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The First English farm journal from the house of Kerala Karshakan

Tree spices



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Perennial trees which are sources of spices are known as tree spices. Spices derived from various parts of trees like fruits, leaves, bark, berries, flower buds etc have been integral to various traditional medicines and culinary practices. They infuse their aromatic flavor in the cuisines which augment our



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Nutmeg



Tree spices

taste senses. The tropical and subtropical regions of India with their ample rainfall and warm temperature makes it an ideal hub for the growth and production of these tree spice. The major tree spices in India are Nutmeg, Cinnamon, Clove, Allspice, Garcinia, Kokum and

Tamarind.

1. NUTMEG

Nutmeg scientifically known as *Myristica fragrans* comes under Myristicaceae family. It is indigenous to Moluccas Island in Indonesia. It is known as "Twin Spice" since we get two spices from this single

plant. One is the dried kernel inside the seeds which is known as nutmeg and other is the dried aril which is the lacy covering on the kernel known as the mace. The seed is known as Jaiphala (Hindi) Jathiphala (Sanskrit), Jathikka (Malayalam) locally and

Cinnamon



the mace is known as Jathipathri (Malayalam) Jaddipathri (Tamil) Japathra (Kannada) etc. The flavour and therapeutic action are due to the volatile oil which is 15 and 20% in nutmeg and mace respectively. Major chemical constituents include α -Pinene, β -Pinene + Sabinene, 1,8-Cineole + Limonene, α -Phellandrene, Myristicin, Myristic acid etc.

Nutmeg is a dioecious evergreen tree reaching to a height of about 8-12m. Monoecious trees and

hermaphrodite flowers also do occur, but are rare. Sometimes male plants produce female flowers also but fruit produced in such plant will be of poor quality. Flowers are either solitary or in cymose clusters produced in the axil of leaves. As per Spices Board during 2021-22 India had an area of 23353 ha with a production of 18429 t, with Kerala and Karnataka being the major producers.

The important varieties are Pullan, Kochukudy, Mundathanam, Punnathanam,

Poothara, IISR Viswasree, IISR Keralashree, Konkan Sugandha (Only hermaphrodite variety), Konkan Swad and Konkan Shrimanti

2. CINNAMON

Cinnamon is another important tree spice which is a native to Srilanka. The scientific name is *Cinnamomum zeylanicum* (Syn : *Cinnamomum verum*) coming under the family Lauraceae. The economic part is the dried bark. There are different species of Cinnamon

1. True cinnamon or Ceylon



Clove



cinnamon which is the dried bark of *Cinnamomum verum*. The bark is smooth and thin. The bark powder is tan in color with less intense aroma. Eugenol is the major constituent. The essential oil content is 0.5-2.0%. It is having good flavour

2. False cinnamon or Cassia / Chinese cinnamon which is the dried bark of *Cinnamomum cassia*. It is used as an adulterant and is cheaper and inferior compared to true cinnamon. Bark is thick and more difficult to crush, and it has a rougher texture. They are reddish brown in colour with more intense aroma. The major constituent is

Cinnamaldehyde. The essential oil content is 1-4.5%. It has pungent aroma with not so delicate flavour

3. Tejpat which is a native to India, commonly known as Indian cassia or Indian Bay leaf is another type of Cinnamon which is *Cinnamomum tamala*, in which the leaves are the economic part.

Cinnamon is an evergreen tree growing to a height of 8-17 m under wild condition. Bark and leaves are strongly aromatic. Leaf shape is ovate-elliptical. From base to the tip of lamina three prominent veins can be seen. Young

leaves are reddish in colour. Flowers are bisexual produced terminally with long greenish white peduncles. In 2021-22, India was having an area of 1682 ha with a production of 4089 t (DASD). It is grown in small pockets of Kerala, Tamil Nadu and Karnataka. Important varieties are IISR Navashree, IISR Nithyashree, Sugandini, YCD-1, Konkan Tej, PPI (C)-1, RRL(B) C-6.

3. CLOVE

Clove commonly known as Lavang, Karanful, Karyophyllon, Grambu is *Syzygium aromaticum* coming under the family Myrtaceae. It is indigenous to Moluccas islands of Indonesia. The word 'Clove' is obtained from Latin word *clavus* which means 'nail' resembling the shape of a nail. The Clove of commerce is the dried aromatic fully grown unopened flower bud. Intact bulbous flower head decides the quality of whole clove in commerce. Major chemical constituent in clove is eugenol.

Clove is an evergreen

monoecious tree attaining a height of about 10-20 m. The leaves are lanceolate to acute which are dark green above and pale below which are glabrous with numerous oil glands on lower surface. There are no distinct varieties. Different types like Zanzibar type, Madagascar type, penang clove are available. Two distinct bud variants apart from normal ones were identified. One is having bolder flower buds than the normal type known as King clove and the other is smaller than the normal clove known as Lilliput clove/Mini clove. As per Spices Board, India is having an area of 1924 ha with a production of 1209 t during 2021-22 and most of the cultivation is confined to South India Tamil Nadu, Karnataka and Kerala

4. ALLSPICE

Allspice scientifically known as *Pimenta dioica* (L.) belongs to

the family Myrtaceae. The name 'Allspice' came from the fact that the spice is said to possess the characteristic flavour and aroma of cloves, nutmeg and cinnamon all combined in this one spice. The word pimenta is derived from the Spanish word 'Pimenta' meaning black pepper because its berry resembles black pepper. The centre of origin of Allspice is West Indies (Jamaica) and it is a major spice of Jamaica. 70 % of the world's production comes from Jamaica and hence the name Jamaican pepper. Allspice of commerce is the dried immature

fruits. Leaves are also used for flavouring purpose. It is known as Pimenta, Jamaican Pepper, Sarvasugandhi, Kattukkaruve etc. Major chemical component is Eugenol (65-80%). In addition, it also contains Methyl eugenol (8%), Beta-caryophyllene (4.2%), Humulene (2.7%) and Cineole (2.3%).

Allspice is a small, medium-sized evergreen tree growing to a height of about 8 to 10 m with large, opposite, petiolate leaves which are bright green above and pale beneath. The leaves bear oil glands and gives off a strong aroma. It is a polygamodioecious plant having bisexual and male flowers on some plants and bisexual and female flowers on others. They are structurally hermaphrodite, but functionally dioecious. Functionally male trees are barren trees which bear no fruits. They produce flowers having above 100 stamens and will flower early which shed abundant pollen. Functionally female trees are fruiting trees



Allspice Leaf



Allspice



Garcinia

which produces flowers having around 50 stamens. These flowers also shed abundant pollen, but are not viable. There are no named varieties in Allspice.

5. GARCINIA

Garcinia gummigutta (Syn: *G. cambogia*) commonly known as Camboge comes under the family Clusiaceae. Dried fruit rind is the commercial spice product imparting flavour and taste and also used for improving the keeping quality. It is known as Brindleberry, Fish Tamarind, Malabar Tamarind, Kerala Tamarind, Kudampuli, Kodukkaippuli etc. In addition to being used as a spice it is

also used in many ayurvedic preparations. It is also a natural source of Hydroxy Citric Acid (HCA) which is a natural obesity regulator. It is also a valuable source of commercial gamboge, a resin used extensively in paints and varnishes. It is also used in

coagulation of rubber latex as a substitute of acetic/ formic acid. The rind is used for polishing gold and silver.

