**EDIBLE FLOWERS: BLOOMING DELICACIES FOR HEALTH AND WEALTH**

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**ABSTRACT**

Edible flowers have gained popularity due to their unique taste, aroma, and nutritional benefits. They have been used in Asian, European, and Middle Eastern cuisines for thousands of years. Edible flowers are not only aesthetically pleasing but also rich in antioxidants, vitamins, and minerals, making them a healthy and natural addition to the diet. This article explores the history, benefits, and culinary uses of edible flowers, with a focus on Indian traditional practices. It also provides information on harvesting, storage, and potential risks associated with consuming certain flowers. As the demand for natural and healthful foods grows, edible flowers are becoming an increasingly important and innovative ingredient in the culinary world. However, caution should be exercised in identifying and consuming only edible varieties, as some flowers can be toxic or harmful. Through continued research and understanding, edible flowers can be integrated into various cuisines and contribute to the promotion of healthier and more sustainable food practices.

**Keywords**: Floriphagia; antioxidants; culinary; storage; harvest

1. **INTRODUCTION**

Flowers are cultivated mostly for their economic and ornamental value; whereas some flowers are traditionally used as medicine, cosmetics and in culinary. These flowers which are taken for consumption are known as Edible flowers. The growing demand for natural, healthful foods has increased awareness of unusual or untried components like edible flowers [8]. Asian, European, and Middle Eastern cuisines all include flowers in their recipes. Eating edible flowers (EF) as salads or dishes or inhaling their perfume in a beverage or cuisine that has them as an ingredient can also give you this feeling of fulfillment. They are now being exploited in the food industries as an alternative to the synthetic anti-oxidants as they are rich source of anti-oxidants. Many people who are concerned about their wellness prefer unprocessed or less processed forms (such as dried petals of rose or powdered saffron ) instead of vitamins and supplements. Nutrients like vitamin A, C, riboflavin, niacin, and minerals can be found in edible flowers [4]. Flowers with bitter or astringent taste like lavender should be used sparingly to achieve correct garnish proportion. The same flower grown in different locations can taste different. Dried edible flowers are an excellent source of vitamins and minerals, and can be added to salads, soups, stews, and desserts. They also add a beautiful color and flavor to dishes.

1. **HISTORY OF EDIBLE FLOWERS**

The modern custom of consuming flowers is a practice of cultures that have been followed for ages [8]. Edible flowers have been used in countries like Asian, European, Indian, and Middle Eastern cuisine, as well as in traditional events, celebratory occasions, dinner parties, and in natural health.

Flowers have been used in cooking for thousands of years; the first instance is from 140 B.C. One of the bitter herbs mentioned in the Old Legal instruments of the Bible was dandelions. Various cultures around the world have used flowers into their conventional dishes. With their numerous and diverse recipes, the Chinese were the first to explore with using flowers as food, dating as far back as 3,000 B.C. Pink, violet, and rose edible flowers were employed in Roman cuisine, while sauces contained lavender. Over a thousand years ago, cooks and gardeners began employing orange blossom and pot marigolds in their recipes.

Day lily buds are used in Asian cuisine, and the Romans employed mallow, rose, and violets. Stuffed squash blossoms originated in Italian and Hispanic cultures, while Ancient Indian traditions frequently employed rose petals in their cooking. Carnation petals are one of the traditional green liqueur, Chartreuse,'s hidden components. It was created in France in the 17th century.

Edible flowers were employed as a flavouring element in food preparation and to decorate meals in ancient cultures. *Rosa spp*. petals were used to sweeten and flavour omelets, purees, drinks, and sweets in ancient Rome. *Calendula officinalis* flower petals were used in numerous salads in France throughout the Middle Ages. During 17th century, *Viola odorata* has been used in coloured syrups, sweets and other beverages . In Central Europe, Breaded flowers of *Sambucus nigra* and *Taraxacum officinale* were boiled with sugar to replace honey was popular [22]. Some flowers or parts of flowers were used as vegetables : We consume the inflorescence bracts of artichoke (*Cynara scolymus*), the inflorescence of cauliflower (*Brassica oleracea* var. *botrytis*), and the flower stalks with closed buds of broccoli (*Brassica oleracea* var. *italica*).

