



## Bioactive and Medicinal Potential of Edible Flowers

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### Abstract

*From the previous decades edible flowers are effectively used in the treatment of various ailments. These edible flowers also used in salads, sauce, beverages and many more. In the composition of edible flowers lipid content, carotenoids, vitamin E, fatty acid, linoleic acid, alpha linolenic acid, xanthophylls, alpha tocopherol, lutein, zeaxanthin and many more chemical components presents. These chemical component shows various activities like anti-cancer, anti-inflammatory, anti-oxidant etc.*

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### Introduction

In all over the world the use of edible flowers is more, number of chefs used these flowers for various purpose, they prepare their dishes, by using these edible flowers they garnish the dishes and then they used in different products like drinks, desserts, entrees, soups and salads. These edible flowers not only add exotic and fresh aroma but also make delicate flavor and give a visual appeal and the use of cuisine gourmet increasing. The most effective and good edible flowers are *L. cyanuscentaurea*, *L. officinalis calendula*, *Canina R*, *Gallica R*, *Alexandria damascene rosa*, *mignon dahlia*. By using these various edible flowers health related problem is dissolved because these are effective in the cure and management of several ailments. These edible flowers also richest source of phytochemicals include phenolic component. These components are very effective for the management of chronic health related issue like cancer, cardiovascular problem, cognitive problem, diabetes etc. number of anti-oxidant component possess by these edible flowers include flavonoids and phenolic acid which strongly show association with color. They give color directly through flavonoids and anthocyanins and indirectly by co-pigmentation process. Different plant and their derivative products used as a flavoring agent, as a preservative and most effectively

used to cure the acute problem of human. So, these effectively shows anti-biotic and anti-microbial, anti-tumor characteristics. From the previous decades people used edible flowers, mostly their use popular in Victorian era in England. The use of these flowers with the passage of time increase now a days used in ice cubes, preserved in distillates, canned in sugar. Sometimes they used as whole but mostly their parts used like tulip petals used, *Rosa* species and flowers buds of daisies, chrysanthemum, nasturtium garden used. Some important herb flowers include thyme, garlic, chives, leeks, alliums, mint, marjoram, summer savory, common sage and flowers of some fruits also effective include berry blossoms, citrus blossoms like lime, orange, lemon, kumquat, grapefruit. Some edible flowers are found in vegetables and these are oleracea l brassica like cauliflowers, *cynarascolymus* like broccoli..

### Chemical composition of edible flowers

The chemical composition of edible flower is very important. These flowers contain number of components which we discussed one by one, but the presence of lipid content is more significant. The dry weight of hibiscus flowers almost contains 19-26 gram of fat content. The presence of fat content in edible flowers ranges from 0.1-8.5gram, but the presence of

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water concentration varies from 70 to 95% and the presence of fat in fresh flowers is low [1]. The presence of fat is varying from part to part like in moringa flowers 2.91g fat is present in which immature pods have 1.28g and leaves contain 4.96gram [2]. In mallow common flowers the total presence of fat is 2.84 in which stem leafy flower have 3.09gram and 2.76 present in leaves [3]. The presence of fat content in vegetable include spinach, cabbage and lettuce almost same [4,5].

Scientific name	Common name	Fat content
Chabaudfilifera yucca	Yucca	2.1
X viola wittrockiana	Pansies	5.0 to 6.0
Majustropaeolum	Garden nasturtium	3.1 to 3.6
Erecta tagetes	Mexican marigold	1.9
Micrantharosa	Rose	1.3
Lam oleiferamoringa	Moringa	2.9
Malvasylvestries	Common mallow	2.8

