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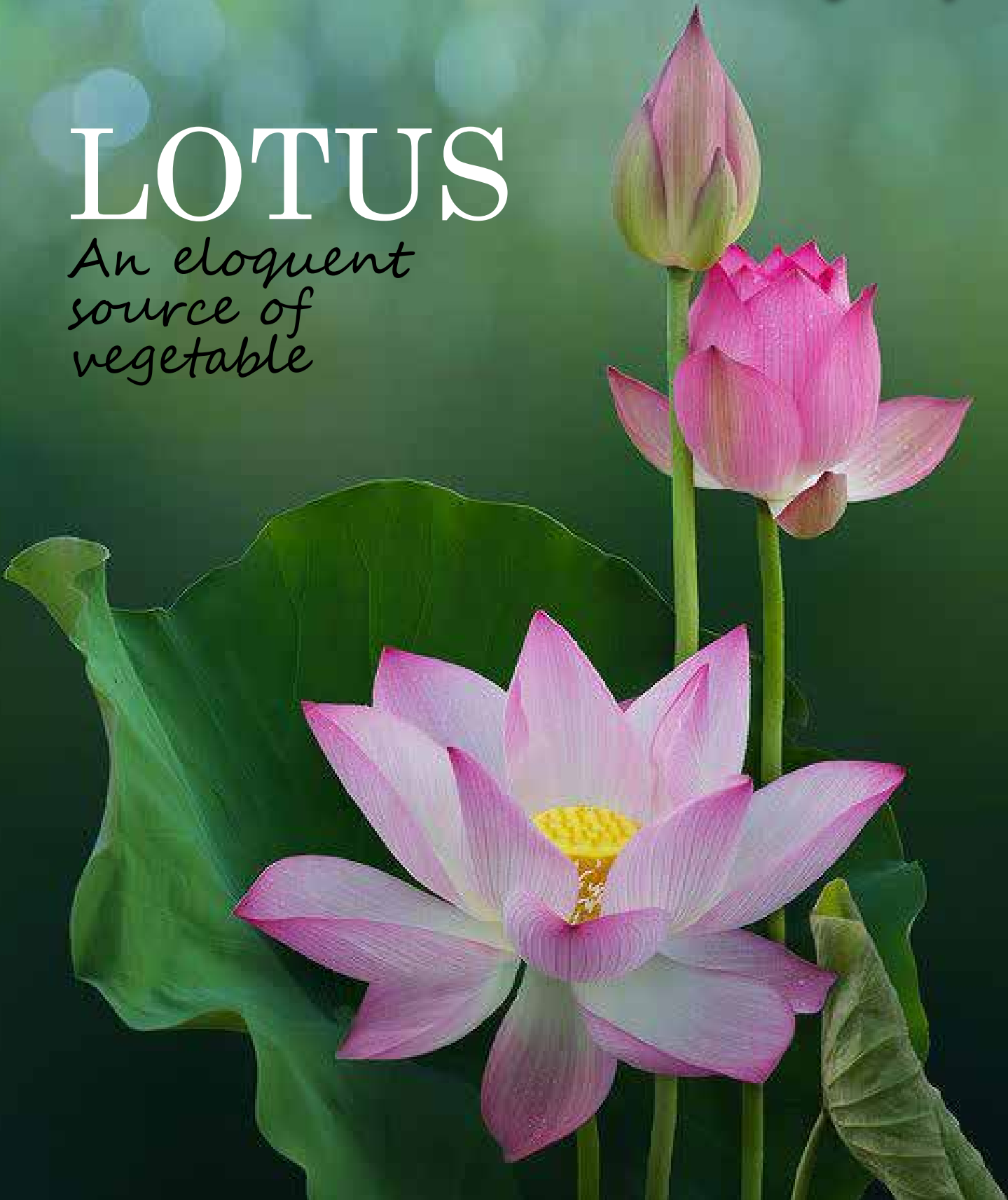
KERALA KARSHAKAN

English journal

The First English farm journal from the house of Kerala Karshakan

LOTUS

*An eloquent
source of
vegetable*



The First English farm journal from the house of Kerala Karshakan

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New Vegetables in the World An overview



Romanesco

Romanesco broccoli, also known as Roman cauliflower, *Broccolo Romanesco*, Romanesque cauliflower, or simply Romanesco, is an edible flower bud of the *Brassica oleracea* plant. It has a natural form that resembles a fractal and is chartreuse in colour. It was first documented in the 16th century in Italy. When compared to regular cauliflower, it has a firmer texture and a delicate, nutty flavour. Romanesco matures in approximately 75 to 100 days, depending on the type, and

produces numerous compact heads that may be snapped off separately as required. Romanesco is high in vitamin C, vitamin K, dietary fibre and carotenoids.

