

# Eating flowers-The consumption and market of edible flowers

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## Abstract

Edible flowers help us gain pleasure from the way our food is presented by paying attention to details like color, shape, flavor and aroma. Consumed since ancient times, edible flowers are regaining popularity in today's cuisines. This paper 1) introduces edible flowers consumed in different countries and cultures around the world, 2) reports some medicinal and nutritional properties, and 3) lists issues related to its market and possible solutions. By learning and sharing the knowledge about edible flowers, we are able to revive the traditional knowledge accumulated by our ancestors that may prove valuable from medicinal and nutritional aspects. Development of edible flower market will rely on reviewing the legislation and standard of production that must differ from ornamental flowers. This is to ensure the health and safety concerns of customers. If specific measures are taken by all stakeholders to educate, convince and comfort consumers, edible flower market has the potential to grow as a new commodity in local markets around the world.

## Introduction

Flowers are sexual organs of a plant designed to attract pollinators with their fragrance, color and shape. The ornamental property is therefore, a basic essence of any flower. However, some flowers are special because they are safe for human consumption and hence the term 'edible flower' was coined. Over time, our human ancestors have identified and utilized the nutritional and medicinal properties of flowers and their knowledge has been passed down to younger generations as herbal remedies and ethnic cuisines. Learning about edible flowers can help us picture and connect diverse streams of knowledge that shed light on regional traditions, culinary arts, aesthetics, nutrition, pharmacy, ethnobotany etc. In this paper, edible flowers consumed in different countries have been reported.

The popularity of edible flowers has grown not only because they make our foods and drinks visually appealing, but also nutritionally enriching. Collecting and recording old recipes that use edible flowers, can become excellent reference materials for pharmacists, herbalists, nutritionists, chefs and horticulturists helping them recognize flowers as sources of antioxidants and biological compounds. However, not all flowers are edible. Flowers such as azalea, crocus, daffodil, foxglove, oleander, wisteria etc. contain excretory substances like glucosides, cyanogenic glycosides, tannins, latex, metallic and non-metallic salts making them deadly toxic (Ghosh, 2013). Consumer awareness is necessary to increase the market demand of edible flowers. In this paper, the nutritional and chemical properties of some edible flowers are discussed.

Many of our plant-based foods are specific parts of the plant body. For example, radish, carrots are roots, sweet potatoes and yams are tubers, spinach, coriander are leaves, tomatoes, egg plants are fruits, cauliflower, broccoli are flowers and cereals and nuts are seeds. In the case of edible flowers, sometimes more than one part of the plant body is edible. For example, both the flower and fruit of banana, plantain, pumpkin, zucchini are edible.

Also, some edible flowers like hibiscus, roses, carnations and jasmine are commonly traded as ornamental plants. Having multiple purposes, edible flowers can therefore be considered value crops worth cultivating for better profits. Yet, despite getting much attention, information related to trade of edible flowers is often unavailable. This paper aims to report why market trends of edible flowers are low in order to understand and stimulate future market potential of edible flowers.

## I. How are edible flowers consumed in different countries?

Edible flowers and their uses as ingredients, garnishes and medicine, are part of unique traditions, practiced since ancient times. Thanks to the global trade channels and internet, edible flowers are being rediscovered for use in modern cuisines, setting a new fashion in the culinary world. Here, a few edible flowers and their use as ingredients, garnishes or medicine have been listed countries-wise. Some cuisines that use flowers as an ingredient are listed in Fig.1.

In Nepal, Mountain Ebony (*Bauhinia Variegata* L.), locally known as ‘*Koiralo ko phool*’ is a seasonal treat. Its buds and flowers are cooked or pickled. They are also known to cure diarrhea and dysentery (Pathak, 2012). A total of 60 species of wild orchids found in Nepal were reported to be used in traditional medicinal practices to cure at least 38 different ailments, including energizers, aphrodisiacs and treatments of burnt skin, fractured or dislocated bones, headaches, fever and wounds (Subedi et al. 2013).