At the end of the twentieth century and commencement of the twenty-first centuries, there was a trend to appreciate wild types, particularly native species, which began to be praised by the media and to be used as cookery components in TV shows, publications, blogs, and cookery books. Edible Flowers is one of them, and it is used both as an ornamental component and as an ingredient in recipes, which helps to spread its use among the common people.But still it was not commonly known consumable in all nations.

In the book "Botanicals with Benefits: Develop a New Relationship with Your Garden: the Edible Flower Volume," there is a section on edible flowers [14].The native population of Northern Thailand regularly consume the flowers of Marigold, Cosmos, Coral Vine, and Bougainvillea in salads and floral teas [15]. Using 'Floriphagia' as the ingestion of fresh, newly selected flowers with nutritional properties, or with some therapeutic and sensory activity related to their look or taste [16] .

Cultural patterns, usage in traditional food, and potential advantages of the most often used Edible Flowers in Mexico. In Mexico, flowers were registered with various symbologies in pyramids, sculptures, caves, and pottery art. Because of Catholic Church rituals during Easter celebrations, flowers began to substitute meat in the diet as a result of Spanish colonisation. Among the most cherised and cultivated species in Mexico are , American coral tree, Marigold, Red Frangipani, prickly pear, *Ferocactus sp*, *Dhalia sp, Cucurbita sp, Yucca sp,* bilberry cactus, *Agave spp*, poinsettia and runner bean*.* Before the arrival of Spanish people, there was preconception against the consumption of flowers, which was connected with poverty and is now not favoured in the domain. [21]. Some flowers (Flowers of medicinal plants, pumpkin, broccoli, cauliflower, inflorescence bract of banana , and artichoke,) were already utilised in food in Brazil as a result of customs introduced by European and Asian immigrants. In Figure.1, we can see some of the commonly used Edible Flowers in the world.

1. **BENEFITS OF EDIBLE FLOWERS**

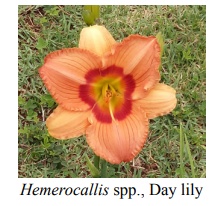
The fact that flowers are often used medicinally besides to being consumed for their taste is highly significant. Flowers are high in nectar and pollen, and pollen has been found in studies to be high in vitamins and minerals. Flowers contain 95% water, hence they are supposed to have considerable nutritional amounts. While blooms provide a pleasing appearance, a nice scent, and a delectable taste, they do not contribute calories. According to the few reviews available, they are almost calorie free. Most edible flowers have a bitter taste (for example, Flower of night jasmine, *Phlogacanthus spp*., etc.). These are prescribed for preventing stomach disorders such as stomach upset, loss of appetite, jaundice, liver problem, cold and cough, polygenic disorder. Edible flowers' health and aesthetic advantages symbolize a specialised market. The food industry operates in an established market. From a tactical point of view, including edible flowers in dishes, drinks, and desserts could be a method to differentiate products and improve service. Edible flowers include a variety of phytochemicals that have been linked to health benefits, including antioxidants, anti-inflammatories, anticancer, anti-obesity, hypoglycemic agents, and compounds that protect the nervous, hepatic, and digestive systems [8]. The tints of fruits and vegetables, as well as the pigments of flowers, point to the presence of phytochemicals such poly phenols, also known as Phenolic compounds, flavonoids, carotenoids, and anthocyanins. Fresh edible flowers can be consumed on their own or as a key ingredient in cosmetic and pharmaceutical goods. They can also be used as functional food ingredients. Some of the edible flowers and their health benefits are listed below. (Table.1)

