

Value addition in Floriculture: A review

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ABSTRACT

Floriculture is presently considered as the most lucrative agro-enterprise in terms of profit making. During the peak season of festivals, religious ceremonies, valentine's day and marriages there is a great demand of flowers and farmer get a good price but during glut, the demand is less and supply is more, thus farmers do not get remunerative price. Due to highly perishable in nature, most of these flowers are being wasted, therefore, value addition is a very good alternative to avoid wastage during glut. So, value addition is an alternate important arena to reduce the losses by proper utilization of fresh flowers and ornamentals with increase in net profit and farm income. Value addition is a process of changing a product from its original state to more valuable state. It improves both postharvest technologies and logistics. Value addition provides an opportunity of employment generation to earn money and making profit. Different kinds of value-added products are now-a-days formulated which include essential oils, pharmaceutical and nutraceutical compounds, jam, jelly, gulkand, gulroghan, potpourri, rose water, insect repellants, floral dyes, floral tea (rose, chrysanthemum, jasmine, hibiscus etc.), edible flowers like chrysanthemum, honeysuckle, nasturtium, calendula, tulips, rose, dahlia, etc. Vitamin C is isolated from rose fruits (hips) and is marketed as "rose hip", and vitamin C is also used for the cure of scurvy. Marigold flowers are richest source of lutein which possess curative properties to cure blindness. The Xanthopylls extracted from the dried marigold petals are mixed in the poultry feed to intensify the yellow colour in egg yolk and flesh colour of broiler chicken. The crafting in floriculture like art of cut and loose flower arrangements, hair adornments, dry flower products etc. are gaining momentum and popularising in our country. Women at small scale can set up small enterprises where floral crafting in the form of bouquets, garlands, vases, flower arrangements in containers, dry flower making, etc. that has high potential for earning and improving livelihood.

Key words: Dry flower, dyeing, essential oil, fresh flower, japanese styles, western styles, pankhuri, poultry feed, value addition, wreath.

INTRODUCTION

Value addition is literally the process of changing or transforming a product from its original state to a more valuable state (by labour and creativity through processing and packaging) to increase the consumer appeal and enhance the shelf life of fresh flowers and it also includes post harvest

technology and improved logistics.

Value addition is used because of its perishable nature where flowers cannot be stored for long time and during flowering season, farmers may not get good price due to glut in the market. In this situation, value addition is a best alternative to increase the farm income.

Objectives of value addition

- To improve quality.
- To enhance selling.
- To gain higher profit.
- To reduce post harvest loss.
- Improve employment generation.
- Increase in export.

Factors of value addition

1. **Unique** - The processed product should be one of its own kind.
2. **Novelty** - It should be new and unusual.
3. **Export potential** - The developed product should have demand in international market for high return and appreciation.
4. **High value** - The product should have higher price for low volume.

5. **Market** - The processed product should have its aggressive marketing because market is the key for the success.

Benefits of Value addition

- Value addition utilizes the excess flowers in season.
- It reduces the floral waste.
- It stabilizes the rate of flowers in the market.
- It stabilizes the farm income.
- It creates novelty and variety of floral products.
- It provides more employment to farming community.
- It provides the space for entrepreneurship development.
- It spreads the availability of flowers throughout the year.