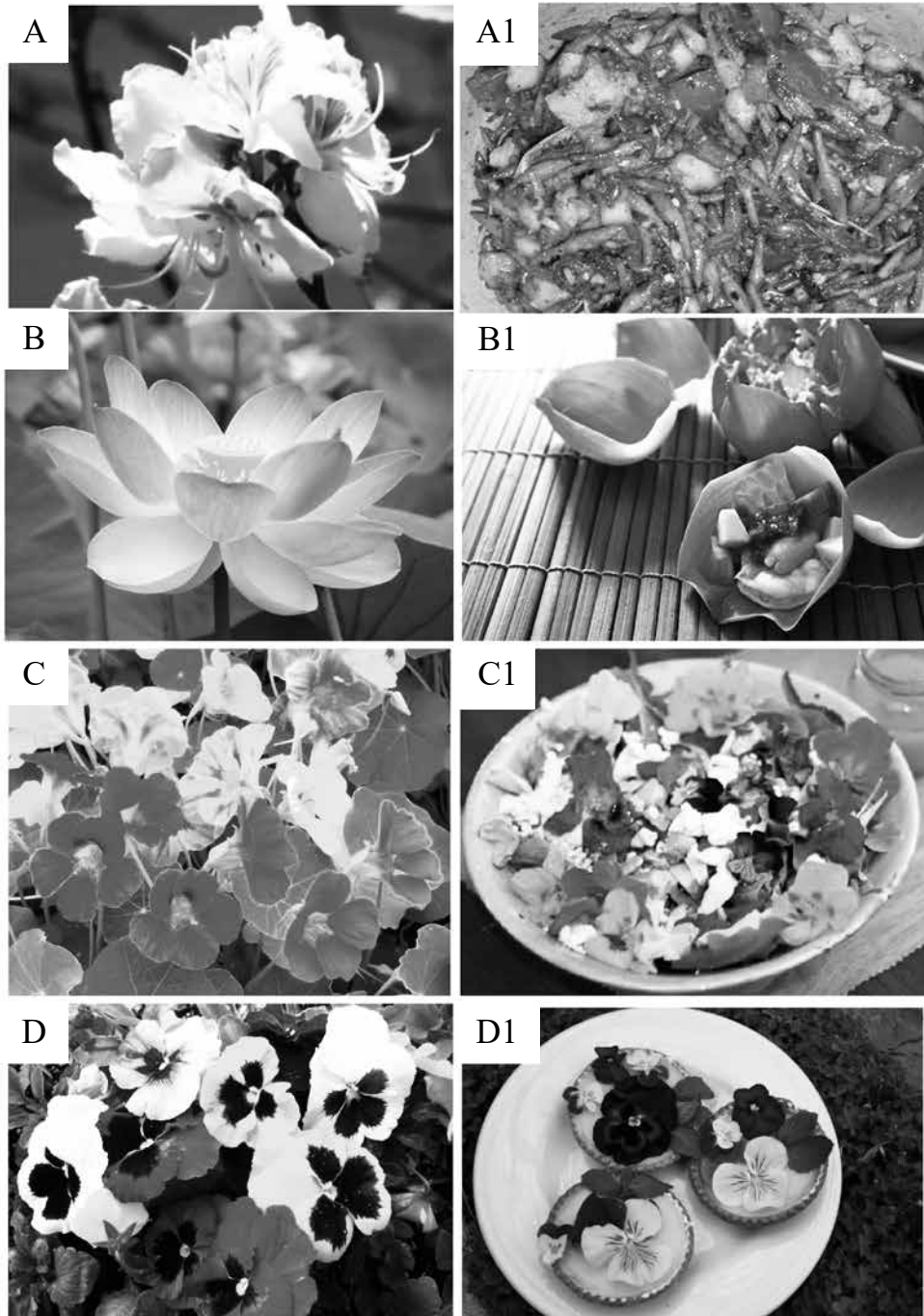
In India, flowers and buds of neem (*Azadirachta indica*) are known to improve digestive health. Fresh, dried, crystallized or frozen petals of roses (*Rosasease* spp.) are used in desserts and syrups. Safflower and marigolds are used as food dye. Flowers of *Tamarindus indica*, locally called ‘Imli’ are used to make Indian cuisine called ‘Chutneys’ (Ghosh, 2013). Ashoka (*Saraca asoca*) flowers and leaves are consumed by women on ‘Ashoka-sasthi’ ritual to guard their children against grief and sorrow (Pradhan et al. 2009).