**Table 1. Health benefits of some Edible flowers**

|  |  |  |
| --- | --- | --- |
| **Flowers** | **Health benefits** | **Reference** |
| **Rose** | Cleanup of gall bladder and liver; improving secretion of bile; relieving mild sore throats and bronchial infections | Chen and Wei (2017).  Hegde *et al*., (2022),  Mileva *et al*., (2021) |
| **Lily** | well-being of the heart; flavonoid that stimulates arterial dilation. | Abelti *et al*., (2023),  Maleki *et al.,* (2019). |
| **Chrysanthemum** | Detoxicate the blood, regulation of blood pressure and calming the nerves; antibacterial properties; hypertension and angina | Shahrajabian *et al.,* (2019),  Cookson (2021). |
| **Jasmine** | Parkinson’s disease, attention deficit disorder, irritable bowel syndrome, premenstrual syndrome and alcoholism. A mild sedative effect, regulating insulin levels and can be used in topical ointment. | Chen and Wei (2017).  Al-Snafi, (2018) |
| **Chamomile** | It relieve diarrhoea and indigestion It has antioxidant and anti-inflammatory properties. | Talebi *et al.,* (2022). |
| **Purple Corn Flower** | Treating inflammation and pain; easing coughs and relieving sore throats. | Sultana *et al.,*(2016). |
| **May Flower** | Contains antioxidant which improve blood circulation; lowering blood pressure; improving functioning of heart. | Li *et al.,* (2022).  Wu *et al., (*2020),  Cloud *et al*., (2020). |

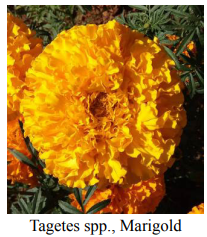
**EDIBLE FLOWERS**

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**Figure 1. Examples of some Edible Flowers (**Santos and Reis, 2021**)**

1. **NUTRITIONAL COMPOSITION OF EDIBLE FLOWERS**

In general, the nutritional makeup of edible flowers is the same as that of other plant parts. However, current studies on edible flowers have concentrated on the examination of bioactive substances (anthocyanins, flavonoids, and carotenoids) and their antioxidant potential [11]. The effects of these phytochemicals on human health and their capacity to prevent some infections/diseases provide justification for such studies. Gourmet chefs frequently use certain flowers in their dishes, such as pansies, centaurea, borage, and camellia, which are available at locations across the world that specialize in selling edible flowers. Some edible flowers and their nutritional composition details are discussed below.

1. **Pansies**

Pansies have a broad variety of petal colors and a fragrant, sweet flavor, which are qualities that both chefs and customers appreciate. Compared to other flowers, white pansies had much greater moisture levels (91.3 g/100 g fw), whereas yellow coloured pansies had the greatest fat content (1.31g/100g fw). The pansy variety with the least dietary fiber was white. Linolenic and Palmitic acid are the major fatty acids found in red and yellow coloured pansies respectively. Yellow pansies had the highest level of total tocopherols (24.89 mg/100 g dw), primarily because -tocopherol was present. Red pansies have highest percentage of oleic acid. It was the behenic acid (C22:0, 24.6%), followed closely by the arachidic acid (C20:0, 24.3%), in white pansies. various colored pansies displayed various profiles of fatty acids, with yellow pansies having the greatest variety of fatty acids [11].

1. **Borage**

The maximum protein content (3.04 g/100 g fw) and mineral content (2.05 g/100 g fw) were found in borage. Linolenic acid and Palmatic acid are the major fatty acids found in borage.

1. **Camellia**

Fat (0.31 g/100 g fw), protein (0.76 g/100 g fw), and the lowest ash (0.37 g/100 g fw), values were found in camellia. Camellia presented high percentages of arachidic acid and the main fatty acid is palmitoleic acid [11].

**V. Edible flowers in Culinary**

Many flowers are used in culinary around the world. Outside of the flowering season, certain flowers are dried and kept for consumption. Regarding, Kumari *et al.,* (2021) assert that edible wildflowers are essential to the socio-cultural and spiritual well-being of traditional rural inhabitants, as well as to their ability to feed themselves and remain healthy. Deka and Nath (2014) conducted a study to catalog the species and the conventional knowledge linked with them in the West Assam region of India due to the value of flowers and their several uses [23]. In India, South Indian cuisine also includes many palatable flowers. Additionally, there is a wide range of delectable flowers and application methods throughout the various socio-geographical locations.