Kalettes

Kalettes are a brassica family member that was formerly called "flower sprouts". It is a hybrid between kale and Brussels sprouts and are the newest hybrid vegetable to reach the US market. Tozer Seeds, a British vegetable-breeding company, developed the new vegetable, which was

introduced to the United States in autumn 2014. They derive their name from kale, with the 'ette' referring to the vegetable's tiny size. They're sprout-sized leafy vegetable that resembles a tiny cabbage in appearance. They're of bright purple and deep green colour. Their leaves aren't as tightly packed as sprouts', and they have a ruffled appearance. They have a sweeter flavour than Brussels sprouts, which may make them a more appealing option for some. Kalettes, which are rich in vitamin C and K, have gained popularity among health



Romanesco

High in vitamin C, vitamin K, dietary fiber & carotenoids



Kalettes

Rich in vitamin C & K

enthusiasts, who have dubbed it a “super food” owing to its nutritious benefits. Kalettes have a similar texture to kale and a savoury, nutty flavour to sprouts. In March, seeds are planted, and the young plants are put in the fields in May. Kalettes may be harvested starting in November. Kalettes are available from the middle of November until the end of March. As a result, they’re great in substantial winter meals or light spring salads. In a Sunday roast, they may even take the place of Brussels sprouts.

Brocco flower

The green vegetable is a

natural hybrid of broccoli and cauliflower that is not genetically engineered. Broccoli and cauliflower are members of the same botanical family and have comparable genetic profiles, making cross-pollination simple. For ages, the two crops have been naturally cross-pollinating in fields, and farmers finally recognised the natural crosses and chose to create a new variety in the twentieth century, releasing it under the name Green cauliflower. A seed business in Holland was the first recognised company to offer green cauliflower. On a trip to Holland in 1987, Rick Antle,

president of Tanimura and Antle Co., a produce business in Salinas Valley, California, first saw the Green cauliflower seeds. There are many kinds of broccoli and cauliflower hybrids marketed in commercial markets under the name Green cauliflower, and some cultivars are also branded as Cauliflower Broccoli. Broccoflower is the brand name for green cauliflower produced by Tanimura and Antle Co. The presence of chlorophyll gives the produce its green colour, while the taste and texture of the hybrid are a pleasant and balanced mix of traits acquired from its parent types. Vitamin C, an antioxidant

that strengthens the immune system, lowers inflammation, and promotes collagen synthesis in the skin, is abundant in green cauliflower. The hybrid type is also high in fibre, which helps to control digestion, vitamin A, which helps to maintain healthy organ function, folic acid, which helps to form red blood cells for oxygen transfer, and copper, which helps to regulate the neurological system. Green cauliflower is available all year, with a peak season from

the middle of winter until the beginning of spring.

Broccolini

Broccolini is a Brassicaceae family hybrid vegetable that has evolved spontaneously. The sweet and delicate cultivar is not genetically engineered and was created via conventional hand-pollinated crosses between *gai lan* and broccoli. Broccolini, also called as Aspirations, was developed in Japan to replace the sales of cool-season broccoli throughout

the season. Broccolini thrives in temperate regions and may be cultivated all year. However, owing to the cultivar's difficult growth qualities and repeated harvest needs, the vegetable has remained a luxury variety. Despite its difficult nature, Broccolini has a tiny following among chefs and broccoli fans who like its mild, sweet taste, zero waste nature, and delicate, crisp consistency. Broccolini is a rich source of fibre and vitamin A, as well as a great source of vitamin C, an



Broccoflower

High in fibre, vitamin A & folic acid



Broccolini

Rich source of fibre, vitamin A, vitamin C



Rapini

Rich source of potassium, iron, calcium, vitamin A & vitamin C

antioxidant that strengthens the immune system while decreasing inflammation. The cultivar also contains calcium to preserve bones and teeth, iron to produce haemoglobin, a protein that transports oxygen in the blood, potassium to maintain fluid balance and reduced levels of folate, vitamin K and manganese.

Broccoli rape/Rapini

Rapini, also known as *Brassica rapa* var. *Ruvo*, is a crisp-tasting cool-season vegetable from the Brassicaceae (mustard) family. Long stalks, big

leaves, and tiny, clustered green buds characterize this cultivar, causing many customers to mistake it for broccoli. Rapini is a turnip-like vegetable that also goes by the names of Broccoli Rabe or Raab, Broccoletti, Cime di Rapa, Friarielli, Rappi, and Ruvo Kale. It is a kind of broccoli that doesn't have any heads. Rapini resembles little broccoli bunches on long stalks snuggled amid spiky big leaves. It's possible that a yellow blossom or two may bloom. This deep green vegetable packs a strong

pungent-bitter punch in terms of flavour. Fans get very hooked to its incredibly bold presence if given a culinary opportunity. Rapini should not be consumed uncooked. Rapini is accessible from late winter to early spring. Rapini has long been cultivated and developed in Italy and Asia. It is currently grown in the US, Canada and Mexico. Rapini has only reached the Chinese and Italians since Americans dislike bitter dishes. Rapini is minimal in calories and salt, with one cup containing approximately 40



Celeriac

Rich in vitamin B6, potassium, manganese & fibre



Beira Kale

Rich Vitamins A , C, iron, calcium, magnesium, potassium, protein & dietary fibre

calories. Rapini is a rich source of potassium, iron and calcium, as well as a great source of vitamin A and vitamin C.

Celeriac

Celery root, also known as *Apium graveolens* var. *rapaceum*, is a bulbous subterranean corm that grows up to one metre in height and belongs to the Apiaceae family, which also includes parsley, carrots, anise and parsnips. Celery root, also known as Knob celery, Turnip-Rooted celery, or Celeriac, is a celery cultivar cultivated for its subterranean corm rather than the green leafy stalks. Celery root is a cool-weather plant used in European cuisine for its nutty, celery-like taste and long storage life.