In Japan, flowers of cherry tree (*Prunus Lannesiana*), locally called ‘*Yaezakura*’ are salted and drunk with hot water as ‘*Sakurayu*’. Chrysanthemum blooms pickled with vinegar are eaten as source of vitamins in autumn (Kamao et al. 2007). Flowers and leaves of ‘*Shiso*’ (*Perilla frutescens*) rich in calcium and iron, are used to dye apricot pickles called ‘*umeboshi*’ and for making a cool summer drink. Emerging buds of ‘*Myouga*’ (*Zingiber mioga*) are eaten raw as salad, with sushi or cold noodles in summer. It is used to treat cough and rheumatism in Japan, Korea and China (Lee et al. 2016).

In China, jasmine (*Jasminum officinale*) is added to tea to create a unique flavor. Sweet Osmanthus (*Osmanthus fragrans*) is used in Chinese scented tea called ‘*Guihuāchá*’ and scented jam, sweet cakes, dumplings, soups and liquor. Side effects like intoxication is avoided when consuming seasonal delicacies of rhododendron species like *Rhododendron decorum* Franch., and *Rhododendron pachypodum* Balf. (Shi et al. 2020).

In Korea, flower pancakes called ‘*Hwajeon*’ are eaten as dessert every season. Petals of Korean rhododendron (*Rhododendron mucronolatum*), or Jindallae, are used in spring, rose petals are used in summer and chrysanthemum in fall. Also, there are many kinds of ‘flower tea’ using bell flowers, chrysanthemum, yellow cosmos and lotus, *Prunus mume*, magnolia, peach blossoms, peony, rose, safflower etc. According to a study conducted by Kim et al. 2005, 36 kinds of edible flowers were available in the Korean market.

In Malaysia, crunchy durian flowers with a tinge of fragrance and sweetness are served with curry at vegetarian cafes. Durian flowers do not taste and smell like durian fruit. All other flower parts are discarded except stamens and creamy yellow petals. The anthers are removed from stamens before consumption.



**Fig. 1.** Common edible flowers used in food items; A: Mountain Ebony, A1: Pickle made of Mountain Ebony consumed in Nepal, B: Lotus, B1: Salad made of lotus petal consumed in Thailand and South-east Asia, C: Nasturtium, C1: Salad with nasturtium consumed in Americas, D: Pansy, D1: Tart with pansy topping consumed in European countries.

In Indonesia, buds of male papaya flowers locally called 'Bunga pepaya' are used in local dishes. Butterfly pea (*Clitoria ternatea*) that brings out a deep blue color when extracted, are locally called 'Bunga telang' and known to enhance memory, treat hair loss and work as antidepressant. Another popular Javanese dish uses the flowers and buds of 'Kembang turi' or *Sesbania grandiflora* that are eaten with vegetables. It has a meaty flavor and slimy texture. It is known to help breastfeeding mothers improve milk production. *Etilingera elatior* called 'Bunga kecombrang' is prepared differently according to region, in local dishes called 'Sambal matah' or 'Arsik ikan mas'.

In Thailand, most parts of the lotus like flowers, tubers, stamens and seeds are consumed. Petals are often used in salads after removing the stigma. Moon flower (*Ipomoea alba*) called 'Chom chan' is served stir-fried with oyster sauce. It is known to benefit the excretory system. Flowers of cowslip creeper (*Telosma cordata*) called 'Tonkin Jasmine', 'Tonkinese Creeper', 'Sabidukong, Bunga Tongkeng', or 'Dok Kajon' is either eaten fresh as salad or cooked lightly with fried eggs or soups. As a specialty flower ingredient, cowslip creeper is popular in most Southeast Asian cuisines including Thailand.

In Iran, male flowers of pomegranate that do not bear fruit, locally called 'Gulnar,' are used to treat syphilis, jaundice, diarrhea, and frequent nosebleeds. Dried flowers and creamy buds are used to treat bronchitis. *Rosa persica* are used to produce essential oil for tea, jam and perfume production. *Crocus Gilanicus*, resembling safflower, specific to the Gilan region of Iran is used as a spice.

