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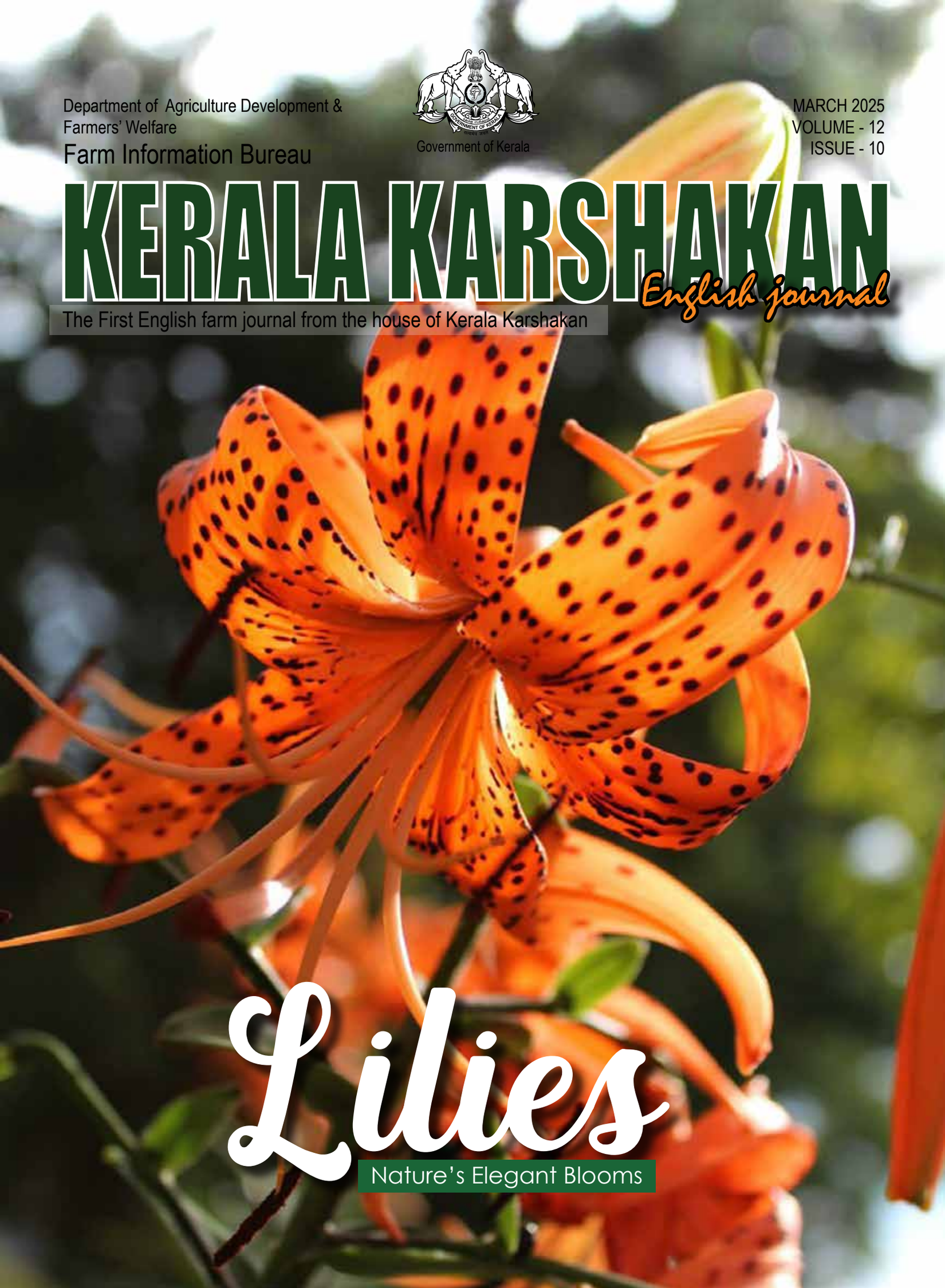
KERALA KARSHAKAN

English journal

The First English farm journal from the house of Kerala Karshakan



Lilies

Nature's Elegant Blooms

INSIDE KERALA KARSHAKAN

English journal

MARCH 2025 Volume - 12 Issue - 10

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CHINESE BROCCOLI

A Boon from the Brassica World

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Introduction

Chinese broccoli (Chinese kale, kai laan, blooming kale, gai-lan) is a leafy green brassica vegetable grown as an annual in Asia. It is cultivated for its short, thin, longer stems, loosely clustered green flower buds, and aromatic dark green leaves, as opposed to western broccoli, and is plucked and consumed before the flowers bloom.

They are hardy, somewhat quick growing, and heat resistant, allowing them to be grown readily in the summer when other main brassicas such as cabbage, broccoli, and cauliflower cannot

be produced due to heat.

Kai-lan is edible in its whole. Flowering stalks, immature leaves, and buds are very delicious to eat. Raw or cooked, the tender leaves and flowering stalks may be consumed. It has a flavor comparable to but stronger than broccoli. In Chinese cuisine, kailan is often used in salads and stir-fries. Gai-lan is a protective meal since it is loaded with nutrients.

Nutritional Significance & Therapeutic Uses

Chinese broccoli, like many other green vegetables, is high in nutrients. It is fortified with

Table 1 – Comparison between nutrient compositions in Broccoli and Chinese broccoli

Vitamin/Mineral/ Other compounds	Broccoli	Chinese Broccoli
Vitamin A	623 IU	1638 IU
Vitamin C	89.2 mg	28.2 mg
Vitamin K	101.6 µg	84.8 µg
Folate	63 µg	99 µg
Choline	18.7 mg	25.3 mg
Ca	47 mg	100 mg
K	316 mg	261 mg
P	66 mg	41 mg

vitamins A, C, E, and K, giving large quantities of these vitamins' daily needs. It contains minerals such as potassium, calcium, sodium, magnesium, and iron. It also includes anti-carcinogenic isothiocyanates and quinines, which act as anti-pyretic cooling agents. Glucosinolates are the primary natural antioxidants found in Brassica crops, as well as a set of sulfur and nitrogen-containing chemicals produced from various amino acids.

Chinese broccoli may help fight cancer, cardiovascular disease, and asthma. It is rich in beta-carotene, which helps prevent age-related macular degeneration. Hot poultice of leaves is given to alleviate arthritis, gout, rheumatism, aches. Its high vitamin C, E, and other nutritional content helps to prevent some malignancies, promote immunity, and stimulate appetite. Because of the vitamin K concentration, crushed leaves may be used to treat boils, cuts, hemorrhoids, inflammations, swellings, tumors, and wounds. This green is also a good source of nutritional fiber.

Origin, Evolution & Distribution

Chinese broccoli is indigenous to China's central and southern regions. This cool-season annual leafy crop derived from the original wild species Brassica oleracea, a fleshy-leaved short-lived perennial from the Mediterranean coast. It is new to Japan, Western Europe, and the United States, although it is widely cultivated in Taiwan, China, and Southeast Asia. Early Portuguese explorers introduced cabbage to Asia, and it has evolved into Chinese broccoli via years of recurrent selections.

Botany

Chinese broccoli, or Brassica oleracea alboglabra, is a leafy annual vegetable. The name comes from the Latin for "white" and "hairless," which describes the color and texture of the plant's leaves. The mature height of the plant is between 30 and 45 cm. The lanceolate, alternating, glabrous (hairless) leaves are characteristic of this plant. Bisexual flowers form a racemose cluster in an inflorescence. The name "Cruciferae" refers to the cross shape formed by the four sepals and the four white petals of the flower. The gynoecium is bicarpellary, with the ovaries located high up. Six stamens make up the

androecium, and these stamens are tetradynamous, meaning that four of them have long filaments and two have shorter filaments. The item is a siliqua. In contrast to many other genera in the Brassicaceae family, the seeds in this one are tiny, a dull yellow-black color, and lack a mucilaginous seed coat.

Varieties

Chinese broccoli varieties can be grouped under two types - white flower/tall type and yellow flower/dwarf type. Although both the horticultural varieties are heat resistant and can grow in the winters, the white flower type is more popular. Some varieties of Chinese broccoli cultivated in England, Taiwan and Australia are Kailaan, Early Jade, Suiho, Happy Rich, Pugong, Helgelan, Gelanya, Kailaan White, Thainan, Dai Sum Kailaan, Sak Sum Kailaan, Green Lance, Mandy, Hon Tsai Ta, Summer Jean and Trong. Kailaan – flat, glossy blue green leaves with thick juicy stems.

Early Jade- an early maturing variety. Plants are uniform, vigorous and slow to bolt. Takes approximately 40-50 days to reach maturity.

Suiho – has slightly wrinkled leaves like kale. It has thick yet tender, sweet, crispy stems.

Broccolini - hybrid of standard broccoli and Chinese broccoli, resembling long slender broccoli side shoots. The flavour is less pungent. This hybrid developed by Sakata Seed Company.

Cultivation

Chinese broccoli is a cool-season crop that can withstand light cold. In the hot tropics, most brassicas have limited growth. Chinese broccoli, on the other hand, may be produced all year in both tropical and temperate climates. The ideal temperature for germination is 25-30°C, while the ideal temperature for growth is 18-28°C. Low temperatures, on the other hand, are essential for floral initiation and development.

Due of its love for soil moisture, Chinese broccoli likes well-drained heavy clay soil. The crop may also be grown well in acid, neutral, and alkaline soils. Crops produced in soils with pH levels higher than 6.8 become susceptible to club root disease, needing the administration of gypsum. Seeds are sown in temperate zones from April to September, and in subtropical areas from September to October. Direct sowing crops need a seed rate of 3-4 kg/ha, whereas transplanted crops require a seed rate of 300-400 g/ha. Seeds are planted at a depth of 1-1.5 cm and germinate in 10-20 days. 3-4 weeks after planting, seedlings may be transplanted 45-60 cm apart in rows and 30-45cm apart within rows.

Crop Care

In general, 15-20 tonnes of farmyard manure, 60-80 kg/ha nitrogen, and 100 kg/ha phosphorus and potash are suggested. During land preparation, the entire phosphorus and potash doses, as well as one-third of the nitrogen dosage, are administered. The remaining nitrogen dosage should be applied topically in two equal split doses. The first is administered 30 days after transplanting, and the second 45 days afterwards.