Celery root is rich in vitamin K, vitamin C and phosphorus, all of which may aid in immunity and heart health. The raw root is rich in vitamin B6, potassium, manganese and fibre, which all help digestion and cleanse the intestines.

Beira Kale

Beira kale is a *Brassica oleracea acephala* cultivar that resembles a cabbage in appearance flavour and growth. In fact, some people argue that it should be classified as a cabbage variety instead. Couve Tronchuda is the name given to it in Portugal, where it is a popular component. Portuguese cabbage, Portuguese kale, Gallician cabbage, Braganza cabbage and sea-kale are some

of the other popular names. Beira is a loose leaf kale with a single basal rosette that does not head. It's a big variety, with an average height of 60 centimetres and a width of 60 cm.

The wide wavy leaves are aqua-green in colour and have strong meaty white ribs comparable to collard greens and Swiss chard. Due to its high water content, Beira kale has a luscious and crisp feel. The sweet taste is similar to baby green cabbage rather than earthy like other kale types. Winter through early spring, Beira kale is available. Vitamins A and C, iron, calcium, magnesium, potassium, protein, carbs and dietary fibre are all abundant in Beira kale.

A close-up photograph of Star Jasmine flowers (Jasminum nitidum) in bloom. The flowers are white with five petals and are arranged in clusters on green stems. Some buds are visible, showing a reddish-pink color. The background is a soft-focus green.

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Star Jasmine

(Jasminum nitidum)

Newly
emerging
Jasminum
species

Jasmine is one of the oldest fragrant flowers, and it is most popular in India, where aromatic flowers are preferred by the majority of the population. The word jasmine comes from the Persian word *jasmine*. In Sanskrit, "Yasmyn" means "fragrance," and it is considered a spiritual flower in India. Because of its gorgeous flowers and sweet fragrance, jasmine is regarded as the "King of Oils". The genus *Jasminum*, which belongs to the Oleaceae family, has 200 species of shrubs and climbing plants endemic to Eurasia. A detailed review of these species, however,

showed that there are only 89 genuine species, 40 of which exist on the Indian subcontinent. Star Jasmine (*J. nitidum*) is an ornamental flowering shrub stands next to Malli (*J. sambac*), Mullai (*J. auriculatum*) and Jathi (*J. grandiflorum*). It originated from south-pacific Islands and belongs to the family Oleaceae. Star jasmine is also known as Angelwing jasmine and Shining Jasmine. Its rules the loose flower markets in South India especially Tamil Nadu particularly Dharmapuri, Sathyamangalam, Erode and Ramanathapuram. *J. nitidum* flowers have recently gained prominence in flower markets due to their long stems

and strong buds. Flower growers are interested in planting star jasmine since it needs less care. Jathimalli will be replaced by Star Jasmine. Because of the off season for the variety, the mainstay in temple ceremonies jathi malli becomes costly and scarce throughout the winter. To solve the problem, we may grow *Jasminum nitidum*, which will bloom all year, as a substitute for Jathi malli. However, star jasmine differs from jathi malli in appearance. Its buds are dark reddish in colour, as opposed to the pure white buds of jathi malli. The petals are white when they bloom, but they are slimmer, longer, and





Dark pinkish flower buds

more spread out. Furthermore, unlike Jathi malli flowers, which droop after 2-3 hours, the blooms would not droop for four to five hours. *J. multiflorum* (Kakada) found to bear non-fragrance flowers whereas this angelwing jasmine possess a scented fragrance and also has beautiful glossy green foliage. These characters eventually recommend this upcoming jasmine species in landscaping also. It is a hardy ornamental plant resistant to salinity.

Botanical features

It is fast-growing evergreen shrubs that may reach

a height of 2 metres. They feature dark green, leathery leaves that are glossy and leathery. The fragrant white blooms have a star shape because of multi-petalled (10 petals) nature. Flower buds are dark pink in colour. Star jasmine flowers throughout the spring and summer. It can be utilised to cover walls and fences as single individuals, in bushy groups, and as climbing plants (they need supports). They are excellent for coastal gardening as they are resilient to salt. *Jasminum nitidum* tolerates both full sun and partial shade. Furthermore, it can withstand

light frosts. They like soil that is well-drained and includes humus, compost, or manure.

Varieties

CO-1-Star Jasmine

This variety was released from Tamil Nadu Agricultural University in 2019. It flowers year around. The flower buds are robust, beautiful and dark pink in colour, with an excellent keeping quality. Because of their strong buds and lengthy corolla tubes, the flower buds are simple to pluck and ideal for string making. When the blooms open, they are pure white, star-shaped, and have a



***J. nitidum* unopened flower buds tied in a string**



***J. nitidum* opened flowers**

faint scent. The beautiful plant architecture makes the plant an excellent decorative ornamental as well. The average flower bud output is 7.5 tonnes per acre per year.

Propagation

It is commercially propagated by Hardwood or semi-hard wood cuttings.

