# Edible Flowers: Super Foods with Potential Health Benefits

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Abstract :

**Edible flowers have become popular in recent years as a unique and visually tempting addition to culinary creations. This review article explores the assorted world of edible flowers, focusing on their potential health benefits, bioactive compounds, and associated toxicological risks, with particular attention to the anti-nutritional compounds and toxic flowers. Edible flowers from different plant species provide a variety of bioactive compounds that contribute to their flavor, aroma, and potential health benefits. These bioactive compounds, including antioxidants, vitamins, minerals and phytochemicals, make edible flowers not only beautiful but also nutritious. Incorporating them into your diet can improve the overall nutritional content of your meals. However, consuming edible flowers is not without risks. Some flowers contain anti-nutrient compounds, such as oxalates and phytates, which can interfere with the absorption of essential minerals and lead to nutritional deficiencies over time. Therefore, it is important to practice moderation when consuming certain edible flowers, especially for those with pre-existing medical conditions or prone to mineral imbalances. However, it is essential to pay attention to anti-nutritional compounds that can affect mineral absorption and the potential toxicity of certain flowers. When used judiciously and safely, edible flowers can be a delicious and healthy addition to a balanced diet. Careful selection and proper preparation are essential to reap the benefits while minimizing the risks associated with these beautiful flowers. This review serves as a valuable resource for consumers, chefs and nutritionists, providing insight into the world of edible flowers and their bioactive compounds as well as considerations regarding anti-nutritional compounds and their toxicity.**

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*Keywords:* Edible flowers, bioactive compounds, anti-nutritional compounds, toxicity

## 1. INTRODUCTION

**Edible flowers are the flowers of any plant that are generally safe for humans. These flowers are becoming increasingly popular, as evidenced by the increasing number of edible flowers used in cookbooks, cooking magazine articles, and political television shows (Roberts, 2014). Many flowers play a prominent role in food preparation, adding fragrance, flavor and aesthetic value, such as roses (*Rosa* spp. L.), which were used in ancient Rome to Increases the flavor and sweetness of foods in drinks, salads, purees, desserts, etc. People in China, the Middle East, and India also use this flower because it originated in ancient civilizations (Deka and Nath, 2014). Today, sales of fresh flowers for human consumption are increasing around the world. In addition, these products, suitably packaged in bags, boxes, etc., will be sold directly in farm stores or through various specialized sales outlets (Mlcek and Rop, 2011). Curiosity about edible flowers is a result of the search for new natural food products. Consumers are increasingly choosing food products containing natural ingredients due to concerns about the negative health effects of synthetic compounds. However, processing and preservation aspects have only been explored for a few edible flowers and could be applied more widely. The commercialization of value-added products from this flower is still very far away due to the lack of scientific reports. The potential of these flowers as superfoods can also be explored.**

## 2. Edible flowers

### 2.1 Edible flowers as a source of bioactive substances

Edible flowers typically contain 70-95% water, petals, nectar, and pollen, making them an important source of metabolites, vitamins, and minerals. Edible flowers are also rich in antioxidant molecules (such as polyphenols and pigments) that can help prevent certain diseases. Edible flowers are important for human health as they are rich in nutrients and bioactive compounds and offer opportunities for further commercialization (Anderson *et al*., 2012). Previous studies have reported many species, genera, and families that produce edible flowers, but no official list has been published by any international organization, and to date only a small number of them have been published. is being researched. Several scientific reports have focused on bioactive substances used as food sources. Some of them are shown below.