During growth, Chinese broccoli need consistent moisture in the soil. Dry circumstances produce fibrous shoots with lower yield, whilst wet conditions slow plant development. Early-sown crops need irrigation every 5 to 7 days, whereas mid- and late-sown crops require irrigation every 10 to 15 days. Weeding by hoeing and earthing up are key intercultural procedures for increasing yield quality and quantity.

Harvest & Yield

Large leaves of Chinese broccoli with good flavour and texture can be harvested 60 days after sowing. Young flowering stems with compact florets and small leaves or a whole plant can be cut with knife. Developed white flower buds should not be open. Delayed harvesting results in tough bitter leaves and flower bud opening.

The average yield in a season with 2-3 harvests is 6-11 t/ha. Stems harvested early in the morning are washed and 5–7 plants are tied in bunches. Common post-harvest defects include open or deteriorating flowers and yellowed or decayed leaves. Being ethylene sensitive, should not be stored with ethylene-producers. It can be

stored for 30 days at 0°C with 90–95% RH.

Crop Adaptation in India

In South East Asia, Chinese broccoli has already achieved greater adaptability. Chinese broccoli, like any other cruciferous vegetable cultivated in India, may be grown effectively under identical ecological circumstances. Because it is more hardy, heat and cold resistant, this crop adapts much too well in India. North Eastern states, Uttar Pradesh, Himachal Pradesh, Bihar, Jharkhand, West Bengal, Madhya Pradesh, Punjab, and Haryana are some promising states for effective production and popularization of the crop in winter and spring. However, Chinese Broccoli is not yet cultivated and has not acquired notoriety in India as it has in China, where the crop is widely farmed.

Recent Research

According to nutritional data of United States Department of Agriculture, one ounce of cooked gai-lan provides almost one-third of the daily vitamin K requirement. Recent scientific studies suggest that consumption of foodstuffs rich in vitamin K may offer significant cardiovascular benefits due the ability of this vitamin to direct calcium into the bone tissue rather than the arteries. Vitamin K is the only cardio-protective vitamin found in gai-lan.

Several studies have reported that dietary intake of cruciferous vegetables has a direct effect on reduction of the incidence of prostate, cervical, ovarian pancreatic and lung cancer owing to sulforaphane content. Sulforaphane reduces DNA damage and mutation rate when cancer-causing chemicals bind DNA. It also promotes detoxification, lowers cholesterol, improves diabetes, boosts immune system and protects skin, eyes, kidney and brain.

Conclusion & Future Perspectives

Chinese broccoli has gained wide recognition as a healthy vegetable due to its flavour and high concentration of health-promoting phytochemicals and minerals such as glucosinolates, chlorophyll and essential elements. The hydrolysis product of glucosinolates – isothiocyanates exhibit cholesterol-lowering, anti-carcinogenic and anti-mutagenic activity and therefore consumption of food rich in glucossinolates is associated with reduced risk of cancer and other chronic diseases. In addition, Chinese broccoli, like other leafy vegetables, is believed to provide essential mineral elements including K, Ca and Mg for well-balanced diets. Thus, with nutritional significance, ease in cultivation and adaptation, scope and importance of Chinese broccoli cultivation and popularisation is likely to be realised and brought into reality in India in the near future.

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Rakthasaali

Reviving an Indigenous Rice Variety for Health, Sustainability and Economic Growth

Rakthasaali rice is known for its distinct red colour and rich nutritional profile, making it a prized variety among consumers. Traditionally it was grown in the pristine, biodiverse environment of Wayanad district of Kerala, it is often considered as a symbol of the region's agricultural heritage. Rakthasaali got its name from the Sanskrit word 'Raktha,' meaning blood, and 'Sali'meaning rice.Unlike other common rice varieties, Rakthashali is non-glutinous, making it suitable for gluten-sensitive people. It is highly valued for its health benefits due to its high nutritional and medicinal properties. Rakthasaali rice is

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consumed unpolished, retaining its full bran. It is particularly recommended for women with anaemia, as it aids in blood cell production and helps to maintain stable blood counts, contributing to a stronger immune system. This rare variety, now preserved by dedicated organic farmers in Kerala, is recognized in Ayurveda for balancing the body's tridosha (vata, pitta, and kapha) and is believed to address various health issues, including liver, kidney, and nerve disorders, also having potential anti-cancer properties. Additionally, it is known to improve blood circulation and has been recommended by healthcare professionals to enhance immunity.

Nutritional benefits

It is a nutritionally rich food as it provides an energy of 363.49 Kcal containing protein (8.96 g), carbohydrate (71.18 g), fat(4.77 g), zinc: 15.75 mg, Iron (0.99 mg). Consumption of this rice regularly can contribute to the following health benefits

Health benefits

Rich in Nutrients: It contains essential vitamins (like B vitamins) and minerals (such as iron, calcium, and magnesium) that

Rakthasaali paddy field at harvesting stage

support overall health.

High Fibre Content: Aids in digestion help prevent constipation and promote a feeling of fullness, which can assist in weight management.

Antioxidants: The red colour indicates a high concentration of antioxidants, which help combat oxidative stress and inflammation in the body.

Low Glycemic Index: it has a lower glycemic index than white rice, making it a better option for managing blood sugar levels. This is beneficial for those with diabetes or insulin resistance.

Heart Health: The fibre and antioxidants may contribute to heart health by reducing cholesterol levels and lowering the risk of heart disease.

Gluten-Free: A great option for individuals with gluten intolerance or celiac disease, providing a safe and nutritious grain alternative.

Promotes Healthy Skin: The antioxidants and vitamins can contribute to skin health, helping to maintain a youthful appearance.

Boosts Immunity: Nutrients

Farmer cultivating Rakthasaali

in Rakthasaali rice can support the immune system, helping the body to fight back diseases.

Blood count: Rakthashali rice can improve blood count and is recommended for women who are anaemic. It can also help stabilize or retain blood count.

Blood sugar management: Rakthashali rice can help manage blood sugar.

Digestive health: Rakthashali rice is fibre-rich, which can improve digestive health.

Weight loss: Rakthashali rice can aid metabolism and weight loss.

Cultivation Practices

Rakthashali rice thrives mainly in the traditional rain-fed farming systems of Kerala, where its cultivation relies on organic practices, making it both environmentally sustainable and locally adaptable.This variety is grown in the "shali" season, from June/July to November/ December, taking about 110 days to mature. It requires careful water management, though it has shown resilience to erratic climatic conditions. Many farmers in Kerala still use traditional farming methods for cultivating Rakthasaali rice, often relying on organic practices and natural fertilizers. Rakthasaali rice thrives in the fertile, alluvial soils found in Kerala. The humid tropical climate with ample rainfall is ideal for its growth. The main cultivation season is during the monsoon, typically from June to September, aligning with the Kharif cropping season. Farmers usually select high-quality, locally adapted seeds to ensure good yields and resilience to pests and diseases. Proper water management is crucial. Fields are often flooded during the growing season, which helps control weeds and provides a suitable environment for the rice plants. Harvesting is typically done using traditional methods, allowing for the careful selection of mature grains.

Though it has high market value due to its medicinal and nutritional benefits but faces several challenges that hinder its wide spread cultivation which are enlisted below as well as their possible solutions.

1. Availability of Quality Seeds: Seed availability can be ensured by establishing seed banks or community seed-saving programs. Promoting seed cooperatives among farmers to reduce costs and improve access to quality seeds.

2. Incidence of Pests and Diseases: Organic farming can often struggle with pest and disease management, as synthetic chemicals aren't allowed. This may increase the costs for alternative pest control methods like organic pesticides or biological controls. But it can be over come by adopting integrated pest management (IPM) practices, combining cultural, biological, and mechanical methods to control pests.

3. High Cultivation Costs: Organic farming typically involves higher labour and organic input costs such as manures and pesticides, which can drive up the overall cost of cultivation. This can be over come by forming local farmer groups to share equipment, resources, and also promoting value-added products from organic rice to enhance profit margins.

4. Limited Farmer Participation: Only a few farmers are engaged in the cultivation of this high-value crop. This leads to a lack of a marketing chain or infrastructure to link demand and supply .Provide incentives or subsidies to encourage more farmers to enter the market.Training may be given to educate new cultivators on best practices. Establishing or linking cooperatives or farmer associations to handle the processing, packaging, and marketing of the crop.

5. Lack of Awareness of Medicinal and Nutritive Benefits: The potential health benefits of the crop may not be well known or understood by the general public leading to limited consumer demand. Launching awareness campaigns highlighting the medicinal and nutritional benefits, using social media, local health experts, or nutritionists.Organizing workshops, seminars, or local fairs to demonstrate its uses and benefits.

6. Lower Yields Compared to Other Varieties: The crop may have lower yields compared to more conventional varieties, making it less attractive for large-scale commercial farming. Hence focus should be given to research on agronomic practices and breeding techniques that could help improve yield without compromising the crop's medicinal properties and nutritive benefits.

7. Market Access and Infrastructure: Without a well-established marketing chain, farmers may struggle to get a fair price to their produce. By developing local or regional marketing networks helps connect producers with consumers.Use of online platforms to reach broader markets, including global buyers interested in organic or medicinal crops. Providing infrastructure facilities for storage, processing, and distribution, to enhance marketability and shelf-life of the crop.

Promotion and Sustainability of this indigenous variety can be augmented by

- Government initiatives on promoting indigenous rice varieties Rakthasaali rice and other traditional rice varieties there by encouraging sustainable agricultural practices there by preserving soil health and biodiversity by providing incentives or subsidies.
- Awareness Campaign about the nutritional benefits of Rakthasaali rice, encouraging more consumers to choose this traditional variety.
- Research and Development: focus on improving yield, disease resistance, and sustainability.
- Culinary Promotion and marketing: efforts to promote Rakthasaali rice in local cuisine can enhance its popularity, alsoorganizing food festivals showcasing traditional dishes made with this rice. Marketing can be enhanced by exploring marketing chains and online platforms.
- Organic Certi fication: organic certification for Rakthasaali rice, helps cultivators to get access to premium markets and higher prices.

Conclusion

Rakthasaali being an indigenous variety, rich in medicinal and nutritive aspects still remains unexplored by the common public. Hence collaborative initiatives between farmers, researchers, and policymakers are essential to enhance the awareness, accessibility, and market integration ensuring its potential to be realised fully towards health and economy.