Soil and climate

Star jasmine can survive in open sunlight and semi-shade conditions. Hardy perennial can withstand salinity but not the frosts. Well-drained sandy loam soil containing humus is suitable for growing.

Irrigation

Weekly once in summer (avoid excess watering) such that the soil should not dry out thoroughly.

Nutrient management

Enriching the field with FYM and organic manures supports the proper growth.

Pruning

Usually done in late winter to maintain the plant architecture

Harvesting

Unopened flower buds are harvested in the early morning hours.

Yield

Year-round flowering and is on its peak during February to May (Ganga et al., 2019). The average flower bud output is 6-9 tonnes per acre per year.

Postharvest

Buds remain unopened for 12 hours under room temperature and 60 hours on refrigeration. Furthermore, recent research study reported that the shelf life of star jasmine can be extended by treatment of 28 hours shelf life by packing with 200 gauge thickness polyethylene bags (Manimaran

et al., 2018).

Reference

Ganga, M., P. Ranchana, S. Ganesh, and M. Kannan. "Jasminum nitidum-a potential unexploited jasmine species." In *III International Symposium on Underutilized Plant Species 1241*, pp. 105-112. 2019.

Manimaran, P., M. Ganga, M. Kannan, and K. Arulmozhiselvan. "Standardization of post harvest management techniques for *Jasminum nitidum* flowers." *Chemical Science Review and Letters* 7, no. 26 (2018): 652-658.

Fully opened flowers



Background

Mr. Shanu M, 32 years, from Karingannur in Kollam district, Kerala, (mobile 9633872300) is a young fire and safety officer who gave up his white color job in Culcutta due to dissatisfaction in job and returned to his village. He

looked for some job in Kollam but went vane as he did not like the bossing in private sector or hierarchy. He wanted to be his own boss and did not have the mind set to work under anybody. More over native greenery of his village always called him back as his parents have an agriculture

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back ground and they own 0.2 ha and 2 ha of leased land. He realized that in agriculture both mind and body equally get satisfaction. According to him agriculture is a business with low investment and endless scope. He started banana and vegetable cultivation in commercial scale in 2 ha of leased land. Though he got a bumper yield, the huge quantity of organic waste such as banana pseudo stem became a problem. Then he started vermicomposting. He approached Krishi Vigyan Kendra for the commercial production of vermicompost. Then he underwent 4 vocational trainings viz organic input production, terrace farming, wick irrigation, farm machinery operation and vermin compost production. After the successful completion of the training he started organic input production commercially as he thought that there is a possibility of making money from booming organic farming. From his words 'All persons are interested in organic cultivation in homesteads and terraces especially in urban and peri urban areas. There is a scope for the supply of organic inputs, as the town dwellers are in search of organic inputs especially organic manures and vermicompost for their cultivation'.

Interventions

Process: A series of vocational training and technical support

He was undergone vocational training on organic input production and marketing (15 days), in the Kendra under the project 'Establishment of organic input production and marketing outlet funded by DoA,GoK during May 2015. He





was exposed to the production and marketing of different organic inputs like coir pith and vermicomposts, growth stimulants, bio fertilizers, bio pesticides, readymade vermin/compost units and wick irrigation. Underwent five day training on terrace farming, which includes the establishment of scientific terrace garden with vegetables, tubers, azolla, vermicompost units and poultry. He also underwent ASCI training on Vermicompost producer. When he approached the authorities to get license for marketing his produce, he faced some difficulties. These complexities sparked an idea to him that 'without license how I can market my produce?'. Hence after training from KVK, he started a new enterprise with two others Dr Alwin Raj and an IT professional Subin C Sudhakar and now harvesting success through which he is popularizing a package for terrace farming aspirants that includes pots with wick irrigation with different crops including vegetables, tubers, ginger, curry leaf (may change according to customer's interest) and drip or wick irrigation system, floor

carpets, sprayer, manure kits and yellow sticky traps etc. He is marketing quality seedlings, organic inputs as quality potting mixture, organic inputs along with service.

He is also keen in the monitoring of the garden set by him and offer the maintenance of garden after one season at a cheaper rate i.e., customer support on call. He formed a club 'organic farmers club-earth' He is promoting the organic farming (by trying to inculcate safe crop production practices in his village). Now he is planning to take license for marketing bio inputs like composts, organic growth stimulants, enriched manures.

Technology

The technology support is from KVK Kollam-safe production of vegetables, tubers and fruits in households

Scientific production techniques of enriched organic manures, vermi and coir pith compost, organic growth stimulants, on farm and commercial production of azolla, AMF, bioagents and botanicals, scientific terrace farming, wick irrigation.