Value addition of flowers

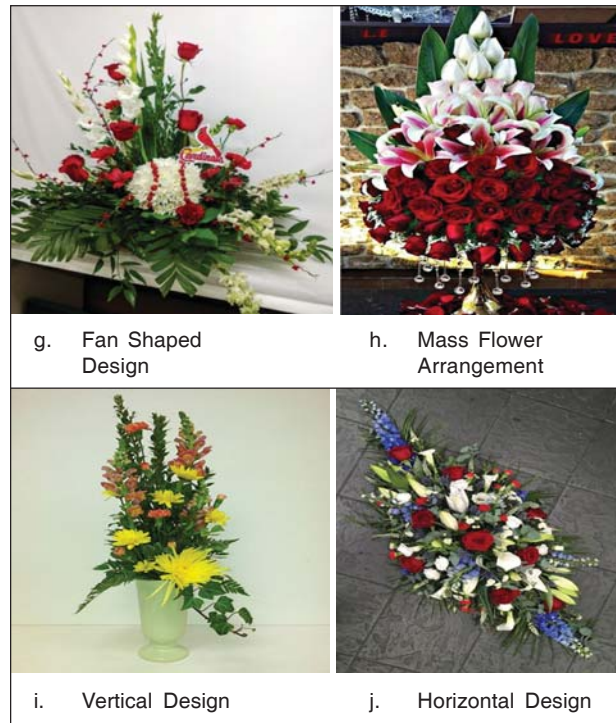
1. Fresh flowers	2. Dried flowers	3. Processed products
A. Floral arrangement 1. Western or English styles 2. Eastern or Japanese styles B. Bouquets Flowers (Rose, Chrysanthemum, Gladiolus, Anthurium, Carnation, Aster, Gerbera), Ornamental fillers (Thuja, Golden rod, Asparagus) C. Garlands Sweet scented flowers (Jasmine, Rose and Tuberose) D. Corsages (For Women), E. Boutonniere (For Men) F. Wreath G. Gajra (Jasmine, Rose, Crossandra, Barleria) H. Veni (Famous in South India) I. Colouring of flowers By Tinting of white orchids, tuberose, jasmine flowers.	A. Dry Flower arrangement (Dried flowers, grasses, seed heads and pods are used) B. Potpourri: Flowers (Rose petals, Gomphrena, Marigold petals, Lotus pods) and Herbs (Rosemary, Basil, Geranium, Fennel) C. Pankhuri D. Floral gifts: Greeting cards, Wall hangings, Book marks, Paper weights, Photo frames, Candles, Wreath etc. E. Artificial colouring of dried products: Bleaching (Sodium Chlorite, Sodium Hypochlorite) and Dyeing	A. Essential oil (Rose, Jasmine, Tuberose, Marigold, Champaca) B. Concrete, C. Absolute. D. Gulkhand, E. Gulroghan, F. Rose water, G. Jam, H. Jelly. I. Syrup (Rose, Rhododendron) J. Wine (Rhododendron, Mahua) K. Poultry Feed L. Herbal Tea (Rose, jasmine, hibiscus) M. Pharmaceutical and Nutraceutical Compounds

FRESH FLOWER ARRANGEMENT

Flower arrangement is a tribute to nature and her profound creation - an attempt to establish a communion with nature, by capturing some of splendour and framing it in an individually conceived design.

1. *Western / English flower arrangement*

- Symmetrical arrangement
- Emphasis is given on mass flower arrangement and is primarily in form of art, to make the arrangement attractive.

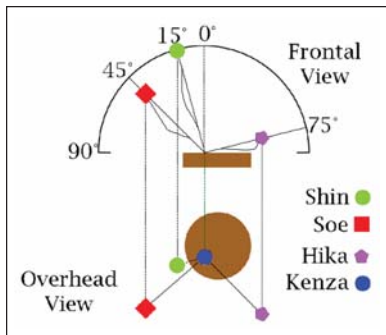


- In England and Europe, this style was first used to decorate palaces, mansions and churches.
- L-Shape, Crescent and S-Shape flower arrangements were introduced.

2. *Japanese or Eastern flower arrangement (Ikebana)*

- Asymmetrical arrangement
- Emphasis is given on spiritual and religious background and only few flowers are used.
- Basic lines in all japanese flower arrangement are Heaven (Shin), Man (Soe), Earth (Hikae) and Fillers (Jushi).

Tinting : Tinting is an important value addition technique in flower crops where colour pigments are absent or in light colour flowers. It is used during post-harvest stage for altering the colours according to our wish and desire. It enhances the appearance and appeal of the arrangement to be more attractive. Tinting of flowers can be adopted



Types of Japanese or Eastern flower arrangement

S. No.	Arrangement Name	Description
1.	Moribana	'Moribana' means piled up flowers, in which arrangements are made in shallow containers. - This arrangement looks very natural and is often called as natural 'Ikebana'.
2.	Nageire	'Nageire' means thrown in and flowers are arranged in upright containers. - Flowers must have sufficient stem length and these are supported with the help of cross bar fixture, which may be single or split types.
3.	Jiyubana	'Jiyubana' means free flowers, which can be arranged both in 'Moribana' or 'Nageire' styles of 'Ikebana'. - Wood, metal or any other material may be used in addition to flowers.
4.	Zeneika	'Zeneika' means abstract and this style does not simulate nature. - Straight material with uneven height is used.
5.	Zeneibana	In this style a beautiful sculpture is created using wood, stone, rocks, metal depicting any natural scenery.
6.	Morimono	- In this style fruits, vegetables and flowers are arranged and this style looks like 'English flower Arrangement'. - These are arranged on a wooden base called "dai" in Japan.