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Dombeya burgessiae

"Dombeya

Exploring its beauty and benefits"

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Dombeya, also known as the tropical hydrangea, is a genus of flowering plants belonging to the family Malvaceae. These plants are native to tropical and subtropical regions of Africa, Madagascar, and parts of Asia, have a diploid chromosome number of 2n = 38. The genus comprises approximately 40 species, renowned for their striking, large blooms in shades of pink, purple and white, making them a popular choice for ornamental gardening. Typically shrubs or small trees, Dombeya species are fast-growing and attract pollinators such as

Dombeya cacuminum

bees and butterflies. Despite their resemblance to pears or hydrangeas, they are unrelated. The name "Dombeya" honors Joseph Dombey, a French botanist and explorer (1742–1794).

Dombeya plants thrive in well-drained soil and are prized for their vibrant flowers and dense foliage. Their non-invasive roots make them safe for planting near buildings,

Dombeya wallichii

patios, or pathways. Often used as focal points or border plants in gardens, these species add charm with their colorful blooms. After the flowering phase, the dried blooms persist on the tree, offering a unique aesthetic contrast. These dried flowers can be repurposed for use in dried arrangements or potpourris, garlands. From June to October, the plant produces small, velvety capsules covered in tawny hairs, adding another layer of ornamental appeal. Dombeya flowers are commonly used in weddings and celebrations, cut flower arrangements symbolizing purity and abundance. They also feature in folklore, where they

Dombeya rotundifolia

Dombeya kirkii

Dombeya platanifolia

Dombeya pulchra

are often associated with magic and enchantment. Additionally, these plants are suitable for bonsai due to their strong, smooth wood, which is resistant to splitting. This durable wood is also used for crafting items such as tool handles, furniture, mine supports and carvings.

Beyond their ornamental appeal, certain Dombeya species are valued in traditional medicine. The leaves and flowers are known for their anti-inflammatory properties, which can help alleviate conditions such as arthritis, muscle soreness

and joint stiffness. They are also believed to have antioxidant effects, protecting the body from free radicals, enhancing immune function and potentially reducing the risk of chronic illnesses.

Botany

Dombeya is a fast-growing, versatile plant that can be cultivated as a small to medium-sized tree or a large shrub, reaching heights of 15 to 30 feet. Its large, velvety, heart-shaped leaves contribute to its lush appearance and can be pruned to maintain a more compact form. The evergreen foliage persists through winter, adding year-round greenery to landscapes. One of Dombeya's most striking features is its flower clusters, which are 4 to 6 inches across. These vibrant pink blooms gradually fade to a light brown while remaining on the plant, providing ongoing visual interest. The tree's long flowering period, often lasting several months, makes it particularly valuable for enhancing winter landscapes. Dombeya thrives in full sun to partial shade and requires moderate watering, making it relatively low-maintenance. Its dense, grey-green foliage also serves as an effective privacy screen, ideal for quickly creating a secluded garden space. The cup-shaped flowers grow in clusters at the branch tips, attracting pollinators such as bees and other beneficial insects.

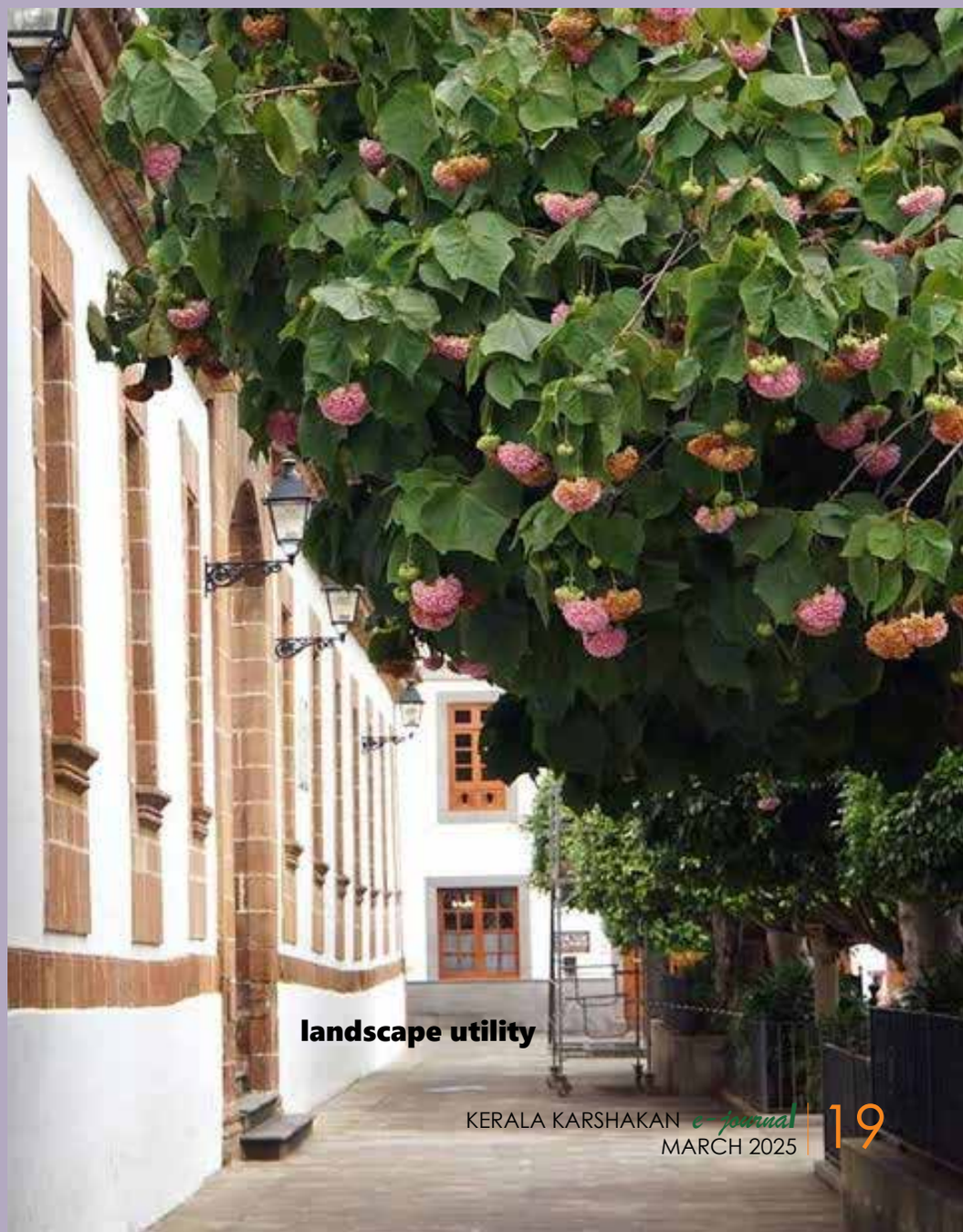
Species:

***Dombeya burgessiae* (Rosemound):** It is used for edible pith, wood, fibre and friction sticks to make fire. Used occasionally as an ornamental.

***Dombeya cacuminum* (Strawberry snowball tree)**: because of its coral red or pink flowers.

Dombeya kirkii: It forms a cluster of white flowers and it responds well pollarding and coppicing.

Dombeya platanifolia: White flowers and the leaves are known to have medicinal



landscape utility

properties.

Dombeya pulchra: The species is similar to D. burgessiae

Dombeya rotundifolia: Grows well in mountain slopes. Rotundifolia refers to the round shape of leaves.

***Dombeya wallichii* (Pinkball tree):** The species can be crossed with Dombeya burgessiae to produce the hybrid Dombeya × cayeuxii.

Dombeya torrida syn D. goetzenii: Pale pink or white flowers with red centres. The largest specimens are found in Mt Elgon.

Growing conditions

The Dombeya thrives in warm climates with temperatures ranging between 60°F and 80°F (15°C to 27°C). While it can tolerate mild cool weather, frost can damage the plant. It grows best in plenty of sunlight but benefits from partial shade during the hottest parts of the day to prevent leaf scorching and promote vigorous, healthy growth. acidic to neutral, ideally between 5.5 and 6.5. Prefers loamy soil, a balanced mix of sand, silt, and clay, which provides excellent drainage while retaining adequate moisture.

Propagation

Dombeyas can be propagated through seeds, stem cuttings, or division. To grow from seeds,

flower arrangement- utility

collect mature seeds from dried flower heads, sow them in well-draining soil, and keep them in a warm, bright spot; germination takes 2–4 weeks. Seedlings can be transplanted once they are a few inches tall. For stem cuttings, select a healthy 4–6 inch stem, remove lower leaves, dip the cut end in rooting hormone, and plant it in well-draining soil. Keep the cutting in a humid, bright environment, and transplant it after 4–6 weeks when roots develop. For division, divide a mature plant with a strong root system in early spring, ensuring each section has stems and roots. Replant divisions at the same depth and keep the soil moist until established. All methods are effective for propagating Dombeyas and ensuring healthy growth.

Dry flower arrangement

Pruning and Maintenance

Timing: Prune Dombeya in late winter or early spring before new growth starts. This ensures the plant directs energy into fresh shoots and blooms.

Dead heading: Remove faded flowers to encourage continuous blooming and prevent seed production, enhancing the plant's appearance.

Thinning and Shaping: Thin out crowded branches and remove damaged or crossing stems to improve airflow and reduce the risk of disease. Regular shaping helps maintain the desired size and form.

Sanitation: Clear fallen leaves and debris from around the base of the plant to minimize the risk of pests and diseases, ensuring overall health and vitality.

Pest and diseases

Aphids and scales commonly infest the leaves and stems, leading to the growth of sooty mold. Soil-borne nematodes can also stress the plant by damaging the root system and reducing its size.

The Art and Science of Bonsai Cultivating Miniature Trees with Timeless Techniques

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Bonsai is a multifaceted art form that combines horticulture, aesthetics, and philosophy. From its ancient roots to modern interpretations, bonsai continues to captivate enthusiasts worldwide. Bonsai is the art of cultivating miniature trees in pots, and it has its origins in ancient China before being refined in Japan.