Camboge is indigenous to the evergreen forests of South Asia particularly Thailand and India. It is a small medium tree



having dimorphic growth pattern. It is androdioecious bearing only staminate flowers on some plants but staminate and pistillate flowers or bisexual flowers on other plants. Male trees bear only staminate flowers which are born in clusters of 10-30 in the leaf axils and shoot tips. These trees have more number of flowers per cluster, higher petiole length, more stamens per flower, higher pollen viability and germination. Female trees are hermaphrodite producing bisexual flowers either solitary or in clusters of 3-5. It has 6-20 stamens which are often sterile or with low rate of fertility. They have higher flower weight, petal length and ovary size. Amrutham, Haritham and Nithya are the major varieties.

6. KOKUM

Kokum scientifically known as *Garcinia indica* is tree spice similar to Camboge coming under Clusiaceae family. Like camboge, rind is the economic part. This tree grows widely in tropical rainforests of Western

Ghats, in South Konkan region especially Maharashtra, Coorg, Wayanad, Goa, West Bengal. It is used for garnishing and is a good substitute of tamarind. This is used in manufacture of wine and liquor, as a good substitute

of grapes in the wine industry. The anthocyanin pigments obtained from it are used as natural colouring agents for food preservation. The edible fat Kokum butter is also obtained from the seed kernels. This is



Kokum





Tamarind

used in the manufacture of soaps and candles and also in various pharmaceutical preparation, especially in skin care products due to its ability to reduce skin degradation thus making the skin soft and plumpy. It also helps in restoring the elasticity of skin thus helps in reducing fissures on lips, hands and feet. Konkan Amrutha and Konkan Hatis are some examples of released varieties of Kokum.

7. TAMARIND

Tamarindus indica L. is a tree spice coming under Fabaceae which is commonly known as Vaalanpuli in Malayalam. The sticky pulp inside the fruit is the economic part. It is a native of Eastern Tropical Africa. The pulp inside the fruit resembles preserved dates of Arabia, so it is nicknamed as Indian dates. It is a large evergreen tree

attaining a height of 20m. They are grown for shade, ornamental value and for the commercial product, the fruit and its pulp. The leaves are alternate, oblong rounded, small. Flowers are in subterminal racemes producing showy and clusters of yellowish or pale yellow blossoms. Fruit is botanically a pod which is green when tender, turn brown when ripe. Seeds are covered with a sticky pulp.

India is the only commercial grower and largest producer of Tamarind. As per Spices Board, the area of Tamarind in India during 2021-22 is 40345 ha with a production of 152409 t, with Tamil Nadu, Kerala, Andhra Pradesh, Telangana and Maharashtra being the major growers. Some important varieties are PKM-1 (Periyakulam-1), Urigam- C,

Prathisthan, DTS-1, DTS-2, Yogeswari.

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“Star Apple

The unrecognized wonder milk
fruit in the Sapotaceae”

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Introduction

Chrysophyllum cainito, commonly known as the star apple, is a tropical evergreen tree belonging to the family Sapotaceae. Native to the Isthmus of Panama, it was domesticated in this region before spreading across the Greater Antilles and the West Indies. Today, the tree is cultivated widely across tropical regions, including Southeast Asia, due to its adaptability and valuable fruit.

This fast-growing species can reach a height of up to 20

meters under optimal conditions. Its fruits are prized for their sweet, milky pulp, making it popular not only for consumption but also for local and commercial cultivation in tropical areas. Its spread beyond the Americas underscores its importance in tropical agriculture, as it has successfully established itself in various countries with similar climates.

The common names “cainito” and “caimito” are believed to have linguistic roots in the Mayan language, likely

derived from the words “cab” (meaning juice), “im” (meaning breast), and “vitis” (meaning sap). These terms were later adopted into Spanish, reflecting the indigenous influence on the nomenclature of the tree. This connection may refer to the milky, sweet juice found in the fruit of *Chrysophyllum cainito*, which resembles the nourishing quality of milk. In addition to “cainito” or “caimito,” the tree is commonly referred to as the “star apple,” a name derived from the star-like pattern visible when the fruit is cut in half. Another less common name is the “purple apple,” which

refers to the typical dark purple color of its ripe fruit, although some varieties may also appear green. These names reflect both the fruit's visual characteristics and its historical significance across different cultures (Das et al., 2010).

Distribution

The species *C. cainito* is generally believed to have originated in Central America, although some sources suggest it may also have roots in the West Indies. The tree is widely

distributed from southern Mexico down to northern Argentina and Peru, thriving in low to medium altitudes. It is particularly abundant on the Pacific coast of Guatemala. Additionally, Vo noted that star apple is prevalent in Vietnam and has spread to countries such as India, China, Sri Lanka, Malaysia, and Indonesia.

C. cainito is native to several regions, including Costa Rica, Cuba, Dominica, Haiti, Honduras, Jamaica, Mexico, the

Netherlands Antilles, Nicaragua, and Panama. In contrast, it is considered an alien fruit in the United States, Uruguay, Venezuela, Argentina, Brazil, Chile, China, Colombia, Peru, the Philippines, Thailand, and numerous African nations, including Egypt, Congo, Ethiopia, South Africa, Mozambique, and Zimbabwe.

Nutrition

The flesh of *C. cainito* (star apple) is notably sweet due to its high glucose content,



comprising about 78.4–85.7% water. Each 100 g of fruit contains 0.72–2.33 g of protein, 14.65 g of carbohydrates, and 8.45 to 10.39 g of total sugars. Additionally, the seeds contain 1.2% of the bitter cyanogenic glycoside lucumin and various active compounds.

Phytochemical analyses reveal that *C. cainito* extracts contain phenols, alkaloids, flavonoids, steroids, saponins, tannins, and cardiac glycosides. A study conducted in 2002 identified 120 volatile constituents in the fruit, including (E)-2-hexenal, limonene, and linalool, among others. The

fruit's extract yielded cyanidin-3-O- β -glucopyranoside, an anthocyanin antioxidant, through advanced chromatography techniques. Flavonoids such as (+)-catechin and quercetin have been characterized from the fruit, and both green and ripe fruits are known to contain vitamin C and various phenolic compounds. The leaves of *C. cainito* also contain several beneficial compounds, including gallic acid and triterpenoids, contributing to their rich phenolic and flavonoid content.

The antioxidant capacity of *C. cainito* is significant due

to its high levels of phenolics and flavonoids. Recent studies indicate strong antioxidant activity, with a semipurified fruit extract demonstrating an IC₅₀ value of $7.9 \pm 0.3 \mu\text{g}/\text{ml}$ in DPPH free radical assays. Quercetin was identified as having the highest antioxidant potential among the tested compounds (Orwa, 2010).

Botanic description

The *Chrysophyllum cainito* tree is an evergreen species characterized by its simple, alternate, oval-shaped leaves that are 5–15 cm long. The underside of the leaves reflects a golden color when viewed from a distance, adding to the tree visual appeal. Its small, purplish-white flowers are both fragrant and delicate, producing a sweet scent. The tree is hermaphroditic, meaning it is capable of self-pollination and it produces a distinctive, strong odour.

The fruit of the tree is globose, typically measuring 2 to 3 inches in diameter. When ripe, the fruit skin is mostly purple, with a faint green hue around the calyx. Inside, a radiating star pattern appears in the soft, sweet pulp, giving rise to the common name 'star apple.' There are also greenish-white and yellow-fruited cultivars, though these are less common. The fruit skin is rich in latex and neither the skin nor the rind is edible



due to its tough texture and latex content. The light brown, flattened seeds are hard, making them inedible. The tree bears fruit seasonally (Morton, 1987).