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**Table 1.** **List of common edible flowers, their bioactive compounds**

| Scientific Name | Common Name | Bioactive Compound | Reference |
|---|---|---|---|
| *Sambucus nigra* L. | Black elder | (poly) phenolic compounds, terpenoid. | Liu *et al*. (2022) |
| *Viola tricolor* L. | Pansy | Flavones (apigenin glycoside), anthocyanin (cyanidin vàdelphinidin**)** | Espinoza*et al*. (2020) |
| *Centaurea cyanus* L. | Cornflower | Cinnamic acid, Flavanols, Benzoic acid, Vitamin C, Tocopherols | Demasi *et al*. (2021)<br>Pires *et al*. (2019) |
| *Dendranthema* spp. | Chrysanthemum | Caffeoylquinic acids, | Sha *et al*. (2021) |
| *Cucurbita pepo* var. giromontiina | Zucchini | Carotenoids, Polyphenols | Grzeszczuk (2007) |
| *Cichorium intybus* L. | Chicory | Polyphenols, inulin, oligofructose, sesquiterpene lactones | Perovic (2021) |
| *Cucurbita pepo* L. | Pumpkin | carotenoids, polyphenols | Grzeszczuk (2007) |
| *Viola odorata* L. | Sweet violet | Eugenol, gamma-sitosterol, tetradecanoic acid, Phytol, Octacosanol. | Jasim *et al*. (2018) |
| *Forsythia Vah* | Forsythia | Forsythiaside, Rutin and Forsythin | Qu *et al*. (2008) |
| *Fuchsia* L. | Fuchsia | Flavonoids, Phenolic acids, Anthocyanins, Tannins | Csepregi *et al*. (2020) |
| *Hibiscus* L. | Hibiscus | Hydroxycitric acid, Anthocyanins, Flavonoids,Phenolic acid | Ojulari *et al*. (2019) |

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| *Lamium* L. | Dead-nettle | Phenolic acids (chlorogenic, caffeic acids), Flavonoids (rutin). | Danila *et al*. (2015) |
| *Jasminum* L. | Jasmine | Saponin, Flavonoid, Quinine, Protein, Steroids | Prakash *et al*. (2019) |
| *Echinacea Moench* | Coneflower | Alkylamides, Polysaccharides, Glycoproteins, Flavonoids and Phenolic compounds | Burlou-Nagy *et al*. (2022) |
| *Trifolium* L. | Clover | Flavones, Flavonols, Isoflavones, Pterocarpans, Cyanogenic glucosides, Saponins, Condensed tannins | Ahmad *et al*.( 2021) |
| *Lavandula* L. | Lavender | Linalool, Limonene, Perillyl alcohol, Linalyl acetate, Cis-smine, Terpene, Coumarin, Tannin, Caffeic acid | Haban *et al*.(2023) |
| *Papaver rhoeas* L. | Common poppy | Phenolic compounds, alkaloids, flavonoids, organic acids and coumarins | Hmamou *et al*. (2023) |
| *Calendula off*. L. | Common marigold | Terpenoids, Terpenes, Carotenoids, Flavonoids | Silva *et al*. (2021) |
| *Tropaeolum* L. | Nasturtium | Anthocyanins, polyphenols and vitamin C | Jakubczyk *et al*. (2018) |
| *Impatiens* L | Impatiens | Phenolic acids and flavonoids | Pires *et al*. (2021) |



### 2.2 Health benefits of edible flowers

Edible flowers provide a palatable blend of aesthetics and nourishment, making them a one-of-a-kind harmonize to culinary creations. Aside from their visual beauty, these blossoms can benefit our overall health and well-being in different ways. First, most edible flowers are rich in antioxidants**,** such as flavonoids and polyphenols, which fight oxidative stress and reduce the risk of chronic disease**.** (Zhang *et al*.2015). In addition, these flowers often contain vitamins and minerals like as vitamin C, which benefits in immune function, and potassium, which aids in the maintenance of appropriate blood pressure levels (De, 2020).

Furthermore, a number of edible flowers, such as calendula and chamomile, have anti-inflammatory effects and can be ingested or applied topically to relieve digestive discomfort or skin irritations (Swarna, 2023). Edible flowers add a rush of colourful flavours and smells to dishes, improving the sensory experience and potentially decreasing the need for excessive salt or sugar (Mouritsen, 2018). Furthermore, integrating edible flowers into your diet can develop a connection to nature and a deeper appreciation for the beauty and diversity of the natural world, both of which can benefit your mental health. However, while hunting or purchasing edible flowers, it is critical to exercise caution to ensure that they are pesticide-free and safe for consumption. Edible flowers, when utilized wittily and correctly, may be a delectable and health-enhancing addition to the culinary selection.