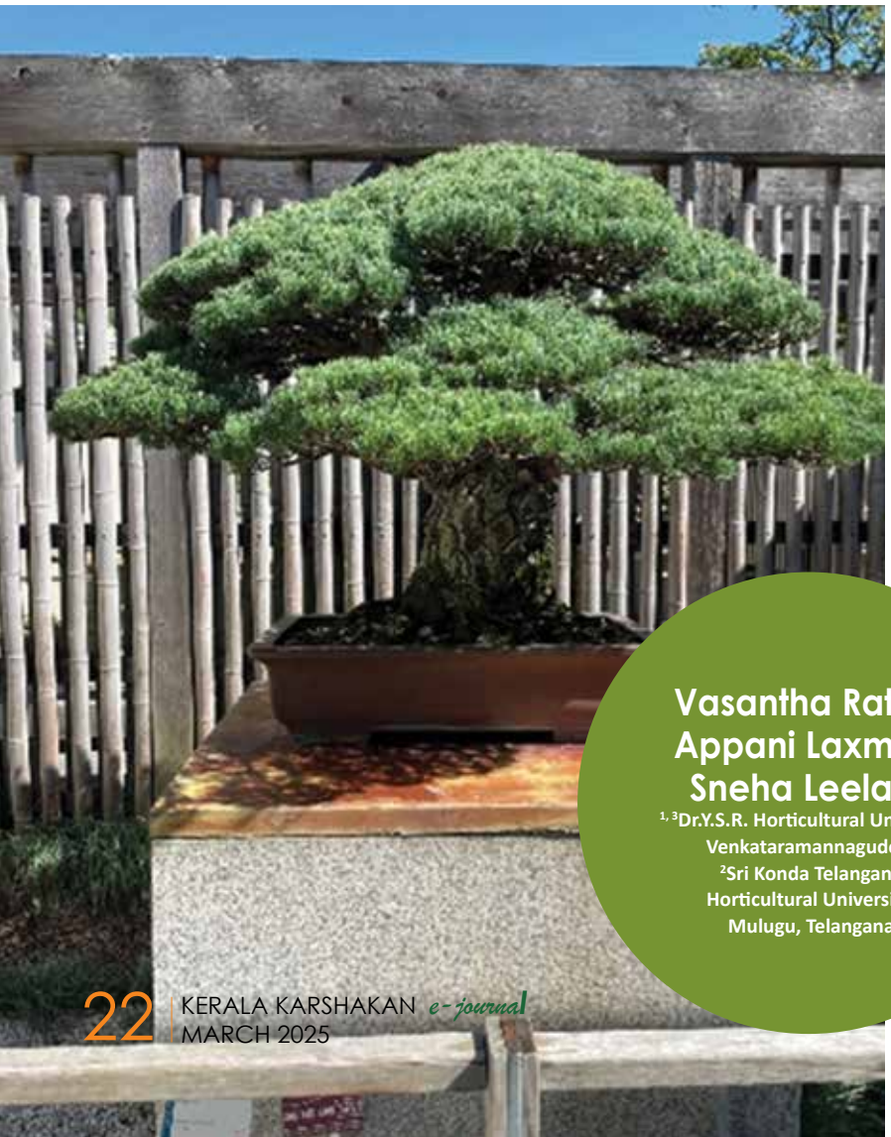
The word "Bonsai" has its roots in the Chinese language and is composed of two parts: bon- which means tray or container, and Sai- which means tree or plant (Pietraszko and Sobota 2008).

History of Bonsai

Origin

The practice of bonsai dates back over a thousand years, originating in China as "penjing," where

Ficus Bonsai



Juniper bonsai

trees were grown in shallow containers to create miniature landscapes. In 200BC, during the rule of Han dynasty the first ever landscape miniatures were created and named as pun-ching.Punching is arrangement nd embedding few or several small trees in a flat tray (Koreshoff, 1984; Hu, 1987).

The art was later refined in Japan, where it evolved into the modern bonsai The Japanese emphasized aesthetics, making bonsai a cultural art form.Japan experienced a substantial bonsai boom during the Edo period (1603–1868) under Tokugawa rule. Remarkably, a pine bonsai cultivated in the first half of the 17th century by the third Tokugawa shogun still thrives today, and it is likely the oldest bonsai in Japan.A significant breakthrough occurred in 1664 when Chu Shun-Sui, a fleeing official, arrived in Japan with his bonsai collection and professional literature. His knowledge and expertise played a major role in popularizing bonsai among the nobility, high-ranking officials, and samurai (Pietraszko and Sobota 2008).

REPOTTING

Significance

Traditional bonsai emphasizes asymmetry and natural forms, reflecting the beauty found in nature. This is an important design element in bonsai, creating balance and harmony within the composition. Bonsai trees can showcase seasonal changes, with flowers in spring, lush foliage in summer, vibrant colors in fall, and bare branches in winter. Bonsai trees often symbolize harmony, peace, and balance. They represent the relationship between nature and humanity. Many practitioners view bonsai cultivation as a form of

WIRING

PRUNING

meditation, promoting mindfulness and patience.

Cultivation Techniques

1. Pruning: Regular pruning of branches and roots is essential to maintain the size and shape of the bonsai. Techniques include: Structural Pruning and Maintenance Pruning Structural Pruning includesfor shaping the overall tree. Maintenance Pruning includes remove unwanted growth and maintain the tree's shape. These are generally of 3 types; main branch pruning, general pruning and leaf cutting (Randhawa & Mukhopadhyay, 2010).

2. Wiring: Wiring is used to shape branches and trunks by wrapping them with wire and gently bending them into desired positions. There are two types of bonsai wires viz., aluminium wires and copper wires. Aluminium wire material is suitable for amateurs and bonsai with thin bark and copper wires material works well for mature and trees with thick bark. Gauges 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24 and 26 are mostly used for bonsai (Pathania et al. 2023).

Banyan Bonsai

Maple Bonsai

3. Repotting: This is crucial for the health of the tree, typically done every 1-3 years. It involves removing the tree from its pot, trimming the roots, and replacing the soil.

Care and Maintenance of bonsai

Watering: Bonsai trees need careful watering; the frequency depends on the species, pot size, and climate. Bonsai trees are watered thoroughly and allowed to dry slightly between waterings.

Manures and Fertilizer application: Regular

fertilization is important, especially during the growing season. Organic fertilizers or specialized bonsai fertilizers are commonly used. During the growth phase of bonsai, a primary fertilizer to consider is rapeseed cake. It encompasses a balanced mixture of nitrogen, phosphate, and potash, with a proportion of 5:3:2 (Herb, 1995; Norman & Sutherland, 2005).

Sunlight: Most bonsai trees require full sun, but specific needs vary by species. Indoor bonsai may need supplemental grow lights.

Common Bonsai Species

Indoor Species: The main indoor species areFicus *(Ficus retusa)*, Chinese Elm *(Ulmus parvifolia)* and Jade Plant *(Crassula ovata)*

Outdoor Species: Japanese Maple *(Acer palmatum)*, *Pine (Pinus spp.)* and Juniper *(Juniperus spp.)* are the important outdoor bonsai species.

Azalea Bonsai

Adenium Bonsai

There are various types of bonsai, each with distinct characteristics and styles. Here's an overview of some popular types of bonsai trees (Nakahata et al. 2020):

1. Ficus Bonsai *(Ficus retusa)*

This is one of the most popular bonsai trees, known for its resilience and adaptability. It features glossy, dark green leaves and a thick trunk. andoften trained in the informal upright

Chinese Elm Bonsai

style.

2. Juniper bonsai *(Juniperus spp.)*

Junipers are popular for their needle-like foliage and rugged appearance. They can be trained in various styles, including cascading and the stylefrequently used are cascade (kengai) and semi-cascade styles.

3. Pine Bonsai *(Pinus spp.)*

Pine trees are traditional bonsai subjects, characterized by their long needles and sturdy trunks. They symbolize longevity and strength. It can be styled in various forms, including formal upright and slanting.

4. Maple Bonsai *(Acer spp.)*

It is known for their beautiful fall colours and attractive leaves, maples are popular for their aesthetic appeal. It is often styled in informal upright and group planting styles.

5. Chinese Elm Bonsai *(Ulmus parvifolia)*

This tree is hardy and can withstand a variety of climates. It has small, serrated leaves and a graceful appearance. Commonly trained in a formal upright or informal style.

6. Azalea Bonsai *(Rhododendron spp.)*

Azaleas produce stunning flowers and are appreciated for their colorful blooms, especially in spring.Typically styled in informal upright and slanting styles.

7. Cotoneaster Bonsai *(Cotoneaster spp.)*

This shrub is known for its small, round leaves and attractive berries. It's a great choice for beginners.Often used in cascading or informal upright styles.

8. Banyan Bonsai *(Ficus benghalensis)*

Famous for its aerial roots and broad canopy, the banyan tree is often used for large bonsai specimens.Typically trained in informal upright and group planting styles.

9. Willow Bonsai *(Salix spp.)*

Willow bonsai is known for their long, slender branches and graceful appearance, willows can create stunning cascades.It is often styled in

Peach Bonsai

Serissa Bonsai

cascading forms.

10. Cypress Bonsai

(Taxodium spp. or Cupressus spp.)

Cypress trees have a unique structure and can grow well in wet conditions. They are often used in pond or water-themed bonsai.Typically styled in informal upright or semi-cascade.

11. Holly Bonsai *(Ilex spp.)*

Holly trees are recognized for their vibrant red berries and glossy green leaves, making them an attractive choice. Commonly styled is informal upright forms.

12. Serissa Bonsai *(Serissa foetida)*

It is known as the "tree of a thousand stars" for its tiny white flowers, Serissa is popular for indoor bonsai.It is usually styled in informal upright or group planting styles.

13. Peach Bonsai *(Prunus persica)*

The peach tree is grown for its beautiful flowers and fruits, adding a seasonal touch to bonsai collections. Typically styled in informal upright and cascade forms.