Fresh Flower Arrangements



i. Bouquets



ii. Garlands



iii. Corsages



iv. Boutonniere



v. Wreaths



vi. Gajra

vii. Veni

by two methods viz., by stem absorption method followed in (carnation, tuberose, gerbera) and by dipping of flower heads in flowers like daisies. (Ranchana *et al.*, (2017)). Tinting can be used in natural flowers by adding artificial colours or food colouring dyes. (Mekala *et al.*, (2012); Anjali *et al.*, (2014); Bharati *et al.*, (2016)).

Dry Flowers : Dried flowers and plants have been exported for the last 40 years and today, India is one of the leading countries in the field. The industry exports 500 varieties of flowers to 20 countries. Dry flower products are handmade paper, lampshades, wall quilt, decorations, greeting cards, bookmark, paper lanterns, photo frame, wall hangers, wedding confetti, paper weights, dry flower topiary, wreath, bouquets. Indian export 71% dry flowers exported mainly to USA, Japan, Australia, Russia and Europe. (De *et al.*, 2016). Top Ten dried ornamentals in global flower market are *Helichrysum*, *Helipterum*, *Limonium*, *Nigella*, *Gysophila*, *Delphinium*, *Amaranthus*, *Papaver*, *Carthamus* and *Rosa*. The dried flower business is confined to about fifty private companies operating from Kolkata, Tuticorin (Tamil Nadu) and Mumbai close to sea ports, as the material being bulky is usually shipped through the sea routes. Ramesh Flower Limited at Tuticorin has about 50 per cent share of the total dried flower export from India. (Dried Ornamentals, Floriculture at glance, Desh Raj). Exporting companies at Kolkata in West Bengal, Tuticorin in Tamil Nadu, Mumbai in

Maharashtra and Hyderabad in Andhra Pradesh are earning 10-15 times higher returns than

Dry Flower Arrangements



a. Greeting cards



b. Bookmarks



c. Lamp shades



d. Wall quilt



e. Paper lanterns



f. Wedding Confetti



g. Dry flower topiary



h. Carry bag



domestic markets. (Verma *et al.*, 2012). Floral craft either in form of fresh or dry flower products is an exclusive technique of value addition to the flowers accounting to the tune of 25% to 100%. (Singh, 2017). Our flowers are subject to price fluctuation and market gluts that accounts for huge postharvest flower losses (30%) as well

Drying Techniques

S. No.	Name	Description
1.	Air drying	- Easiest methods of preservation - Commonly referred to as the "hang and dry" method. - No special equipment is needed. - Longest drying method. - Some flowers that are air-dried and used include Dahlias, Poppy seed heads, Roses, Delphinium, Larkspur, Lavender, Golden rod, African marigold, Strawflower, Cornflower, Statice, Globe amaranth - Pertuit (2002) found that blue and yellow coloured flowers retained their colour when air dried but pink flowers were faded in some plants. 
2.	Water drying	- The leaves are stripped off and the flower stems placed in 5 cm of water then, placed in a warm place, out of direct sunlight. - The water is absorbed and evaporates as the flower dries. - Hydrangeas, Hybrid delphiniums, Acacia, Gypsophila, Bells of Ireland, Proteas dry well this way. 
3.	Press drying	- Flowers are kept under pressure, to remove the moisture out while leaving the color of the flowers and structure intact. - By placing them in heavy books we can allow for drying. - Unglazed paper, such as newsprint or an old telephone book, is best for pressing. - Pressed flowers are especially suitable for flower pictures, as well as decoration on note paper, cards etc. 
4.	Drying by embedding in dessicants	- A desiccant is simply a substance with a high affinity for water which can be used as a drying agent. - Silica gel, borax and dry sand used. - Champox (1999) reported silica gel as the best medium for getting excellent dry flowers with colour and shape retention. - Usually, the flower colour fades in the natural drying process, but loss of colour was not observed in embedding method. 

5. Glycerin drying

- Moisture in a flower or foliage is replaced with glycerin and water.
- The flower is preserved and not dried.
- Retain their natural shape and flexibility.
- The bark of the stem is removed and the cut end is smashed using a hammer. This portion of the stem is immersed in the glycerin and water solution.
- The leaf turns brown with glossy appearance after a month.



