More Than Ornamentals: Exploring the Treasure of Chrysanthemum

Shwetha U N, Shrijitha and Gunjeet Kumar*

Division of Floriculture and Landscaping, ICAR-IARI, Pusa, New Delhi-110012

Corresponding Author
Gunjeet Kumar
Email: kumar_gunjeet@yahoo.com

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ABSTRACT

Chrysanthemum, a time-honoured flower, is admired not only for its vibrant beauty as an ornamental plant but also for its therapeutic, edible and industrial applications, particularly in East Asian traditional medicine. Its delicate blooms are rich in health-promoting compounds, extending its relevance from ancient remedies to modern wellness products. In Eastern cultures, the chrysanthemum is also a cherished symbol of wealth, good fortune, longevity, and happiness.

INTRODUCTION

A Culinary Delight

Among various ornamental chrysanthemums, several species have also been cherished for centuries as culinary ingredients, particularly in Asian cultures. One of the most prominent examples is chrysanthemum tea;an aromatic, refreshing beverage brewed from the dried flowers of *Chrysanthemum morifolium*, traditionally used in Chinese medicine since as early as 1500 BCE. Chrysanthemum flower tea is naturally caffeine-free, making it a popular alternative to caffeinated drinks such as tea and coffee. Additionally, the young leaves and petals of *Chrysanthemum coronarium* (commonly known as "Shungiku" in Japanese) are widely enjoyed as a nutritious vegetable in East Asia. Frequently used in salads, stir-fries and hot pots, they offer a slightly bitter, peppery flavour that adds a distinctive character to a variety of dishes.

Core Therapeutic Actions


Chrysanthemum morifolium


Chrysanthemum carinatum

Chrysanthemum has long been valued for its role in managing ailments affecting the eyes, nose, ears, throat and skin, particularly in the early stages of disease. Species such as *C. morifolium* and *C. indicum* exhibit notable antimicrobial activity against bacteria including *Bacillus subtilis* and *Staphylococcus aureus*, along with anti-inflammatory effects through the reduction of nitric oxide and pro-inflammatory cytokines. They also demonstrate hepatoprotective properties against toxins such as carbon tetrachloride, with a minimum inhibitory concentration of 62.5 µg/mL (Sharma *et al*., 2023). Additionally, *C. zawadskii* is recognized for its anti-adipogenic and antioxidant actions, while *C. trifurcatum* has shown potential in reducing oedema and liver enzyme elevation. These therapeutic benefits align with traditional uses of chrysanthemum in teas and herbal formulations for respiratory infections, fever, and cardiovascular health.

Different species of chrysanthemum and their uses

Species	Uses	Major Bioactive Compounds
Chrysanthemum morifolium	Culinary (tea), medicinal (anti-inflammatory, fever, headache, antioxidant, cardiovascular, neuroprotective)	Luteolin (3.24 µmol/g), apigenin (0.88 µmol/g), terpenoids (15-51%)
Chrysanthemum indicum	Culinary (tea, soups), medicinal (detox, anti-inflammatory, anti-adipogenic, antidiabetic), inhibitor of oral bacteria	Luteolin, apigenin, quercetin, myricetin, terpenoids, essential oils
Chrysanthemum coronarium	Culinary (greens, salads, hot pot), medicinal (anti-inflammatory, renoprotective), Nematicidal properties	Rutin, chlorogenic acid, cynarine, quercetin, 3,4-dicaffeoylquinic acid, pyrethrin I/II, cinerin I/II, jasmolin I/II and campesterol
Chrysanthemum cinerariifolium	Insecticidal (pyrethrum extraction, pest control), medicinal (potential anticancer activities)	Pyrethrins (pyrethrin I, II), terpenoids, carotene, linoleamide, orphenadrine
Chrysanthemum boreale	Medicinal (neuroprotective, anti-inflammatory, skin healing), antioxidant, anti-bacterial, anti-diabetic	Acacetin, linarin, sesquiterpene guanosine
Chrysanthemum segetum	Environmental (air purification)	Flavonoids, essential oils, alkaloids, tannins
Chrysanthemum trifurcatum	Anti-inflammatory, hepatoprotective	Luteolin, apigenin, quercetin
Chrysanthemum carinatum	Antioxidant, anti-inflammatory, antimicrobial	Apigenin, quercetin, rutin, Chlorogenic acid
Chrysanthemum coccineum	Insecticidal	Pyrethrin

(Source: Ma *et al*., 2017; Sharma *et al.,* 2023)

Industrial Uses

Natural dyes


Chrysanthemum coronarium

The versatility of chrysanthemums also extends to industrial applications. Their petals serve as a valuable source of natural pigments, particularly carotenoids and yellow flavonoids, which are

abundant in bright yellow and orange varieties. These compounds are widely utilized as natural dyes in food colouring and textile industries, providing an eco-friendly and sustainable alternative to synthetic chemical colourants.

Bio-Insecticide

Chrysanthemum cinerariifolium (pyrethrum daisy) is integral to eco-friendly pest management due to its production of pyrethrins; natural insecticidal compounds extracted from dried flowers. Pyrethrins act by disrupting insect sodium channels, causing rapid paralysis and death. Key constituents such as pyrethrin I/II, cinerin I/II, and jasmolin I/II can reach yields of up to 2% in high-producing cultivars, providing strong control against numerous pests including aphids, whiteflies, thrips, beetles, fleas, ticks, mosquitoes, and ants (Paramesha *et al*., 2018). A major advantage of pyrethrin-based products is their comparatively low risk to beneficial insects like bees when applied properly. Moreover, their rapid breakdown in sunlight—typically within 1-2 days helps minimise environmental residues and lowers the risk of resistance development relative to synthetic pesticides.

Ecological Uses

Chrysanthemum species exhibit significant phytoremediation potential, as they can accumulate heavy metals such as lead (Pb), cadmium (Cd), chromium (Cr), copper (Cu), and arsenic (As) from polluted soils while maintaining their ornamental appeal. Among them, *Chrysanthemum indicum* has shown particularly strong lead-remediation capacity, especially when supported by EDTA and vermicompost amendments. Studies report Pb uptake of up to 42 mg/kg, with a maximum translocation factor of 0.63 and a bioaccumulation factor of 0.46 (Mani *et al*., 2015).

Bioethanol production from chrysanthemum petals has been successfully demonstrated using lignocellulosic biomass. Fermenting chrysanthemum flower waste with *Saccharomyces cerevisiae* has produced a bioethanol yield of 13.53% with a density of 0.981 g/ml (Nugrahini *et al*., 2022). This approach efficiently transforms inedible floral residues into a sustainable, value-added biofuel resource.

Chrysanthemum morifolium is widely valued as a natural air purifier due to its ability to remove common indoor volatile organic compounds (VOCs). According to the NASA Clean Air Study, this plant can effectively reduce harmful airborne chemicals such as ammonia, formaldehyde, benzene, and xylene, although real-world efficiency varies depending on plant density and environmental conditions. These pollutants are frequently emitted from everyday products including plastics, synthetic textiles, and household furnishings.

CONCLUSION

Chrysanthemum is a versatile flower that offers far more than ornamental value. With the growing focus on sustainable floriculture, wellness products, and bio-based industries, chrysanthemums present promising opportunities for innovation and entrepreneurship. By fully recognising and utilising their diverse applications, we can transform chrysanthemums from decorative blooms into high-value botanical resources with significant economic and scientific potential.

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