The Assam Western area, which is a part of the state of Assam, is a good place for numerous species to develop and survive. Western Assam has one of the greatest reserves of wild food plants and is rich in floristic diversity because of its unique geographic location. Many indigenous tribes around the world depend on wild food plants. Numerous cultures in this area have employed a variety of natural plants for centuries. In India, some of the flowers are either made into curry, fried with flour or even consumed as raw. Some flowers, including those from the Gumhar (*Gmelina arboria*), Midnight horror (*Oroxylum indicum*), Ram basak (*Phlogacanthus thyrsiformis*), Malabar nut (*Justicia adhatoda*), Pulutus (*Dendrocnide sinuate*), Papaya (*Carica papaya*), and Night jasmine (*Nyctanthus arbortristis*), are cooked in rice flour and eaten as a side with curry.

When cooking flowers, it is occasionally necessary to use the traditional alkali (known locally as kola Khar), which is made by burning the rhizome of a banana plant and extracting the liquid after soaking the ash in water. Of course, the floral recipe is typically served with little fish or with dry fish. The various species of Arum (*Alocasia acuminateare*), Papaya (*Carica papaya*), Kanakachu (*Lasia spinosa*), and Wild nongmangkha (*Phlogacanthus Curviflorus*) are among the floral ingredients utilized in this dish. This is a typical meal that is very well-liked essentially throughout the entire state of Assam. Some of the flowers which are commonly consumed in India and benefits are discussed below.

1. **Midnight Horror (*Oroxylum indicum*)**

The flowers of Midnight Horror (*Oroxylum indicum*), which has the ability to prevent and treat malaria, jaundice, and the most dangerous cancers. These flowers are mostly consumed by the tribal people of Assam, India.

1. **Marigold – Potted plant (*Calendula officinalis*)**

In Switzerland, ray flowers or part of the blossoms, are occasionally used in salads and were first used in Danish salads in the early period (1800s). In Europe, The European Medicines Agency (EMA) has categorized ray flowers as a traditional herbal remedy, but only for topical use or as a mouthwash or gargle [9]. There are no known harmful effects in humans following consumption of *C. officinalis* flowers. Carotenoids ,triterpene saponins, ionone- , triterpene alcohols, and sesquiterpene glycosides, coumarins (scopoletin, umbelliferone, asculetin), and polysaccharides are all present in ray flowers [10].

1. **Garland Chrysanthemum *(Chrysanthemum coronarium L.)***

The flowers are the source of campor, which is used for flavouring of food worldwide. An adult (70 kg) can consume more than 3 kg of fresh flowers (based on 0.13% essential oil with 29% camphor) before reaching the acute toxicity limit for camphor, the amount of camphor in the flowers does not pose a health risk.*Tanacetum cinerariifolium* (Trevir.) Sch. Bip., a different species of Chrysanthemum from which pyrethrines have been extracted, has not been found in *C. coronarium*.

1. **Borage (*Borago officinalis* L.)**

Flowers have been used in salads, as a spice, and as a snack in Switzerland and Denmark. Children in Spain used to consume the flowers for nectar and utilize them as salads were first embellished in the 1700s. Whereas, it has been found that the aerial parts of B. officinalis contain toxic 1,2- unsaturated pyrrolizidine alkaloids, which have the potential to be harmful if the flowers are consumed by humans.

1. **White dead nettle (*Lamium album* L.)**

Flowers have been eaten in local Mediterranean dishes along with leaves and in Switzerland, Estonia, shoots has been taken as a snack during agricultural work and by children [1]. The flower's essential oil contains many terpenes, alcohols, alkanes, and ketones. 55% of the measured phenols in the aerial portions (a mixture of flowers, leaves, and stems) were made up of verbascoside and isoverbascoside. In two strains of Drosophila melanogaster, verbascoside was not genotoxic in vivo; however, the results may be attributable to the compound's poor gut absorption [24]. HH

Hence, BLV accepts the plant's use for infusions but not for regular eating.