The fruit is primarily consumed as a fresh dessert and is often served chilled for a refreshing taste. It comes in three distinct colors: dark purple, greenish-brown, and yellow. The purple variety has a thicker skin and a denser texture, while the greenish-brown variety has a thinner skin and a more liquid pulp. The yellow variety is less commonly available.

In addition to *Chrysophyllum cainito*, other species of star apples are found in Africa, such as *Gambeya albida* and *Gambeya africana*, which are also valued for their fruit. These related species share similar characteristics, contributing to the star apple widespread appeal across different regions.

Biology

Chrysophyllum cainito, commonly known as star apple, typically begins to bear fruit between its third and fifth years of growth, with full production generally achieved by the sixth to seventh year. This relatively quick onset of fruit-bearing makes it an appealing option for growers looking to establish productive orchards. Flowering occurs during the summer months, with the tree producing small, inconspicuous flowers that can

be greenish-yellow to purplish-white in color.

Following pollination, the fruits mature over a span of several months, usually from late fall to summer. In the West Indies, the peak ripening season for star apples is during April and May, a time when the fruits are most plentiful and ready for harvest. However, it has been noted that trees do not fruit in the Virgin Islands, which may be due to climatic or ecological factors affecting the local environment (Yahia and Gutierrez-Orozco, 2011).

The dispersal of star apple seeds is largely facilitated by bats, which play a crucial role in the trees reproductive cycle. These nocturnal creatures feed on the sweet, milky pulp of the ripe fruit and, in the process, help disperse the seeds over considerable distances. This seed dispersal mechanism not only aids in the propagation of star apple trees but also contributes to maintaining the ecological balance in their native habitats. Overall, the fruiting habits of *C. cainito*, along with its unique relationships with local fauna, underscore its significance in tropical ecosystems and agriculture.

Harvesting and processing

Establishing a maturity index for fruit on a tree can be challenging since not all fruits mature simultaneously. Fruits harvested prematurely will often

have a poor, gummy texture and an astringent taste, along with sticky latex that renders them inedible. To facilitate easier transportation and minimize physical damage, fruits can be picked while their base is still green (Sagarpa, 2010). Fully mature fruits, on the other hand, have dull skin and feel soft when touched, typically exhibiting a pale to dark purple coloration. Star apple fruits are primarily enjoyed fresh, but their pulp can also be preserved in jellies. Additionally, the seed kernels can be processed to create a drink that resembles almond milk, as well as nougats and other confectionery items. The frozen pulp of star apple can be utilized to make ice cream and sherbets (Morton, 1987).

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Bananas

The Fruit That Can Buy You Happiness



Cavendish Bananas



Barangan Bananas

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Abstract

Serotonin, a key hormone responsible for regulating mood (long-lasting happiness), is found in significant amounts in bananas. Known as the “feel-good” neurotransmitter, serotonin plays a crucial role in promoting long-lasting happiness and well-being in the



Red Bananas



Banzano Bananas



Lady Finger Bananas



Blue Java Bananas



Gold Finger Bananas



Mysore Bananas

human brain. Bananas, rich in serotonin and its precursor tryptophan, contribute to the synthesis of this hormone, helping to alleviate anxiety, improve mood, and support mental health. Regular consumption of bananas can naturally enhance serotonin production, leading to mood stabilization and reduced symptoms of depression. This makes bananas an essential addition to a balanced diet for maintaining emotional and psychological well-being.

Keywords: serotonin, happiness and banana
Introduction

From a scientific perspective, certain hormones in our brain are closely associated with positive emotions. Dopamine, known as the "happiness hormone," plays a key role in feelings of joy, while serotonin helps regulate mood. When a person is physically



Gros Michel Bananas



Pisag Raj Bananas



Apple Bananas

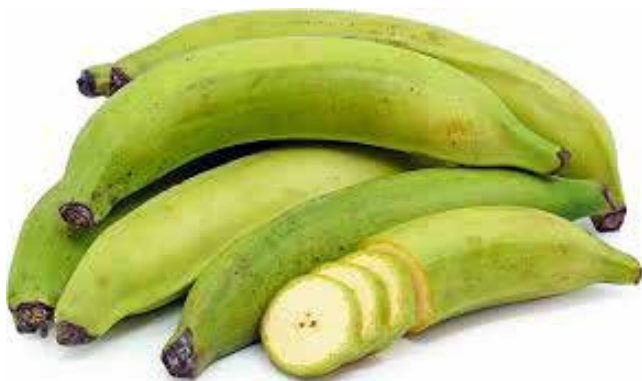


Praying Hands Bananas



Burro (Orinaco) Bananas

attracted to someone, dopamine is activated, serotonin levels increase, and oxytocin—a hormone that reduces pain perception and strengthens emotional bonds—is released. At the same time, the amygdala, which processes negative emotions like fear, is deactivated. Interestingly, the consumption of bananas has been linked to the release of serotonin in the brain.



Plantain Bananas

Bananas are a rich source of bioactive compounds, including dopamine, N-acetyl serotonin, and polyphenols, all of which have potent antioxidant properties (Dikshit et al., 2016). Beyond their sweet taste and creamy texture, bananas offer intriguing benefits for brain health. While they are well-known for their high content of potassium, vitamin C, and fibre, they also



Rihno Horn Bananas

contain compounds that may influence brain chemistry, particularly serotonin. Serotonin, often referred to as the “feel-good” neurotransmitter, is vital for regulating mood, appetite, and sleep. It is synthesized from tryptophan, an amino acid abundantly found in bananas. When consumed, bananas provide a source of tryptophan, which can be converted into serotonin in the brain, promoting positive emotional well-being.

Several studies have investigated the potential effects of banana consumption on serotonin levels in the brain. While the research remains ongoing and complex, there is evidence to suggest that bananas may positively impact serotonin production and mood regulation. One study published in the *Journal of Affective Disorders* examined the effects of dietary tryptophan—found in bananas and other foods—on mood and cognitive function. The researchers found that participants who consumed a tryptophan-rich diet reported improvements in mood and cognitive performance compared to those on a low-tryptophan diet. This indicates that dietary sources of tryptophan, such as bananas, may enhance serotonin synthesis and improve mood.

Another key factor in serotonin production is the role of carbohydrates. Bananas are rich in carbohydrates, particularly natural sugars like glucose and fructose. When carbohydrates are consumed, they trigger the release of insulin, which facilitates the uptake of amino acids, including tryptophan, into cells. This increased tryptophan uptake in the brain can potentially boost serotonin synthesis. Additionally, bananas contain other bioactive compounds that may influence serotonin levels. For instance, vitamin B6, present in bananas, is a cofactor in the conversion of tryptophan to serotonin. Bananas



Saba Bananas



Macho Plantain Bananas



Bluggoe Bananas

Plant part	Serotonin content (ng g-1)	References
<i>Musa sapientum L.</i>		
Banana peel	150,000	Udenfriend et al., 1959
Inner peel (hard green)	74,000	
Ripe	96,000	
over ripe	1,61,000	
Outer peel (hard green)	13,000	
ripe	38,000	
over ripe	170,000	
Banana pulp (hard green)	24,000	
ripe	36,000	
over ripe	35,000	
<i>French plantain Musa paradisiaca var. sapientum</i>		
Ripening	49,900 to 56,700	Foy et al., 1960
Over ripening	12,000	
<i>Prata banana (M. acuminata x M. balbisiana)</i>		
Ripened (Untill the 14 th day of storage)	15,000 and 20,000	Udenfriend et al., 1959
Ripened (After 35 days storage)	7500	

Fig 1. Different Types of Bananas and Their Diversity (Note: The first image was sourced from Facebook, and the original photographer is unknown)

are also high in antioxidants, such as flavonoids, which have been associated with improved cognitive function and mood regulation. It's important to remember that while bananas can contribute to serotonin production, they are just one element of a balanced diet. Serotonin synthesis is a complex process influenced by multiple factors, including genetics, overall diet, and lifestyle. Incorporating bananas into a diverse and nutritious diet, along with other serotonin-boosting foods like nuts, seeds, and dairy products, may help support optimal brain health and mood regulation.

