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Farmers' Welfare
Farm Information Bureau



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English journal

The First English farm journal from the house of Kerala Karshakan

Pumpkin seeds

A nutritional
goldmine



The First English farm journal from the house of Kerala Karshakan

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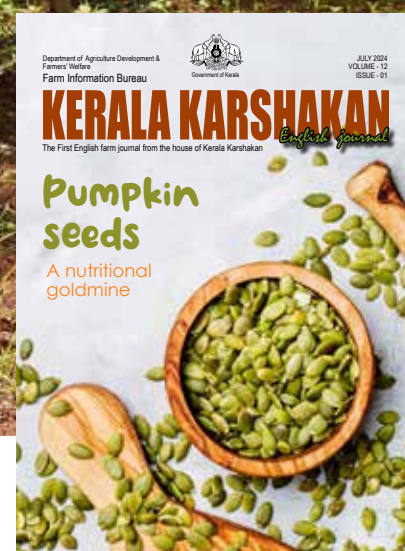
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Introduction

In recent years, indoor plants have surged in popularity, not only for their aesthetic appeal but also for their health benefits. Among these, the snake plant stands out as a favorite due to its striking appearance, hardy nature, and exceptional

air-purifying qualities. Known scientifically as *Sansevieria*, the snake plant is often dubbed “Mother-in-Law’s Tongue” for its long, upright, sword-like leaves. This resilient plant is more than just a decorative element; it’s a natural air purifier, capable of removing toxins such as

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SNAKE PLANTS

GROW YOUR OWN AIR PURIFIER

Golden Snake Plant





formaldehyde, benzene, and trichloroethylene from the air. Whether you're a seasoned gardener or a complete novice, cultivating a snake plant is an easy and rewarding way to enhance your living space and improve indoor air quality. In this article, we will explore the various types of snake plants, provide detailed cultivation tips, and highlight the numerous benefits of having these green companions in your home. Get ready to discover how to grow your own air purifier and enjoy a

Twist Snake Plant

healthier, greener environment.

1. Golden Snake Plant

The Golden Snake Plant (*Sansevieria trifasciata* 'Laurentii'), also known as Mother-in-Law's Tongue, is a popular ornamental plant characterized by its striking vertical leaves with green and yellow variegation. These leaves are stiff, sword-like, and can grow up to several feet tall. The plant is exceptionally hardy and can tolerate a wide range of growing conditions, making it a favorite for both indoor and outdoor cultivation. It thrives in

indirect sunlight but can also withstand low light conditions, making it suitable for various interior spaces. The Golden Snake Plant prefers well-draining soil and infrequent watering, as overwatering can lead to root rot. During the growing season, which spans from spring to summer, it benefits from occasional feeding with a balanced fertilizer. Propagation is typically done through division or leaf cuttings, which can easily root in soil or water. This plant is not just admired for its aesthetic appeal but also for its air-purifying

qualities. It is known to filter toxins such as formaldehyde, xylene, and toluene from the air, contributing to a healthier indoor environment. Additionally, the Golden Snake Plant is used in Feng Shui practices to bring positive energy into homes and offices. Overall, its resilience, low maintenance, and functional benefits make it a versatile and valuable addition to any plant collection.

2. Twist Snake Plant

The Twist Snake Plant (*Sansevieria trifasciata* 'Twist') is

Golden Hahnii Snake Plant



a striking cultivar known for its unique, spirally twisted leaves that add an architectural flair to any indoor space. Its variegated foliage, with dark green bands and light yellow edges, enhances its visual appeal. This hardy, drought-tolerant plant is ideal for low-light conditions, making it a popular choice for homes and offices. Cultivation practices for the Twist Snake Plant are straightforward; it thrives in well-draining soil and requires minimal watering, typically once every few weeks, ensuring the soil dries out between waterings to prevent root rot. It can tolerate a wide range of temperatures but prefers a warm environment. During the growing season, a balanced, diluted fertilizer can be applied monthly. As a slow-growing plant, it requires infrequent repotting. Beyond its aesthetic value, the Twist Snake Plant is known for its air-purifying qualities, effectively filtering toxins such as formaldehyde and benzene from the air. Its resilience and low maintenance make it an excellent choice for novice gardeners and those seeking a decorative, health-boosting addition to their indoor plant collection.

3. Golden Hahnii Snake Plant

The Golden Hahnii Snake Plant, a compact variety of *Sansevieria trifasciata*, is notable for its distinctive rosette shape and variegated leaves featuring bright yellow margins and green interiors. Characterized by its short, broad, and slightly twisted foliage, this plant typically

reaches heights of 6-8 inches, making it an excellent choice for indoor environments and small spaces. Cultivation practices for the Golden Hahnii are relatively straightforward, as the plant is highly adaptable and resilient. It thrives in indirect to low light conditions and requires well-draining soil to prevent root rot. Watering should be infrequent; the soil should be allowed to dry out between waterings to mimic its native arid conditions. This snake plant variety can be propagated through leaf cuttings or division of rhizomes. Golden Hahnii is not only valued for its aesthetic appeal but also for its practical uses. It is known



Bowstring Hemp Snake Plant

for its air-purifying qualities, effectively removing toxins such as formaldehyde and benzene from indoor environments. Additionally, it contributes to improved indoor humidity and has been associated with positive effects on mental health by enhancing the visual appeal of living spaces and offices.

4. Bowstring Hemp Snake Plant

Bowstring Hemp, also known as the Snake Plant (*Sansevieria trifasciata*), is a hardy perennial native to West Africa. It features long, upright, sword-like leaves that are typically dark green with lighter green or yellow variegated patterns. The plant is well-known for its low maintenance and air-purifying qualities, making it a popular choice for indoor environments. Cultivation practices for the Snake Plant are relatively simple; it thrives in indirect sunlight but can also tolerate low light conditions. The plant prefers well-draining soil and should be watered sparingly, as it is drought-tolerant and susceptible to root rot from overwatering. During the growing season, it benefits from occasional feeding with a balanced, diluted fertilizer. Propagation is commonly done through leaf cuttings or division of rhizomes. In terms of uses, apart from its decorative appeal and air-cleaning properties—removing toxins like formaldehyde and benzene from the air—it has been traditionally used to produce bowstrings, ropes, and other fibrous materials due to

the strong, fibrous nature of its leaves. Additionally, some cultures utilize the plant in traditional medicine to treat a variety of ailments, leveraging its purported antibacterial and anti-inflammatory properties.

5. Bantel Sensation Snake Plant

The Bantel Sensation Snake Plant, a cultivar of the *Sansevieria trifasciata* species, is renowned for its striking, variegated foliage. This plant

features long, narrow leaves with distinctive vertical white stripes against a deep green background, offering an elegant and modern aesthetic suitable for various interior designs. Characteristically, it is a robust and resilient plant, capable of thriving in low light conditions and tolerating neglect, which makes it an excellent choice for novice gardeners and busy individuals. Cultivation practices for the Bantel Sensation include

planting in well-draining soil, such as a cactus or succulent mix, and ensuring minimal watering to prevent root rot. It is best to let the soil dry out completely between waterings, as the plant is drought-tolerant. Additionally, it should be positioned in indirect light, though it can adapt to lower light conditions. Regularly wiping the leaves helps maintain their appearance and prevents dust accumulation. The Bantel Sensation Snake Plant is not only valued for its ornamental appeal but also for its air-purifying qualities. It can remove toxins such as formaldehyde and benzene from the air, contributing to a healthier indoor environment. This dual role as a decorative element and an air purifier makes it a popular choice for both homes and offices.

6. Moonshine snake plant

The Moonshine snake plant (*Sansevieria trifasciata* 'Moonshine') is a striking cultivar renowned for its unique silvery-green foliage, which distinguishes it from other members of the *Sansevieria* genus. This plant features broad, upright leaves that taper to a point, with a smooth, slightly waxy surface. The leaves are primarily a pale, almost metallic green, creating a luminescent effect that gives the plant its "Moonshine" name. In terms of cultivation, the Moonshine snake plant is incredibly resilient and low-maintenance, thriving in a variety of lighting conditions, from low indoor light to bright,

Bantel Sensation Snake Plant



indirect sunlight. It prefers well-draining soil and requires infrequent watering, as it is quite drought-tolerant. This plant is also known for its air-purifying qualities, effectively removing toxins such as formaldehyde and benzene from the air, making it an excellent choice for improving indoor air quality. Additionally, its architectural form and striking color make it a popular decorative element in both homes and offices. The Moonshine snake plant's ease of care and aesthetic appeal, combined with its health benefits, make it a versatile and valuable addition to any plant collection.



Moonshine snake plant

7. Cleopatra Snake plant

The Cleopatra Snake Plant, scientifically known as *Sansevieria trifasciata* 'Cleopatra', is a striking variety of the *Sansevieria* species renowned for its ornamental value. This plant features unique, intricately patterned leaves that exhibit a blend of dark green and light green stripes with reddish edges, forming a rosette-like structure. Its robust, upright leaves contribute to its reputation for being exceptionally hardy and low-maintenance. In terms of cultivation, the Cleopatra Snake Plant thrives in well-draining soil and can tolerate a range of lighting conditions from low, indirect light to bright, direct sunlight. It prefers infrequent watering, allowing the soil to dry out completely between waterings to prevent root rot. The

Cleopatra Snake Plant is not only prized for its aesthetic appeal but also for its air-purifying qualities. It is known to improve indoor air quality by filtering toxins such as formaldehyde, benzene, and trichloroethylene, making it a functional addition to indoor spaces. Additionally, its low-maintenance nature and resilience to neglect make it an ideal plant for beginners and busy individuals. Overall, the Cleopatra Snake Plant combines beauty, ease of care, and health benefits, making it a versatile and valuable addition to any plant collection.

8. Boncel snake plant

The Boncel snake plant, scientifically known as *Sansevieria cylindrica* 'Boncel', is a popular ornamental succulent renowned for its distinctive,

cylindrical leaves that grow in a fan-like arrangement. These leaves are thick, smooth, and typically display green-gray stripes, giving the plant an elegant and modern aesthetic suitable for indoor decor. The Boncel snake plant is remarkably low-maintenance and thrives in a variety of conditions. It prefers bright, indirect light but can tolerate low light levels, making it ideal for homes and offices. Cultivation practices for the Boncel snake plant are straightforward: it requires well-draining soil, infrequent watering (allowing the soil to dry out completely between waterings), and minimal fertilization. Overwatering is a common mistake, as it can lead to root rot. During its growing season, which spans from spring



Cleopatra Snake plant

to early autumn, a balanced liquid fertilizer can be applied sparingly. The Boncel snake plant is also drought-tolerant and can withstand periods of neglect, making it a great choice for busy or novice gardeners. Beyond its aesthetic appeal, the Boncel snake plant has practical uses as well; it is known for its air-purifying properties, effectively removing toxins such as formaldehyde and benzene from indoor environments.