Impact

Horizontal Spread:

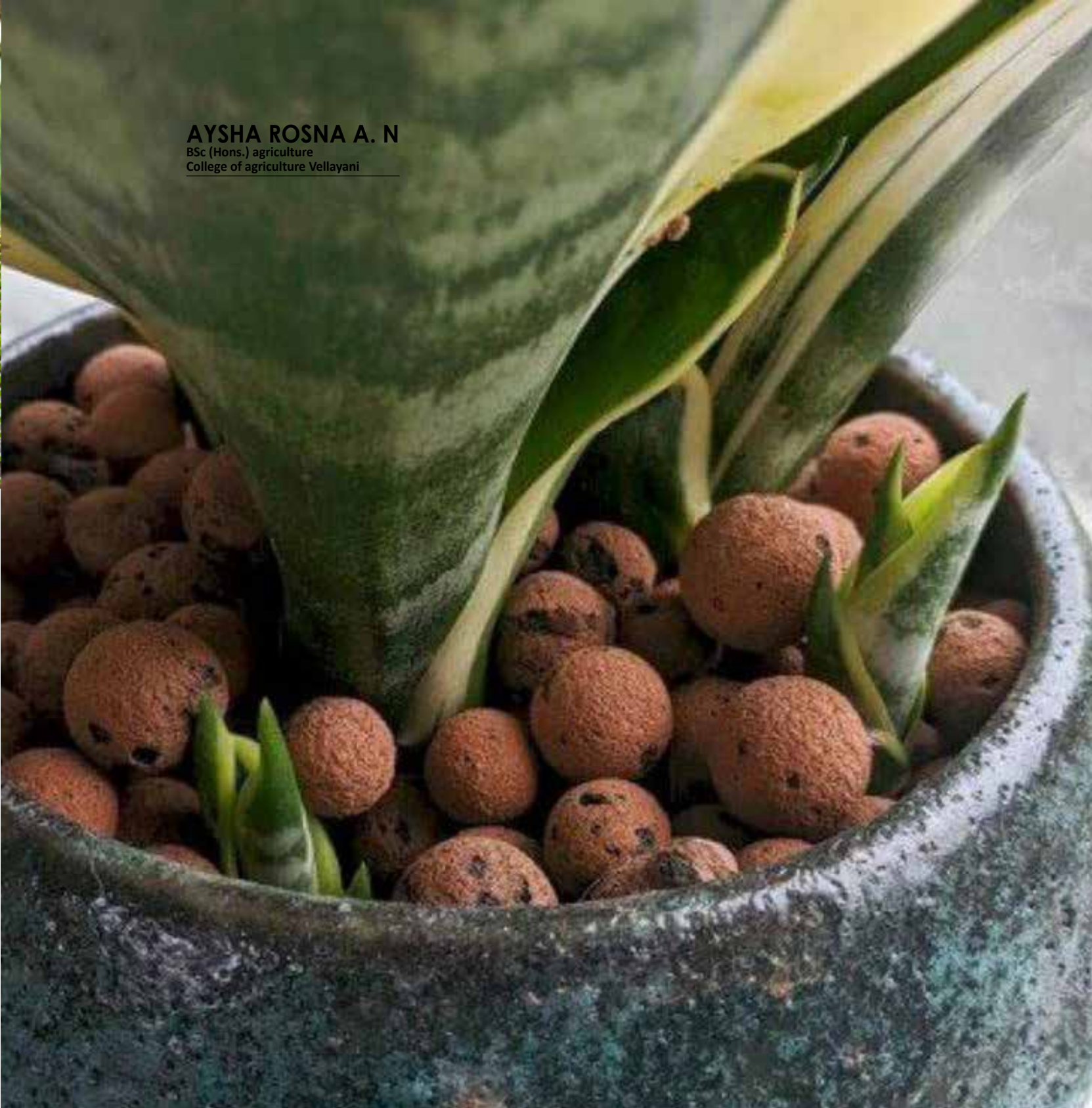
- Has set up 208 terrace vegetable garden all over Kerala.
- Formed a group entitled organic farmers club which has a face book account with more than 4000 followers (link:www.facebook.com/OrgaAayur).
- Floated a company ORGAAYUR PRIVATE LTD. along with a doctor and an IT engineer which promotes organic farming and value addition. It provides services, guidance and materials for safe food production.
- He is also maintaining a whatsapp group with his clients which includes 99persons.
- Sharing good agriculture practices through you tube, face book and instagram (www.instagram.com/p/ByUpMZAGcO).

Economic gains: Earning Rs 35000 to Rs. 40000 per month

Employment Generation

Providing employment to 16 persons comprising of 6 office staff, 1 driver and 10 labourers.

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LECA BALLS

W E L C O M E T O T H E F U T U R E

Everyone loves plants. The Covid pandemic has given us a chance to rethink about learning a new talent. Growing plants is a talent and you should have some basic knowledge to do the same. If you want to make every stages of growth of your plant baby healthier, you must have curiosity to learn new technologies in agriculture and the confidence to adopt those technologies in your garden. Learn, learn and learn about taking care of your plant. If you want to make it best, provide the best for it. Shall I tell you what is best for a plant? It's nothing but hydroponics. If you are thinking that hydroponics is not your cup of tea and you are not equipped to provide the best for your plants; I must say that you are missing the idea of LECA balls. So today I 'am going to introduce you a future friend of yours as well as of your plants called LECA balls aka hydrotons.