Serotine content in bananas

The pulp of both underripe and ripe yellow bananas contains serotonin (SER), with

concentrations of 31.4 ng/g and 18.5 ng/g, respectively. However, during the ripening of *Musa cavendish*, SER levels decrease. Significantly higher SER concentrations are found in the peel, measuring 150,000 ng/g, compared to 24,000 ng/g in the pulp. As bananas ripen, the SER levels in both the inner and outer peel increase. In the French plantain (*Musa paradisiaca var. sapientum*), SER levels during ripening range from 49,900 to 56,700 ng/g but drop to 12,000 ng/g by the final stages of ripening (Udenfriend et al., 1959). Similarly, in *Musa cavendish*, SER levels reduce as the fruit matures. In Prata bananas (*Musa acuminata x M. balbisiana*), SER levels stay between 15,000 and 20,000 ng/g for the first 14 days of storage but then fall to around 7,500

ng/g after 35 days. Considering these findings, eating bananas daily may help reduce anxiety and promote the release of serotonin, often called the “happiness hormone,” which plays a vital role in supporting mental well-being in today’s fast-paced lifestyle.

Health Benefits and Serotonin

Serotonin plays a crucial role in regulating many bodily functions, and low levels can result in serotonin deficiency syndrome, which manifests in symptoms such as depression, insomnia, anxiety, negative thoughts, obesity, pain, and migraines. On the other hand, maintaining healthy serotonin levels in the brain supports mood stability, feelings of happiness, satisfaction, headache prevention, anxiety reduction, relief from premenstrual syndrome, restful sleep, and a balanced sex drive.

1. Serotonin (SER) is responsible for regulating essential functions in humans, such as sleep, appetite, thirst, mood, and sexual activity.
2. Several plant species contain SER and other neurotransmitters, which may have positive effects on human health and help manage chronic conditions.
3. SER supplements have been used to treat serotonin deficiency syndrome and ease symptoms related to conditions like Parkinson’s disease and obesity.

Conclusion

Bananas are among the richest natural sources of serotonin (SER), a compound known for its positive effects on happiness. Including bananas in your daily diet can significantly enhance your overall sense of well-being. Many factors, such as environmental stress, can negatively affect our lifestyle, but incorporating bananas along with other serotonin-rich fruits can help maintain a balanced mood. The recommended daily fruit intake is 400g, and bananas, due to their mood-regulating properties, are a valuable addition

for boosting happiness levels. Research has demonstrated that bananas play a significant role in improving mood, making them essential for promoting overall health. Although SER is found in many plant species, questions still surround its site of synthesis, its exact impact on human health, and how its levels fluctuate seasonally in plants. Ongoing research into SER’s presence in medicinal plants calls for further exploration, and detailed studies on its bioavailability are necessary to fully understand its health benefits. While recent studies have shed light on SER in plants, much remains unknown, and further investigation is required to comprehend its metabolism and functions fully.

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FLOWERS AS FOOD

An insight to edible flowers

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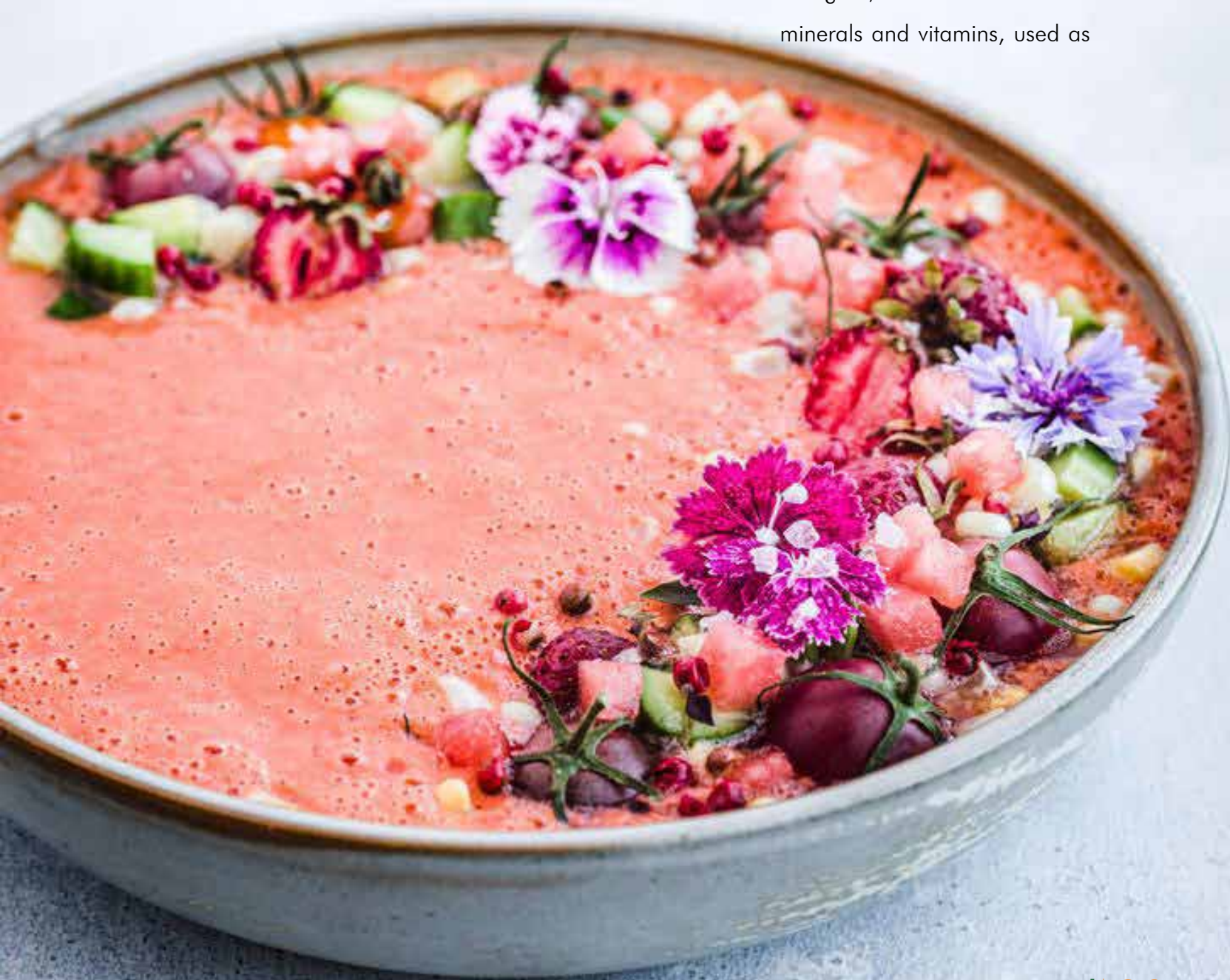
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Flowers can do more than just decorate your garden. They can bring vibrant colors to your plates and add a healthy boost to your meals. Whether it's the bright petals of calendula sprinkled over a salad or the delicate blossoms of chive flowers adding a subtle onion flavor, these edible flowers transform everyday dishes into a feast for both the eyes and the body, as many are packed with vitamins and antioxidants,

making them more nutritious. In the past, edible flowers were commonly used as vegetables and for their medicinal benefit. Today, scientists highlight their rich nutritional profiles and beneficial phytochemicals. Unfortunately, the idea of eating flowers is still viewed with mistrust.