Additionally, it is believed to contribute to improved air quality by converting CO₂ into oxygen at night, making it a beneficial addition to bedrooms.

9. Whale fin snake plant

The Whale Fin Snake Plant (*Sansevieria masoniana*), also known as Mason's Congo, is a striking succulent renowned for its broad, paddle-shaped leaves that can grow up to 3 feet long and 10 inches wide. The leaves are typically dark

green with irregular light green spots and a distinct, wavy edge, making it a popular choice for decorative indoor plants. Its hardiness and minimal care requirements contribute to its popularity. In terms of cultivation, this plant thrives in well-draining soil and prefers indirect, bright light but can tolerate low light conditions. It is drought-tolerant, necessitating watering only when the soil is completely dry, making it an excellent choice for busy or novice gardeners. Overwatering can lead to root rot, so it's crucial to allow the soil to dry out between waterings. The Whale Fin Snake Plant benefits from occasional feeding with a balanced, diluted fertilizer during the growing season. As a member of the *Sansevieria* genus, it is known for its air-purifying qualities, efficiently removing toxins such as formaldehyde and benzene from the air. Additionally, its architectural foliage makes it a striking feature in both modern and traditional interior designs. Beyond its aesthetic appeal, its resilience and ability to improve indoor air quality underscore its versatility and value as a houseplant.

10. Black Dragon Snake plant

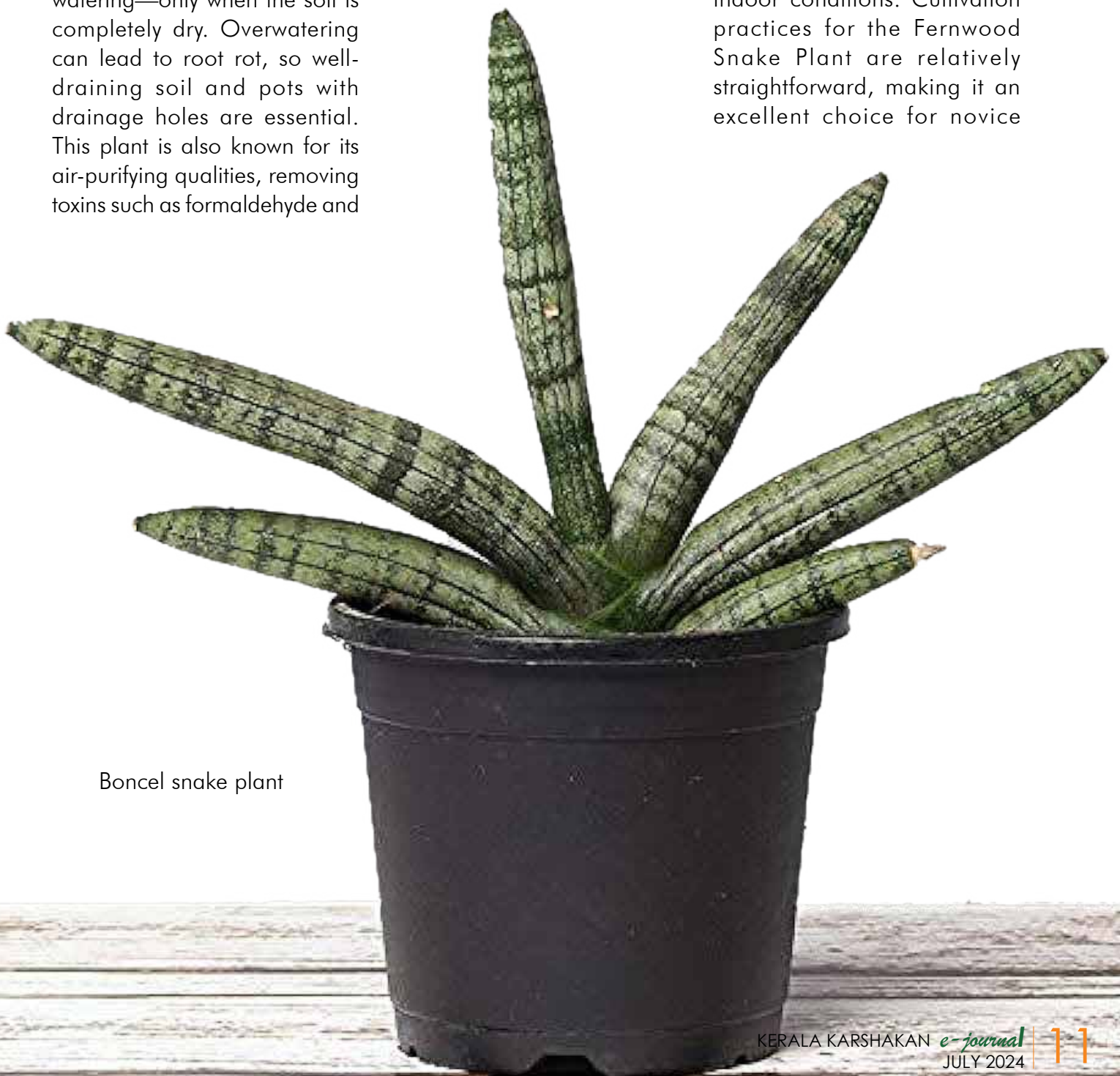
The Black Dragon Snake Plant (*Sansevieria trifasciata* 'Black Dragon') is a striking cultivar known for its compact rosette of dark, glossy green leaves, which can appear almost black in low light. This unique appearance makes it a popular choice for both home and office environments, where it adds a

touch of modern elegance. The leaves are thick, sword-shaped, and typically grow upright, making it an excellent plant for vertical interest. Cultivation of the Black Dragon Snake Plant is relatively straightforward, as it thrives in a range of light conditions from low to bright indirect light, though it prefers bright indirect light for optimal growth. It is highly drought-tolerant, requiring infrequent watering—only when the soil is completely dry. Overwatering can lead to root rot, so well-draining soil and pots with drainage holes are essential. This plant is also known for its air-purifying qualities, removing toxins such as formaldehyde and

benzene from the air. Beyond its aesthetic appeal and air-cleaning properties, the Black Dragon Snake Plant is also valued for its resilience and low maintenance needs, making it ideal for beginner gardeners and busy individuals. Additionally, it is often used in feng shui practices, believed to bring protective energy and good luck into the home.

11. Fernwood Snake Plant

The Fernwood Snake Plant, also known as *Sansevieria Fernwood* or *Dracaena bacularis*, is a distinctive and hardy houseplant renowned for its vertical, lance-shaped leaves that feature a unique variegation of dark green and light green stripes. These plants are characterized by their sturdy, upright growth habit and their ability to thrive in a variety of indoor conditions. Cultivation practices for the Fernwood Snake Plant are relatively straightforward, making it an excellent choice for novice



Boncel snake plant

gardeners. It prefers indirect light but can tolerate low light conditions, and it thrives in well-draining soil. Watering should be infrequent, as this plant is drought-tolerant and prone to root rot if overwatered. During the growing season, a balanced liquid fertilizer can be applied monthly to encourage robust growth. The Fernwood Snake Plant is not just an aesthetic addition to home decor but also offers practical benefits, such as air purification. It is known to filter toxins like formaldehyde, benzene, and trichloroethylene from the air, contributing to a healthier indoor environment. Its low maintenance and adaptability make it a popular choice for enhancing both homes and offices.

12. Golden Flame Snake Plant

The Golden Flame Snake Plant, also known as *Sansevieria trifasciata* 'Golden Flame', is a striking cultivar of the widely popular snake plant species. Its distinguishing characteristic is its vibrant, upright leaves with bold yellow edges and a dark green center, making it a visually appealing choice for both indoor and outdoor decor. This plant is renowned for its hardiness and low maintenance, thriving in a range of lighting conditions from low indoor light to bright, indirect sunlight. It prefers well-draining soil, typical of succulent mixes, and requires infrequent watering, approximately every 2-6 weeks depending on the environment, allowing the soil to dry out completely between waterings. The Golden Flame Snake Plant is highly tolerant of neglect and can withstand



Black Dragon Snake plant

Whale fin snake plant



periods of drought, making it an ideal plant for beginners or busy individuals. The uses of the Golden Flame Snake Plant extend beyond aesthetics. It is known for its air-purifying qualities, effectively removing toxins such as formaldehyde, benzene, and trichloroethylene from the air, thus improving indoor air quality. Additionally, it is believed to have feng shui benefits, symbolizing cleanliness and resilience, and is often used in homes and offices to create a calming, inviting atmosphere.

13. Starfish snake plant

The Starfish snake plant is a distinctive and hardy succulent known for its fan-shaped arrangement of cylindrical leaves

that resemble starfish. These leaves are thick, smooth, and grayish-green with darker green concentric banding, making the plant a striking ornamental addition to both homes and offices. Cultivation of the Starfish snake plant is straightforward, as it thrives in bright, indirect light but can tolerate low light conditions. It prefers well-draining soil, such as a cactus or succulent mix, and should be watered sparingly, allowing the soil to dry out completely between waterings to prevent root rot. This plant is drought-tolerant and can survive periods of neglect, making it ideal for busy individuals or those new to plant care. Additionally, the Starfish snake plant is known for its air-purifying qualities, effectively removing toxins like



Fernwood Snake Plant

Golden Flame Snake Plant



formaldehyde and benzene from the air. It's also reputed to be relatively pest-resistant and can be propagated easily through leaf cuttings or by division. With its unique appearance and low maintenance needs, the Starfish snake plant serves as both an aesthetic and functional element in interior landscaping.

14. Fischeri snake plant

The Fischeri snake plant (*Sansevieria fischeri*), also known as the East African wild *Sansevieria*, is a unique and hardy succulent native to East Africa. Characterized by its compact, rosette-forming habit, the plant produces thick, cylindrical leaves that are often mottled with light and dark green patterns, providing an

attractive appearance. Unlike many other snake plant species, *S. fischeri* tends to remain relatively small, making it ideal for container gardening and indoor cultivation. The leaves can reach up to 1-2 feet in length and occasionally produce small, tubular flowers on a tall spike. Cultivation of the Fischeri snake plant is straightforward, as it is highly tolerant of neglect and thrives in a variety of conditions. It prefers well-draining soil and can tolerate low light conditions, though it grows best in bright, indirect light. Overwatering is one of the few potential issues, so it is crucial to allow the soil to dry out between waterings. It is an excellent choice for improving indoor air quality, as it is known to filter toxins such as formaldehyde and benzene from the air. Additionally, its robust



Fischeri snake plant

nature and low maintenance requirements makes it a popular choice for busy individuals and those new to gardening.