6. Microwave oven Drying

- Quick and relatively simple.
- It takes only a few minutes and provides dried flowers that look fresher and more colorful than obtained by other methods.
- Flowers with thick petals like magnolia are not suitable for drying in microwave.
- Flowers such as lilies, roses, violets, zinnias, and dahlias work well with this process.



7. Freeze drying

- Technically known as "lyophilization"
- The process of lowering the temperature of an object and then using a vacuum to extract all the moisture from the item.
- The freeze drying machine drops the temperature to a -20 degrees F then it slowly returns the freeze dried flowers to room temperature over a four week period.
- This slow preservation process allows the freeze dried flowers to retain their original form, while the colors become enriched.



as price fall upto 80%.

Dyes : Colored substance that has an affinity to the substrate to which it is being applied such as textile, food processing etc. The dye is applied in an aqueous solution, and may require a mordant to improve the fastness of the dye on the fibre. Dyes are soluble in water whereas pigments are insoluble. At present total market of natural dyes are about US \$ 1 billion and is growing tremendously @ of 12% per annum. Per capita consumption of dyes is 400g to 5 kg in

developed and underdeveloped countries for their utility in paints, inks, textiles, polymers, etc. Nature has gifted more than 500 colour yielding plants (Gokhale *et al.*, 2015). As per the report of the German ministry of food, agriculture and forestry, about 9,000 tonnes of natural dyes can be produced every year.

Two types of dyes

- Natural dye :** For the extraction of natural dye different plant parts are used such as seeds, flowers, leaves, barks, berries and roots. Plant dyes are obtained from Examples: *Annatto*, *Bixa orellana*, *Eucalyptus fibrosa*, *Ficus tinctoria*, *Gardenia jasminoides*, *Indigofera*.
- Synthetic dye :** The synthetic dye are easily available and show superior fastness properties over natural dye. Synthetic dye is not easily degradable and bio-accumulated in natural environment. It has been estimated that, nearly 10,00,000 tonnes of synthetic dye were used per annum. The synthetic dye may cause pollution, skin diseases, health hazards to human and other important organisms. Hence the use of ecofriendly and bio-degradable dye has main concern worldwide. Synthetic dyes are man made from petrochemicals.

Types of Synthetic dyes

- Acid dyes :** Water soluble, applied to fibers such as silk, wool and nylon. Ex: Alizarine pure Blue B, Acid red 88.
- Basic dyes :** Water soluble, applied to acrylic fibers, silk, wool. Also used in coloration of paper.
- Direct / Substantive dye :** Used on cotton, paper, leather, wool, silk & nylon.
- Mordant dyes :** Substance used to set dyes on fabrics by forming a coordination complex

with dye, which then attaches to fabric. *Ex:* tannic acid, sodium chloride, sulfur (inexpensive).

Methods for extraction of dye from petals

- 1. Aqueous extraction method :** 10 g fresh petals of red rose were boiled in 100 ml distilled water at 100°C for 30 minutes. The decolorized petals were taken out from extraction solvent.
- 2. Alkaline extraction methods :** In alkaline extraction method, 10 g fresh petals were boiled in 1% Sodium hydroxide for 30 minutes. The decolorized petals were taken out from extraction solvent. Finally, filter the solution and used for further study.
- 3. Acidic methods :** In acidic extraction method,

10 g fresh petals were treated with 1% of acidic solution boil at 100°C for few minutes. Finally, filter the solution and used for further study.

- 4. Alcoholic Extraction methods :** In alcoholic extraction method, 10 g fresh petals were boiled in 50% alcohol for 30 min. filtrate was used for further study. Patil *et al.* (2016).

PROCESSED PRODUCTS

- 1. Essential oils :** Essential oils are accumulated in the specialized structures like glandular cells and glandular trichomes. In flower crops, these occur in leaves (Marigold, Lavender) and flowers (Rose, Jasmine, Champaca, Tuberose).