There are plenty of ways to grow plants without soil. Hydroponics is actually the technique of growing plants in a different medium than soil to support the root system and using nutrient rich water to nourish the plants. Growth of terrestrial plants without soil, in mineral nutrient solutions was called solution culture. Solution culture is now considered as a type of hydroponics where there is no inert medium. Other than solution culture aka water culture, there are 5 more systems of Hydroponics namely, Wick system, Ebb and flow system,

drip system, NFT system (Nutrient Film Technique) and aeroponics. Aeroponics possesses a lot of differences from hydroponics; yet is considered as a system of hydroponics since water is used as the nutrition medium in aeroponics too. In all these systems of hydroponics there comes a growing medium other than nutrient solution which are used to anchor the plants and improve the efficiency of the system. LECA balls or hydrotons are one of those inert media.

In hydroponics terrestrial plants can be grown with only their roots exposed to the mineral solution, or the roots may be supported by an inert medium like Lightweight Expanded Clay Aggregate (LECA), Coconut fibere, Perlite, Vermiculate, Rockwool/Stone wool, Sawdust and Lava rocks. Soil comes with a set of risks for farmers, ranging from soil-borne diseases to invading weeds. Using growing mediums instead of soil mitigates these risks. LECA balls/ clay balls/ hydrotons are getting popular now a days in India. Recently India has started producing them. LECA balls aka Lightweight Expandable Clay Aggregates are nothing but a growing medium like soil which are made by firing natural clay at a temperature exceeding 1200°C. When clay is heated at such a high a temperature it expands and develops a natural honeycomb structure, with plenty of air holes in them. These particles are round in shape and are available in different sizes like small, medium and

large. The size of the balls made depends on the end use. They can be used in all the systems of hydroponics as inert growing media but are used lesser in aeroponics. Not only LECA balls but also all other media are not used much in aeroponics since in aeroponics nutrient solution is sprayed directly to the plant root system. Also you can simply use hydrotons in your pot instead of soil and provide nutrient solution by hand watering and then drain the excess solution from the pot. This is the simple and primitive form of hydroponics that you can follow in your indoor as well as in outdoor. Since hydrotons store the nutrient solution in its pockets, no need of continuous circulation of nutrient solution is there which save you from complex set up of hydroponics.

LECA balls save plant roots from sitting in water. Using these clay balls you can place your root system fit in the pot. You can add the nutrient solution (flooding or dripping or just flowing, depending upon the system of hydroponics you have adopted) until it soaks the balls. After filling all the pores of the balls with nutrient solution drain the excess water to the drainage system or the main reservoir. Unlike rock wool or cocopeat LECA balls have a lesser water holding capacity. This prevents plants from over watering and provides a medium humid atmosphere to the root system.

In general, if you are using LECA balls instead of soil, these inert neutral particles allow



Image source: <https://5.imimg.com/data5/IC/TF/CL/SELLER-33737871/hydrotons-leca-clay-balls-500x500.jpg>

the plants to choose when to drink and how much to drink. Since the roots are not sitting in the water all the time they can sip on the water that has been soaked into the clay balls. These balls also assist in providing better aeration to the plant

root system and leave a wider space for the root growth. So if the plants are really thirsty the roots grow deeper towards the reservoir which is not a big deal. It's not an issue if you over water the clay balls, because the plant decides how much to

drink. Unlike soil, LECA is not a live medium. So using them will reduce the risk of disease and pest infestation. If the pot is transparent, you can easily watch the root development and also the damages to the root system, if any. If you are



growing the plants in a non-transparent pot, you can easily pull out the plant from pot along with the media and monitor the root growth. But don't do this frequently, because it may cause damages to roots when you pull up. Do this only if it is necessary. LECA balls are reusable. The things that you should take care of when you are using LECA balls are, you should rinse the balls before using to remove the dirt on them. Try to continue rinsing until the water become clear. Soak the balls for atleast 6 hours before using. They're pH neutral

and rather inhospitable to bugs. You can crush them to increase water retention for use in the germination stage of growing.

One drawback you can see in LECA balls is that they are used as a substitute for soil which is the cheapest and easily available growth media. LECA balls have a cost of Rs. 30 per litre. Also you should be vigilant while using them since here, all the things that are needed for the growth of a living system is being provided externally. Unlike soil LECA balls alone can't meet any needs for a plant.

According to Buckminster Fuller, 'you never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete'.

Changes are necessary to make a revolution. If it's in agriculture it will reflect in your body as well as in your pocket. Hydroponics is not a big deal to follow. Just go and pot your plants in LECA balls, feed your plants with accurate concentration of nutrient solution. And that's it; welcome to the world of hydroponics!

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POST HARVEST HANDLING OF ALOE VERA



The Aloe vera plant has been known and used for centuries for its health, beauty, medicinal and skin care properties. The name Aloe vera is derived from the Arabic word “Alloeh” meaning “shining bitter substance,” while “vera” in Latin means “true.” 2000 years ago, the Greek scientists regarded Aloe vera as the universal panacea. The Egyptians called Aloe “the plant of immortality.” Today, the Aloe vera plant is being used for various purposes in dermatology. However, the Aloe Vera crop which is highly perishable needs scientific postharvest management techniques, for processing into quality products. In this regard an attempt is made in this article to inform the readers about post-harvest handling of aloe vera.

Harvesting

Once planted the crop gives production for a period up to five years. The crop is harvested after 9-10 months of planting to have maximum yield. The mature leaves with more juice and freshness need to be harvested. Harvesting of too much old leaves and new and immature small leaves is undesired as it gives poor quality and quantity of gel.