In Syria's capital city Damascus, Damask rose is used to produce rosewater to make various sweets and desserts. It is effective in treating sore throat, heart disease, and headache.

In Jordan, *Gundelia tournefortii* locally called 'Akkoub' is a wild plant whose flowers are eaten as a vegetable despite having spiny leaves. Its taste is similar to artichoke and its buds, leaves, stems, roots are all edible.

In Turkey, rosewater, rose syrup, rose petal jam, rose custard, 'panna cotta', rose-scented sponge cake, rosy-hued meringues are enjoyed along with a sweet called 'Turkish delight.' Powdered rose petal is the secret ingredient in 'Ras-el-hanout,' the famous Middle Eastern spice used in tagines and roasted meat dishes.

In most European countries, chamomile (*Matricaria recutita*) is used as tea because it is believed to benefit people suffering from insomnia. Chamomile could provide mixed benefits on sleep diary measures relative to placebo in adults with chronic primary insomnia (Zick et al. 2011). Borage (*Borago Officinalis*) is used in salads or as garnishes, soups, cocktails or as float in drinks or frozen in ice cubes. Candied flowers are used to decorate cakes, pastries and deserts. Carnation petals are used to make chartreuse (a classic green liqueur) in France. In Italy, zucchini flowers are fried in a crispy batter and served with a dominant-tasting dip of olives, anchovies or capers.

In Morocco, flowers of dwarf artichoke heads are eaten either raw or boiled and fleshy receptacles are cooked with meat. The flowers are also used in coagulating milk (Tanji, & Nassif, 1995). Flowers of mint that taste milder than leaves and are used to make a herbal drink called 'mint tea.'

In Kenya, sweet petals of *Impatiens walleriana* Hook.f. locally called 'Busy lizzie', native to East African countries, are used in salads or mixed in fancy drinks (Rop et al. 2012).

In Zambia and Malawi (Kasulo et al. 2009), tubers of wild orchids belonging to the genera *Disa*, *Habenaria* and *Satyrion* are eaten as 'Chikanda.' Because of its popularity, and due to over collection in the wild, this species has become threatened to extinction (Velman et al. 2018).

In Brazil, *Amaranthus hypochondriacus*, *Tropaeolum majus* (red and orange varieties) and *Spilanthes oleracea*

L. that contain high amounts of phenolic compounds and hydrolysable tannins are consumed as edible flowers. Tea is prepared from the flowers of an indigenous plant *Vitex cymosa* Bertero ex Spreng, locally called ‘Taruma’, and ‘Mado’ by Guató people (Bortolotto et al. 2015).

In USA, bee balm (*Monarda didyma*) is used as garnish in salads, or to make herbal tea. Apple blossoms (*Malus* species) are mixed in fruit salads. Arugula (*Eruca vericaria*) are used in salads or snacks. Flowers of *Arachis glabrata* or perennial peanut are used in cookies and salads and taste like its fruit.

In Mexico, *Agave salmiana*, *Aloe vera*, *Arbutus xalapensis*, *Cucurbita pepo*, *Erythrina americana*, *Erythrina caribaea*, *Euphorbia radians benth* and *Yucca filifera* are consumed traditionally. Before consuming specific flowers, toxic substances are diminished or eliminated by discarding the broth while cooking. Such traditional knowledge has made it possible to consume edible flowers of wild plants contributing to people’s diet during the short blooming season (Sotelo et al. 2007). Alkaloid contents in *Erythrina* species are removed by discarding the water in which this flower is cooked (García-Mateos et al. 1996). Flowers of zucchini (*Cucurbita pepo*) is available every season and consumed in ‘tacos’ or ‘quesadillas’ without broth elimination.

In Australia, indigenous native plants are being revived. Not just flowers, other specific parts of the plant are also eaten. In case of Sydney rock orchid (*Dendrobium speciosum*), its starchy stems are also eaten raw or roasted. Nectar from *Grevillia* flowers are edible, bulb of *Bulbine bulbosa* or Bulbine Lily are eaten like potatoes and *Brachyscome multifida* or cut-leafed daisy are edible as salad or toppings on cakes.