**Table 2. Potential health benefits of common edible flowers**

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| **Common name** | **Scientific name** | **Health benefits** | **Reference** |
|---|---|---|---|
| Black elder | *Sambucus nigra* L. (Black elder) | Antioxidant, antibacterial, bone protection, healing, anti-inflammatory and pain relief | Agalar (2019) |
| Pansy | *Viola tricolor* L. | It is used to treat scabs, itching, ulcers, eczema, and psoriasis, as well as lung and chest infections such as bronchitis and asthma. | Hellinger *et al*. (2014) |
| Cornflower | *Centaurea cyanus* L. | It has antibacterial, anti-inflammatory, neurological, antioxidant, diuretic, gastroprotective, and many other effects. | Al-Snafi (2015) |
| Chrysanthemum | *Dendranthema spp.* | Easing stressand anxiety. Improving cardiovascular, health and protect against oxidative damage.Inhibit | Shahrajabian *et al*. (2019) |

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| | | inflammation and support healthy immune function. | |
| Zucchini | *Cucurbita pepo var. giromontiina* | The antioxidant activity of Cucurbitaceae appears to be of great interest in many application areas, including CVD (cardiovascular diseases) associated with oxidative stress. | Rolnik A *et al.* (2020) |
| Chicory | *Cichorium intybus L.* | Relieves symptoms associated with mild digestive disorders (such as bloating, flatulence, and indigestion) and temporary loss of appetite. | Street *et al.* (2013) |
| Pumpkin | *Cucurbita pepo* L. | Heal and purify fatigue and thirstblood.Cure colds and relieve pain. Seeds treat irritable bladder, prostate complain, anthelmintic, acaricide. Treatment of gastritis, burns, enteritis, and feverdisease. Increase hemoglobin content in the blood. | Ratnam *et al.* (2017) |
| Sweet violet | *Viola odorata* L. | Anti-inflammatory, analgesic, antioxidant, and diuretic effects, as well as other positive effects such as antihypertensive, antihyperlipidemic, diaphoretic, antipyretic, and antifungal effects, as well as weight loss effects, etc. | Feyzabadi *et al.* (2014) |
| Phlox | *Phlox* L. | Antioxidant and antimicrobial activity | Farinas *et al.* (2019) |
| Forsythia | *Forsythia Vah* | Antipyretic and anti-inflammatory activity in the treatment of bacterial infections and upper respiratory ailments | Zeng *et al.* (2017) |

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|---|---|---|---|
| Freesia | *Freesia sp.* | inhibiting sympathetic nervous excitement and reducing blood pressure | Xu *et al.* (2023) |
| Hibiscus | *Hibiscus* L. | Antihypertensive effect, antilipidemia effect, hypoglycemic effect, body fat reduction effect, renal protection effect, antianemia effect, antioxidant effect, anti-inflammatory effect, antistromal effect | Montalvo-Gonzalez (2022) |
| Dead-nettle | *Lamium* L. | Antimicrobial, antiviral, anti-inflammatory, anti-nociceptive activity, and pain therapy and cytotoxicity and cytoprotective activity | Salehi B *et al*. (2019) |
| Jasmine | *Jasminum* L. | Anti-oxidant, anti-inflammatory, anti-cancer, anti-obesity, and neuroprotective effect | Lu *et al*. (2016) |
| Coneflower | *Echinacea Moench* | Antioxidant potential, immunomodulatory effect, therapeutical uses | Burlou-Nagy *et al.* (2022) |
| Clover | *Trifolium* L. | estrogenic and progestogenic activities, antioxidant, anti-cancer and others | Ramos. *et al.* (2012) |
| Lavender | *Lavandula* L. | Anti-inflammatory, antiseptic, antibacterial, antifungal antimicrobial, antidepressant properties | Sharma *et al.*(2020) |
| Common poppy | *Papaver rhoeas* L. | Polyphenols content, antioxidant power and antibacterial effects. | Marsoul *et al.* (2020) |