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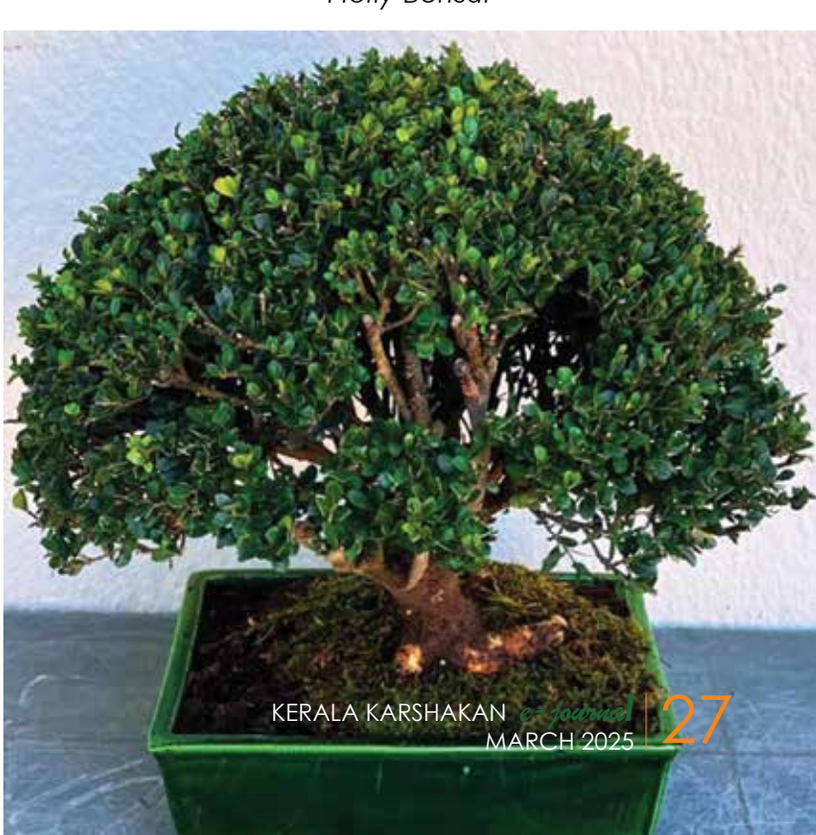
Holly Bonsai



Lilies

Nature's Elegant Blooms

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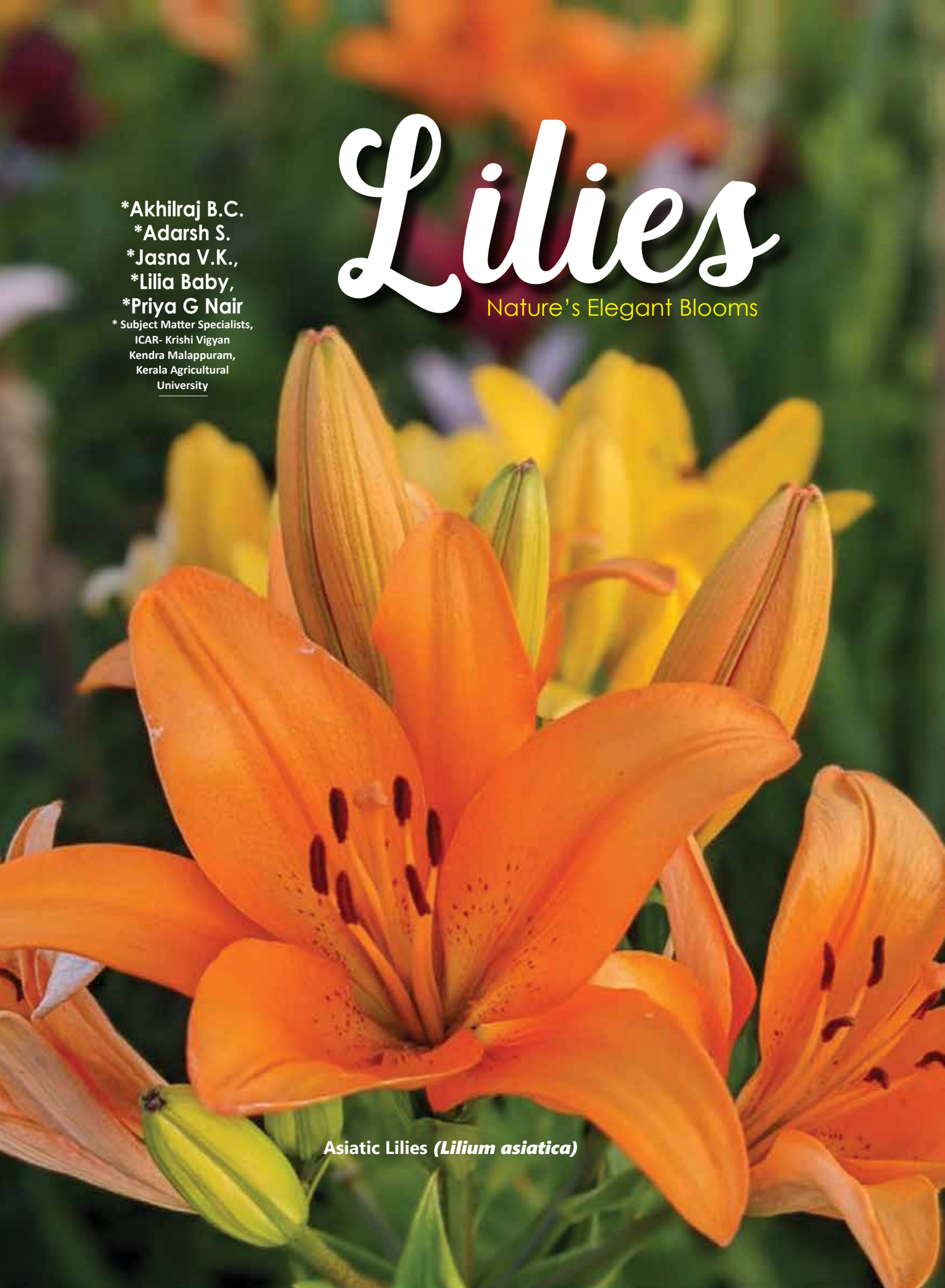

Asiatic Lilies ***(Lilium asiatica)***

Introduction

Lilies, with their enchanting beauty and intoxicating fragrance, have captivated gardeners and flower enthusiasts for centuries. In India, these exquisite blooms are cherished for their vibrant colors, symbolic meanings, and versatility in gardens, weddings, and religious ceremonies. From the snow-capped Himalayas to the lush landscapes of the Western Ghats, lilies thrive in diverse climates across the country. Let's delve into the world of lilies and explore the popular types that grace Indian gardens and landscapes.

1. Asiatic Lilies *(Lilium asiatica)*

Asiatic lilies, among the most popular and widely grown lilies in India, are celebrated for their bold, bright colors and upward-facing blooms, making them a favorite for both gardeners and florists. Available in a stunning array of shades, including yellow, orange, pink, red, and white, these hardy and easy-to-grow lilies bloom early in the season (spring to early summer) and lack the strong fragrance of other lilies, making them ideal for those sensitive to strong scents. Thriving in well-drained soil and requiring plenty of sunlight, Asiatic lilies are commonly grown in the plains and lower Himalayan regions of India, where they are perfect for cut flower arrangements and garden borders, adding vibrant elegance to any setting.

2. Oriental Lilies *(Lilium orientalis)*

Oriental lilies, the showstoppers of the lily family, are renowned for their large, fragrant blooms and striking colors, often featuring intricate patterns like spots or stripes in shades of white, pink, and deep crimson. Blooming later in the season (mid to late summer), these lilies are celebrated for their intense

Oriental Lilies *(Lilium orientalis)*

fragrance and dramatic, ruffled petals. They thrive in slightly acidic, well-drained soil and prefer partial shade, making them commonly cultivated in cooler regions of India such as Himachal Pradesh and Uttarakhand. Their exquisite beauty and fragrance make Oriental lilies a popular choice for wedding bouquets, religious offerings, and ornamental gardening, adding a touch of elegance and charm to any setting.

Trumpet Lilies *(Lilium longiflorum)*

3. Trumpet Lilies *(Lilium longiflorum)*

Trumpet lilies, also known as Easter lilies, are famous for their elegant trumpet-shaped flowers and sweet fragrance, often symbolizing purity and widely used in religious ceremonies. These lilies feature large, white blooms with a golden-yellow throat and typically bloom from late spring to early summer. Thriving in cool climates and well-drained soil, they are commonly grown in the Himalayan regions and parts of South India with moderate temperatures. Their timeless beauty and serene symbolism make trumpet lilies ideal for floral arrangements and as enduring symbols of peace and devotion.

4. Tiger Lilies *(Lilium lancifolium)*

Tiger lilies, easily recognizable by their vibrant orange petals adorned with dark spots that resemble the coat of a tiger, are hardy flowers that can thrive in a variety of conditions. Known for their downward-facing blooms that appear in mid to late summer, these lilies are celebrated for their resilience and ability to grow even in less-than-ideal environments. Preferring full sun to partial shade and well-drained soil, tiger lilies are commonly found in the wild in the Himalayan foothills and are also cultivated in gardens across India. Their striking appearance and adaptability make them popular for use in traditional medicine and as ornamental plants, adding a bold and exotic touch to any landscape.

5. Daylilies (Hemerocallis)

Although not true lilies, daylilies are often included in the lily family due to their similar appearance,

Tiger Lilies *(Lilium lancifolium)*

Daylilies ***(Hemerocallis)***

and they are known for their prolific blooming ability, despite their individual flowers lasting only a day. Available in a wide range of colors, including yellow, orange, red, and purple, daylilies are low-maintenance and bloom continuously throughout the summer. Thriving in full sun and well-drained soil, they are grown in gardens across India, from the plains to the hills, and are popular for landscaping and as ground cover due to their dense foliage, making them a versatile and vibrant choice for enhancing outdoor spaces.

6. Madonna Lilies *(Lilium candidum)*

Madonna lilies, one of the oldest cultivated lilies, are revered for their pure white, trumpet-shaped blooms and heavenly fragrance, with a rich history often linking them to the Virgin Mary in Christian symbolism. Blooming in early summer, these highly fragrant flowers prefer well-drained soil and full sun, making them commonly grown in cooler regions of India, where they are frequently used in religious and cultural ceremonies. Symbolizing purity, Madonna lilies are cherished for religious offerings and traditional medicine, embodying both beauty and spiritual significance.