Proper identification of edible flowers is very much essential because there is huge array of floras, but only few are palatable. Different types of edible flowers are available commercially, and demand for them is noticeably high. There are 97 families, 100 genera, and 180 species worldwide

from which edible flowers are obtained. These flowers are generally consumed fresh but they can also be eaten in processed form such as cakes, tea, jam, salads and beverages or directly used as vegetables. Many of the flower crops such as nasturtium, hibiscus, rose, cosmos, chrysanthemum, marigold, lotus etc. are rich in minerals and vitamins, used as



edible flowers.

Nutritional composition of edible flowers: The fundamental segment of palatable blossoms is water (over 80%) and their fat and protein substance are viewed as low, with various amounts of total sugars, minerals and dietary fiber. When



Bougainvillea



Pot marigold

compared to ordinary fruit and vegetables, edible flowers are a good source of minerals. Many studies revealed that flowers are outstanding source of mineral elements especially potassium and phosphorus are plentiful in edible blossoms. Potassium was the most abundant macro

element observed in all flowers whereas among micro elements, iron was found lavishly in all flowers.

Carbohydrates were the copious macronutrients, followed by proteins and ash in petals and infusions of dahlia, rose, calendula and corn flower. Calendula infusions and rose petals contributed to uppermost content of organic acids.

Chrysanthemum



Nutraceutical properties of edible flowers: Phytochemicals are biologically active, non-nutritive, naturally occurring chemical compounds found in plants, which impart human health benefits as medicinal constituents. The most common phytochemicals found in edible flowers are phenolic acids, carotenoids, flavonoids, including anthocyanins. Flower colour is attributed due to the presence of carotenoids and flavonoids, which also impart antioxidant power to the flowers. Phytochemicals of marigold particularly lutein and flavonoids are reported to have anti-inflammatory, free radical scavenging and cytotoxic effects against various cancerous cells.



Butterfly Pea

Studies have shown that anthocyanin compounds have

a high free radical scavenging capacity and play an important role in the prevention of cancer, cardiovascular disease, obesity, diabetes and other diseases. Rose, chrysanthemum, hibiscus, pelargonium, petunia and pansy are the rich source of anthocyanin pigment.

Hibiscus



Carotenoids play vital role in human/animal nutrition since new carotenoids cannot be



Roselle

is a component of carotenoid pigments.

Flavonols exists in different forms in rose, day lily, Chinese rose, magnolia flower and honeysuckle. Flavones are abundant in various edible flowers like chrysanthemum. Rose petals are rich source of flavanols. Phenolic acids are another key

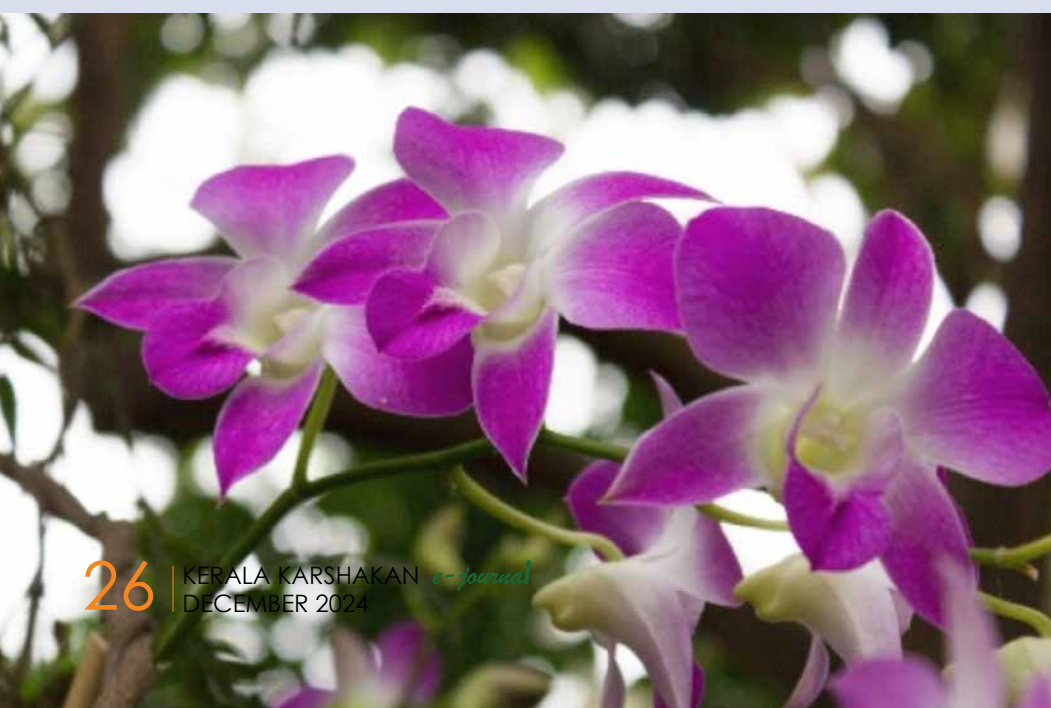
synthesized; therefore, they must be absorbed from natural foods and supplements. Researches have shown that carotenoids can reduce peril of vitamin A deficiency, age-related macular degeneration (AMD), cataracts, photoprotection, cancer, and cardiovascular diseases. Various studies revealed that marigold flowers are potential source of lutein and its derivatives which



Orchid

group of phytochemicals found in edible flowers for instance, honeysuckle.

These phytochemicals present in edible flowers are responsible for their health promoting properties like antioxidant, hypoglycemic, anticancer, anti-diabetic,





Rose

erecta, rose are some among them. Also, Roselle, Hibiscus sabdariffa, a rich source of flavonoids is well studied for its anticancer potential. Antioxidant properties of butterfly pea flower is well renowned.

Risks related to edible flowers: It is very important to

anti-obesity, neuroprotective, hepatoprotective and anti-microbial.

Many scientists found out that edible flowers like *Catharanthus roseus*, *Butea monosperma*, *Bauhinia variegata*, Honey suckle etc have potential to lower the elevated glucose levels in blood. Edible flowers exerted strong activities against various types of cancers. *Bauhinia tomentosa*, *Tagetes*



Pansy

Nasturtium



identify the flower exactly before its consumption because; some flowers may have toxic effect on humans. Very limited information is available on anti-nutritional/ toxic factors found in edible flowers. Allergies occurs in wind-pollinated species characterized



Marigold

blossoms to develop functional foods is increasing day by day in global food and pharma industry which has opened immense opportunity for the rise of edible flower market. Hence, edible flowers have opened new possibilities in alleviation of malnutrition, diversification of agriculture, as well as alternative

by very small pollen capable of aero dispersion.