Uses of Essential Oils :

- It is used in making perfumes.
- It is used in cosmetics, essences, after shave lotions.
- Flavoring beverages, soft drinks, juices, candy, cakes, ice creams.
- Preparation of soaps, detergents, room fresheners, shampoos, bath oils, hair oils, talcum powder, tooth pastes, mouth washes, pain balms, deodorants, aerosols.
- Preparation of medicines.
- Making agarbattis.
- Used as Insect repellent.
- Used as solvents in the paints and varnish industries.
- Used in manufacture of paper, plastics, leather, textiles.
- Larvicidal activity was also tested to the essential oil of *Tagetes patula* showing a potent activity specially against *Aedes aegypti*. (Dharmagadda *et al.*, 2005).
- The essential oil of *Tagetes terniflora* (Tereschuk *et al.*, 2003) and *Tagetes lucida* have reported antibacterial activity against

Dyeing Methods

S. No.	Name of method	Description
1.	Bleaching and Dyeing	• Drawback of dry flower products is that they are dull and lack the brightness of fresh flowers. • Bleaching is essentially whitening or decolourizing. • Various chemicals like sodium hypochlorite, hydrogen peroxide and sodium chlorite to be the most commonly used bleach for plant foliage. • Both chemical and natural dyes can be used. Enamel paints, interior paints, poster paints and tube paints could be employed for this purpose.
		
2.	Skeleton Leaves	• Skeleton leaves are semi-transparent leaves, also called fossil leaves. • They are prepared by soaking the fresh leaves in bleached water and then by hand rubbing the soft green flesh from the network of veins. • The leaves can be then dyed to variant colors to give them a beautiful and pleasing appearance. • They work surprisingly well on gift tags, greeting cards, scrapbooks, and stamping.
		 

Staphylococcus aureus, *Streptococcus pneumoniae*, (Caceres *et al.*, 1991), *Escherichia coli*, *Salmonella enteritidis*, *Salmonella typhi*, (Caceres *et al.*, 1990).

- The antibacterial and antifungal activity of the essential oil of *T. minuta* and *T. tilifolia* has also been reported (Zygadlo *et al.*, 1994).

Scenario of essential oil in the World

- Largest producer of rose oil -Bulgaria
- Largest producer of jasmine oil -Egypt
- Largest producer of tube rose oil -France
- Largest producer of carnation oil -France

Amount of essential oil in flowers

Flowers	Oil recovery (%)	Constituents of essential oil
<i>Rosa damascena</i>	0.025-0.030	Geraniol, Citronellol, Ethanol, Linaliol, Nerol, Eugenol, Phenyl Ethyl Alcohol
<i>Jasmine</i>	0.25-0.30	Benzyl Acetate, Indole, Cis-jasmone, Methyl Jasmonate
<i>Tagetes minuta</i>	0.20-0.35	Limonene, Ocimene, Ocimenone, Tagetone, Dihydro Tagetone
<i>Champaca</i>	0.13-0.20	Linalool, Methyl Eugenol, Methyl Ester, Phenol
<i>Narcissus concrete</i>	0.20-0.40	Eugenol, Benzyl Alcohol, Cinnamyl Alcohol, Benzaldehyde, Benzoic Acid

Scenario of essential oil in India : India ranks 26th in import & 14th in respect of export in world in the trade of essential oil. India holds around 0.7% of import & 1.1% of export. Jasmine and tuberose concentrate from South India have created a marks in world market. The major buyers of Indian essential oil are Former USSR, USA, France, UK, Netherlands, UAE and Saudi Arabia. Growth in perfumery is higher *i.e.*, 15% in India compared to 7% in America and 5% in Europe.

Export of major essential oil from India : Mint oil, Cedar wood oil, Clove oil, Eucalyptus oil, Tuberose concentrate, Palmarosa oil, Patchouli oil, Sandalwood oil, Lemongrass oil, Davana oil, Coriander oil, Dill oil, Spearmint oil, Rose oil, *Mentha piperta*, Jasmine concentrate, Jasmine oil.

Import of major essential oil : Citranella oil, Geranium oil, Jasmine oil, *Mentha arensis*, *Mentha piperata*, Vetiver oil, Cedarwood oil, Clove oil, Eucalyptus oil, Palmarosa oil, Patchouli oil, Sandalwood oil, Lemon grass oil, Davana oil, Anise oil, Caraway oil, Coriander oil, Spearmint oil, Lavender oil.