7. Spider Lilies *(Lycoris radiata)*

Spider lilies, also known as Hurricane lilies, are unique for their striking bright red flowers and long, spidery stamens, often associated with the monsoon

season in India. These dramatic blooms appear in clusters on leafless stems, typically emerging after the first rains of the monsoon. Thriving in moist, well-drained soil and partial shade, spider lilies are commonly found in regions with high rainfall, such as West Bengal and Kerala. Often planted in gardens for their eye-catching appearance, they also symbolize renewal, making them a meaningful and visually stunning addition to any landscape.

Conclusion

Lilies, with their diverse forms, colors, and fragrances, hold a special place in Indian culture and horticulture. Whether adorning a wedding venue, gracing a temple altar, or simply brightening up a home garden, these flowers continue to enchant and inspire. From the majestic Himalayas to the tropical south, lilies thrive in India's varied landscapes, offering a glimpse of nature's boundless beauty. So, the next time you encounter a lily, take a moment to appreciate its elegance and the rich tapestry of life it represents.

Spider Lilies
(Lycoris radiata)

"HARVESTING THE STARS: CROPS FOR SPACE FARMING"

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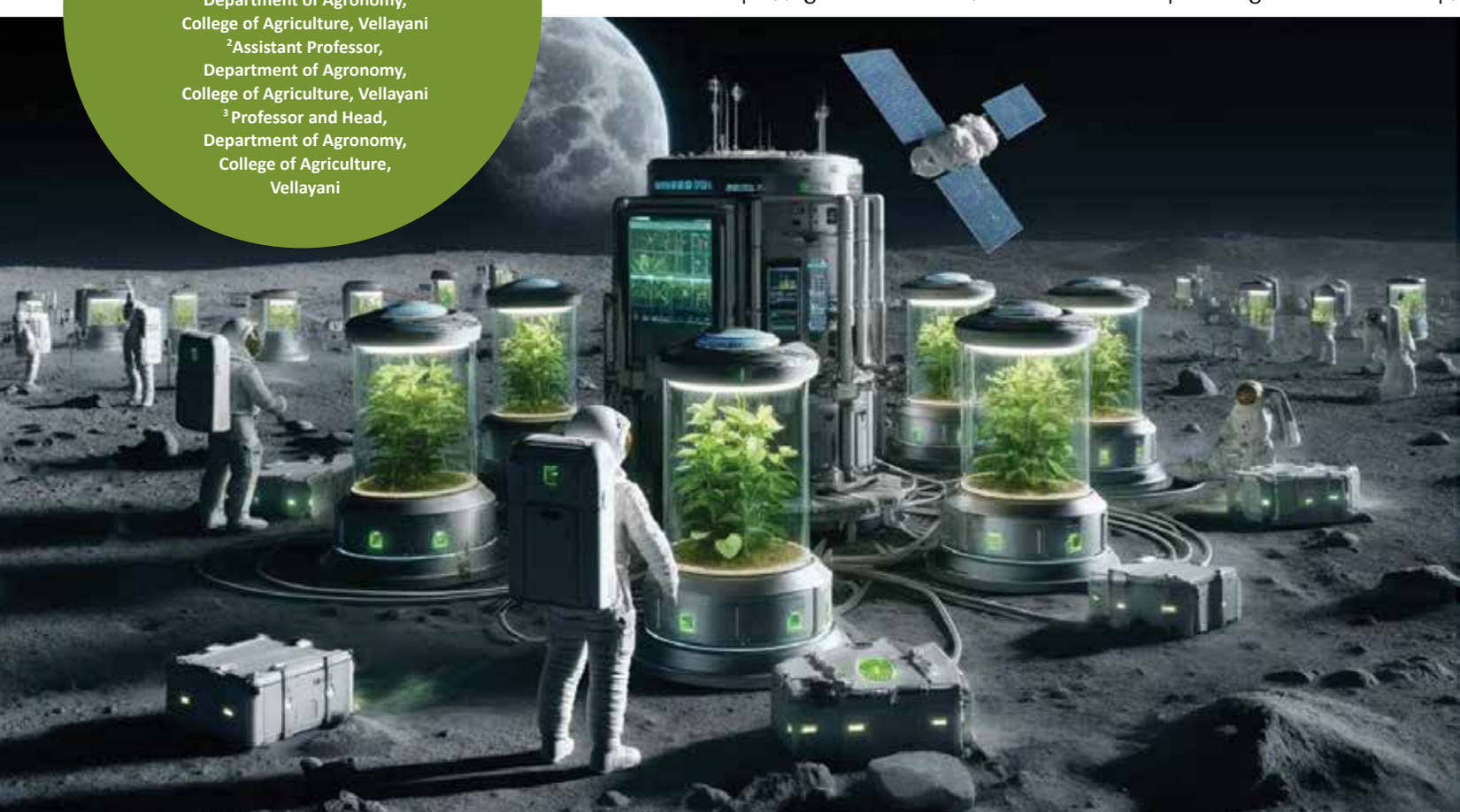
The prospect of establishing a permanent human settlement on Mars or the Moon is increasingly feasible, with various nations and private enterprises gearing up for this endeavour. A significant challenge will be ensuring the availability and safety of food. Feeding astronauts and space travellers on longduration missions incurs substantial costs. Implementing a space farm aboard a spacecraft or space station could be vital in creating a sustainable ecosystem, as it would facilitate the recycling of wastewater, oxygen generation, continuous air purification, and conversion of waste into usable resources.Space farming refers to the practice of growing plants and cultivating crops in outer space environments. It aims to address sustainable food production challenges for longduration space missions. However, the distinct challenges of space farming such as microgravity, limited resources, and the lack of natural sunlight require the selection of robust and efficient crops. From rapidly growing microgreens to proteinrich legumes, choosing appropriate

Source:https://igrownews.com/nasa-efforts-in-space-agriculture-a-recap/



crops will be crucial for establishing effective extraterrestrial farms.

Arabidopsis thaliana

Arabidopsis thaliana, often referred to as the "white mouse of the plant research world," is a key model organism in space farming studies. Experiments aboard the International Space Station (ISS) have successfully demonstrated that Arabidopsis can complete its entire life cycle in microgravity. For instance, the Advanced Astro Culture (ADVASC) system was used to grow Arabidopsis from seed to seed, showing that the plant does not require gravity for growth and development (Link et al., 2014).

Chinese Cabbage

The Tokyo Bekana chinese cabbage was the first of its kind to be cultivated in space, marking a significant milestone in NASA's Veggie plantgrowth experiments. Astronaut Peggy Whitson made history by harvesting

Source: NASA

Source: https://phys.org/news/2018-04-roots-space-advanced-habitat.html

Tokyo Bekana Chinese cabbage aboard the International Space Station. This achievement marked a significant step forward in NASA's efforts to grow fresh food in space. Tokyo Bekana, a variety of Chinese cabbage, was chosen for its fast growth cycle and adaptability to microgravity environments(Amelinckx, 2017).

Wheat

Wheat is a globally important cereal crop and a prime candidate for extraterrestrial agriculture due to its high nutritional value and versatility. Dwarf forms of wheat have been specifically chosen for experiments aboard the International Space Station (ISS). These varieties are smaller in stature, making them more suitable for the confined spaces of spacecraft. The "Green Dwarf Wheat" is one such example that has been successfully grown using hydroponic systems in the Advanced Plant Habitat on the ISS (Ricroch, 2023).

Potatoes

Potatoes are recognized for their significant nutritional value and adaptability, making them ideal candidates for space farming. In 2015,

the International Potato Center initiated the "Potatoes on Mars" project, where researchers successfully grew potatoes in a simulated Martian environment. The results indicated that potatoes could potentially thrive in the harsh conditions of Martian soil, suggesting they may play a vital role in future extraterrestrial agricultural efforts (Rust, 2015).

Lettuce

Lettuce, specifically red romaine, was grown aboard the International Space Station (ISS) between 2014 and 2016 using a specialized growth chamber called "Veggie." This system featured LED lighting and a controlled watering mechanism, allowing the lettuce to grow undisturbed for 33 to 56 days. Part of the harvest was consumed by the crew, while the remaining portion was preserved for further analysis on Earth. Indian origin NASA astronaut Sunita Williams, who is currently on an eight month mission aboard the ISS, is leading an innovative agricultural experiment. She is overseeing a groundbreaking study to understand how plants grow in microgravity. As part of this mission, the space station commander is growing romaine lettuce under different water conditions to examine its growth patterns and nutritional value. The experiment, named Plant Habitat-07, aims to

Source: https://m.economictimes.com

Source:https://images.moneycontrol.com/static-mcnews/2024/12/20241204075622_job-offers-13.png?impolicy=website&width=770&height=431