Curiosity, novelty and innovation are the features driving the market to pay closer attention to edible flowers. The growing interest in edible flowers is motivated not only by decorative and nutraceutical objectives, but also by the desire for new flavours and new opportunities for gastronomic innovations. Utilization of edible



Honey suckle

Bauhinia



source of income.

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*Value-added
products from*

Dragon Fruit

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Dragon is an exotic fruit recently introduced in India and is gaining popularity in our markets. Beautiful colours, relishing taste nutritional and medicinal values are attractive features of the fruit. Apart from the traditional uses, there is scope for producing many value-added products from dragon fruit. The major value-added products are mentioned below:



1. Dragon fruit powder

Dragon fruit is a source of natural colour. Dried fruit powder is used as a natural colouring and flavouring agent in smoothies, juices, lessy, milkshakes, cakes, bread, cookies etc. Dragon fruit powder is prepared by spray drying and lyophilisation techniques. Since the powder is highly hygroscopic (absorbing moisture from the air), the use of some carriers like maltodextrin is essential to prevent this type of damage.



2. Dragon fruit chips

Thin slices of dragon fruits are dried using hot air drying, freeze drying, or explosion puff drying techniques; and packed in suitable packing materials. Dragon fruit chips are consumed as snacks.

3. Dragon fruit yoghurt

Fruit yoghurts are becoming popular due to their health advantages like pro-biotic and pre-biotic qualities. Dragon fruit yoghurt is prepared by adding different microbial cultures of *Lactobacillus* and *Bifidobacterium* to fruit juice of 30% concentration, and such yoghurts can be stored for up to 15 days under refrigerated conditions at 4oC.





4. Dragon fruit jelly and jam

Materials required for preparing one kg of dragon fruit jelly are: 450g fruitjuice (filtered to remove seeds); 550 g sugar, 5 g citric acid, 300 ppm potassium metabisulphite (KMS) and 5-15 g pectin. Pectin is mixed with an equal quantity of sugar. The remaining sugar is mixed with fruit juice and slowly heated to boil until the TSS reaches 55o Brix. Then add the pectin-sugar mixture, stir well and heat continuously until the TSS reaches 58o Brix. Add citric acid and heat till the final TSS reaches 67o Brix. This can be stored in sterilized bottles.

Dragon fruit jam is also prepared almost in a similar way. Filtered fruit juice and sugar are mixed in a 2:1 ratio. Fruit juice, sugar and pectin are mixed and heated until the TSS reaches 60-68 o Brix. Now citric acid is added so as to bring the pH level to 3.5. The hot jam at 85oC is packed in sterilized glass bottles and stored.

5. Fermented products from dragon fruit:

Dragon fruit wine is a novel product. Yeast species like *Torulasporea*, *Lachancea*, and *Saccharomyces* etc. are used for fermentation.

Dragon fruit Kombucha- a type of fermented tea is also becoming popular. (Kombucha is a product developed by fermentation of sweet tea using bacteria and yeast).

Fermented products of dragon fruit are prepared by adding 10% fermented juice to fresh juice. It can be stored for up to 3 months at 8°C under refrigerated conditions. Anti-bacterial activity of fermented juice is three times higher than that of fresh



6. Utilization of fruit wastes

Fruit waste is a good source of many by-products. Fruit skin is used for the extraction of colour (beta cyanin) and pectin. Oil is extracted from seeds and fruit rind (skin) is converted to powder. Research on the utilization of dragon fruit wastes is progressing for the production of biofuel, bioplastic, adsorbent etc.

Dragon fruit cultivation is expanding in our country. The fruits are highly perishable and storability is poor. Hence scientific approaches to cultivation, post-harvest handling, transit storage and processing are essential to sustain commercial cultivation. Value-added products are a solution to overcome the hurdles like excess production during the fruiting season and fruit's perishable nature.



Hydrangea Hues Nature's pH Indicator

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H ydrangeas are ornamental plants known for their lush foliage and large, showy blooms, belongs to family Hydrangeaceae and genus Hydrangea commonly named as pH indicator plant or



Fig. 1: The pH scale and how it affects the Hydrangea's flower colour

hortensia, consist of more than 75 diverse group of species and over 600 named cultivars that vary in their morphological and growing habits, native to Asia and the America. The greatest species diversity is in eastern Asia, notably China, Korea and Japan. The word Hydrangea is derived from Greek word means 'water vessel' in reference to the shape of its seed capsules. The earlier name, Hortensia, is a Latinised version of the French name Hortense, probably came from 'hortus', garden.

History

- The discovery of hydrangeas can be traced back to ancient China and Japan. Hydrangeas were first cultivated in China, admired for their ornamental beauty. The French botanist Philibert Commerson was first to introduce hydrangeas to Europe. He named the plant

"Hydrangea" in reference to its affinity for water, as the name is derived from the Greek words "hydro" (water) and "angeion" (vessel).

- Hydrangea macrophylla* 'Hortensia,' was introduced by Jean-Nicolas Collot in the early 19th century. 'Hortensia' quickly gained popularity for its stunning pink and blue flowers and became synonymous with the hydrangea genus itself.
- In Japan, hydrangeas are celebrated during the annual 'Ajisai' festival, where people gather to admire the stunning displays of hydrangea blooms.
- There are two cultivated sps of hydrangea; *Hydrangea macrophylla*, known as bigleaf hydrangea, can be broken up into two main categories; mophead hydrangea and lacecap

hydrangea that changes pink-blue color, other is *Hydrangea serrata*.

Morphology

Hydrangeas are deciduous or evergreen shrub with woody stem. Leaves are opposite and simple, with serrated margins, ovate to elliptical in shape depending upon the species. The flowers are produced in corymbs or panicle type of inflorescence, bloom from early spring to late autumn. The inflorescence consists of a cluster of flowers arranged in various forms, such as the ball-shaped clusters of mophead hydrangeas (*Hydrangea macrophylla*) or the flattened clusters of lacecap hydrangeas (*Hydrangea serrata*). The individual flowers within the inflorescence can be either sterile or fertile and they typically have four or five petals. *Hydrangea quercifolia* was declared the official state wild flower of

Alabama in 1999.

Hydrangeas are very popular both as cut flowers and pot plant for the garden because of their big, beautiful blooms. The large flowerheads look like pompoms growing on bushes that can get as tall as trees. Unlike many cut flowers, Hydrangeas change colour through natural means, like a litmus test for your garden. The sepals on your Hydrangea act like tiny litmus paper and their color reflects the pH of the soil. The water-soluble pigments in

Hydrangea blooms are called anthocyanins. Today, hydrangeas are grown and appreciated worldwide, cherished for their striking blooms, ranging from delicate pastels to vivid blues, pinks and purples.

Symbolism of flower colour in Hydrangea

In Japan, the flower is associated with heartfelt emotion, unity, understanding and apology. Contrastingly, Europe have a negative sentiment i.e. arrogance and boastfulness. This association is based on the

ability of the plant to produce many flowers but very few seeds.

- Blue Hydrangea: Gratitude and sorry
- White Hydrangea: Purity, grace, arrogance, vanity or boasting
- Pink Hydrangea: True feelings of sincere emotions and the meaning of love.
- Purple Hydrangea: Desire for deep understanding, pride, royalty and gratefulness

Hydrangeas have the unique ability to change color, unlike most colors, depend



solely on the wavelengths of light that pigments absorb or reflect. This unique property of colour change in hydrangea blooms due to color shifts between red and blue, just like the pH scale. There are actually three conditions that must be true in order for a hydrangea to bloom blue:

- The soil must contain aluminium
- The aluminum in the soil must be available for the plant to take up through its roots
- The variety must be capable of turning blue
- How Hydrangeas indicate Soil pH

The color variation in hydrangea flowers can be attributed to a compound called delphinidin, a type of anthocyanin pigment found in the petals. When aluminum is present in the soil and available to the plant, it binds to the delphinidin turning the flowers blue. In the absence or limited availability of aluminum, the flowers will be pink or red.