15. Patens snake plant

The Patens snake plant, scientifically known as *Sansevieria patens*, is a unique

and visually striking species within the *Sansevieria* genus. This plant is characterized by its cylindrical, arching leaves that can grow up to several feet in length. The leaves are typically a deep green color with light banding, adding to its

Starfish snake plant





Patens snake plant

ornamental appeal. In terms of cultivation, *Sansevieria patens* thrives in well-draining soil, often a cactus or succulent mix, and requires minimal watering, making it highly drought-tolerant. It prefers bright, indirect sunlight but can also adapt to lower light conditions, making it versatile for indoor growing. Ideal temperatures range from 60 to 85 degrees Fahrenheit, and it benefits from occasional feeding with a balanced fertilizer during the growing season. The Patens snake plant is renowned for its hardiness and low maintenance requirements, making it a popular choice for both novice

and experienced gardeners. Additionally, it has air-purifying qualities, removing toxins such as formaldehyde and benzene from indoor environments. Its striking form and ease of care make it a favored plant for decorative purposes in homes and offices.

Conclusion

Cultivating snake plants is an excellent way to combine the benefits of indoor greenery with the practicality of natural air purification. These resilient and low-maintenance plants are perfect for both beginners and seasoned gardeners, thriving in various light conditions and

requiring minimal care. By following simple cultivation guidelines, you can ensure that your snake plants not only flourish but also enhance the air quality of your home, making your living space healthier and more aesthetically pleasing. Whether you choose the classic *Sansevieria trifasciata* 'Laurentii' with its striking yellow-edged leaves or explore other varieties, the rewards of growing your own air purifiers are manifold. Embrace the beauty and functionality of snake plants, and enjoy the fresh, clean air they bring into your home. Happy gardening!

Introduction

Plants face the challenge of coping with unpredictable and ever-changing environmental stresses, including temperature fluctuations, radiation levels, precipitation patterns, humidity

variations, wind intensity, and soil conditions. When subjected to suboptimal environmental conditions due to climatic shifts or human interference, plants' survival and productivity are compromised. Allantoin,

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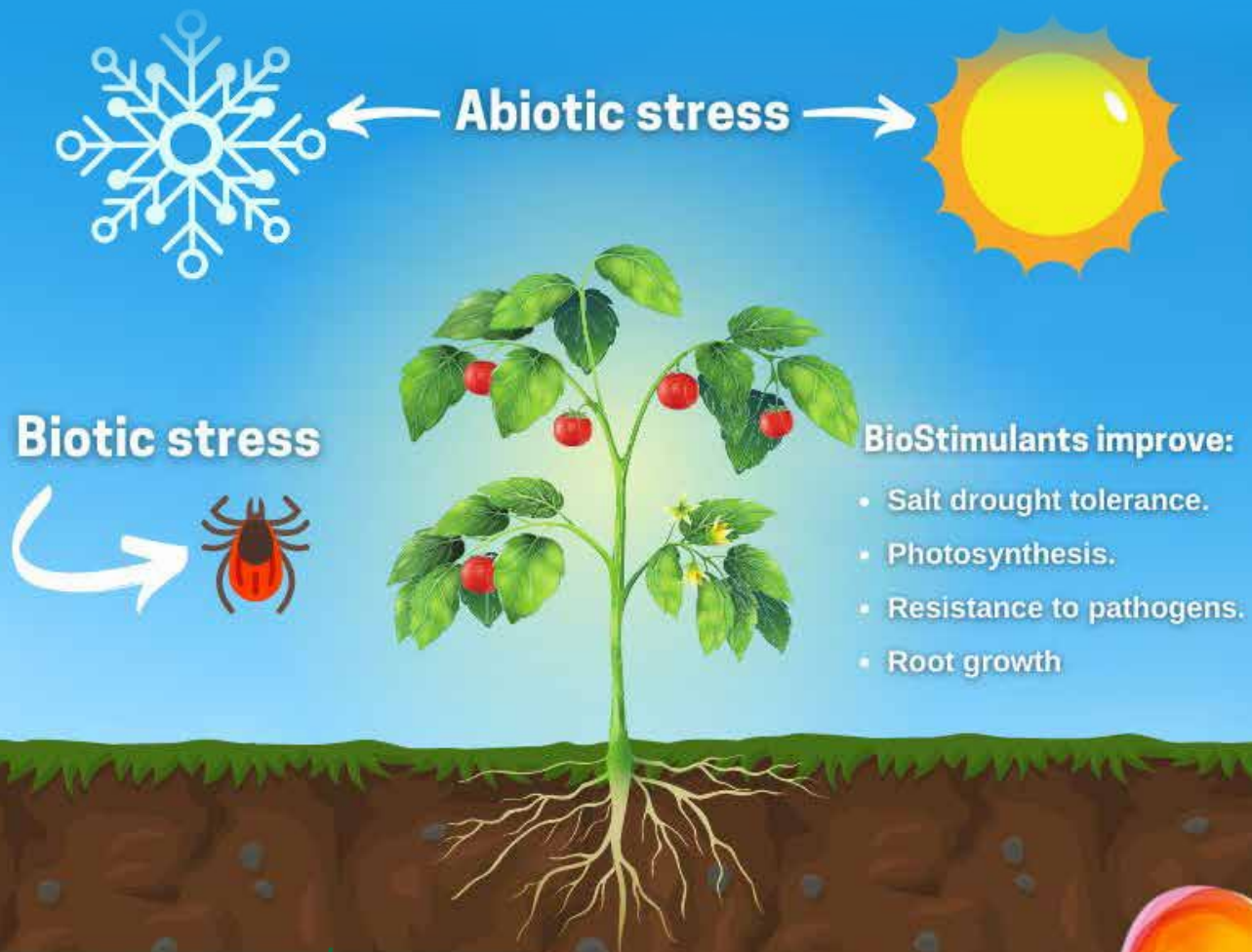
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Allantoin Synthesis, Accumulation, and Functional Roles in Plant Abiotic Stress Tolerance





a nitrogenous compound found across the plant kingdom, plays a vital role in mitigating stress. Serving as an important nitrogen form transported within plants from source to sink, recent research highlights its significance in responding to diverse stressors such as salt, drought, osmotic stress, high irradiance, and heavy metal exposure. This compound emerges as a key regulator of stress in plants, underscoring its functional importance in maintaining plant resilience and productivity amidst environmental challenges.

Synthesis and accumulation

- Allantoin (C₄H₆N₄O₃), also called glyoxyldiureide (diureide of glyoxylic acid)

or 5-ureidohydantoin, is a heterocyclic nitrogen-rich compound universally present in plants. It is an intermediate metabolite of purine catabolism and follows a common synthesis pathway in all plants and accumulates in various plant parts.

- Higher allantoin biosynthesis and accumulation in plants is correlated with an increase in different abiotic stress tolerance such as drought, salt stress, heavy metal stress, irradiation.

Drought

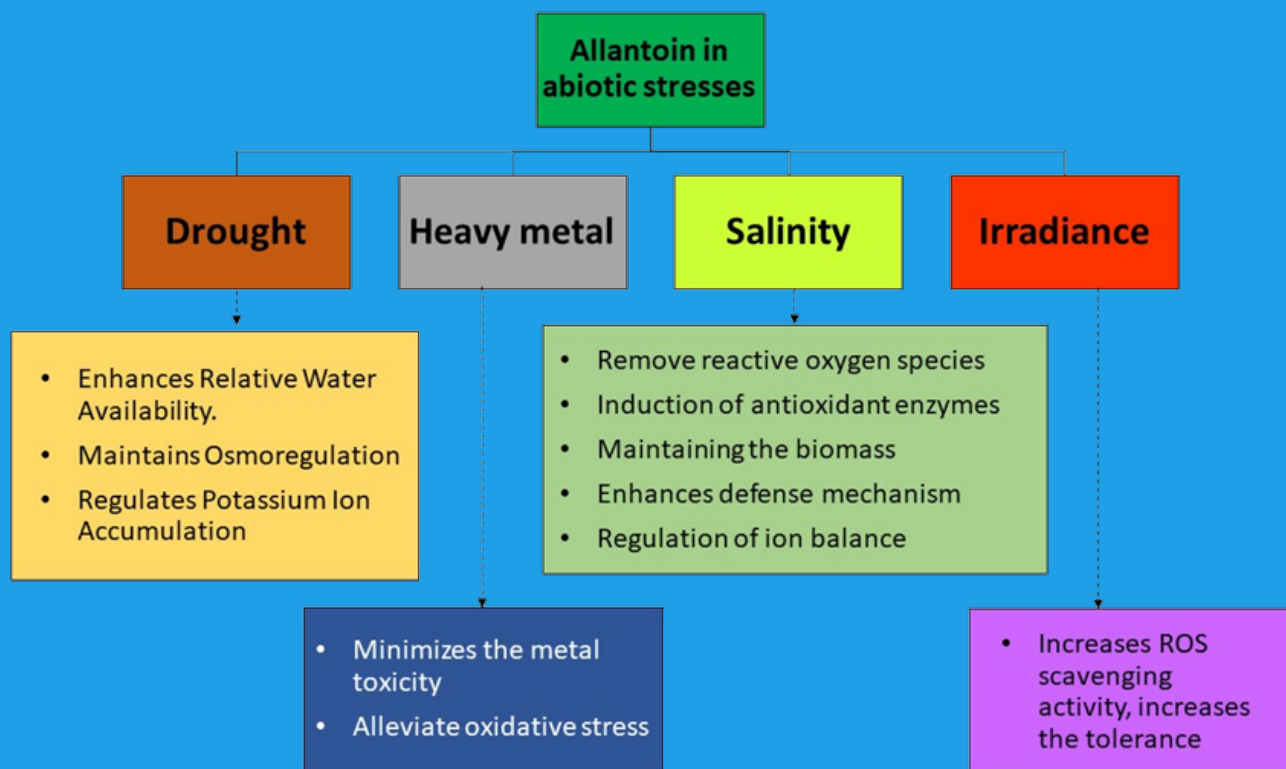
- Drought is the most important abiotic stress which hampers plant growth and development by

impairing cellular osmotic potential. Under drought stress condition plants tend to accumulate allantoin in their different organs.

- Allantoin Enhances Relative Water Availability, Maintains Osmoregulation, and Regulates Potassium Ion Accumulation in Plants under Drought. Overall, the beneficial effects of allantoin supplementation resulted in the improved plant growth, biomass, and yield of rapeseed under drought conditions.