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**2.3 Anti-nutritional compounds in edible flowers**

Antinutritional factors are substances or compounds found in fruits, flowers, and vegetables that are generally toxic to humans. They reduce the availability of nutrients such as minerals, vitamins, and even proteins found in plants. This affects the nutritional value of these plants. Antinutrients include amino acids, proteins, simple amines, alkaloids, glycosides, and phenolic compounds. When plant foods are consumed as a food source, antinutrients are absorbed, posing health risks to consumers (Ugwu and Oranye, 2006). Antinutritional factors are natural compounds that are present in varying amounts in different foods, depending on the type of food, how it is grown, and the chemicals used to store it. Food storage and preservation (Panhwar, 2005). These antinutritional factors are also called "secondary metabolites" of plants and have been shown to be highly biologically active. These secondary metabolites are secondary compounds that occur as byproducts of processes that lead to the synthesis of primary metabolites. Antinutrients are chemicals that plants produce for self-defense. These anti-nutritional factors are produced by plants to protect themselves from fungi, insects and predators and represent a plant defense mechanism. These anti-nutritional factors are known to impair metabolism, thereby negatively impacting growth and bioavailability of nutrients (Abara, 2003). Many edible flowers are also known to contain these anti-nutritional components, and most of these edible flowers are directly consumed by rural people. Although these are not necessarily toxic plant substances, they reduce the nutritional value of plant foods, often making essential nutrients unavailable or indigestible to humans and animals. Animal Consumption (Petroski W, Minich DM, 2020). Some vitamins found in foods can be destroyed by antinutrients. Below are some of them and the compounds they contain.

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**Table 3.** **List of edible flowers having anti-nutritional compounds**

| Name of Flower | Toxic Compound |
|---|---|
| *Allium cepa* | Phytates, Oxalates, Alkaloids and Saponin |
| *Carica papaya* | Tannins, Phytates, Oxalates and Alkaloids |
| *Cucurbita maxima* | Tannins, Oxalates, Alkaloids and Saponin |
| *Moringa oleifera* | Alkaloids and Saponin |
| *Musa paradisiaca* | Tannins, Phytates, Oxalates, |
| *Musa acuminata* | Tannins, Alkaloids and Saponin |
| *Woodfordia fruticosa* | Phytates, Alkaloids and Saponin |

Halder and Khaled (2021)

**Apple Blossoms (*Malus* species)**

**Citrus Blossoms**

**Elderberry Blossoms (*Sambucus* spp)**

**Banana Blossoms (*Musa paradisiaca*)**

**FIG. 1 Common edible flowers of fruit crops**


Arugula (*Eruca vesicaria*)


Artichoke (*Cynara scolymus*)


Broccoli Florets (*Brassica leracea*)


Mustard (Brassica species)


Okra (*Abelmoschus esculentus*)


Pea Blossoms (Pisum species)


Radish Flowers (*Raphanus sativus*)


Squash Blossoms (*Curcubita pepo*)

**FIG.2 Common edible ornamental crops**

## 4. CONCLUSION

This review research has focused light on the numerous health benefits linked with eating edible flowers. Edible flowers provide a unique and attractive addition to the diet, delivering both flavour and health benefits, thanks to their rich nutritional profiles and potential antioxidant and anti-inflammatory capabilities. However, when selecting edible flowers for food, it is critical to use caution and discretion. The disadvantage is the presence of poisonous blooms, which, if consumed inadvertently, can cause severe health difficulties or even death. To discern between safe and dangerous floral kinds, it is critical to be well-informed and rely on expert help.

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