Role of aluminum

Aluminum ions interact with the pigment in Hydrangeas and impact the chemistry inside the plant.

- **Acidic Soil (pH below 6.0):** In acidic conditions, aluminum is more soluble and available for hydrangeas to absorb. This aluminum interacts with the pigments in the flower, leading to a blue or purple-blue color. The more acidic the soil, the more intense the blue color can become. This phenomenon is most commonly observed in *Hydrangea macrophylla*, also known as bigleaf or mophead hydrangeas.

- **Neutral to alkaline Soil (pH above 6.0):** In neutral to alkaline soils, aluminum becomes less available because it precipitates out of the solution and is no longer accessible for the plant to absorb. As a result, hydrangea flowers in these conditions tend to be pink or red. The intensity of the pink hue can increase with the soil's alkalinity.

However, since the presence of aluminum is the primary factor in color change, and not all soils are equally high in aluminium hence, few hydrangea still stay pink, acidic soil isn't necessarily enough on its own, you need to add aluminum to your soil.

Despite being widely known for their chameleon-like quality, not all Hydrangeas change color, even if the soil composition drastically changes. White Hydrangeas, for example, *Hydrangea arborescens* (smooth hydrangea) and *Hydrangea paniculata* (panicle hydrangea) don't contain the pigments that pink and blue Hydrangeas have. Because of this, white Hydrangeas do not change color the way that many other varieties of blooms do naturally.

As figure:1 depicts, soil with a pH of 5.5 or lower will produce blue flowers, a pH of 6.5 or higher will produce pink and red hydrangeas, and soil in between 5.5 and 6.5 will have purple hydrangeas. White hydrangeas cannot be color-manipulated by soil pH because they do not produce pigment for color. The pink hydrangea has risen in popularity all over the world, especially in Asia. When soil is neutral, Hydrangea blooms present as shades of purple. These are arguably the most difficult to maintain unless the soil is naturally neutral.

How to Change the Colour of Hydrangea Blooms

Hydrangeas can naturally change color due to underground



chemistry, such as lime leaching out of concrete from foundations, patios, or sidewalks near the shrub. Decaying materials in the surrounding soil can also change the soil's pH. Excessive rainfall, especially in sandy soils, can also naturally cause an increase in the soil's pH and affect your Hydrangea's color, as can using high-nitrogen fertilizer on nearby grass.

- To make your Hydrangea's blooms turn blue, need to adjust soil's pH level between 5.2 – 5.5, by adding soil acidifiers, such as aluminum sulfate, sulfur or organic materials like pine needles or coffee grounds
- Pink bloom - 6.0 – 6.2, this will involve using a soil additive such as lime, Vinegar, Burying rusty nails, Citrus peels, Pine needles etc. Garden lime soil amendment is an easy, one-step soil additive that will increase the pH and allow your Hydrangea to turn pink.

Uses of Hydrangea

- Hydrangeas are highly valued for their abundant blooms, making them popular choice for ornamental gardening. They are widely cultivated in gardens, parks and

landscapes, adding beauty and color to outdoor spaces, creates interest with their changing colour pattern based on pH level.

- Hydrangeas serve as focal points in bouquets or as complementary elements in mixed floral designs, adding volume, texture and color with their diverse color palette, including shades of blue, pink, purple and white because of their large, showy flower heads and long-lasting blooms on various occasions of weddings, birthdays, anniversaries and special events.
- Hydrangeas provide environmental benefits in gardens and landscapes and also, by observing the color of hydrangea flowers, can identify the soil's pH in that area (acts as pH indicator). Their lush foliage and dense growth habit contribute to control of soil erosion, helping to stabilize slopes and prevent runoff. Additionally, hydrangeas attract pollinators such as bees and butterflies, supporting biodiversity and enhancing the overall health of the ecosystem.

- Hydrangea flowers contain natural pigments that can be used for dyeing textiles and other materials obtained from petals of some hydrangea ranging from blue and purple to pink and even green.
- With ability to retain their shape and color even after drying, used for dried flower arrangements and crafts (wreaths, floral and home decorations)
- *Hydrangea arborescens* and *Hydrangea macrophylla*, have a history of traditional medicinal, the root and bark of these species have been used in herbal remedies, particularly in traditional native American and Chinese medicine, for their potential diuretic, anti-inflammatory and kidney-stone dissolving properties.
- In Western culture, the hydrangea has many different uses. Native Americans used the root as a diuretic and the bark as pain relief specifically for muscle pain and burns. 'Amacha' is a Japanese beverage made from fermented leaves of *Hydrangea macrophylla* var. *thunbergii*.

Introduction

Black rice, a variety of *Oryza sativa* L., is rapidly gaining attention in the agricultural and health food sectors. Known for its distinctive black colour, glutinous texture, and high nutrient content, this ancient grain is primarily cultivated in Asia and is becoming increasingly popular worldwide.

Origin and Varieties

Black rice is a type of rice species *Oryza sativa* L. which

is black in colour, glutinous, and packed with a high level of nutrients. In India, it is primarily grown in the North-East region (known as ChakHao) and the southern region (known as Kavuni in Tamil). As an heirloom rice, it is open-pollinated and has been cultivated historically, though not widely grown in modern agriculture.

Black rice encompasses several varieties which includes Forbidden rice, Purple rice,

Japonica black rice, Chinese black rice, Indonesian black rice and Thai black rice. These varieties share the characteristic dark colour due to the presence of anthocyanins in the pericarp (outer part) of the kernel.

Characteristics and Culinary Uses

Black rice comes in short-grain, long-grain, and glutinous varieties, featuring a slightly nutty flavour and a smooth, firm texture that is less sticky

Black rice

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A nutritional powerhouse with agricultural promise





than most white rice. It is often reserved for festive seasons and special occasions, sometimes as an offering to deities. Traditional preparations include: Black rice kheer, Thaotan (fried black rice pancake), Tanphut (steamed black rice pancake), Chakhao cha (black rice tea), Kabok (black rice laddoo).

Nutritional Profile and Superfood Status

Black rice is widely considered a 'superfood' by

scientists. The term 'superfood' is used to describe food items with extremely high nutritional value, and black rice certainly fits this description. It is a super nutritious type of rice that is high in fibre, Antioxidants, Vitamins B and E, Iron, Thiamine, Magnesium, Niacin and Phosphorous. Compared to white, parboiled, and red rice, black rice contains higher levels of protein, fat, ash, crude fibre, dietary fibre, polyphenols, phytates, zinc,

and manganese. It also exhibits greater DPPH radical scavenging activity. The rice has a very low amylose content, resulting in a moist and sticky texture after cooking. What sets black rice apart is its rich content of powerful disease-fighting antioxidants. It also contains anti-inflammatory and anti-carcinogenic properties, making it a potent functional food.