Salinity stress

- Salinity is a major abiotic stress affecting plant growth and yield worldwide. Salinity affects plants in many



different ways: dehydration, ion poisoning, nutritional imbalances, and oxidative stress.

- During the initial phase of salinity stress, both osmotic stress and ion toxicity occur, which affect the expansion of cells and tissues, leading to nutritional imbalances and oxidative stress and ultimately affecting DNA transcription and translation. Plants remove reactive oxygen species (ROS) by regulation of metabolite-driven osmotic adjustment and induction of antioxidant enzymes
- Increased allantoin content

has been considered a salt stress tolerance marker. Increased allantoin might help in maintaining the biomass of these tolerant varieties under salinity stress. Allantoin altered the enzyme activities related to polyamine metabolism.

- Allantoin reduced oxidative damage caused by salt stress. Allantoin was involved in the regulation of ion balance under salt stress.

Heavy metal stress

- Industrial activity such as mining, unchecked use of inorganic fertilizers, pesticides, and other chemical applications on

soil increases the level of hazardous metals, e.g., cadmium, zinc, and lead.

- The plant's growth is severely hampered by these metals. Allantoin accumulation in plants has also been found to increase tolerance against heavy metal stress. Allantoin increases the ROS scavenging activity, which suggests its possible role in ROS detoxification.
- Metal (Cd) stress initiates ureide metabolism and leads to the accumulation of allantoin and allantoate to alleviate the detrimental effects of stress and confer tolerance in plants.

- Allantoin helps to alleviate heavy metal induced oxidative stress and minimizes the metal toxicity in plants.

Irradiance

- High irradiance causes damage to the photosystem II during photosynthesis which is known as photooxidation of green plants.
- In addition to other abiotic stresses, high irradiance has also been shown to increase allantoin accumulation. Synthesis and degradation of allantoin showed a higher expression in wild-type plants.
- The mutant plants showed better growth in both moderate as well as in high irradiance conditions. The higher level of allantoin accumulation and less amount of anthocyanin accumulated during irradiance in mutant clearly indicated the tolerance ability of allantoin in irradiance stress. Allantoin increases the ROS scavenging activity, which suggests its possible role in ROS detoxification and increases the tolerance.

Dark Stress

- Light is an essential factor for photosynthesis in plants, under low light condition,

the photosystems are severely affected. The dark stress causes chlorosis of leaves as well as decrease in biomass in addition to other symptoms.

- Allantoin biosynthesis had reduced growth, increased chlorophyll degradation and higher accumulation of ROS compounds compared with wild type under dark stress. Allantoin increases the ROS scavenging activity, which suggests its possible role in ROS detoxification and increases the tolerance.

Signaling

- Allantoin functions as signalling molecule to stimulate stress-responsive genes (P5CS; pyrroline-5-carboxylase synthase) and ROS (reactive oxygen species) scavenging enzymes (antioxidant).
- Recently, allantoin has been attributed to the role of kin recognition in plants, which highlights its role as a signal molecule that facilitates inter-plant interactions.

Conclusion

This study revealed that allantoin accumulation could be activated by multiple abiotic stresses. This might be due to the overlapping nature of various abiotic conditions, which is more relevant to plants in their

natural habitats where they might experience more than one type of stress at any particular time. Activation of allantoin accumulation in response to multiple stresses suggests that allantoin might function as an important stress tolerance inducer or a signalling molecule that is evolutionarily conserved in plant kingdom.

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Lactose intolerance is a common digestive disorder where the body cannot effectively digest lactose, a sugar found in milk and dairy products. This is due to a deficiency in lactase, an enzyme produced in the small intestine that breaks down lactose into

Lactose in tolerance and dairy milk alternatives

SAFRIN S

3rd year student College of dairy science
and technology kolahalamedu idukki

simpler sugar for absorption.

Symptoms of lactose intolerance

Bloating, diarrhea, nausea, and pain in our abdomen.

Foods that contain lactose

We may not need to completely avoid foods and beverages that contain lactose – such as milk or milk products, we may get less calcium and vitamin D than we need.

The way we may be able to tolerate milk and milk products of we;

- Drink small amount of milk at a time and have it with meals.
- Add milk and milk products to

Soy milk



Cashew milk

our diet a little at a time and see how we feel.

- Try eating yogurt and hard cheeses like cheddar or Swiss , which are lower in lactose than other milk products.
- Use lactose products to help digest the lactose in milk and milk products.

Calcium and vitamin D

- If we are lactose intolerant, makes sure get enough calcium and vitamin D each day. Milk and milk products are the most common sources of calcium.

Many foods that don't contain lactose are also sources of calcium:

- Oranges
- Broccoli and leafy green vegetables
- Fish with soft bones , such as canned salmon or sardines.
- Almonds , Brazil nuts and dried beans.
- Products with labels that show they have added calcium, such as some cereals, fruit juice and soy milk.

Dairy milk alternatives

Dairy milk alternatives includes almond milk, soy milk, coconut milk, oat milk, rice milk , cashew milk.



Oat milk

Benefits of dairy milk alternatives

1. Soy milk

- Naturally high in protein (similar to dairy milk) and isoflavones (plant based estrogens)
- May help lower cholesterol and improve heart health.
- Popular among those with lactose intolerance, dairy allergies or following a vegan diet.

2. Almond milk

- Low in calories and fat.
- Rich in vitamin A, D and E.
- Fortified version can provide calcium and protein, vitamins similar to dairy milk.
- Can help with weight management and



Coconut milk

bone health.

- Suitable for those with dairy intolerance or preference.

3. Coconut milk

- High in healthy fats and for energy and brain function.
- Rich in fiber, Vitamins and minerals.
- May aid in weight loss and improved cholesterol levels.
- Supports digestive health and immune system.
- May help lower blood sugar levels.
- Suitable for those with dairy intolerance or preference.



Cashew milk

4. Oat milk

- Popular among those with dairy intolerance or preference
- Lower in calories and fat than dairy milk.
- Rich in fiber and vitamins.
- May help lower cholesterol and improve heart health.

5. Cashew milk

- May help lower cholesterol and improve heart health
- Popular among those with dairy intolerance or preference.
- Lower in calories and fat than dairy milk.
- Rich in magnesium, copper and zinc.

6. Rice milk

- Popular among those with dairy milk alternatives.
- Lower in calories and fat than dairy milk.
- Rich in carbohydrates.
- May help lower cholesterol and improve heart health.

Conclusion

In conclusion, lactose intolerance is a common condition that affects millions of people worldwide, making it difficult for them to digest lactose, a sugar found in dairy milk. However, with the rise of dairy milk alternatives, those with lactose intolerance can still enjoy the nutritional benefits of milk without the discomfort. From soy milk to almond milk, coconut milk to oat milk, the options are vast and varied. Additionally, advancements in technology have made it possible to create lactose-free and low-lactose dairy products, making dairy more accessible to those with intolerance. Whether you're lactose intolerant or simply looking for a plant-based alternative, there's a milk option out there for everyone. By understanding lactose intolerance and exploring dairy milk alternatives, individuals can make informed choices about their diet and enjoy a healthier, happier lifestyle.



Rice milk



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ASHWAGANDHA

THE POST PANDEMIC IMMUNITY POWERHOUSE

Introduction

The history of India's traditional medical system, Ayurveda, dates back to 6000 BC. Ashwagandha has been utilised as a Rasayana throughout the majority of these 6000 years. As a tonic, aphrodisiac, narcotic, diuretic, anthelmintic, astringent, thermogenic, and stimulant, ashwagandha root is valued for

these properties.

With tiny, smooth, and glossy hairs all over the plant, Ashwagandha is an upright, branching shrub that can reach a height of 1.25 metres. Leaves are ovate, with hairs and soft to touch. Flowers have a greenish hue. Roots are fleshy, tapering and whitish brown in colour. Leaves and roots are narcotic

in large dose. Because of its similar restorative qualities to those of Chinese ginseng (*Panax ginseng*), it is also known as "Indian Ginseng."

Ashwagandha is one of nature's most powerful gifts to humankind. It derives its name from two Sanskrit words: Ashwa (meaning 'horse') and Gandha (meaning 'smell'). Some say it

was so named because of its uncomfortable aroma, which is often likened to the smell of horse urine.

The species is found all throughout the world, from Africa and the Mediterranean to India and Sri Lanka. It is found throughout India's sub-Himalayan regions, rising to elevations of up to 1000 metres. It can be found in Punjab, Himachal Pradesh, and other arid regions of India. It grows in the drier, subtropical regions of India, including Madhya Pradesh, Uttar Pradesh, Haryana, Rajasthan, Gujarat, and Maharashtra.

Area and Cultivation

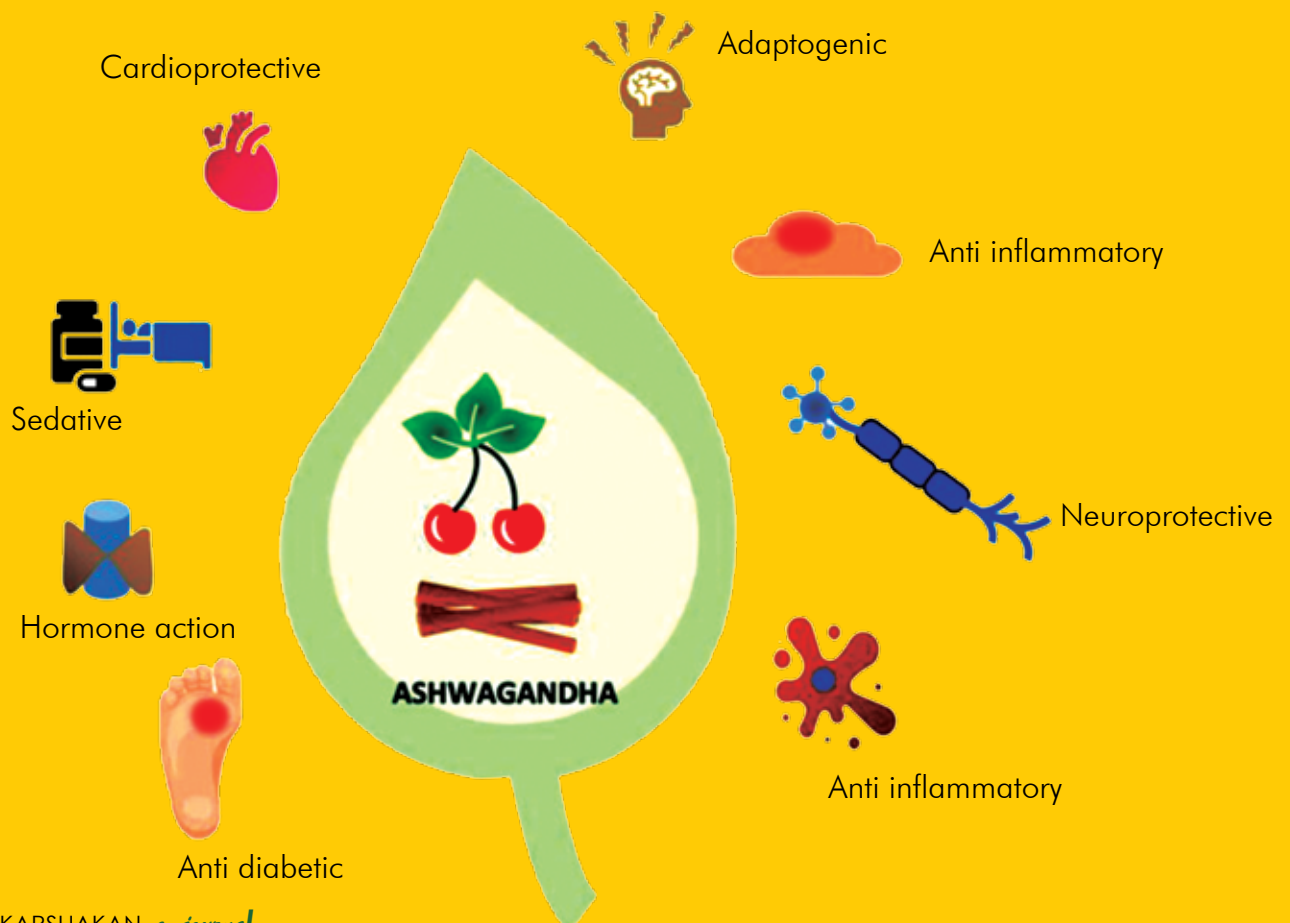
In accordance with reports from 2021, Ashwagandha