In edible flowers include carotenoids, phenolic component, moisture content, dietary fiber, protein, flavonoids, anthocyanins, flavanols, iso-rhamnetin, glycosides, flavones, glycosides apigenin, cyanidin, glycosides delphinidin, lutein [6,7]. Vitamin C, I minerals present calcium, iron and potassium [8-10], hexoside O and 3 o sophorosidepelargonidin. Number of edible flowers plant are present which have important component these plants include hibiscus, dandelion, lavender, nasturtium, borage, honeysuckle, purslane, rose, squash blossom, pansy, chamomile, calendula, zucchini blossom, sage flowers, violets and their chemical composition include anthocyanin, cyanidin, polyphenol, DPPH, delphinidin, anthocyanidin, hydroxy citric acid, stigmasterol, gossypetin, sophorose, myrtillin, mannose, inulin, sesquiterp lactone, chicoric acid, taraxasterol, lupeol, amyrin, taraxerol, cycloartenol, aesculin, linalool, linalyl acetate, eucalyptol, monoterpene, terpinen 4-ol, caryophylle, borneol, terpineol, ocimene, lavandulol, lavandulyl acetate, camphene, farnesene, terpinene, p-cymene, sabinene, phellandrene, pinene beta, acetate neryl, bisabolol, acetate geranyl, isothiocyanate benzyl, acetonitrile benzene, phenylethyl 2 isovalterate, linoleic acid, oleic acid, palmitic acid, stearic acid, eicosenoic acid, erucic acid.

**Medicinal potential of edible flowers**

Edible flowers show maximum effect for acute and chronic diseases. As we discussed number of edible flower plant are present from these, we obtained various important phytochemical component which shows anti-oxidant, anti-inflammatory, antiobesity, anti-cancer, neurologic effect, hypoglycemic effect and many more. The component of edible flowers which shows anti-oxidant activity in food related industry used in both form natural and synthetic [11-13]. The presence of phytochemical in plants indicate through plant flowers color, vegetable and fruit color which shows in these plants lots of carotenoid, anthocyanins, flavonoids and phenolic component present [14-16]. So, when plants are used for consuming purpose then it is better to understand what part of plant are edible or not [17,18]. The nursery florists flowers mostly used for herbicides, fungicides and pesticides purpose [19]. These edible flowers effectively used as aadditive of food like flavorings, dyes, preservatives and as good anti-oxidant [20]. For eating purpose not all the flowers are safe some show toxic effect, some edible

flowers are used in many dishes like sauces, salads, beverages and in making entrees. The important edible flowers are hibiscus sabdariffa which usually grow in sub-tropical and tropical areas all over the world. The flowers of this plant almost 15cm and the color of these flowers give various shades like yellow, pink, white, red. It shows number of medicinal and culinary uses, effectively used to control the level of cholesterol and blood pressure. Mostly people used in jam, salads, relishes and tea, hibiscus tea is very effective for medical point of view. Hibiscus contain important component which know as anthocyanin which possess anti-oxidant properties and this component give also color to the petals of hibiscus plant. The extract of this plant effectively used in the cure of skin wound and the product of this plant used in the form of capsule and supplements [21].

Dandelion edible flower plant also known as garden weed and highly nutritious plant, the petals of this plant is yellow bright color.it is a potent edible flower which show anti-oxidant characteristics. All parts of dandelion include roots, flowers, leaves and stem all are effective and used for eating purpose. Lavender is well known for their lots of traditional uses; the growth of this herb occurs in Mediterranean and Africa. It gives calming and soothing effect. In china honeysuckle is effectively used in china traditional medicine, shows good anti-inflammatory effects, also used in making tea for fragrant purpose or in syrup. Variety of minerals and health promoting component present in nasturtium which shows anti-oxidant and anti-inflammatory activities. Borage is another important herb used to cure the acute ailments like cough and sore throat.

**Consumption of flowers and their medicinal properties**

Direct benefits have been obtained from plants by including them in both human and animal diets and indirect by obtaining by-products such as: fibers, waxes, lubricants, secondary metabolites, fuels, constructionmaterials, among others [22]. The human being has selected and domesticated plants that provide a benefit, while developing cultivation techniques that help to significantly increase food production. These actions made it possible to identify the centers of plant origin, which host the “greatest diversity of types of a given specie”. According to Vavilov [23], there are eight centers of diversity of cultivated plants, where China is considered the oldest and largest center of origin, with a great variety of crops, such as: rice, millet, soybeans, beans, sugar cane, oats, barley, sesame, pumpkin, sorghum, asparagus, pear, apple and citrus, among others. While centers of origin such as Mexico and Central America have great diversity in corn, beans, squash, maguey, nopal, sunflower, avocado, cocoa, sweet potato, walnut, cotton and fruit trees [24].

Currently, the world's staple diet depends largely on three cereals: corn, rice and wheat, which contribute 42.5% of the world's food calorie supply [25]. Projections for 2050 estimate that the world population will exceed 9,000 million people, which implies the need to increase food production [26]. Although, increase in the production of basic crops should not be the answer to this problem, since it would favor the generation of monoculture and homogeneity in the human diet, aspects that have a negative impact on agriculture (generation of pests, increase in the use of pesticides, decrease in biodiversity), as well as in health maintenance [25,27].