1. **Garden nasturtium (*Tropaeolum majus* L.)**

Since the 1600s, flowers have been consumed or employed as food ingredients in Europe. According to ethno botanical studies, Switzerland, Denmark, and Estonia used flowers to flavor and decorate meals during the 1800s and 1900s, including salads. The flowers have a high fatty acid content (36% of dry weight), with erucic acid making up the majority (34.5% of the fatty acids), or 12.4% of the dry weight. However, when offered to Wistar rats or mice, extracts of the leaves (both aqueous and 70% ethanolic) were examined for acute oral toxicity, but no harmful effects were seen. Hence, flowers can be consumed in smaller portions but not the leaves.

1. **Agathi (*Sesbania grandiflora*)**

Agathi (*Sesbania grandiflora*) is consumed as pokora, also known as bor in the Assam region of India.

1. **Crape jasmine (*Tabernaemontana divaricata*)**

Flowers of crape jasmine is also fried and eaten as pakora in regions of India.

1. **Drum stick (*Moringa oleifera*)**

The drum stick, *Moringa oleifera*, flowers are consumed after being fried with an egg. There are several findings on the biological and physiological activity of *Moringa oleifera* in addition to its traditional usage as a food and medicine. These include the management of heart disease, ulcers, and dyspepsia, as well as hypoglycemic and hypo cholesterolemic effects that are also analgesic, anti-inflammatory, and antihelmintic. When in bloom, the drumstick plant resembles a leguminous species.

1. **Water lily (*Nymphae spp*.)**

After frying, the flower of the water lily (*Nymphaea spp*.) is frequently used because it is said to be useful against anemia. These things are regularly prescribed to young girls or women who are anemic.

1. ***Musa* *spp*.**

Due to the high iron content of Musa spp. floral spadix, they aid to speed up blood hemoglobin growth and speed the healing of burns and cuts on patients. Various Assamese tribes and clans frequently prepare Musa spadix together with pigeon meat using a traditional spicy, tasty recipe.

This mixture works wonders to treat low blood pressure, fever, colds, and cough. In South Asian and Southeast Asian cooking, banana hearts are utilized, either raw, steamed with dips, or cooked in soups and curries.

1. ***Cassia siamea***

The Caesalpiniaceae family plant, Cassia siamea, has edible flowers. The use of different Cassia species in various nations would draw attention to the plant for its pharmacological, traditional, and therapeutic properties.

Some other plants like Pumpkin (*Cucurbita moschata*), Drum stick (*Moringa oleifera*) flower, and arrow leaf *Monochoria hastata*, an oval-leaved pond weed, is an energy-giving plant. Calcium is found in the flowers of plants including common arum (*Alocasia acuminate*) and kanakachu (*Lasia spinosa*). Therefore, they are recommended for women, especially during pregnancy, and are excellent for bone formation.

These are some of the commonly consumed flowers which are be taken by many people through generations. The flowers may vary accordingly to their region of origin and practice of the native people.

**VI. HARVEST AND STORAGE OF EDIBLE FLOWERS**

**Harvesting for edible flowers**

**When to harvest for edible flowers**

* Blooming
* Fully open
* Not under-ripe

Morning is the best time to harvest, when plants are fresh, contain the maximum amount of scent, flavor and turgid.

**Harvesting depend on the type of flower**

* For some plants [such as dill](https://gardenerspath.com/plants/herbs/grow-dill/) or [fennel](https://gardenerspath.com/plants/herbs/fennel/), the entire flower heads can be harvested and used. For others, like [roses](https://gardenerspath.com/plants/flowers/grow-roses/) , pick off the petals individually is recommended.
* For Lavender flowers, florets can be picked off the stem directly as well.
* For  [Nasturtiums](https://gardenerspath.com/plants/flowers/grow-nasturtiums-easiest-annuals/) and [viola blooms](https://gardenerspath.com/plants/flowers/grow-pansies/) : cut just below the flower with a sharp equipment.
* To decorate a cake, making sure the flowers are still intact. For teas, dry the flowers.
* Some flowers can be eaten as a whole such as Nasturtiums , male [squash blossoms](https://gardenerspath.com/plants/vegetables/grow-summer-squash/), and clover. Delicately flavored portion in most of the flowers is going to be the petals.
* To improve the taste, the rest of the flower parts such as stamens with their pollen and pistils, should be removed
* To reduce the bitterness in the culinary items, one has to remove the sepals, or green petals at the base of the flower, the white base of petals (rose petals).