is cultivated over an area of 10,780 ha with a production of 8,429 tonnes in India. Based on the current trend, the demand of Ashwagandha would be around 12,500 tonnes (Das and Singh, 2021). It is cultivated in several states across India, with Madhya Pradesh, Gujarat, Haryana, Maharashtra, Punjab, Rajasthan and Uttar Pradesh being the primary producers. In Madhya Pradesh specifically, it is grown on over 5,000 hectares in Manasa, Neemuch and Jawad talukas of Mandasaur district. Neemuch and Mandasaur markets of Madhya Pradesh are popular for Ashwagandha. This herb is always on demand, however, demand has risen further due to its immunoboosting capacity

which would be a great therapy for fighting COVID-19 like situation. Being hardy and drought tolerant species with enormous bio-compounds, the use of Ashwagandha has enjoyed monopoly in many parts of India. The herb has been identified by the National Medicinal Plants Board of India as one of the 32 selected priority medicinal plants, which are in great demand in domestic and international markets. Since the production is lesser than its consumption, there is a need necessitating the increase in its cultivation and higher production.

Botanical Description

Ashwagandha (*Withania somnifera*) belongs to the





genus *Withania* and family Solanaceae. Two species, such as, *Withaniacoagulans* Dunal and *W. somnifera* Dunal, are found in India. *W. coagulans* is a rigid grey under shrub that reaches a height of 60–120 cm. In contrast, *W. somnifera* is an erect, evergreen, tomentose shrub that grows to a height of 30–75 cm.

Roots: Its roots are stout, fleshy, cylindrical, 1–2 cm in diameter, and whitish brown in color.

Leaves: Leaves are simple, glabrous, dull green, petiolate, elliptic-ovate to broadly ovate, entire, ex-stipulate, opposite and up to 10 cm long.

Flowers: Flowers are bisexual, inconspicuous, greenish or dull

yellow in color, 4–6 mm in diameter, borne on axillary umbellate cymes, and comprise five sepals, petals, and stamens each; the two-celled ovary has a single style and a bilobed stigma. The petals are united and tubular. The stamens are attached to the corolla tube and bear erect anthers that form a close column or cone around the style. Pollen production is poor.

Fruit: The fruit is a small, globose, orange-red berry when mature, 5 mm in diameter and is enclosed in a persistent calyx.

Seed: The seeds are small, flat, yellow, 2 mm long, 1.5–2.0 mm wide and 0.5 mm thick and reniform in shape and very light in weight.

The cultivated plants have sizeable differences from the wild forms not only in their morphological characteristics but also in their therapeutic action, although the alkaloids present are the same in both.

Chemical constituents

Various parts of the plant contain a multitude of chemical compounds. Among these, alkaloids such as ashwagandhine, anahygrine, anaferine, cuscohygrine, tropine, isopelletierine, pseudotropine, 3-tigloyltropine, 3-tropyltigloate, dl-isopelletierine, hygrine, mesoanaferine, choline, somniferine, withanine, withananine, hentriacontane,



visamine, and with a somnine are noteworthy. The plant also features steroidal compounds, including ergostane and various steroidal lactones like withasomidienone, withasomniferols A–C, withanone, withanolides A–Y, and withasomniferin–A. Additionally, it contains saponins such as sitoindoside VII and VIII, which possess an extra acyl group, as well as withanolides like sitoindoside IX and X that include a glucose molecule at carbon 27. Withanosides I, II, III, IV, V, VI, and VII are identified as withanolide glycosides.

Furthermore, ashwagandhine and pseudowithanine are classified as pyrazole derivatives. The plant is also rich in a variety of amino acids, including aspartic acid, proline, tyrosine, alanine, glycine, glutamic acid, cystine, and tryptophan, along with other substances such as acylsterylglucosides, starch, reducing sugar, hentriacontane, and ducitol.

Medicinal Properties

In Ayurvedic medicine, Ashwagandha is regarded as a “rasayana” medication, believed to promote longevity, youthful vigor, and enhanced

intelligence. The primary part utilized commercially is the root, which is characterized by its bitter flavor, hot potency, and properties that include germicidal, aphrodisiac, diuretic, and the ability to alleviate vata and kaphadoshas. It is employed in the treatment of leucoderma, rheumatism, dropsy, fever, cough, dyspnea, ulcers, and impotence. Additionally, it is recommended for conditions of general debility and is known to enhance physical strength. Ashwagandha has been shown to possess potent anti-tumor properties and is highly effective

in treating anxiety neurosis. Significant preparations using this medication include Asvagandharishtam, Chavanaprasam, and Valiya Narayanatailam.

Leaves: The leaves exhibit antipyretic and anthelmintic properties, helping to reduce fever and eliminate intestinal worms. A leaf fomentation is used to treat boils, swollen hands and feet, and sore eyes. Leaf paste is administered topically on syphilitic sores, carbuncles and lice infestations. For wounds and bedsores, an ointment made by boiling the leaves in fat is beneficial. It has been reported that leaves contain anti-inflammatory properties. Apart from its therapeutic applications, ashwagandha is often consumed

as tea at home.

Roots: Increasing immunity is one of ashwagandha root's most well-known uses. It is possible for the roots to produce more white blood cells. It has mild sedative qualities that aid in promoting restful sleep and relieves insomnia. It aids in the management of weight reduction and helps to control blood sugar levels. The pharmacological properties of roots of *Withaniasomnifera* include alterative, aphrodisiac, deobstruent, diuretic, sedative, and restorative effects. The root's steroidal lactones and alkaloids are responsible for its pharmacological effects. Research findings indicate that powdered ashwagandha roots may be a useful herbal remedy

for cancer treatment. It can impede the growth of tumours. It enhances male sperm count and treats erectile dysfunction. In India, ashwagandha root is a well-liked male sex tonic. Additionally, it aids in lowering bad cholesterol, which is the cause of hypertension and other cardiovascular issues. According to recent research, ashwagandha root has steroidal qualities that make it useful for alleviating inflammation. Additionally, sciatica and low back pain are treated with it. Because it is entirely natural and has no negative side effects, it is generally safe to use. Somniferine is an alkaloid found in root. As a tonic, stimulant, alternative medicine, aphrodisiac, narcotic, diuretic, abortifacient, and





deobstruent, the root is useful. The plant's roots are classified as rasayanas, which are said to enhance resistance to illness, delaying the ageing process, revitalize the body in debilitated conditions, increase an individual's capacity to withstand harmful environmental factors, and foster a sense of mental well-being in order to promote health and longevity. For women who frequently miscarry, the root is highly effective in toning up the uterus. For the treatment of scrofula, a decoction of the root is combined with long pepper, ghee, and honey. A decoction is advised for colds and chest

complaints. Carbuncles, ulcers, and swellings are treated with a paste prepared from the roots and leaves; scrofulous and other glandular swellings are treated with a warm paste made from the fresh roots.

Berries and seeds: The seeds and berries are used to cure chest ailments and are diuretic. Ashwagandha seeds are used to thicken milk in India. Berries are used to coagulate milk in cheese making, instead of rennet.

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Moringa oleifera belonging to the family of Moringaceae is an effective remedy for malnutrition. Because its leaves, pods, and seeds contain a range of vital compounds, moringa is high in nutrients. Moringa contains 92 essential nutrients, some of which are vitamin C, Potassium, Magnesium, and Manganese. Moringa is highly nutritious not

only for their protein content – it is also packed with Vitamin B (Thiamine, Riboflavin), Vitamin B6, Phosphorous, Calcium, Iron, and Zinc. Moringa has 7 times more vitamin C than oranges, 10 times more vitamin A than carrots, 17 times more calcium than milk, 9 times more protein than yoghurt, 15 times more potassium than bananas and 25 times more iron than spinach. Moringa oleifera is a