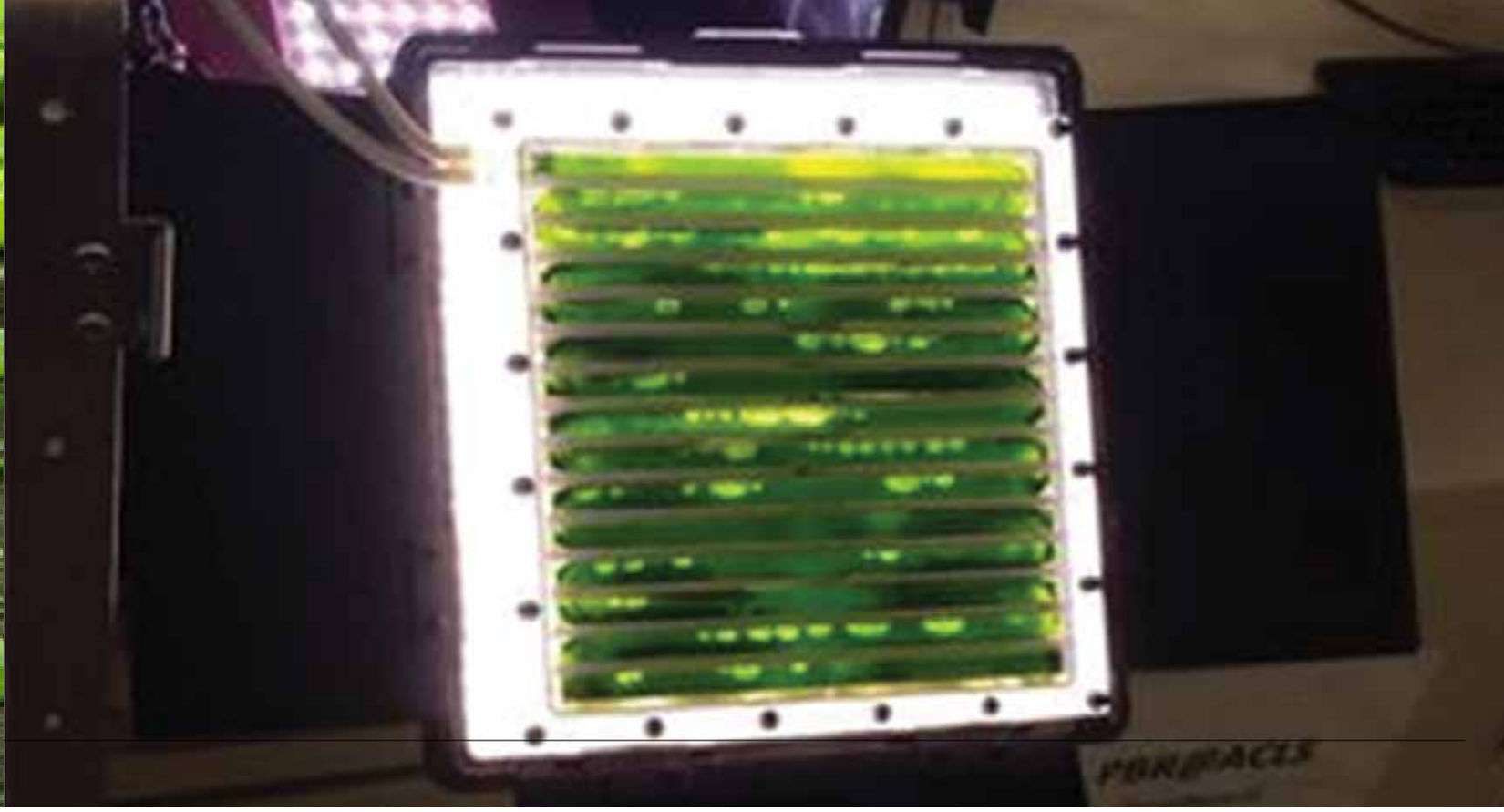
investigate how varying levels of water availability impact plant growth in space.

Quinoa

Quinoa has gained attention as a nutritious and resilient crop suitable for extraterrestrial agriculture due to its adaptability to diverse climates and soil conditions. Its high protein content (12-18%) and unique amino acid composition, particularly its lysine levels, make it an excellent candidate for Controlled Ecological Life Support Systems (CELSS), which are essential for longterm space missions. Research conducted by NASA's Kennedy Space Centerhas explored quinoa's growth in controlled environments and microgravity, with initial findings indicating that specific cultivars, such as CO407 x ISLUGA, show promising productivity in greenhouse studies.

Chlorella

Chlorella is nutrientdense and can function both as a food source and an oxygen producer through photosynthesis. Its cultivation in closedloop systems allows for the recycling of waste products, creating a sustainable microecosystem that could support human life during extended space missions. Studies conducted in controlled environments have demonstrated that Chlorella can effectively remove carbon dioxide and produce oxygen, making it a vital component for life support



In the photobioreactor, the green microalgae Chlorella vulgaris converts carbon dioxide into oxygen and edible biomass through photosynthesis.

systems in space. For instance, experiments like the Russian BIOS-3 project indicated that a small area of Chlorella could replace the oxygen needs of a human in a sealed environment.

Sweet potatoes

Sweet potatoes are recognized for their nutrient density and adaptability, making them a valuable candidate for space agriculture. They can thrive in various environments and have been studied for their ability to produce tubers even under adverse conditions. The "Orange Harvester" project aims to cultivate sweet potatoes on Mars, emphasizing the crop's resilience and potential role in future extraterrestrial farming initiatives. Studies conducted in simulated Martian soil conditions have shown that sweet potatoes can grow effectively, highlighting their suitability for cultivation in space. Overall, the resilience and

Source: http://www.quinoaconference.com/node/47

nutritional benefits of sweet potatoes position them as a promising crop for sustaining human life during longduration missions beyond Earth.

Rice

Rice is a staple food for a large portion of the global population and shows significant promise for space agriculture due to its high caloric value and adaptability. A study published in the journal Scientific Reports in 2017 investigated the growth of rice in lunar and Martian soil simulants, indicating that rice could potentially be cultivated on these celestial bodies with appropriate cultivation techniques. In experiments using a simulant developed from basaltic soil, researchers found that while rice could grow in Martian conditions, its development was enhanced when mixed with traditional potting soil. This suggests that with further refinement of cultivation techniques and genetic modifications, rice could become a viable crop for future extraterrestrial farming initiatives, supporting human life during long-duration missions on Mars and potentially benefiting agricultural practices on Earth as well.

Radish

Radishes are an ideal candidate for space farming due to their rapid growth and low resource requirements, making them efficient for cultivation in microgravity environments. The "Plant Habitat-02" experiment by the

Source: https://thepost.net.ph/news/campus/mmsu-prof-leads-study-on-growing-rice-on-mars/

Rice on Mars: MMSU prof leads groundbreaking research in US university

PHOTO COURTESY: MARIANO MARCOS STATE UNIVERSITY

ISS successfully cultivated radishes, providing valuable insights into how plants develop under these unique conditions. Conducted by NASA, this experiment involved growing radishes for 27 days in the Advanced Plant Habitat (APH), which utilizes LED lighting and a controlled nutrient delivery system to support plant growth. Astronaut Kate Rubins harvested the firstever radish crop from space on November 30, 2020, marking a significant milestone in space agriculture. By studying radishes, which are genetically similar to Arabidopsis, scientists can gain insights into plant responses to environmental changes, ultimately aiding in the development of sustainable food production systems in space.

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Chinese Hat

An elegant ornamental with medicinal properties

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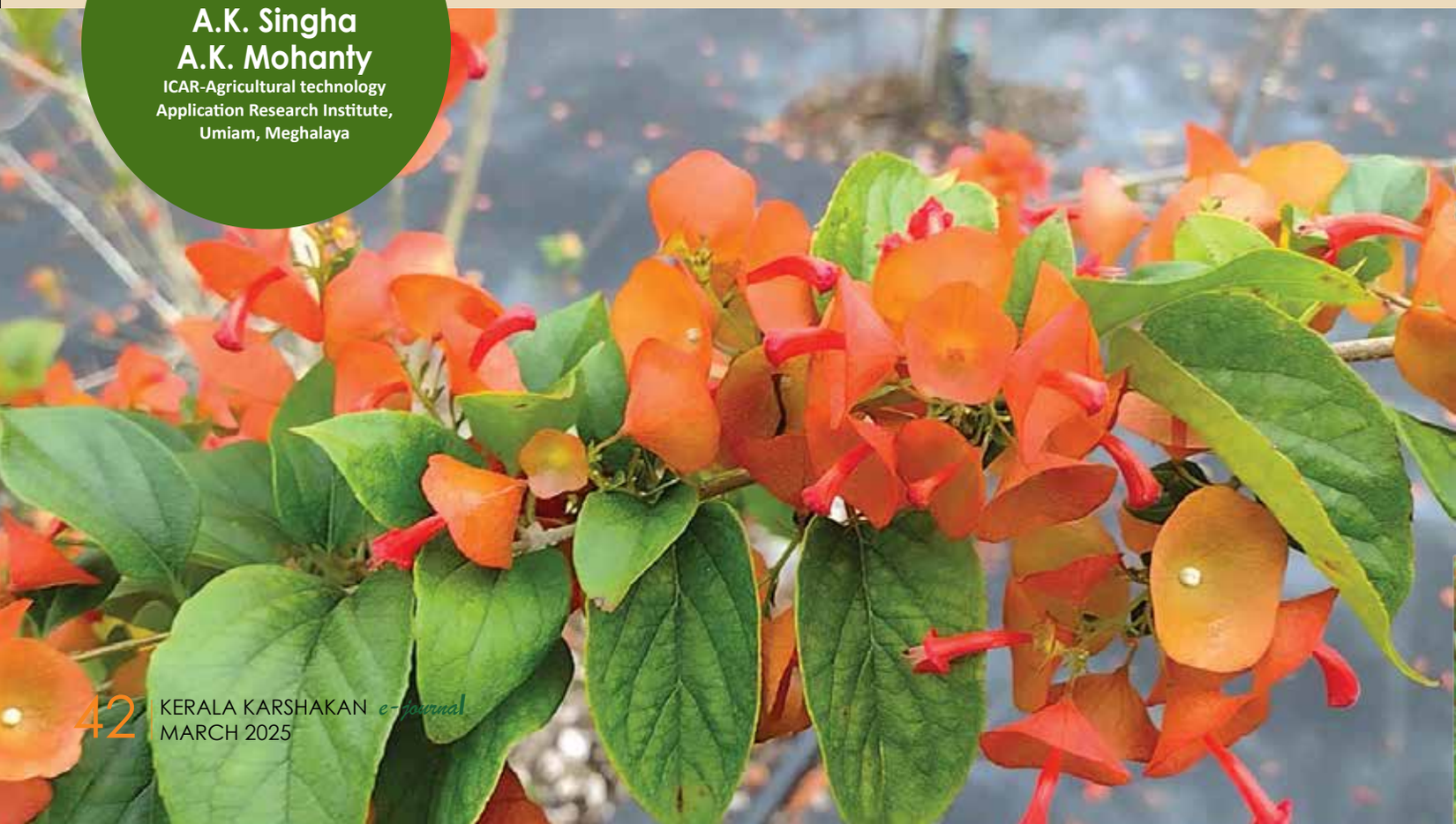
The Chinese hat plant *(Holmskioldia sanguinea)* is a fast-growing, evergreen shrub or small tree belonging to the Verbenaceae family. It is known for its unique, hat-shaped flowers, which give the plant its common name. The flowers are tubular, emerging from flat, circular bracts, and come in vibrant shades of red, orange, or yellow. The plant grows to a height of 2-4 meters and has arching branches with ovate, serrated green leaves. Native to the Himalayan regions of India, Nepal, and Bhutan, the Chinese hat plant thrives in tropical and subtropical climates. It grows wild in Meghalya adding aesthetic value on avenues. It prefers well-drained soils and can adapt to a variety of soil types, including loamy, sandy, and clay soils. This plant is commonly found in gardens, parks, and as hedges in its native and introduced regions.