According to the World Health Organization (WHO), nutrition and physical activity are determining factors to maintain good

health, while, on the contrary, a deficiency in both factors leads to the development of chronic diseases, such as hypertension, diabetes, cancer and those of the gastrointestinal type that top the list of diseases that cause premature deaths, of up to 75% worldwide and have a negative impact on public health [28,29]. Poor nutrition is a current trend in many countries, the hasty lifestyle and access to food where almost no or no time is invested in its preparation has triggered the consumption of highly processed products, rich in calories, saturated fat, sugar and salt, but poor in protein content, fiber and micronutrients [26]. It is necessary to return to a more diversified diet. It is well known that ancient cultures included cultivated and wild plants in their diet, from which they consumed their stems, leaves, roots, flowers and fruits, whose nutritional and medicinal benefits were known through experience and were transmitted from generation to generation [30,31]. Many of these species are used only locally, restricting their use by the inhabitants of the geographical areas where they are located, since they require the trained identification of their inhabitants.

One of the practices that has gained strength in recent years is the consumption of flowers, known as flowerphagia, a practice with medicinal and nutritional purposes carried out for hundreds of years in European and Chinese cultures, presenting itself as an alternative for improve eating habits. Edible flowers, in addition to providing conventional nutrients, confer exquisite flavors, colors and aesthetics to the preparation of dishes and many of them, due to their pleasant smells and chemical properties, are consumed in the form of infusions or refreshing drinks. According to their composition, they can be included directly in food, without being subjected to any previous processing, while some others due to the presence of anti-nutritional compounds, a cooking, soaking or dehydration process is recommended to discard them and thus be able to include them in the preparation of soups, desserts, ice cream, jellies, salads, side dishes, stews and drinks [32,33].

The rose (*Rosa spp*), belonging to the Rosaceae family, of Asian origin, is one of the most cultivated and its petals, with high antioxidant capacity and phenolic content, are used to prepare infusions, as well as in the preparation of desserts and in ornamentation [34]. While cauliflower (*Brassica oleraceae* var. *Botrytis* L.) and broccoli (*Brassica oleracea* var. *Italic* Plenck) are used as a vegetable or garnish [33]. Some other species such as: chamomile (*Matricaria* L.), calendula (*Calendula officinalis*), sunflower (*Helianthus annuus*), chrysanthemum (*Chrysanthemum spp*), dahlia (*Dahlia spp*), daylilies (*Hemerocallis fulva*), carnations (*Dianthus spp*), and lavender (*Lavandula angustifolia*) are part of the great variety of plants with edible flowers [14,29,33].

With the advent of technology and the interest in improving the food system of the global population, researchers from around the world have taken on the task of rescuing and highlighting the nutritional value of traditional foods, including different types of edible plants. In order to publicize healthy and varied food alternatives, which not only satisfy nutritional requirements, but also many of them could be considered a source of chemical compounds with physiological properties in human health [35]. So that the inclusion of highly varied foods, in addition to providing vitamins, amino acids, proteins, carbohydrates, lipids and minerals, also provide antioxidants and bioactive compounds such as polyphenols (flavonoids, anthocyanins, tannins, catechins, glucosinolates, lignans and phenolic acids) characterized by having a pharmacological effect,

highlighting the antiparasitic, antibiotic, anti-inflammatory, anti-hyperglycemic, anticancer, anti-allergenic, vasodilator, detoxifying activity, among others [29,36].

Central America is no exception and within its great culinary culture a great variety of plants with edible flowers is included, belonging to at least 84 different genera, among which are *Agave*, *Cucurbita*, *Begonia*, *Dhalia*, *Lippia*, *Opuntia*, *Phaseolus*, *Portulaca*, *Yucca*, just to mention a few examples, all these flowers with nutritional, ornamental, sensory and medicinal properties [37]. There are plants with edible flowers widely cultivated and used in Central American gastronomy, such as the pumpkin flower (*Cucurbitapepo*), even those of the wild type, for local consumption, whose properties are known empirically. Without a doubt, plants contain a great variety of compounds, which give them a certain pharmacological activity, these are distributed in the different plant structures. Here are some edible flowers of cultural, economic, and functional importance.