## II. Medicinal and nutritional properties of some edible flowers:

Thymol present in bee balm (*Monarda Didyma*), a native North American plant, is used as an active ingredient in commercial health-care products. Native Americans used its antiseptic properties to cure skin infections and minor wounds. ‘Oswego’ tea made from this plant cures mouth and throat infections, headaches, fevers and stomach ailments.

Phytochemicals like alkaloids, flavonoids, stilbenoids, anthocyanins, triterpenoids, orchinol, hircinol, cypripedin, bibenzyl derivatives, phenanthrenes, jibantine, nidemin and loroglossin are present in leaves, pseudobulbs, roots, flowers or the entire plant of orchids (Okamoto et al. 1966; Williams, 1979; Majumder and Sen, 1991; Majumder et al. 1996; Zhao et al. 2003; Yang et al. 2006; Singh and Duggal, 2009).

Borage oil consists of gamma linolenic acid (GLA) supplement which, if consumed excessively, can have a diuretic effect. Nasturtium leaves contain vitamin C and trolamylt, a natural antibiotic. According to Drava et al. 2020, higher concentrations of particular trace elements are present in flowers: manganese (Mn) in *Acmella oleracea*, copper (Cu) and strontium (Sr) in basil (*Ocimum basilicum*), pumpkins (*Cucurbita moschata*), zucchini (*Cucurbita pepo*) and nickel (Ni) in orange daylily (*Hemerocallis fulva*). Potentially toxic elements like cadmium (Cd), cobalt (Co), vanadium (V) are present at very low concentrations, below the maximum permitted levels in foodstuffs. From these studies, we know that the mineral composition of edible flowers has lower risks for consumer health and can be a good source of essential elements.

Floral cuisines constitute antioxidants like phenols, flavonoids, ascorbic acids and minerals. According to Rop et al. (2012), the highest level of mineral elements was observed in flowers of *Chrysanthemum*, *Dianthus* or *Viola* especially, potassium (1,842.61 to 3,964.84 mg/kg of flower mass). Such research results attract general interest to select flowers for the best combination of nutritional balance and visual appeal. Pires et al. 2018, reported that edible flowers can substitute the artificial color E163 and rose extract turned out to be the most suitable.

### **III. Current market trend of edible flower industry:**

Edible flowers are cultivated and traded differently than ornamental flowers. Despite the popularity, market value of edible flowers has remained low. Some reasons behind the low market and strategies to increase consumption are listed below:

- 1) Expanding the restaurant's role to introduce dishes that use edible flowers, not merely as garnish but as key ingredients.
- 2) Creating opportunities to educate foreign tourists about local cuisines using edible flowers. Organizing foraging tours where participants enjoy outdoor trips recognizing and collecting locally available edible flora.
- 3) Setting global standards to certify organically produced edible flowers for safe consumption.
- 4) Distributing complimentary recipes to customers who buy edible flowers at garden centers so they can enjoy cooking with them.
- 5) Utilizing pigments like anthoxanthin, flavonoid, carotenoid and betanidin etc. obtained from edible flowers as healthy natural food coloring.
- 6) Creating a year round availability chart to educate customers about seasonal nature of edible flowers to keep them expecting and pre-ordering.
- 7) Trading imported edible flowers has drawbacks like higher cost, increased carbon footprint and most importantly, the taste deteriorates as flowers lose their freshness. Dried, pickled, salted, crystallized, candied or powdered edible flowers can be traded for lower cost. For example, rose flakes and rose powder are already available commercial products.
- 8) Information on edible flower production and trade is not easily available so it must be studied and reported to indicate future market trends locally and globally.
- 9) Advertising the use of pickled, candied or crystallized edible flowers in bakery.
- 10) Flower specific packaging to efficiently trade edible flowers that come in different size and shape.
- 11) Diversity and abundance of natural antioxidants present in edible flowers must be explored further for application in pharmaceuticals.
- 12) Legislation regarding edible flower trade must be both consumer and farmer-friendly. Local bodies need to host platforms where chefs demonstrate and educate potential consumers about the effective uses of edible flowers to improve flavor, add color or enhance the visual appearance of dishes.
- 13) According to Fernandes et al. 2018, extending the shelf life of edible flowers can lead to reduced waste, lowered shipping cost, making ground transport possible thus enabling growers to expand their market.
- 14) Having staff ready to answer questions and offer suggestions to customers at the marketplace itself.
- 15) Setting the trend of expecting edible flowers to appear in a meal as entrées, main dish, salads or deserts in high end restaurants.
- 16) Identifying the best marketable and profitable form of edible flowers either fresh, frozen, dried, crystallized, as a foam, as a jelly, pickled with vinegars, with spice blends, with teas, as teas, with syrups, with liquors or as food dyes and colorings.
- 17) Raising awareness and lowering the cost for the general public to enjoy edible flowers.
- 18) To make edible flowers more accessible, large-scale production must be avoided. Instead, household level production must be encouraged even in urban areas.
- 19) Developing legislation to enforce restrictions of pesticide and insecticide usage during the cultivation of edi-