- Concrete :** It is the impure form of essential oil in which the plant pigment, terpenes and waxes are present. Concrete yields 45-50% of absolute.
- Absolute :** It is brownish concentrated liquid prepared from concrete by alcoholic extraction. During alcoholic extraction, terpenes, waxes and other materials are removed from absolute.
- Pankhuri :** It is prepared by drying the rose petals. Dried petals are used in cool drinks and potpourris.
- Gulkand :** Gulkand which is prepared by mixing equal proportions of petals and white sugar. Flower petals of *Rosa damascena*, *R.gallica*, *R.chinensis* are suitable for making gulkand. Gulkand is rich in antioxidant property. It is used as a cooling tonic and laxative and to cure heart related problems. It is widely used in pan, shakes, sweets, ice creams.
- Gulroghan :** Rose hair oil is prepared by enfleurage the 300g rose petals with 1 litre sesame oil. It is also used in aromatherapy.

7. **Rose water** : Rose water can be prepared by boiling of rose petals in water. The suitable species are *Rosa damascena*, *R.borboniana*, *R.centifolia*, *R.alba*, *R.gallica*. Rose water has antiseptic and cooling property. It is used in eye lotions, eye drops, skin tonics, facial toner, medicines, jams, jellies, ice creams, fruit salads, and juices. Rose water is sprinkled on the guests at weddings, feasts and social functions.
8. **Potpourri** : It is prepared by mixing dried rose and other flower petals, cones, pods, fruits, foliages. It can be used for decoration and as room freshner.
9. **Herbal tea** : Rose petals and fruits (hips) are used for preparing tea. Fruit contain vitamin C (150-2000mg/100 g fresh weight), minerals (calcium, potassium and phosphorous), anti inflammatory, antioxidant and diuretic properties.
10. **Juice** : The rose juice can be extracted from hips and used in many recipes for flavouring.
11. **Syrup** : Syrup is prepared from rose flower extract and sugar. It is used in flavouring sweets and cakes.
12. **Jam, Jelly** : Rose fruits, petals are used for preparing jam, jelly.
13. **Poultry feed** : Xanthophylls extracted from dried marigold petals is mixed with poultry feed to intensify yellow colour of egg yolk and skin colour of broiler.
14. **Pharmaceutical compounds** : Marigold petals have anti fungal, anti bacterial, anti-inflammatory, antiseptic and anti-oxidant properties. Skin creams are prepared from petals. The juice is extracted from petals and heated with an equal quantity of ghee is good remedy against bleeding piles. It has been used in folk medicine to treat diarrhoea, vomit, fever and skin diseases. (Ivancheva and Zdravkova, 1993). Presence of flavonoids and terpenes displaying insecticidal properties. (Tereschuk *et al.*, 1997; Perich *et al.*, 1995).
15. **Neutraceuticals** : The term "Neutraceutical is coined from""Nutrition" & "Pharmaceutical" in 1989 Stephen DeFelice (M.D, Founder of FIM). Generally neutraceutical is, "A food or part of food or nutrient, that provides health benefits, including the prevention and treatment of a disease." (AAPS *Pharmacy sci*, 2003) and as per Canadian health department, 1998, "A Neutraceutical is a product isolated from foods but sold in powders, pills and other medicinal forms not generally associated with food and are demonstrated to have physiological benefits or provide protection against chronic diseases". Some of the examples of neutraceutical as per this definition Vitamin pills, Mineral pills, Herbal pills/supplements, Oil gel caps' Phytochemicals, Zoo chemicals.

Fresh edible flowers of ornamental plants - A new source of nutraceutical foods

Edible flowers contribute to the increase of aesthetic appearance of food, antioxidant activity, scavenging activity of reactive oxygen radicals and prevent against cancer. In medieval France, the flowers of calendula (*Calendula officinalis*) were used when preparing various salads. In the 17th century, violets (*Viola odorata*) were used for the coloring of sugar, syrups. In Europe, dandelion (*Taraxacum officinale*) flowers were used for the preparation of drinks and salads. Petals of tulips, chrysanthemum and roses, Flower buds: Daisies, Garden nasturtium. (Kopeck & Balik, 2008). Herbal teas made of edible flowers they do not contain caffeine which causes a transient increase in blood pressure. (Hodgson *et al.*, 1999). Edible flowers may be used not

only as decoration or a garnish of various meals and salads, but also for other culinary purposes (baking and the flavoring of sauces, jellies, syrups, vinegar, honey, oils, teas, candied flowers, wine). Even a small amount of edible flowers may often improve the health condition of human beings.

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(Received: January 2025, Accepted: April 2025)