### Pumpkin flower (*Cucurbita spp*)

These flowers are the best known and most in demand in Mexican cuisine. They come from squash (*Cucurbita pepo*), family Cucurbitaceae, it is an herbaceous type plant, annual, prostrate, climbing with spirally wound tendrils. This family has about 100 genera and 850 species. Among which are, watermelon (*Citrullus spp*), cucumber (*Cucumis sativus*), melon (*Cucumis melo*), loofah (*Luffaa egyptiaca*) among others. They are distributed mainly in tropical and semi-tropical regions, and are abundant in Mexico [38].

The Pumpkin, which was known as "ayotli" by the Aztecs, has large, alternate leaves similar to those of the vine, its fruits are edible with flattened seeds and similar to large berries. They are monoecious or dioecious plants. Its flowers are oblong, yellow and campanulate, they are radiated unisexual (male or female) and rarely hermaphrodite, its calyx has five sepals and its corolla five fused petals. Due to its yellow color and its exquisite flavor, they have become an attractive dish for the consumer, with which tacos and quesadillas are prepared. They contain a high percentage of moisture (93.2%), carbohydrates (471 g.Kg<sup>-1</sup>) and protein (219 g.Kg<sup>-1</sup>), have a good mineral content (159 g.Kg<sup>-1</sup>) and fiber (105 g. Kg<sup>-1</sup>), and low fat content (50 g.Kg<sup>-1</sup>). The most notable amino acids are glutamic acid (30.82 mg.g<sup>-1</sup>) and leucine (16.21 mg.g<sup>-1</sup>). They have low concentrations of trypsin inhibitors and do not show hemagglutinin, hemolytic, or alkaloid activity [30].

### Yucca flower (*Yucca spp*)

Within the Agavaceae family, one of the most representative plants are those of the *Yucca* genus, which are characterized by being perennial, succulent, shrubby and arborescent. Dominant in arid and semi-arid zones of Mexico. They are generally provided with a trunk, some of their species growing as tall as a tree. The *Yucca* genus is made up of 49 species, of which 29 are found in Mexico and are distributed from Canada to Central America [22,39].

Plants of the *Yucca* genus have been used by indigenous cultures in North America for several millennia. From them, high resistance fibers known as "ixtle de palma" were obtained, which are used in the production of ropes, sandals, clothing and basketry. Its young leaves have served as livestock feed in times of intense drought. Its robust trunks have been used to build huts and living fences delimiting property territory and areas for livestock [22]. Some of these species, due to their large size and characteristic shapes, are used in the ornamentation of parks,



gardens and ridges, especially in cities in the North and Central Mexico. Due to its high amount of saponins, its roots are used as soap and other more specific ones, its flowers and fruits serve as food for both man and cattle [30,31].

Historically, *Yucca* leaf extracts have been used to treat inflammatory disorders, arthritis, and rheumatism. Currently there are studies that show its antimicrobial and anticancer activity. *Yucca aloifolia* variegata leaf extracts, with the presence of 18 flavonoids and 19 phenolic acids, have been tested together with those of *Y. filamentosa* and *Y. elephantipes*, in carcinogenic lines, resulting in extracts of *Y. aloifolia* variegata being the most effective against liver and breast cancer [40].

*Yuccas* reproduce both sexually (by seed) and vegetative (by shoot or shoot). They are characterized by presenting a panicle-shaped inflorescence, either erect (*Y. carnerosana* and *Y. treculeana*) or pendular (*Y. filifera*). *Yucca* or *Izote* flowers, as they are commonly known, are campanulate-globose with a creamy white color, made up of 6 petals, sometimes have pinkish or purple tints and produce little or no nectar. Its flowering lasts for more than a month between March and April, coinciding with the Holy Week festival in Mexico, so they are included as part of the traditional dishes of that season, improving the taste, color, smell, flavor and food decoration.

For dishes preparation, the flower buds or only the petals can be included when it has flowered, trying to remove the pistils, since it confers a bitter and unpleasant taste when ate. Its petals are soft and fleshy, with a high content of moisture (88%), carbohydrates (538 g.Kg<sup>-1</sup>) and protein (259 g.Kg<sup>-1</sup>), they have a good content of minerals (97 g. Kg<sup>-1</sup>) and fiber (85 g.Kg<sup>-1</sup>), and very low fat content (21 g.Kg<sup>-1</sup>). The most notable amino acids are glutamic acid (29.27 mg. G<sup>-1</sup>) and proline (19.02 mg.g<sup>-1</sup>). In addition, in terms of antinutrients, they have low concentrations of trypsin and hemagglutinin inhibitors and zero alkaloids [30]. In addition, it has been reported that it presents anti-hypoglycemic activity when combined with alfalfa in different proportions [31].