ble flowers to ensure safer consumption.

### Conclusion:

Edible flowers add unique flavors, textures and colors to our food presentation. In this paper we presented various edible flowers consumed in different countries and cultures, highlighted some medicinal and nutritional properties and listed strategies that can increase the demand of edible flowers in markets globally. Though not all countries and regions were included in this paper, information was collected from published papers regarding particular uses for specific plants. This is helpful to gain the interest and attention of potential 'florivores', chefs, physicians, gardeners, herbalists etc. Keeping a record of indigenous usage of edible flowers is important to enrich our culinary culture both nutritionally and visually. While the approach to edible flower consumption may differ according to country, this paper suggests generally implementable strategies based on previous studies.

Since organically grown edible flowers in ordinary households are safer, flowers can also be grown personally. This way urbanites can reconnect with nature and learn about the importance of growing one's own food. Decorating a dish with colorful and fresh edible flowers elevates it to an extraordinary treat. The range of flavors, aromas and textures of edible flowers adds seasonality, originality, freshness and a feeling of personal care increasing the value of a meal many folds. Further flower-specific studies by country are necessary to understand and influence the edible flower market at local level.

### References:

- 1) Basurto-Pe, F., D. M. A. Castro-Lara, A. Martínez, 2003. Edible Begonias from the north of Puebla, Mexico. *J. Econ. Bot.*, 57: 48–53.
- 2) Bortolotto, I. M., de Mello Amorozo, M. C., Neto, G. G., Oldeland, J., & Damasceno-Junior, G. A. (2015). Knowledge and use of wild edible plants in rural communities along Paraguay River, Pantanal, Brazil. *Journal of Ethnobiology and Ethnomedicine*, 11(1), 46.
- 3) Chang, S. S., Wu, M. L., Deng, J. F., Lee, C. C., Chin, T. F., & Liao, S. J. (1999). Poisoning by *Datura* leaves used as edible wild vegetables. *Veterinary and human toxicology*, 41(4), 242–245.
- 4) Chen, N. H., & Wei, S. (2017). Factors influencing consumers' attitudes towards the consumption of edible flowers. *Food quality and preference*, 56, 93–100.
- 5) Drava, G., Iobbi, V., Govaerts, R., Minganti, V., Copetta, A., Ruffoni, B., & Bisio, A. (2020). Trace elements in edible flowers from Italy: Further insights into health benefits and risks to consumers. *Molecules*, 25(12), 2891.
- 6) Ebert, A. W. (2013). Sprouts, microgreens, and edible flowers: the potential for high value specialty produce in Asia. *SEAVEG 2012 High Value Vegetables in Southeast Asia: Production, Supply and Demand*, 216.
- 7) Fernandes, L., Ramalhosa, E., Pereira, J. A., Saraiva, J. A., & Casal, S. (2018). The unexplored potential of edible flowers lipids. *Agriculture*, 8(10), 146.
- 8) García-Mateos R, Lucas B, Zendejas M, Soto-Hernández M, Martínez M, Sotelo A (1996) Variation of total nitrogen, nonprotein nitrogen content, and types of alkaloids at different stages of development in *Erythrina americana* seeds. *J Agric Food Chem* 44: 2988–2991.
- 9) Ghosh, D. (2013). A feast of flowers. *Resonance*, 18(11), 1004-1014.
- 10) HE, C. Y., & MAO, G. J. (2003). Study on determination of several kinds of inorganic elements in edible flowers [J]. *Journal of Harbin University of Commerce (Sciences Edition)*, 6.
- 11) Halevy, A. H. (1999). New flower crops.
- 12) Hamashita, M. (2016). Why Be Aesthetic? Some Comments on the Japanese Attitudes to Cherry Blossoms. *estetica*.

