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Edible flowers

A promising source of Human nutrition

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Introduction

Currently, globalisation and consumer awareness have helped develop and revive past lifestyles, where edible flowers play a significant role. This plant part is a plentiful natural resource, and the majority of them contain phytochemicals that may offer potential health benefits. In folk medicine, edible flowers have long been used to treat illnesses, but more recent research has confirmed these advantages, highlighting the abundance of bioactive chemicals in edible flowers that have been linked to

functional qualities. For instance, in ancient Rome, different types of puree or omelettes were prepared using the blossoms of different species of roses. The blossoms of the calendula plant were used to make a variety of salads in mediaeval France. Comparable to saffron inflorescences, this species' flowers are still employed as food colouring ingredients. Violets (Viola odorata) were used to colour sugar, syrups, and different remedies in the 17th century. Several flower species contain hazardous or antinutritional compounds that cannot be consumed by humans, such as trypsin inhibitors, hemagglutinins, oxalic acid, cyanogenic glycosides, or alkaloids.

Quality of edible flowers

Today, higher standards are being set for flower quality when determining if they are suitable for human nourishment. In addition to their attractive look, their healthfulness and, last but not least, their appropriateness for effective economic usage are also preferred. Respecting the limitations of the amount of hazardous substances is essential for edible flowers to be medicinally sound. Consuming less well-known or hazardous for humans flowers, such as *Conavallaria majalis* and *Anemone ranunculoides*, could be harmful. Consuming flowers that have been freely collected in the wild requires precise identification at all times. Limiting variables may also include the quantity of flowers utilised in cooking and their soundness (i.e., lack of pathogens). It is expressly advised against eating edible flowers from ornamental plants that come from untested cultivars and/or florist shops since they may have been exposed to pesticides such as fertilisers and herbicides.

Consumption of edible flowers

In certain instances, only a portion of edible flowers are ingested, such as the petals of tulips (Tulipa spp.), chrysanthemums, or roses (Rosa spp.). Occasionally, only flower buds are eaten, such as those of daisies or garden nasturtiums (Tropaeolum majus), which are used in place of capers, which are significantly more expensive. Some of their portions need to be removed since they are excessively abrasive and could get stuck in the throat. This also applies to roses because the bitter bases of their petals need to be removed. The most frequent way to consume edible flowers is in fresh but they can also be consumed dried, in cocktails (in ice cubes), canned in sugar and preserved in distillates. Pansy, centaurea, borago, rose, nasturtiums and hibiscus are examples of edible flowers that are normally used to garnish dishes. Typically, edible flowers are used to salads, soups, dinners, desserts, and beverages to enhance colour, fragrance, and flavour. Although some experts and chefs have shown interest in edible flowers in this order, there is still great room for improvement. Regarding how people choose to consume edible flowers (as a garnish, in a meal, or in a salad), as well as how they received edible flowers, consumers exhibit a variety of attitudes and behaviours (grown organically or if they grew the flowers themselves). Independent of the previously specified characteristics, participants generally chose to purchase edible flowers to eat as a garnish, followed by salad and dinner.


Sources of edible flowers

Fruit, vegetable, medicinal, and ornamental plant inflorescences are potential sources of edible flowers. These beautiful plants are the source of the most popular floral produce. Nevertheless, there are numerous different plants that are utilised around the world for their beauty as well as culinary and/or medical purposes. Therefore, for instance, varieties like garden nasturtium, viola, and borage (Borago officinalis) are utilised for this purpose in the USA. This group includes dandelion (Taraxacum officinale), daisy (Bellis perenis), mallow (Malva syl vestris), marshmallow (Althea officinalis), and many other plants in Europe.

Benefit of edible flowers:

Chives, Signet Marigold, Nasturtiums, Portulacas, Purslanes, Rose	Rich in Vitamin – C
Calendula and elderberry Blooms	Aid digestion, reduce fevers and stimulate the immune system.
California poppies Chamomile and Lavender	Ease stress and work as gentle sleep aids.
Hibiscus	Contains antioxidants that help prevent cholesterol deposits and aids liver disorders.
Honeysuckle and Hyssop	Relieve respiratory problems and soothe the stomach and colon.
Violas and Violets	Anti-inflammatory properties and are good for respiratory ailments, and yarrow helps relax blood vessels and reduce fevers and colds.
Mullein	Help respiratory ailments, pain and headaches and induce sleep, nasturtiums contain antibiotic properties
Dandelions	Source of Vitamins A and C and the greens are high in calcium, iron and phosphorous.

Harvest

Because they are at their optimum flavour during the height of bloom, edible flowers should be harvested in the cool of the day. Selected flowers should be free from pest and disease issues. Except for daylilies, gathering unopened blossoms and wilted or fading flowers should be avoided since they could taste bitter or unpleasant. Flowers from plants that have been fertilised with untreated manure, those that have been sprayed with pesticides, or those that grow by roadsides should never be picked for eating because they may be poisonous or contagious due to the presence of diseases. Also, buying flowers from florists, garden centres, or nurseries should be avoided because these establishments almost certainly employ chemical goods (synthetic fertilisers and pesticides) in the production of flowers, which can be harmful to human health. Only organic farming is suitable. The majority of flowers should have their stems, sepals, pistils, and stamens removed before usage. The flavour of flowers may be diminished by pollen, which can also make certain people allergic. All flowers should have their sepals removed due to how bitter they are, with the exception of violas, pansies, and johnny-jump-ups, whose sepals are more aesthetically pleasing. Only the petals of many flowers, such as roses, lavender, tulips, calendula, and chrysanthemums, are edible.