After harvesting for production of juice mature leaves of appropriate size are cut from the base and are hung for 5-6 hours by keeping cut portion down. For obtaining





gel the leaves are cut open longitudinally and the white coloured transparent gel is scrapped with the help of knife for further processing. For other uses, whole plant can be cut from the base or take out along with root and dried.

The crop should be harvested in the morning hours. Before attaining five years of growth, the crop should not be eradicated by roots. After cutting the leaves the crop again sprouts and get ready for harvest by next year. This process may continue for 5 years.

Storage

For gel extraction the harvested leaves are immediately processed and are not usually stored. But in many 'Ayurvedic' preparations whole plant is used in dried form.

Drying of Leaves

Aloe leaves contain 80-

90 per cent moisture and need to be dried under open sun. For this, the leaf is transversely cut into 10-12 small pieces and spread on the yard. The leaves hardly take a week to get fully dried when left under the sun. Leaves should be uniformly dried by constant stirring of leaves. Improper drying causes blemishes, fungal infections and moulds which reduced the marketability. One kg of dry leaves could be obtained by drying 80 kg of fresh leaves.

Processing and Product Development

Aloe vera is considered to be nature's miracle by people all over the world because it possess numerous medicinal properties.

Selection of Leaves

The first step in the process of making aloe vera gel is harvesting of the aloe vera

leaf.

The fully matured (2-3 years old) leaf is chosen for aloe vera processing. Then they are immediately processed into gel. If the time gap between harvesting and processing into gel is more, the quality of the fresh leaves deteriorates. If aloe vera is not used immediately, need to be kept in refrigerator within 4-6 hours after harvesting.

Cleaning

Once the aloe vera leaves are harvested, it has to undergo a thorough cleaning process. In most aloe vera processing companies, the aloe vera leaves have to go through a series of soak tanks, high pressure sprayers and scrub brushes to wipe out any unwanted remains that can deteriorate the quality of the end product.

Processing

Aloe vera processing

can be divided into three main steps which include crushing, grinding and pressing of the whole leaf. Most manufacturing companies make use of aloe vera processing equipments for extracting whole leaf aloe vera gel. First, the tip as well as the base of each aloe vera leaf is removed and cut into small pieces. These aloe vera pieces are placed in a grinding unit where they are crushed till they achieve a soup like consistency.

This aloe vera liquid is then transferred into cleaned and sanitized stainless steel tanks. After this, the large pieces of pulp present in the liquid are removed with the help of a depulping extractor.

Filtration

The liquid that is obtained in the end goes through the filtration process. This is

important to separate the aloin or latex from the liquid, along with the microscopic remains of sand, leaves and other such particles. The filtration process is done with the help of a press filter which possess various carbon coated plates. These plates have the ability to absorb the latex from the aloe vera liquid.

This process is repeated until the whole liquid is free from almost 99% of aloin. After this, the liquid goes through a press filter that contains 5 micron filter paper several times, until it is completely devoid of latex. Finally, the aloe vera liquid is purified through cold filtration process.

Stabilization

The stabilization of the aloe vera liquid or gel that is obtained after processing is

extremely important. This is because processed aloe vera is bound to get oxidized, thus making it unusable. Stabilization of aloe vera gel or liquid can be done through various techniques including cold processing as well as heat treatment processing.

Cold processing

It is done by using enzymes like catalase and glucose oxidase in the aloe vera gel to stop the production of aerobic organisms. Another cold processing method is to expose the aloe vera gel to ultraviolet rays. On the other hand, heat treatment processing involves pasteurization of the liquid at a high temperature. Another aloe vera gel stabilizing method is by adding preservatives and additives like potassium sorbate, sodium benzoate, vitamin E, citric acid, etc. in the gel.



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DRY FLOWER

INTRODUCTION

Flowers are wonderful creation of nature and regarded as a symbol of love, beauty and a paradigm of life. Besides their aesthetic value, flowers play important role in improving the environment in addition to their economical and medicinal properties. Flowers are synonyms of delight and blissfulness due to their power to make people happy and cheerful. Flowers are available in varied colours and

used to express human feelings. Even our day begins with worship of God with flowers as people believe that flowers can also please the holy spirits. Some flowers like Jasmine, tuberose, rose etc. are used by women to decorate their hair and their extracts are integral part of many cosmetics. Flowers are used in many forms as loose flower, cut flower and dry flower from time immemorial for decorating homes due to their fragrance and to welcome the guests at home.

Flowers are associated with mankind from the dawn of civilization and in the modern era. These have become an integral part of human life. Love for flowers is a natural instinct. The beauty and fresh look of cut flowers can be retained only for few days even by using the best techniques of post-harvest technology but the charm of dried flowers and foliage can be maintained from a few months to years with lesser cost; if protected from the damage of high humidity. In recent times revolutionary changes are seen in the floriculture industry. One component contributing for this revolution is dried flower industry, dehydrated flowers and foliage are excellent due to their special beauty, long lasting value and can be enjoyed during heat of summer and the cold of winter. In the dehydration process, the moisture is removed from flowers and foliages without affecting its aesthetic value. The charm of flowers can be maintained and preserved for

several years by the technique of dehydration or drying. Drying and preserving flowers makes sense economically because ordinary flowers will only last about a week and dried flowers will last indefinitely. Dried flower products are long lasting and retain their aesthetic value irrespective of the season.