#### Agave flower (*Agave* spp)

The *Agave* genus is considered one of the most representative of the Mexican territory and is the largest (about 300 species) of the Agavaceae family, which comprises 18 genera and 600 species. They are characterized by being succulent plants with basal or crowded leaves at the base of the stem, rigid, fleshy, pointed and in the shape of a rosette. They are monocarpic, that is, they only flower once throughout their life and this process takes up to 10 years from the establishment of the plant. They have a very tall inflorescence, which can measure up to 10 meters in height, robust and with 15 to 25 panicles, each panicle with umbels that have up to 150 flowers [41].

Plants of the *Agave* genus are abundant in arid and semi-arid areas and are considered of great ecological, cultural and economic importance. Its flowers are yellow in color and produce a large amount of pollen on which a wide variety of birds, insects and bats feed. Its reproduction is sexual and its flowering can last up to three months [41]. Some species of economic importance are *Agave tequilana* from which the traditional tequila is obtained and *Agave salmiana* from which pulque and mezcal are obtained [42,43].

Agave flowers contain a high percentage of moisture (87.4%), carbohydrates (621 g.Kg<sup>-1</sup>) and protein (164 g.Kg<sup>-1</sup>), have a good content of minerals (58 g.Kg<sup>-1</sup>) and fiber (127 g.Kg<sup>-1</sup>), and low fat content (49 g.Kg<sup>-1</sup>). The most notable of its amino

acids are glutamic acid (17.78 mg.g<sup>-1</sup>) and proline (19.43 mg.g<sup>-1</sup>), in addition to Isoleucine, Leucine, Valine, Phenylalanine, and Tryptophan. Regarding their antinutrient content, they have low concentrations of trypsin inhibitors (1.11 TUI / mg sample) and present hemagglutinating and hemolytic activity and do not have alkaloids [31]. While, Pinedo-Espinoza, et al. [44], indicated that Agave flowers contain 88% moisture, carbohydrates (71.58 g. 100 g sample), protein (11.58 g. 100 g sample), minerals (5.65 g. 100 g sample), fiber (9.65 g.100 g sample) and very low-fat content (1.58 g.100 g sample). Among the macroelements that have been quantified in Agave flowers are sodium (Na) phosphorus (P), potassium (K), calcium (Ca) and magnesium (Mg) in a range of 0.12 to 160 g. 100 g DW, and microelements such as iron (Fe), copper (Cu), zinc (Zn), manganese (Mn) and boron (B) in concentrations of 6.50 to 86.60 g.kg DW [44].

A high antioxidant capacity has been reported in Agave flowers because its bioactive compounds such as: carotenes (red, yellow and ascorbic acid), phenolic compounds (chlorogenic, vinyl, caffeic and ferulic acids) and flavonoids such as rutin (helps blood circulation, it is considered a heart attack reducer), floridzin (reduces glucose absorption), apigenin (has anti-inflammatory and anti-cancer effects) and galangin (used in the treatment of induced vitiligo) [44]. Similarly, the presence of other flavonoids such as quercetin and kaempferol glycosides have been mentioned in Agave durangensis flowers [43].

#### Jamaica flower (*Hibiscus sabdariffa*)

The *Hibiscus* genus has 300 species and belongs to the Malvaceae family, which consisting of 75 genera and 1000 species and is distributed in tropical and temperate zones. Jamaica (*Hibiscus sabdariffa*) is an annual herbaceous plant with a red, branched stem, with simple alternate leaves, bisexual flowers, red at the base and pale ends. Its calyx is conical at the base with five red sepals. Its fruit is a spiny capsule and its dehydrated calyces are widely used in the preparation of refreshing drinks and infusions, salads and jams. To extract a large part of its compounds, a decoction process can be carried out, where the water can be drunk and the calyces with a high content of dietary fiber and antioxidant capacity can be consumed [45]. Jamaica has an African origin, and in America, Mexico is the main producer.