Health Benefits

The impressive nutritional

profile of black rice translates into numerous potential health benefits:

a) Anti-inflammatory properties: Black rice helps increase the immune system's inflammatory response against infections by boosting chemical factors such as serotonin, bradykinin, and histamine.

b) Antioxidant effects: The anthocyanins in black rice act as powerful antioxidants, potentially preventing tumours and reducing oxidative stress on normal cells.

c) Anti-cancer potential: Studies suggest that anthocyanins in black rice may inhibit cancer progress and metastasis in various types of cancer, including breast, colon, prostate, lung, and oesophageal cancers.

d) Heart health: Black rice may help decrease atherosclerotic plaque, potentially preventing heart attacks and strokes, maintaining cholesterol levels, and controlling hyperlipidemia.

e) Digestive and metabolic health: The fibre in black rice can help prevent constipation and diarrhoea by binding to waste and toxins in the digestive tract.

f) Brain function: Some research indicates that black rice may improve memory impairment and reduce the risks of Alzheimer's disease, dementia, and depression.

g) Weight management: Black rice may aid in weight management due to its high fibre content and low-calorie density.

h) Diabetes prevention: The high fibre and antioxidant content may help in regulating blood sugar levels, potentially aiding in the prevention of diabetes mellitus.

Market Trends and Popularity

Black rice is experiencing a surge in popularity, particularly in Western markets. Demand for this rice is growing rapidly in the USA and European countries, driven by increasing awareness of its health benefits and its attractive, naturally dark colour. While it's a relative newcomer to Western markets, black rice has been consumed throughout Asia for thousands of years. It has a significant history of use in China, India, and Thailand, where it has long been valued for its nutritional and medicinal properties.

In recent years, black rice has been gaining traction among health-conscious consumers and dieticians alike. Its high nutritive value and potential medicinal benefits have catapulted it to the status of a trendy health food. As a result, black rice is becoming the new "IT" organic food that everyone is talking about, and the attention it's receiving is well-deserved.

Agricultural Aspects Distribution:

Black rice (*Zizania aquatica*) is formed by the mutation of the Kala4 gene. It is mainly cultivated in Southeast Asian countries, with China

accounting for 62% of global production, followed by Sri Lanka, India, Indonesia, and the Philippines. In India, it is grown primarily in northeastern states like Manipur, Mizoram, Meghalaya, Assam, and some parts of Odisha.

Challenges in Production of Black rice: -In India, black rice production faces several constraints:

- Low productivity compared to conventional rice varieties
- High photosensitivity, leading to a prolonged vegetative phase
- Limited availability of high-yielding varieties

Future Prospects

Despite the challenges, black rice offers promising opportunities for agricultural development in terms of development of varieties with desirable agronomic traits, particularly higher productivity, Utilization of black rice's natural drought tolerance and pest/disease resistance in breeding programs, Potential to improve farmers' nutritional and economic status through increased cultivation and consumption.

Conclusion

Black rice represents a unique opportunity in the agricultural sector, combining ancient wisdom with modern nutritional science. Its rich nutritional profile, potential health benefits, and growing market demand make it an attractive crop for farmers looking to diversify. As consumer interest in superfoods



and functional foods continues to grow, black rice is well-positioned to play a significant role in both global cuisine and preventive health strategies. While challenges in production exist, ongoing research and development efforts aim to address these issues, paving the way for wider adoption of this nutritious grain. The future of black rice looks promising,

offering benefits for farmers, consumers, and the food industry alike.

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“The Honey plant” Nature’s secret weapon for vitiligo

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Vitiligo characterized by the loss of melanin in the skin resulting in white patches, poses a significant challenge in modern medicine. While treatments exist to manage the condition and restore skin colour to some extent, a



complete cure remains elusive. However, traditional remedies rooted in ancient practices, offer potential solutions. Since ancient times only handful of plants are known to cure vitiligo one such plant is Ammi majus.

Introduction

Ammi majus, commonly known as Bishops weed or Queens Anne lace, belongs to Apiaceae family and is native to Egypt. Introduced to India in 1955 at Forest Research Institute, Dehradun this annual plant grows to a height of 0.9-1.5 meters, featuring whitish taproots, and an erect stem with compound umbel inflorescence. Its fruits, entire cremocarps (schizocarp) possess a slightly pungent taste.

Importance

Dating back to 200 B.C., ancient Egyptians utilized Ammi majus by rubbing its juice on vitiligo patches, encouraging patients to bask in the sun. Over time, powdered seeds of Ammi majus, combined with honey, were employed for vitiligo under the trade name 'Aatrillal'. Even today, the powdered seeds, rich in furocoumarins such as xanthotoxin, bergapten, and isopimpinellin, are referred to by the same trade name. Notably, compounds like psoralen and its derivatives found in Ammi majus have been shown to induce repigmentation in vitiligo patients.

Aatrillal plays a significant role in the Unani system of medicine, predominantly utilized for treating vitiligo through oral

or topical administration, either independently or in combination with other medications. In this system, MajoonAatrillal and Dawae Bars are two pharmacopoeial preparations commonly employed. Moreover, A. majus extract or its active principle, Xanthotoxin, is a key component in numerous pharmaceutical products worldwide, marketed under trade names such as 'Oxsoralen', 'Methoxsalen', or 'Meladinine' by various pharmaceutical companies across different countries. Additionally, Amil pharmaceuticals manufactures suntan lotions, Lukoskin ointment, and oral liquid formulations, utilizing A. majus as an Ayurvedic proprietary. Beyond vitiligo treatment, Ammi majus





is utilized for addressing diverse skin ailments such as psoriasis, leukoderma and leprosy, alongside other skin disorders. It also finds application in managing conditions like asthma, diabetes and digestive problems. Furthermore, it serves as an antispasmodic, diuretic and carminative agent, contributing to the regulation of menstruation.

Cultivation

Cultivating Ammi majus is restricted to temperate and sub-tropical regions, including Himachal Pradesh, Uttar Pradesh, Gujarat, Tamil Nadu





and Karnataka. The crop thrives in mild, cool climates during its vegetative phase, followed by warm, dry weather during maturity. Optimal growth is achieved in fertile, well drained sandy loam to clay loam soils rich in organic matter. Propagated through seeds, cultivation methods include direct sowing or nursery raising. Farmers commonly opt for direct sowing, requiring 12 kg/ha of seeds, or nursery raising with 1.5-2 kg/ha of seeds sown in September- October at a spacing of 45×30 cm or 45×60 cm which is followed by light

irrigation. Application of 80-100 kg N, 100-120 kg P₂O₅ and 40 kg K₂O per hectare is optimum for the good growth of plants.

Interculture operations include irrigating the crop at interval of 7-10 days depending on the weather conditions and weeding as and when the weeds appear as the crop is very sensitive to competition by weeds for space, light, moisture and nutrients. Harvesting, typically performed 5- 7 months after planting, involves manual handpicking, with umbels harvested as they mature to

prevent seed shedding. Seed yield of 1000-1200 kg per hectare is achieved in well managed fields.

Prospects

Despite its medicinal and pharmaceutical importance, Ammi majus cultivation faces challenges such as the availability of quality planting material, market fluctuations, and limited awareness. Investing in research to refine production technology and conduct clinical trials on its efficacy could unlock the full potential of Ammi majus in treating vitiligo and other skin ailments. With concerted efforts,

it could emerge as a valuable crop in the future offering hope to those affected by vitiligo and related conditions.

In conclusion, while vitiligo remains a challenging condition, Ammi majus stands as a beacon of hope in the quest for effective treatments. Through continued exploration and innovation, traditional remedies like Ammi majus have the potential to revolutionize the management of vitiligo, bringing relief to millions worldwide.

Seed development

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