- studi e ricerche*, 6(2), 327–340.
- 13) How to cook durian flowers? 2020.07.24. Retrieved from <https://goirantours.com/persian-flowers-from-ancient-persia-to-iranian-culture/>.
  - 14) Kamao, M., Suhara, Y., Tsugawa, N., Uwano, M., Yamaguchi, N., Uenishi, K., ... & Okano, T. (2007). Vitamin K content of foods and dietary vitamin K intake in Japanese young women. *Journal of nutritional science and vitaminology*, 53(6), 464–470.
  - 15) Kasulo, V., Mwabumba, L., & Cry, M. (2009). A review of edible orchids in Malawi. *Journal of Horticulture and Forestry*, 1(7), 133–139.
  - 16) Kelley, K. M., Behe, B. K., Biernbaum, J. A., & Poff, K. L. (2002). Consumer purchase and use of edible flowers: results of three studies. *HortTechnology*, 12(2), 282–287.
  - 17) Kelley, K. M., Cameron, A. C., Biernbaum, J. A., & Poff, K. L. (2003). Effect of storage temperature on the quality of edible flowers. *Postharvest Biology and Technology*, 27(3), 341–344.
  - 18) Kim, H. J., Park, Y. J., Byun, K. S., Kim, S. J., Chon, S. Y., Heo, B. G., ... & Park, S. H. (2005). Kinds and characteristics of edible flowers marketed as food material in Korea. *The Korean Journal of Community Living Science*, 16(4), 47–57.
  - 19) Lee, D. H., Ahn, J., Jang, Y. J., Ha, T. Y., & Jung, C. H. (2016). Zingiber mioga reduces weight gain, insulin resistance and hepatic gluconeogenesis in diet-induced obese mice. *Experimental and therapeutic medicine*, 12(1), 369–376.
  - 20) Mayer-Chissick, U., & Lev, E. (2014). Wild edible plants in Israel tradition versus cultivation. In *Medicinal and Aromatic Plants of the Middle-East* (pp. 9–26). Springer, Dordrecht.
  - 21) Mlecek, J., & Rop, O. (2011). Fresh edible flowers of ornamental plants—A new source of nutraceutical foods. *Trends in Food Science & Technology*, 22(10), 561–569.
  - 22) Newman, S. E., O’Conner, A. S., & Badertscher, K. B. (2009). Edible flowers. *Gardening series. Flowers; no.7.237*.
  - 23) Pathak, J. (n.d.). *Koiralo ko Phool (seto-rato) Bauhinia* [tasteofnepal.blogspot.com/2012/04/koiralo-ko-phool-seto-rato-bauhinia.html](http://tasteofnepal.blogspot.com/2012/04/koiralo-ko-phool-seto-rato-bauhinia.html).
  - 24) Phonpho, S., Idowu, D. O., IGE, M., Sadeghi, Z., Valizadeh, J., Abdalla, M. M., ... & Abdel-Fattah, A. (2014). The relationship of lotus to Thai lifestyle in terms of religion, arts and tradition. *International Journal of Agricultural Technology*, 10(6), 1353–1367.
  - 25) Pires, T. C., Dias, M. I., Barros, L., Barreira, J. C., Santos-Buelga, C., & Ferreira, I. C. (2018). Incorporation of natural colorants obtained from edible flowers in yogurts. *Lwt*, 97, 668–675.
  - 26) Pradhan, P., Joseph, L., Gupta, V., Chulet, R., Arya, H., Verma, R., & Bajpai, A. (2009). *Saraca asoca* (Ashoka): a review. *Journal of chemical and pharmaceutical research*, 1(1), 62–71.
  - 27) Rachkeeree, A., Kantadoung, K., Suksathan, R., Puangpradab, R., Page, P. A., & Sommano, S. R. (2018). Nutritional compositions and phytochemical properties of the edible flowers from selected zingiberaceae found in Thailand. *Frontiers in nutrition*, 5, 3. Retrieved from <http://tasteofnepal.blogspot.com/2012/04/koiralo-ko-phool-seto-raato-bauhinia.html>
  - 28) Rodrigues, H., Cielo, D. P., Gómez-Corona, C., Silveira, A. A. S., Marchesan, T. A., Galmarini, M. V., & Richards, N. S. P. S. (2017). Eating flowers? Exploring attitudes and consumers’ representation of edible flowers. *Food Research International*, 100, 227–234.
  - 29) Rop O, Mlecek J, Jurikova T, Neugebauerova J, Vabkova J (2012) Edible flowers-a new promising source of mineral elements in human nutrition. *Molecules* 17: 6672–6683
  - 30) Shi, Y., Zhou, M., Zhang, Y., Fu, Y., Li, J., & Yang, X. (2020). Poisonous delicacy: Market-oriented surveys of the consumption of *Rhododendron* flowers in Yunnan, China. *Journal of Ethnopharmacology*, 265, 113320.
  - 31) Sotelo, A., López-García, S., & Basurto-Peña, F. (2007). Content of nutrient and antinutrient in edible flowers of wild plants in Mexico. *Plant Foods for Human Nutrition*, 62(3), 133–138.
  - 32) Subedi, A., Kunwar, B., Choi, Y., Dai, Y., van Andel, T., Chaudhary, R. P., ... & Gravendeel, B. (2013). Collection and