The red calyces of Jamaica have a high content of carbohydrates (79.25%), protein (6.40%), minerals (6.52%) and fats (5.13%), while the fiber content is 2.70%. Regarding their mineral content, they have a higher concentration of iron (Fe, 833 mg.100g sample) and to a lesser extent mineral such as phosphorus (P, 22 mg.100 g sample), sodium (Na, 15 mg.100g), calcium (Ca, 3.0 mg.100 g), zinc (Zn, 1.17 mg.100 g), magnesium (Mg, 1.0 mg.100 g) and copper (Cu, 0.70 mg.100 g) [46].

The presence of anthocyanins confers color, organic acids, and flavor to these beverages. Several studies have shown that they have diuretic activity, as well as anti-inflammatory, bactericidal, antifungal, anti-hyperglycemic, anti-hypertensive properties, among others. In addition, they have phenolic compounds, flavonoids, saponins, polysaccharides and phytosterols that help to reduce the intestinal absorption of cholesterol. It also has beta-carotenes, thiamine, riboflavin and ascorbic acid [32,47].

#### Bougambilia flower (*Bougainvillea* spp.)

The *Bougainvillea* genus, which includes this plant, comprises 18 species and belongs to the Nyctaginaceae family. It is

originally from Brazil and is found distributed throughout the world. Species such as *B. buttiiana*, *B. glabra* and *B. spectabilis* are used for their properties in traditional medicine and are characterized by being climbing shrubs, evergreen, elliptical leaves, trunk and branches with thorns. Its flowers, which are modified leaves, present a wide range of colors that go from white, yellow, pink, magenta, orange, red and purple. They are considered resistant plants to diverse climates, especially hot and dry ones. Its propagation is by cuttings and its flowering occurs in the months of March to December [48,49].

The benefits of the infusions of *Bougavillea* spp. (*B. glabra*, *B. spectabilis* and *B. buttiiana*) are known to treat cough and whooping cough, their expectorant action helps to expel secretions from the respiratory tract, for which the flowers can be boiled with orange, cinnamon, oregano and thyme [49]. *B. engrave* is used to treat asthma, bronchitis, dysentery, and less so for stomach pain. *B. spectabilis*, in addition to being applied in cases of bronchitis, is also used to relieve lung pain and snoring [50].

*Bougavillea* spp. has been studied extensively and some of the compounds that have been determined in its leaves, bracts and flowers of *B. buttiiana*, are aliphatic hydrocarbons (alkanes, alkenes and cycloalkanes) considered a source of energy, and some fatty alcohols compounds such as triacontanol and doctriacontanol, which have a growth regulating function. Beneficial compounds for the human diet have also been determined, such as essential fatty acids, including dodecanoic, tetradecanoic, hexadecanoic and eighth decanoic acids [51].

Analysis of *B. glabra*, *B. spectabilis* and *B. buttiiana*, indicate the presence of more than thirty volatile compounds that include: aldehydes, ketones, phenols, oxides, esters and alcohols, a dozen of phenolic compounds such as gallic, vanillic, coumaric, ferulic, caffeic acids, among others, and compounds such as peltoginoids and flavonoids (rutin, apigenin, quercetin), and some others such as phytosterols, terpenes and carbohydrates that are part of its leaves, bracts and flowers [51,52].

*B. glabra* has been the most studied specie of this genus and with the greatest number of reported properties, among them its analgesic, antiparasitic, antidiabetic, antiarrhythmic, antihyperlipidemic, anti-inflammatory, anti-microbial, antioxidant, antipyretic, anti-ulcerative, cardioprotective, neuroprotective and thrombolytic activities. *B. spectabilis* and the *B. x buttiiana* hybrid have only some of these properties, coinciding in their anti-inflammatory, antidiabetic and antioxidant properties and only cases of infertility have been reported in mice when using *B. spectabilis* [51,53].

### Artichoke flower (*Cynarascolymus*)

There is a discrepancy regarding the artichoke origin, some authors affirm that its is European, while others consider it to be native from Africa. Italy is the main artichoke producer in the world with about 474,000 t, followed by Spain, France and Greece. It belongs to the Asteraceae family and is believed to have arisen through selection and traditional breeding that Italian farmers applied to wild thistle species. Today, it is cultivated around the world and its consumption has increased due to its health benefits [54] and because it is considered a functional food.