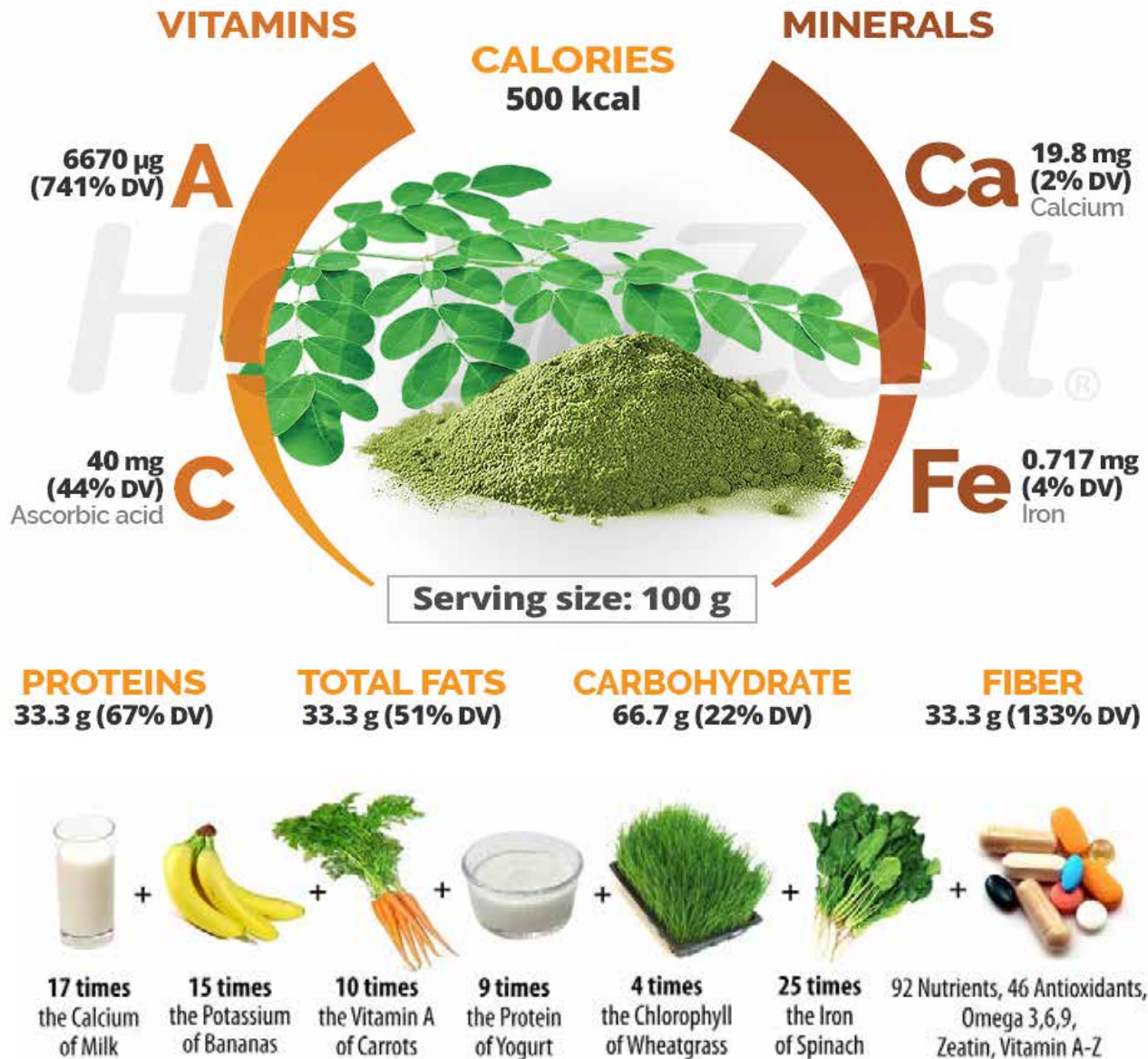
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Moringa

A Nutrient Packed Super food



Moringa Nutrition



small, fast-growing evergreen or deciduous tree that usually grows up to 10 or 12 m in height. It has a spreading, open crown of drooping, fragile branches and feathery foliage. The leaves are bipinnate or more commonly tripinnate, up to 45 cm long. The fragrant, yellowish white flowers are borne on slender, hairy stalks in spreading or drooping axillary clusters (panicles) 10–25

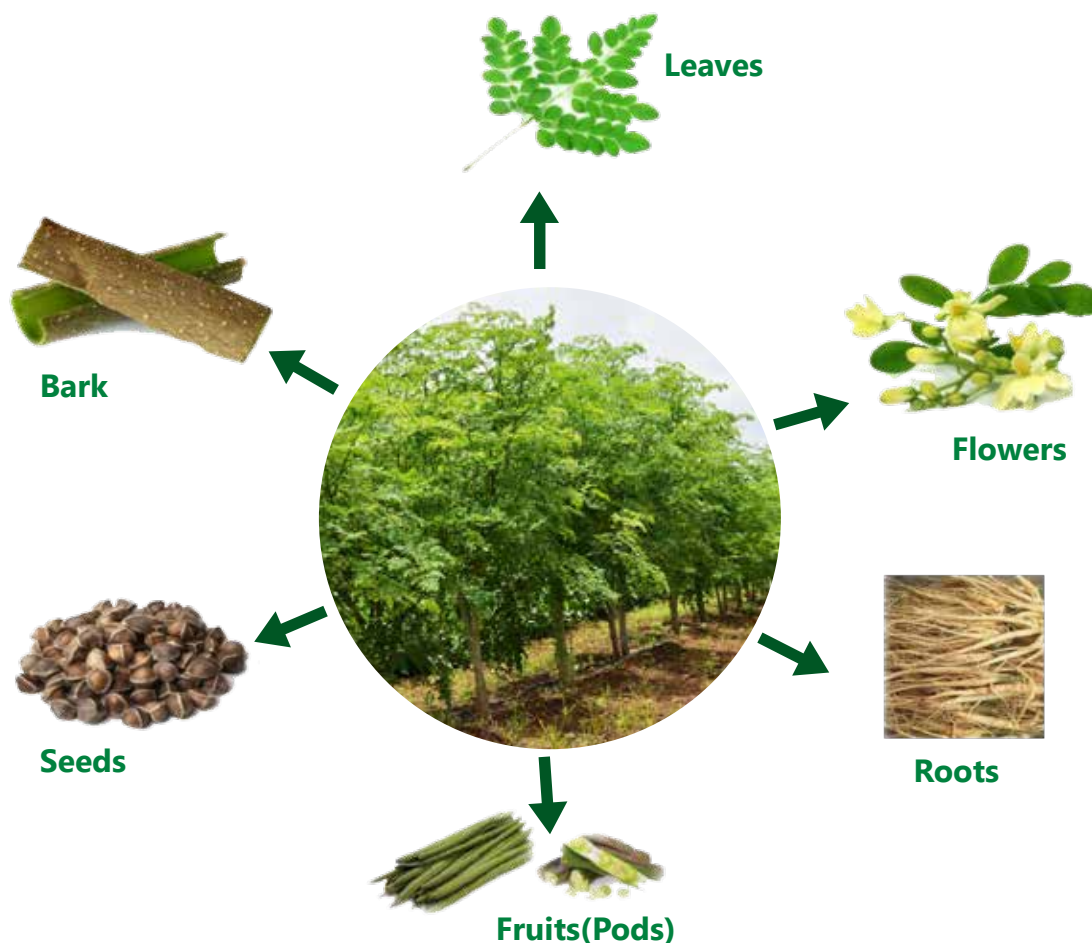
cm long. Fruits are tri-lobed capsules and are referred to as pods. Seeds are round with a brownish semi-permeable seed hull, with papery wings

Nutritional Supplement

Moringa leaves are used as a dietary supplement around the world. The leaves can be eaten as a vegetable. The leaves can also be dried and stored at room temperature for several

months with no loss of nutritional content. The leaves can be dried and ground into powder as a food supplement. The powder or dried leaves can be used to any dish to increase the nutritious worth of the products.

Promotion of moringa leaf incorporated foods would help not only alleviate micronutrient deficiencies but also foster entrepreneurship,



which might provide an extra source of income, employment and exports.

Benefits

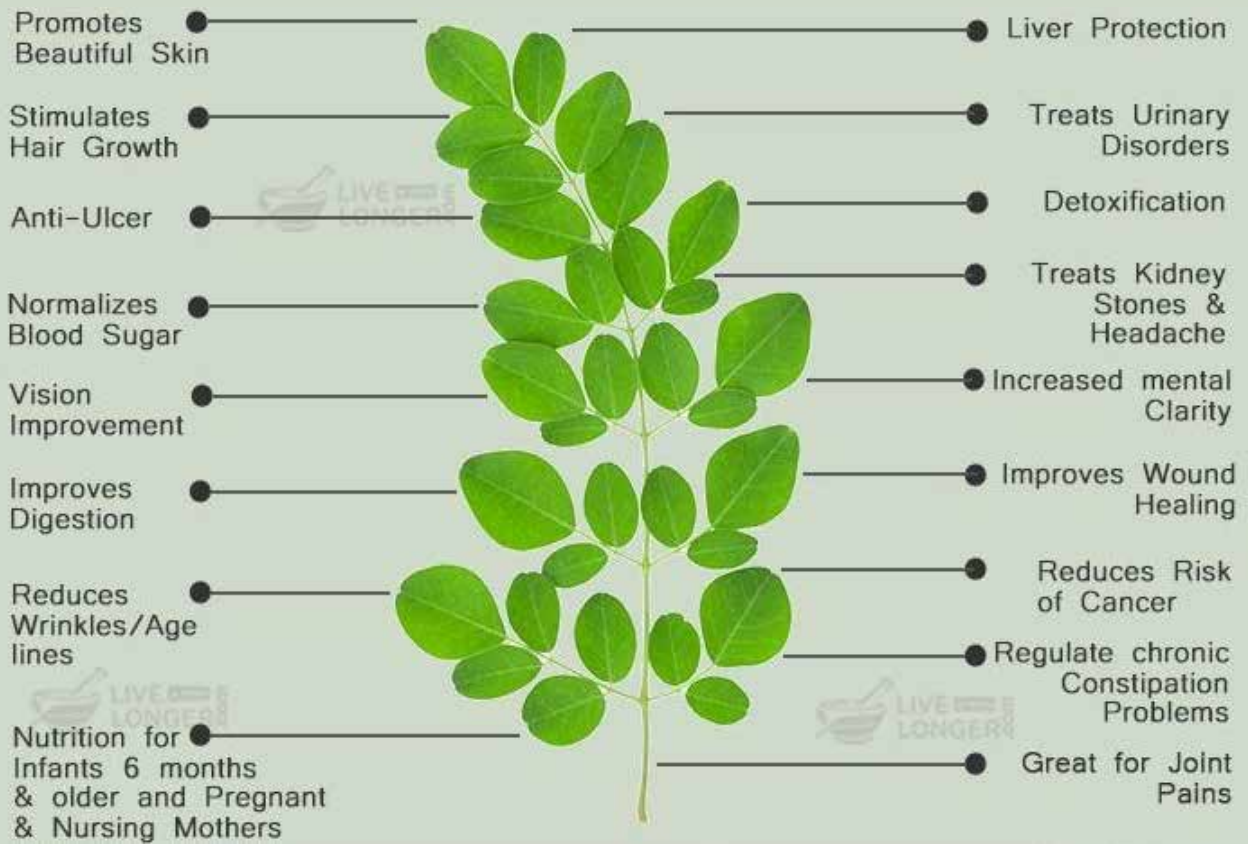
- **Anti-inflammatory properties:** Moringa powder has anti-inflammatory compounds that can help reduce inflammation in the body. This can help those with arthritis, asthma, and allergies.
- **Lowering cholesterol:** Moringa powder has been shown to lower cholesterol

levels in the blood, reducing the risk of heart disease.