- trade of wild-harvested orchids in Nepal. *Journal of Ethnobiology and Ethnomedicine*, 9(1), 64.
- 33) Tanji, A., & Nassif, F. (1995). Edible weeds in Morocco. *Weed Technology*, 617–620.
- 34) Tukan, S. K., Takruri, H. R., & Al-Eisawi, D. M. (1998). The use of wild edible plants in the Jordanian diet. *International journal of food sciences and nutrition*, 49(3), 225–235.
- 35) Veldman, S., Kim, S. J., Van Andel, T., Bello Font, M., Bone, R., Bytebier, B., ... & Ngugi, G. (2018). Trade in Zambian Edible Orchids-DNA Barcoding Reveals the Use of Unexpected Orchid Taxa for Chikanda. *Genes*, 9(12), 595.
- 36) Yang, B. Y., Zhang, F. Y., Wei, Q. Y., & Zhong, F. L. (2011). Edible flower's business and development [J]. *Subtropical Agriculture Research*, 1.
- 37) Yanping, C. (2007). Current Research Situation of Natural Edible Pigment in China. *Food and Fermentation Industries*, 33(1), 80.
- 38) Zick, S. M., Wright, B. D., Sen, A., & Arnedt, J. T. (2011). Preliminary examination of the efficacy and safety of a standardized chamomile extract for chronic primary insomnia: a randomized placebo-controlled pilot study. *BMC complementary and alternative medicine*, 11(1), 78.

## 花を食べる？食用花利用の歴史と未来

トウラダール アスタ

### 要 旨

色、形、味、香りが豊富な食用花を使うことで食事をもっと楽しむことができる。食用花は昔から利用されていたが、最近になって人気が再燃している。この論文では世界中の国や文化で花が食用として使われてきた歴史や、花に含まれている栄養・薬用成分、食用花の市場の開発、その発展を妨げる要因について論じる。食用花に関する昔ながらの知恵を発掘することで栄養学や製薬方法に役立てることができる。また、食用花市場の発展のためには食用花の安全性と正しい利用方法について消費者に教育を行うことが必要不可欠である。食用花の栽培、利用、市場開発のためには、国ごとに独自の工夫を重ねていくべきであり、その方法についても研究を深める必要がある。本論文では過去の事例に基づき、食用花の普及に向けた今後の取り組みについて考察した。