## **VII. STORAGE**

* After harvest, dip the flowers or petals in cool water to rinse off any excess dirt particles.
* Lay the flowers out to dry on a paper towel, instead of salad spinner.
* The flowers can be stored up to a week in a basket or container lined with moist paper towels to maintain the humidity, placing the flowers on top, and popping it into the fridge. But It’s best to use the flowers as soon as after harvesting.
* To prevent the flowers from crushing, sticking to one another or with bag, avoid plastic bags.
* Letting the flowers to float in an ice water bath for a few minutes before using to revive the flowers from wilt.
* For herbal tea blends, the flower can also be dried in a dehydrator or a low oven**.**

**VIII. RISKS**

Foods can benefit from the distinct flavor and captivating appearance of edible flowers. It is crucial to correctly identify each kind of flower and understand which portions of the flower should be eaten because not all flowers are edible. Only little amounts of some flowers can be eaten without risk. Pesticide traces are frequently found in flowers, which also frequently harbor other species like insects.

Flowers grown for decorative purposes in gardens are not meant to be consumed. It is best to avoid common garden flowers that are to some extent harmful.

* Johnny Jump-ups (*Viola tricolor* *officinalis*) flowers contain saponins.
* Apple flowers (*Malus spp*.) contain cyanide precursors.
* Daylilies (*Henterocallis spp*.) and Borage (*Borago officinalis*) are diuretics.
* The herb sweet woodruff (*Galiunt odoratum*) may thin the blood.
* Linden tree (*Iilia spp*.) flowers are harmless in moderation, but excessive ingestion can harm the heart.
* Marigolds (*Tagetes spp*.) have a tasty flavor, yet they can be dangerous in big quantities.
* The edible petals of the oblong-shaped Begonia (*Begonia tuberhybrida*) plant. The petals contain oxalic acid and should only be consumed in moderation. People with gout, kidney stones, or rheumatism should also avoid eating the petals.
* Borage (*Borago fficittalis*) flowers should be avoided by pregnant and lactating women since more than eight to ten blossoms can make milk flow. They ought not to be consumed in large quantities because they might also have a diuretic effect.
* The true jasmine (*Jasminum officinale*) is edible, but the fake jasmine (*Gelsemium sempervirens*), which belongs to a completely different species, is too poisonous for eating by humans.
* *Tagetes patula, Tagetes tenudolia,* and *Tagetes patula x erecta* marigolds can be dangerous in excessive quantities. They should only be consumed in moderation and on rare occasions.
* *Phlox paniculata,* a perennial, is the only type of phlox that is edible. Annual and low-growing varieties are not edible.

**IX. CONCLUSION**

Due to the increased gastronomic usage of EF and the interest of many businesses in novel ingredients for the creation of new goods, EF are gaining fresh attention globally and their market is growing. Different kinds of culinary preparations can benefit from the use of edible flowers to make them more appealing.

Although the inclusion of flowers in food may seem innovative, it is actually a holdover from earlier cultures. Due to this, many EF have their uses established via tradition; but, for many species, it is still required to gain a deeper understanding of the chemical makeup and, specifically, the maximum daily intake. To boost confidence and security in the use of these items, it is also essential that the knowledge reaches the manufacturers and customers. The large accumulation of bio active compounds may be a result of environmental stressors experienced during plant growth.

Because emerging food with edible flowers can be produced for less money at a lesser environmental and economic cost, using wild plants may benefit the local economy. Future evaluation and assessment of edible flowers' sensory qualities and post-harvest performances will be crucial to promoting their consumption.Furthermore, the produce could be standardized through improved cultivation procedures.

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