- **Blood sugar control:** Moringa powder has been shown to manage blood sugar levels, which may be beneficial for people with diabetes.
- **Boosting the immune system:** Antioxidants found in moringa powder can strengthen the immune system and protect the body from sickness.
- **Improving digestion:**

Moringa powder has been used to treat digestive issues such as constipation and bloating. It can also help improve gut health by promoting the growth of good bacteria in the gut.

- **Nutrient-Dense:** Moringa Powder is rich in vitamins (A, C, E, K), minerals (calcium, iron, potassium), and antioxidants, providing a wide range of essential nutrients to support overall health and well-being.



- **Energy and Vitality:** The high nutrient content of Moringa Powder makes it an excellent natural energy booster. It helps combat fatigue, increases stamina, and promotes a sense of vitality.
- **Digestive Health:** Moringa Powder contains fiber that aids in digestion and promotes a healthy gut. It may help relieve constipation, support regular bowel movements, and improve overall digestive function.

Culinary Uses

- **Smoothies:** Moringa

powder can be added to smoothies for an extra boost of nutrients. It pairs well with fruits such as bananas, mangoes, and berries.

- **Soups and stews:** Moringa powder can be added to soups and stews to boost the nutrient content. It pairs well with vegetables such as carrots, sweet potatoes, and spinach.

- **Baked goods:** Moringa powder can be added to baked goods such as muffins and bread for an extra boost of nutrients. It pairs well with ingredients such as coconut

and honey.

- **Salad dressings:** Moringa powder can be added to salad dressings for an extra boost of nutrients. It pairs well with ingredients such as olive oil and lemon juice.

Moringa is increasingly recognized as a versatile superfood with numerous health benefits and nutritional value. This superfood is high in vitamins, minerals, and antioxidants, which can offer several health benefits. It can be a convenient and effective strategy to increase nutritional consumption and improve your overall health.

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Fermented beverages have been considered as a part of human knowledge since ancient times. Wine is one of the oldest, fermented, traditional, convenient alcoholic beverages of the mankind containing an alcohol ranging from 7% to 15% by volume. The vine industry in Kerala is expanding significantly, with the majority of these vines being produced from fruits like grapes. The development of wines goes beyond the conventional use of fruit vines, incorporating a wide variety of different crops. Various alternative wines are produced from non fruit sources such as vegetables, mead, herbs and thus these

Agricultural Wines

Beyond the
Vineyard





wines are known as agricultural wines. Given Kerala's abundant variety of crops, the agricultural vine sector has the potential to start a new way in the vine industry. And these crops can be fully explored to their grass root level.

MEAD

Mead, a traditional beverage derived from honey, typically contains 8 to 18% ethanol through the alcoholic fermentation of diluted honey by yeast. Mead is having economic significance, therapeutic and nutraceutical qualities. Kerala is blessed with rich floral diversity and congenial climatic conditions which offers immense scope for beekeeping in the state thus contributing a major share of total honey production in India. Production of mead from honey can enhance the profit of farmers. By adjusting the proportion of honey to water and determining when to halt the fermentation process, various types of meads can be prepared. Since dark honey have strong and unpleasant flavour light and cream fawn coloured honey is used as the better raw material for the mead preparation. Additives like fruit juices, potassium tartarate and ammonium phosphate (0.04%) are used to make sugar: acid balance in the mead.

SWEET POTATO WINE

Sweet potato scientifically known as *Ipomoea batatas* L. is a dicotyledon plant from the family Convolvulaceae. It is one of the most important crops in Kerala. Starchy tuberous roots of sweet potato are rich in minerals, vitamins and protein.



It is essential to create awareness among the rural communities of Kerala about the nutritional benefits of sweet potato and it needs to be popularized. Anthocyanin rich purple sweet potato is promising raw material for the production of wines. Juice extraction from purple sweet potato can be boosted through amylase enzyme treatment. Sweet potato juice can be fermented using yeast best at a pH of 4.5 and a temperature of 25°C with an inoculum size of 10% v/v. When the juice's TSS is between 18 and 22°Brix, the percentage of ethanol is at its highest, and any higher TSS reduces the amount of ethanol that is formed.

TOMATO WINE

Tomato is one of the TOP (Tomato, onion and potato) vegetable having considerable amount of bioactive compounds. It can be consumed fresh as well as in the processed form. High perishability of tomato makes it a suitable raw material for value addition to increase the profit of farmers. Wine is one of the best processed products from tomato. Tomato is a great source of lycopene, vitamins and polyphenols. Fresh tomato wine possesses total soluble solids 7°Brix, pH 3.3, specific gravity 1.035, titratable acidity 0.45 g/100 mL and alcohol 7.88%. The ideal pH and temperature for increased total antioxidant activity (TAA) levels in tomato wine are 4.1 and 20°C.

YELLOW RICE WINE

Huangjiu, commonly referred to as yellow rice wine or Chinese rice wine, is among the world's oldest wines to be





produced through traditional methods. It is a traditional Chinese alcoholic beverage made from fermented grains such as rice, millet, or wheat. It holds a significant position among the three major brewed

wines (Huangjiu, grape wine, and beer). Huangjiu has a unique flavor that can be sweet, savory, and umami, with a complex aroma profile that can include notes of nuts, spices, and fruits. The alcohol content of Huangjiu generally ranges from 10% to 20%. The production process involves steaming the grains, fermenting them with the qu starter, and aging the resulting liquid. The taste profile of Huangjiu is primarily influenced by variations in raw materials, fermentation starters, manufacturing methods, and the diverse range of microorganisms involved in the traditional brewing process.

Conclusion

The world of agricultural wines is a rich tapestry of diverse flavors and intricate processes. From the careful selection of raw materials to the utilization of specific fermentation starters, the production techniques play a crucial role in shaping the unique characteristics of these wines. The complex fermentation process, which includes steps like feedstock steaming, starter addition, saccharification, alcoholic fermentation, pressing, filtration, sterilization, and more, adds depth to the final product. As we explore the world of agricultural wines, it becomes evident that each aspect of the production journey contributes to the unique and distinctive flavors that make these wines a fascinating and integral part of the beverage sector.

Introduction:

Pumpkin seeds, obtained from several species of Cucurbita are often thrown away as agricultural waste. However, they have a significant nutraceutical and therapeutic worth since they contain a diverse range of bioactive substances. These

seeds are highly nutritious, as they include proteins, fibres, polyunsaturated fatty acids, phytosterols, antioxidants like carotenoids and tocopherols, and vital minerals such as zinc, magnesium, and iron. Pumpkin seeds are renowned for their ability to promote good health. They have been

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Pumpkin seeds

A nutritional goldmine



Nutrition Composition of Pumpkin seeds

Composition	Value	Composition	Value
Moisture (mg)	56.74	Total Fiber (mg)	46.65
Ash (mg)	3.54	Ascorbic Acid (mg)	15.00
Energy (kJ)	311.54	Sodium (mg)	1.35
Carbohydrate (mg)	5.18	Potassium (mg)	434.71
Total Sugars (mg)	9.73	Iron (mg)	6.02
Protein (mg)	21.31	Calcium (mg)	4.00
Fat (mg)	23.45	Zinc (mg)	18.78
Phosphorus (mg)	0.74	Manganese (mg)	1.35
Copper (mg)	0.31	Magnesium (mg)	4.35

associated with positive effects on blood glucose levels, cholesterol, liver health, and immune system enhancement. Additionally, they possess antidiabetic, anticancer, anti-inflammatory, and antibacterial characteristics, rendering them highly important for both the food industry and traditional medicinal practices in diverse cultures. Pumpkin seed oil is becoming increasingly

popular in the culinary world due to its favourable fatty acid composition, which is mostly composed of oleic and linoleic acids. This flexible ingredient is great for dressing, cooking, and improving the nutritional content of food products. The seeds can be consumed in various ways, such as raw, roasted, or as an ingredient in other cuisines and snacks, showcasing their versatility and growing global

appeal. The sustainable utilisation of these seeds not only enhances health advantages but also fosters environmental sustainability by converting agricultural waste into goods with increased value. The increasing interest in pumpkin seeds highlights their potential as a functional food element that can help fight non-communicable diseases and improve overall well-being. This supports their incorporation into contemporary dietary patterns on a global scale.

Incorporating Pumpkin Seeds into Various Food Products:

Pumpkin seeds are a nourishing and adaptable component that can improve the nutritional composition





and taste of different food products. Here are several methods for integrating pumpkin seeds into various dishes:

1. Baked Goods:

Incorporating pumpkin seeds into bread, muffins, and cookies can enhance their texture and nutritional value. They are particularly beneficial in whole grain products,

contributing to the texture and providing a distinct nutty taste.

2. Breakfast Cereals: Adding toasted pumpkin seeds to oats or granola provides a pleasant texture and an increase in nutritious fats, protein and minerals such as magnesium and zinc.

3. Snack Bars: Pumpkin seeds can enhance the nutritional value of energy bars and

protein bars by providing plant-based protein and healthy fats, resulting in a fulfilling snack option.

4. Salads: Pumpkin seeds provide a crisp garnish for salads. They complement both leafy greens and fruit-based salads, offering an array of textures.

5. Smoothies: To enhance the nutritious value, pumpkin seeds can be incorporated into smoothies by blending

them. Protein, fat, and fibre are provided by them, which contributes to enhancing the fullness of smoothies.

6. Soups: Roasted pumpkin seeds serve as a garnish for soup, imparting a delightful texture and taste. They excel when paired with creamy soups, especially pumpkin soup.

7. Pasta and Rice Dishes: Pumpkin seeds that have been toasted can be scattered over pasta or rice dishes to enhance their texture and impart a savoury, nutty taste.

8. Vegetable Dishes: Incorporating pumpkin seeds into steamed or roasted vegetables can improve both their texture and nutritional content.

9. Desserts: Pumpkin seeds can be integrated into or scattered over sweets such as cakes, puddings, and ice creams to provide an unforeseen crispy texture.

10. Pumpkin Seed Butter: This product is created by grinding pumpkin seeds into a smooth paste. It can be utilised as a spread on toast or as a dip for fruits and vegetables.

Integrating pumpkin seeds into food products not only increases their nutritional value but also improves their sensory attributes, including texture and flavour.