This commodity is considered an herbaceous and perennial plant, with long (60 cm long) and pinnate-lobed leaves. Its reproduction is vegetative or by seed. The leaves are split green on the upper part and whitish on the underside due to

the presence of fine white filaments that make the color of the leaves pale. Its erect, thick and branched stems, reach 1 m in height, end in rosette-shaped structures, with superimposed green bracts that look like scales. Its flowers are pink, tubular and gathered in structures of up to 15 cm (weight 50 to 100 g), where the floral receptacle and the base of its bracts are edible (bud) [55].

The inflorescences can be eaten raw as part of salads or cooked and the water can be drunk as an infusion or they can be baked, roasted or browned in oil. The internal part of the inflorescence known as "artichoke heart" is what is consumed, and is characterized by being meaty, crunchy, succulent and its flavor is slightly bitter and sweet at the end. Because it is an important component of the Mediterranean diet, the artichoke is marketed in a wide variety of presentations: fresh or dehydrated, canned, frozen and preserved due to its high content of crude fiber, minerals and inulin (which favors the absorption of minerals and prevents colon cancer). Its nutritional content when fresh has a water percentage of 75.80%, with 76.84% carbohydrates, 13.84% protein, 7.21% minerals and 1.56% lipids, and a crude fiber content of 63.76 mg/g. Contains minerals such as Na (92.53 mg/100 g), K (364.30 mg/ 100 g), Mg (59.07 mg/ 100g), Fe (1.23 mg/ 100g), Mn (0.23 mg/ 100g), Ca (43.31 mg/ 100g) and Zn (0.46 mg/ 100g) and vitamins such as C vitamin (15.42 mg/ 100 g), A vitamin (0.043 mg/ 100 g), thiamine (B1) (0.49 mg / 100 g), riboflavin (B2) (0.51 mg/ 100 g), cyanocobalamin (B12, 1.27 mg / 100g) and folic acid (0.39 mg/ 100 g). It is recommended to consume it with strawberries, since when subjected to the cooking process there is a slight decrease in components such as vitamins, fiber and carbohydrates [56].

Due to its high fiber content, artichoke is widely used as a slimming diet, as it favors intestinal transit (laxative) and inhibits fat absorption. It has anti-hyperglycemic activity, so it is highly recommended to control blood sugar levels in diabetic people. Due to its potassium content, it has diuretic activity, fighting fluid retention and cellulite. It is considered a purifying food, with a high content of cynarin, a substance that favors the production of bile and the metabolism of the liver [57].

Artichoke flowers are considered a by-product of the crop, however, they are also consumed as a vegetable in the human diet, when they are mature, a substance known as milk coagulant protease accumulates in their stigmas. These proteins (cinnarases) are glycoproteins with activity at pH 5 and 70 degrees centigrade and their use has been proposed in the dairy, meat, pharmaceutical, food, and bakery industries. As a coagulant of vegetable origin, it is used in the production of traditional cheeses in Spain and Portugal. These enzymes are believed to play an important role in plant reproduction and in protective action against pathogens and insects [58].

The extracts based on the leaves, stems and roots of the artichoke are known for their pharmacological uses for the treatment of digestive disorders, it reduces the values of total cholesterol (hypocholesterolemic) and triglycerides (hypotriglyceremic), thereby reducing the accumulation of cholesterol in coronary arteries avoiding arteriosclerosis. It also has hepatoprotective and antioxidant activity (attributed to the scavenging action of free radicals by its phenolic, flavonoid and phenolic acid content), diuretic and choleric, in situations of jaundice, liver failure and non-ulcer dyspepsia or disorders that originate when food is not well digested or digestion is heavy and slow [54]. Pharmacological properties are attributed to the presence of phenolic compounds, such as cepheic acid, cynarin

(dicaffeoylquinic acid), caffeoylquinic acid, chlorogenic acid, lactones, in addition to inulin and flavonoids, such as apigenin, luteolin, rutin, glycosides, rutosides and pigments such as anthocyanins, which give the inflorescences a color from green to violet [59].

## Conclusion

Low nutrient content present when edible flowers are fresh like fat because at that time water is main component. The oil of edible fresh plant is very crucial and effectively used as therapeutic purpose. Mostly edible flowers are rich source of alpha tocopherol and vitamin E which have potential to possess biological activities. Carotenoids also effected as health beneficial.

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