overuse of Resources

High water and nutrient inputs inflate footprints; **xeriscaping** and water-efficient design mitigate demand (Bethke & Cloyd, 2009; Tanaka et al., 2015).

6. Design and Planning for Maximum Benefits

Combine native-forward palettes, vertical and horizontal structural diversity, and year-round bloom sequences (Dirr, 2011). Embed ornamentals in rain gardens, bioswales, green roofs, and façades to couple beauty with hydrologic and thermal functions (Ahiablame et al., 2012; Berland et al., 2017). Planning should align with biodiversity and equity goals (IPBES, 2019).

7. Future Perspectives

Priorities include **breeding climate-resilient ornamentals** (Byrne et al., 2021), standardized **ecosystem-service quantification** (Baró et al., 2014), **circular horticulture** and waste valorization (Nunes et al., 2021), and **inclusive access** to green amenities (Jennings & Gaither, 2015).

8. Conclusion

Ornamentals are multifunctional assets delivering cooling, filtration, hydrologic regulation, pollinator habitat, and psychological restoration (Bowler et al., 2010; Nowak et al., 2014; Baldock et al., 2015; Kaplan & Kaplan, 1989). Transitioning from mere beautification to **bioconservation** requires native/non-invasive, low-input species, and nature-based infrastructure (Reichard & White, 2001; Roloff, 2016; Berland et al., 2017). With science-based design and equitable deployment (IPBES, 2019), ornamental plants can anchor climate-adaptive, healthy, and culturally resonant cities.

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