Medicinal Values: Although not extensively studied, the Chinese hat plant is used in traditional medicine for its potential therapeutic properties:

- **Wound Healing:** The leaves and flowers are used to promote the healing of



wounds and cuts.

- **Antimicrobial Properties:** Extracts of the plant are believed to possess antibacterial and antifungal properties.
- **Anti-inflammatory:** Used in traditional remedies to reduce inflammation and alleviate pain.
- **Fever Treatment:** Certain parts of the plant are used in concoctions to reduce fever.
- **Ornamental Values:** The Chinese hat plant is widely appreciated for its aesthetic appeal
- **Unique Flowers:** Its unusual hat-shaped blooms make it a standout ornamental plant.
- **Attracts Wildlife:** The flowers are a favorite among hummingbirds, butterflies, and bees, adding life to gardens.
- **Versatile Use:** Suitable for hedges, borders, or as a standalone specimen plant.
- **Hair Care Values:** The Chinese hat plant is believed to have properties that benefit hair health, making it an emerging interest in natural hair care:
- **Scalp Health:** Its antimicrobial properties help reduce dandruff and combat scalp infections.
- **Hair Growth:** The plant's extracts may promote healthy hair growth by improving blood circulation to the scalp.
- **Nourishment:** Rich in flavonoids and phenolic compounds, it nourishes hair follicles and strengthens hair strands.
- **Conditioning:** Traditional uses suggest it can help condition hair, leaving it soft and manageable.

Propagation: Propagation of the Chinese hat plant is typically done through cuttings or seeds

- **Cuttings:** Semi-hardwood cuttings taken in spring or summer root well when placed in a moist, well-draining medium.

- **Seeds:** Seeds can be sown in well-prepared soil, but germination may be slower compared to cuttings.

Chemical Compounds: Research into the phytochemical properties of *Holmskioldia sanguinea* is limited, but preliminary studies suggest the presence of:

- **Flavonoids:** Known for their antioxidant and anti-inflammatory effects.
- **Tannins:** Contribute to the plant's antimicrobial properties.
- **Phenolic Compounds:** Offer potential health benefits through their antioxidant activity.

Care and Maintenance: The Chinese hat plant is relatively low-maintenance but thrives with proper care:

- **Light:** Prefers full sun to partial shade.
- **Water:** Requires regular watering but should not be overwatered. Allow the soil to dry slightly between watering.
- **Pruning:** Regular pruning helps maintain shape and encourages new growth.
- **Fertilization:** Benefits from occasional feeding with a balanced fertilizer during the growing season.

Harvesting: The flowers and leaves of the Chinese hat plant can be harvested as needed for ornamental or traditional medicinal uses. Care should be taken to avoid overharvesting, which may stress the plant.

Uses in Landscaping: The Chinese hat plant is a versatile addition to landscapes:

- Can be used as a decorative shrub in gardens.
- Makes an excellent privacy screen when grown as a hedge.
- Suitable for container planting in patios and terraces.

Conclusion: *Holmskioldia sanguinea*, with its striking flowers and diverse uses, is a plant of both ornamental and medicinal value. Its adaptability and ease of care make it a favorite among gardeners and landscapers. Further research into its phytochemical properties may unlock additional therapeutic potential, enhancing its significance in traditional and modern medicine.

Yellow Vein Mosaic Virus
(YVMV) is threat in

Okra

Production in India

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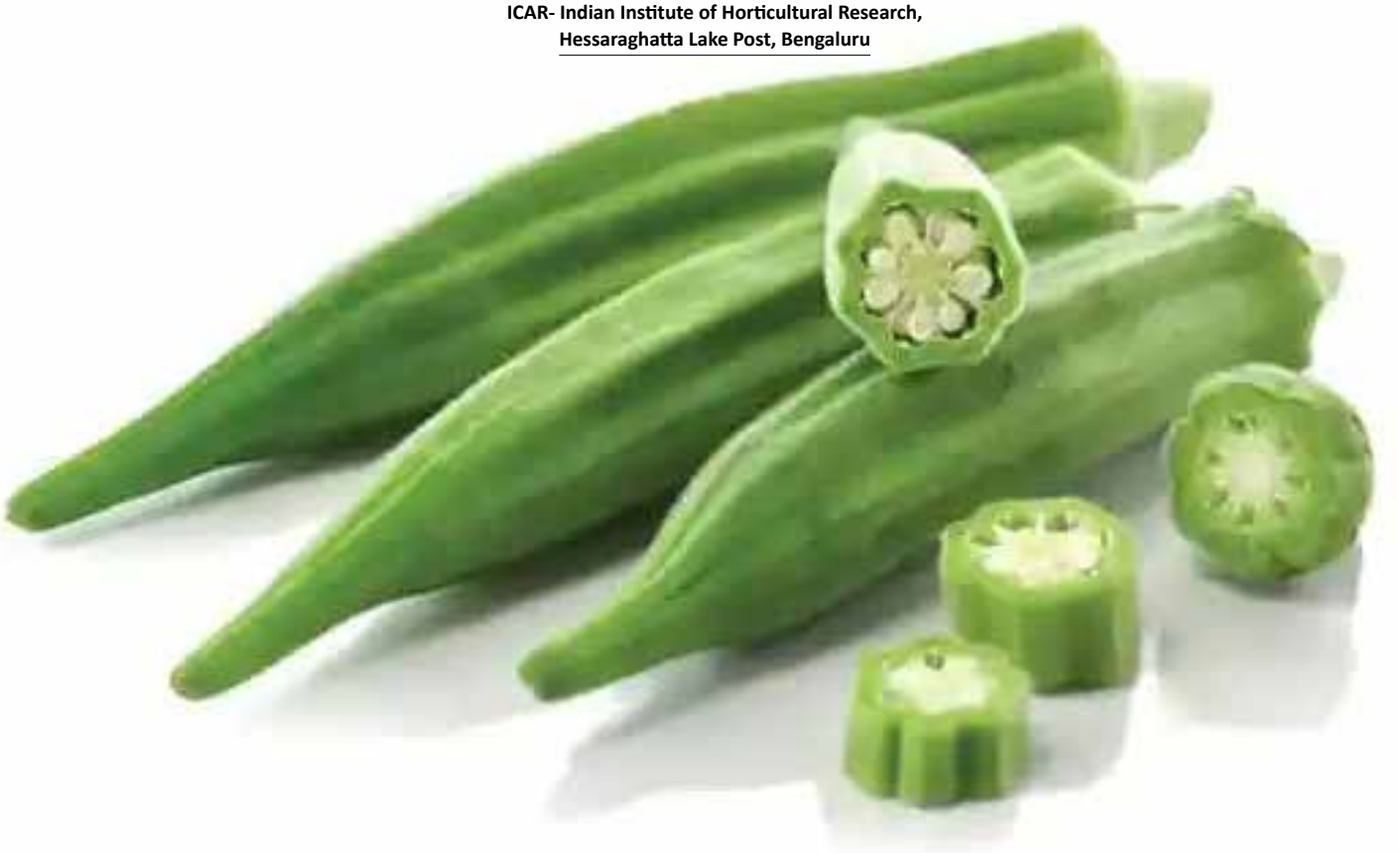

Okra (*Abelmoschus esculentus [L.]* Moench) is an important nutrional and traditional vegetable crop of the family Malvaceae. It is grown extensively in tropical, subtropical and warm temperate regions of the world. Okra is the most consumed vegetable worldwide with the potential for diverse ecological adaptation. India ranks first in the world for okra fruit production with 6.87 million tones harvested from 550,000 ha, whereas Africa produces 3.54 million tonnes from 2.17 million hectares of

Figure 1: Okra line Accession No. 1685 showed susceptibility to the Yellow Vien Mosaic Virus Disease (YVMV) during *rabi* 2024

land (FAOSTAT, 2022). Okra accounts for about 60% of the export of fresh vegetables from India to the Middle East and Europe (Singh et al., 2014). In India alone, the F1 hybrid okra seed market is nearly 3,050 tonnes, which is approximately worth 110 million US dollars (based on an average F1 seed price of ₹ 3,000 per kg (1US $ = ₹ 83). Public sector institutions have played a pivotal role in introducing and disseminating improved okra varieties and hybrids, with more than 40 cultivars introduced in recent decades. Some of these varieties have demonstrated substantial improvements in okra production across India. Private sectors also place a significant role for providing more than 60% shares of F1 hybrid seeds to the farming communities and substantially improving the farm income of small and marginal farmers of our country. Okra cultivation in India and neighboring South Asian countries are challenged by the disease Yellow Vien Mosaic Virus Disease (YVMVD) spread by the insect vector whitefly, in a semi-persistent manner. The viruses are neither sap- nor seed-transmitted, the viruses belong to the genus Begomovirus, family Geminiviridae. cause major yield losses ranging from 30-100% depending on the age of the plant at the time of infection (Singh, 1996), The viral diseases of okra in the tropics threatening its commercial cultivation, the marketable yield loss of YVMV ranged from 17.09 to 96.49% (Jamir et al. 2020). Symptoms of YVMV include different intensities of chlorosis and yellowing of veins and veinlets, smaller leaves, plant stunting and fewer and smaller yellow unmarketable fruits. Management of whitefly by spraying chemicals is one way to control the disease.

Identification of resistant varieties is a convenient and eco-friendly way towards sustainable management of diseases in okra. Pusa Sawni was the first YVMV resistant open-pollinated cultivar released in 1960 by the Indian Agricultural Research Institute (IARI), Delhi, India (Singh et al., 1962), followed Arka Anamika and Arka Abhay was released by Indian Institute of Horticultural Research (IIHR), Bangalore (Dutta, 1984); Parbhani Kranti

from Marathwada Agricultural University (Jambhale and Nerkar, 1986), Punjab Padmini (Sharma, 1982) and Punjab-7 (Thakur and Arora, 1988) by Punjab Agricultural University. However, now as on date none of the varieties and hybrids are resistant to both YVMV at all the agroecological zones of the country. Based on the present scenario, there are no sources of resistance to YVMV from the cultivated sources due to break down of YVMV resistance among the released varieties of okra. Hence there is a need of action plan to identify the YVMV resistance from untapped wild relatives of Bhendi, transfer resistant sources in to cultivated and elite lines which are having good horticultural qualities including fruit colour, shape, and size and consumer preferences.

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