Therapeutic Benefits of Pumpkin Seeds

Pumpkin seeds provide not only a delicious treat but also a range of therapeutic advantages. Below are

the primary therapeutic applications of pumpkin seeds

1. Prostate Health: Pumpkin seeds include a high concentration of zinc and other essential elements that play a crucial role in maintaining prostate health. They are frequently employed to mitigate symptoms of benign prostatic hyperplasia (BPH), a disorder characterised by the expansion of the prostate gland.

2. Heart Health: Pumpkin seeds include magnesium, which aids in the regulation of blood pressure and the prevention of cardiovascular illnesses. Their abundant antioxidants aid in reducing inflammation and safeguarding the heart.

3. Sleep Aid: Pumpkin seeds are rich in tryptophan, an essential amino acid that aids in the promotion of sleep. Ingesting them several hours prior to bedtime can potentially enhance the sleep's overall quality.

4. Mental Health: Pumpkin seeds contain magnesium, which has positive effects on mood and cognitive performance. Frequent consumption can aid in the management of depression, anxiety, and stress.

5. Anti-Diabetic Effects: Research indicates that pumpkin seeds have the potential to reduce blood sugar levels, thereby providing advantages for individuals diagnosed with diabetes.

6. Bone Health: Pumpkin seeds, due to their high

magnesium content, are beneficial for bone growth and have the potential to prevent osteoporosis.

7. Anti-Inflammatory Properties: Pumpkin seeds have anti-inflammatory qualities that can alleviate illnesses such as arthritis.

8. Immune Support: Pumpkin seeds, due to their elevated zinc levels, have the ability to enhance immune function and combat infections.

Adding pumpkin seeds to your diet can be a tasty method to improve your health because of their abundant nutrients and healing properties.

Conclusion:

Overall, pumpkin seeds exemplify the convergence of traditional knowledge and modern scientific study in rediscovering and re-evaluating a natural resource that provides outstanding health and environmental advantages. Given the increasing global desire for healthier food choices, pumpkin seeds are positioned to have a significant impact on the development of functional foods that promote healthier lives and sustainable food systems. The ongoing research and growing consumer awareness are expected to contribute to the continued incorporation of these products into various dietary habits worldwide, establishing them as a fundamental component in the quest for health and sustainability.

Nature's Golden
Harmony: Beauty
and Wellness in

Solidago

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Solidago canadensis

Solidago, also known as goldenrod, comprises a diverse genera of flowering plants within the Asteraceae family, boasting over 140 species. The word solidago comes from the Latin word 'solido' which means "to make whole or heal" because of its immense medicinal properties. Renowned for its striking yellow blooms, typically seen in late summer



Fireworks

and early autumn. Most are native to North America, but some are also found in Central America, the Caribbean, South America, Europe, and Asia. Flowers have an anise-like scent, with hints of liquorice and sweet spice. It is a popular ingredient in herbal supplements and teas, prized for its potential benefits in promoting urinary health and reducing inflammation. The flower is also the state flower of Kentucky. It is widely known as a plant that attracts Monarch and other butterflies, making it the perfect addition to any butterfly garden. It also attracts other pollinator insects, including

bees.

Uses

Goldenrod presents a multifaceted array of potential applications

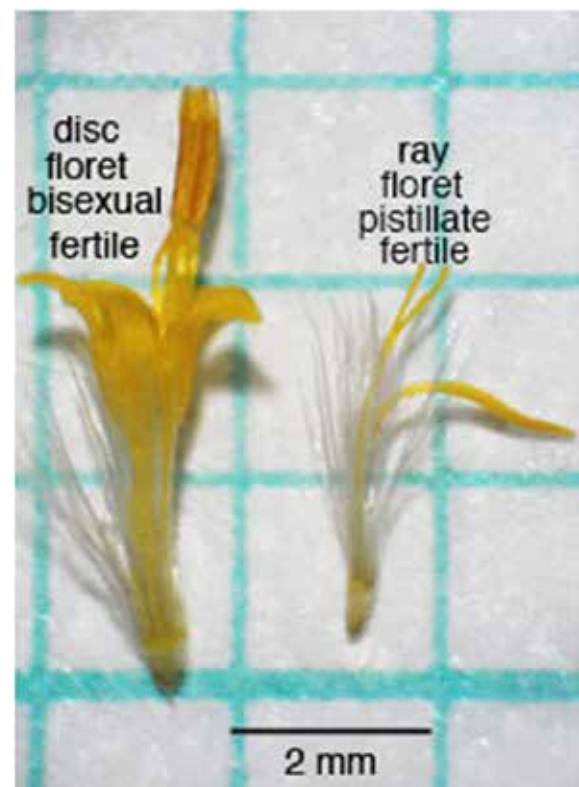
Cut Flowers: The long-lasting, bright yellow blooms of *Solidago* make it a popular choice for floral arrangements and bouquets, both fresh and dried. *Solidago* can be used as a vertical line flower in arrangements to achieve height. It can also be used as a filler in bouquets and arrangements.

Culinary and herbal supplements: It constitutes a prevalent component in herbal supplements, selected for its



potential health advantages. These supplements are available in diverse formats, including capsules, tinctures, or teas.

Medicinal purposes: Some traditional herbal medicine practices use *solidago* for its purported diuretic, anti-inflammatory, and antiseptic properties. It has been used to treat conditions such as urinary tract infections, kidney stones, and arthritis. In various assessments by the European Medicines Agency concerning *Solidago virgaurea*,





shows diuretic, anti-inflammatory, antioxidant, analgesic, spasmolytic, antibacterial, antifungal, anticancer and immunomodulatory activity.

Botany

Solidago species are clump-forming perennial herbs with long and short rhizomes. Their stems range from decumbent to ascending or erect, with a range of heights from 5 cm to over a meter. Most species are unbranched, but some show branching in the

upper part of the plant. Both leaves and stems vary from glabrous to various forms of pubescence.

They have many small yellow heads in panicles, spikes or racemes containing ray and disc florets. Ray florets are female, others are male, hermaphroditic or entirely sterile. Head involucre are campanulate to cylindrical or attenuate. Floret corollas are usually yellow, but white in the ray florets of a few species such as *Solidago bicolor*.

Goldenrods have been wrongfully accused of causing hay fever which is actually an allergic reaction to wind-borne pollen from other plants such as ragweed. Goldenrods produce heavy pollen and are insect pollinated.

Species diversity and Cultivars

S. virgaurea (European goldenrod) – best garden plant and is the source of yellow dye
S. canadensis (Canadian

goldenrod) - flowers are produced in large terminal panicles for several months

Solidago rugosa (Rough stemmed goldenrod) - heads in a broad pyramid panicle closely arranged on one side of the curving branches

Solidago speciosa (Showy goldenrod) - it has got a large showy inflorescence. The flower heads are arranged spirally around the branch

Solidago caesia (blue-stemmed goldenrod) - flowers form spikes along the whole length of its bluish-purple stems

Solidago nemoralis (Grey goldenrod) - the flowers are very persistent and is good for sunny borders

A number of cultivars have been selected, including several of hybrid origin. A putative hybrid with aster, known as \times Solidaster is less unruly, with pale yellow flowers, equally suitable for dried arrangements. Fireworks, Minuta, Leraft, Golden





Solidago rugosa

Gate, Golden Wing, Monte Solo, Peter Pan, Super and Tara Gold are some cultivars.

Propagation

It can be propagated through seeds, suckers or rhizomes and cuttings. Seed propagation is not followed commercially due to variation. It can be used for developing new variety. Seeds are very small in size and need stratification. Stratification for 10 weeks at 50 C showed the maximum germination percentage in *Solidago petiolaris* (Bratcher et

al., 1993).

Commercial method of Propagation is achieved through division of clump or suckers. Soil is ploughed to fine tilth and flat beds are formed. The aerial part of plant is cut back immediately after flowering to promote shooting. When shoots of 3-4 cm bearing 5-6 leaves have appeared the clumps are lifted, divided and planted in the field. Care must be taken to divide clumps every three years and replant them properly. Apart from this apical cutting and

micropropagation methods are also practiced.

Soil and climate

Sandy loam and red loam soils with good drainage are preferable for cultivation. Heavy rain and severe drought can hinder flower production. Extreme temperatures below 10°C or above 40°C are detrimental to plant health. Short days promote flowering, while long days encourage shoot elongation and vegetative growth.

Planting

The land must be thoroughly pulverized to a depth of 25-30 cm. Planting can be done in May- June. Suckers are planted on ridges at 60 x 60 cm spacing or in flat beds. Spacing for one year crop is 30 x 30 cm and for ratooning, it is 30 x 60 cm or 45 x 60 cm.

Manures and fertilizers

Apply FYM @2-5 tons/ha, 100-150 kg N, 100-150 kg P and 50-100 kg K/ha as basal dose. Apply nitrogen in 3-4 split doses as top dressing helps to maintain continuous flowering. Goldenrod may develop a leggy and floppy appearance due to excessive fertilization and overly fertile soil. When this occurs, it tends to flop over.

Harvesting

Flower stalks emerge from the base of the plant and grow up to 90-120 cm. Harvesting can be done when 25% of flowers are opened from the distal end. It is better to harvest in the morning when the flowers are fresh. Under optimal growing conditions, yield ranges from 150-200 flower stalks/m². First harvest is after 75th day of planting and continued daily

for 30 days. This practice can be repeated continuously for 2 years.

Post harvest

Typically, Solidago remains fresh for 6-8 days after harvesting. However, a treatment involving a combination of 2% sucrose and 1 mM HQS has been shown to extend vase life up to 12.75 days (Patil et al., 1997).

Value added products

Value-added products allow Solidago to be utilized in diverse industries beyond its traditional use as a cut flower.

- **Essential oils:** Used in aromatherapy, skincare products, and perfumes due to their fragrance and potential therapeutic properties.
- **Herbal remedies:** Solidago has medicinal properties and is used in herbal remedies such as teas,



Peterpan



tinctures, and extracts for its purported diuretic and anti-inflammatory effects.

- **Cosmetics:** Solidago extracts are incorporated into cosmetic products like creams, lotions, and shampoos for their potential skin and hair care benefits.
- **Capsules and tablets:** Solidago supplements are formulated into capsules or tablets for convenient consumption, offering a standardized dosage of the herb for various health purposes.
- **Teas:** Solidago leaves and

flowers can be dried and used to make herbal teas, which are consumed for their potential health benefits, including promoting urinary tract health and reducing inflammation.

Pests & Diseases

Solidago is vulnerable to various pests and diseases. Aphids and spider mites are notable pests, causing leaf distortion and discoloration, respectively. Powdery mildew, characterized by a white coating on leaves, stems, and flowers, along with rust, leading to leaf drop. Root rot can cause wilting

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