Post-harvest technologies

Flowers that can be eaten are delicate and highly perishable. Flowers are vulnerable to tissue browning, wilting, dehydration, and petal abscission after harvest. Hence, storing edible flowers in cold storage between 4-6 °C before packaging them for short journeys can extend their shelf life from 2 to 5 days after harvest. Currently, flowers are generally put in tiny, stiff plastic (or plastic wrapped) packaging to prevent desiccation and retain their delicate structure. Hence, methods for enhancing quality preservation and extending edible flower shelf life must be developed. There are currently no standards for the storage of edible flowers, and there is little information available that indicates quality limiting variables and preservation techniques. There have only been three studies conducted thus far: one on the impact of storage temperature, one on the controlled release of 1-methylcyclopropene and the use of modified atmosphere packaging (MAP) and the third on the impact of various types of packaging, namely polyvinyl chloride (PVC) or polypropylene (PP), with or without modified atmosphere on flowers' quality. Violaceae, pansies, and nasturtium flowers. Both edible carnations and snapdragons lost much less weight after being packaged in modified environment and aided in maintaining their visual quality.

Properties of edible flowers

Nutritional value

Flowers can be broken down into pollen, nectar, petals, and other parts from a dietary perspective. Proteins, carbohydrates, saturated and unsaturated lipids, carotenoids, and flavonoids can all be found in pollen. Fructose, glucose, and sucrose are the three sugars that make up nectar, along

with free amino acids, proteins, inorganic ions, lipids, organic acids, phenolic compounds, alkaloids, and terpenoids, among others. Flowers' petals and other parts are full of nutrients, antioxidants, and vitamins. This indicates that variations in the flavour and texture of flowers depend on the species; for example, some edible flowers are extremely tender and crisp, while others are delicate or even velvety. Sensory qualities that our senses register (e.g. attractive appearance, size, shape, taste, aroma and coloring) represent the most important criteria of quality of edible flowers. Consumers usually prefer yellow and orange colors most; blue and combinations of other colors are less favored.

Antioxidant activity and individual compounds

Antioxidants from flowers have been extracted using a variety of techniques, including various solvents, periods, temperatures, and extraction methods. The two most popular techniques have been maceration and Solvent extraction. The choice of solvent is greatly influenced by the particular characteristics of the bioactive molecule being assessed. The most often employed solvents have been methanol and methanolic solutions. Tetrahydrofuran, water, ethanol, acetone, isopropanol, ether, and solvent mixtures have also been employed as solvents. Another factor that may have an impact on the extraction of chemicals is temperature. A branched pathway for the synthesis of flavonoids produces both colourless molecules like flavonols and coloured pigments like anthocyanins, polymeric phlobaphenes, and proanthocyanidins (Koes et al., 2005). The anthocyanins, one of the most significant types of flavonoids, are what give flowers their red and blue hues. The three most common anthocyanins discovered in edible flowers are cyanidin, delphinidin, and pelargonidin; however, Viola species also include malvidin, peonidin, and petunidin. The group of flavonoids also includes flavones like apigenin and luteolin, flavones like quercetin, kaempferol, myricetin, and rutin, and flavan-3-ols like catechins and epicatechins

Aromatic components and health effects of edible flowers

Edible flowers of ornamental plants exhibit considerable anti-inflammatory benefits within the human body in addition to antioxidant and ROS scavenging properties. Also touted as a source of anti-inflammatory, anti-bacterial, anti-fungal, and anti-viral compounds are the blossoms of decorative roses. 2-phenylethanol (70–80%) and the terpenes linalool (3%), citronellol (7.2%), nerol (4.2%), and geraniol (up to 7%) make up the majority of the aroma of rose blossoms. Citronellol (47.5%) and geraniol (18%) were the predominant constituents of rose oil. The oil from marigold flowers is well recognised and frequently used in American and African complementary (alternative) medicine because of its anti-inflammatory effects. Linalool (22.5%), 2-hexyl-1-decanol (18.3%), piperitone (13.4%), and caryophyllene (7.0%) are said to be its main constituents by. Piperitone and various other components of this oil may have harmful effects on human organisms when used in greater doses. Many substances, including hexenal, 1-

hexanol, 2-hexanol, nonanal, benzaldehyde, benzyl alcohol, benzyl benzoate, and caryophyllene, are responsible for the smell of carnation blooms. The terpene caryophyllene is regarded to be the main anti-inflammatory compound in carnations.

Conclusion

Ordinary plant organ components like proteins, lipids, saccharides, and vitamins are present in edible flowers in relatively similar amounts (e.g. leaves). Several compounds mentioned in this study exhibit either protective or even therapeutic actions, which lower the risk of the development of numerous diseases. The ones that exhibit antioxidant properties, such as phenolic chemicals, carotenoids, etc., are the most intriguing of all. Many dinners and salads can be garnished with edible flowers, but they can also be utilised for other culinary purposes (baking and the flavouring of sauces, jellies, syrups, vinegar, honey, oils, teas, flower-scented sugars, candied flowers, wine and flavoured liqueurs). Even a small amount of edible flowers can regularly improve consumers' health. Many edible flowers have known or under investigational nutritional and chemoprotective benefits. On rare occasions, flowers may be considered nutraceutical foods. The positive effects of flowers from ornamental plants on the human immune system are, however, poorly understood. This article tries to summarise the various qualities of flowers from ornamental plants that we currently understand and to propose potential uses for them in human nutrition.

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