INDUSTRIAL GOAL

In the new era of eco-consciousness, use of natural products like dry flowers and their parts has become the premier choice of the masses in their lifestyles for interior decoration. Future prospects of the dry flower industry is expected to contribute a lot to the country's economy, in comparison to the fresh cut flowers and other live plants. Dry flower market has grown exponentially as consumers become "eco-conscious" and chooses dried flowers as they are eco-friendly and biodegradable alternative to fresh flowers. Thousands of flowers, wild plants, forest species, weed, grasses have great economic and cultural importance in the making of dry ornamentals. Dehydration technology can be exploited for preservation and to maintain its original colour and shape for long term enjoyment and for commercial utilization of unutilized/underutilized plant species. A cottage-scale industry based on floral craft/dry ornamentals can come up for self-employment of unemployed youth and housewives as well as rural women through this creative occupation. More important is the promise that this industry

holds in employing rural women. It helps women empowerment in the rural area by giving small scale industry for their livelihood.

ADVANTAGES OF DRIED FLOWER

- Cheaper, eco- friendly and biodegradable
- Raw material is cheap and available year-round
- Shelf life is much high
- Novel colour and fragrance can be used
- Survive the heat of summer and cold of winter.
- Not easily perishable and have extended longevity
- Sophisticated training and expensive equipment are not needed
- Dried ornamentals offer longer periods of sale if properly preserved, packaged and handled
- Dried ornamental is versatile. They can be arranged into different crafts according to one's preferred style, design, and use.
- Dried plant materials provide distinctive indoor decoration.
- Arrangements made from dried materials are long lasting and require little care
- Drying flowers and foliage expands gardening activities
- Dried flowers can be put to many beautiful and varied causes such as long lasting pictures, frames, wreaths, cards, covers, calendars, festival decorations, candles, potpourri and many other things according to one's creativity.
- Natural dye preparation
- Natural food colour



preparation

- Improved colour in egg yolk
- Use as a garnishing material in food industry viz., in ice cream, candy, cold drinks.

DEHYDRATION TECHNIQUES

For drying of flowers and foliage, numbers of dehydration techniques are practiced at commercial scale and home scale which vary according to the suitability of any species and the purpose for which dehydrated material is required.

Air Drying

Air-drying is the easiest method of preserving flowers and plant materials. Many garden flowers and wild plants can be collected, tied together at the stem ends in loose bundles with rubber bands or pipe cleaners, and hung upside down in a warm, dry area. With good air circulation, flowers take 1 to 3 weeks to dry completely. Large flower heads should be hung individually. Most flowers can be dried on their own stems; however, some flowers, such as the strawflower, have a weak stem and require that a wire be inserted before drying to support the flower.

Embedding Method

The flowers can be dried with embedding in desiccants. The important desiccants used are silica gel (white and blue), borax Powder, white river sand, alum powder, corn powder, saw dust, etc. Flower dry silica gel is comprised of a mixture of very small blue indicating and white silica gel beads (or crystals) that work to adsorb the moisture from



the petals. The blue indicating silica gel beads will change color from blue to pink once the silica gel is saturated and needs to be replaced or recharged.

Press drying

Pressing is done by placing plant materials between layers of an absorbent paper material and applying weight or pressure for at least 5 to 10 days or until the plants are dried. Newspapers, telephone directories, blotter paper, or tissues are good papers to use. Plant presses are also available.

Preserving Using Glycerine

Some foliage can be preserved using glycerine. Glycerine will not preserve the green colour, but the foliage will retain its soft, pliable feel and can be painted or used naturally in arrangements. Foliage preserved with glycerine can be wiped or cleaned and will last indefinitely. The flower absorb the glycerine, replacing its water content with it. This keeps the flowers supple and bright. Simply place the stems of fresh flowers in a mixture of two parts lukewarm water to one part glycerine (car antifreeze is a good solution). Let the flowers to sit in the mixture for two to three weeks.

Water Drying

Some flowers dry well if placed in water. The stems of the flowers are initially placed in a couple of inches of water, then the water is allowed to evaporate and be taken up by the cut flowers. The container and flowers should be in a dry and warm and in dark location.

Hot Air Oven

The containers are kept in the hot air oven at a temperature ranging between 45°C and 60°C for a few hours to three days depending upon the plant material to be dried. Drying technology for a number of cultivated ornamental plants has been standardized by Kher and Bhutani (1979).

Microwave Oven

Flowers are dehydrated within 5 – 10 minutes. Pots after taking out from micro wave oven are kept for two hours at room temperature for setting.

Solar Cooker

Flowers can be directly embedded in the container of solar cooker and it can be dried under sun. The time of exposure vary according to day temperature. The solar cooker can also be operated electrically. Solar cooker will be most suitable for rural women. They can cook their food in solar cooker and rest of the time can utilize for dehydration work.

Freeze Drying

The flowers are arranged in the specimen chamber, and then these are frozen unto -35°C. By eliminating the water, the flowers dry up with life freshness and retain better integrity and more durability.

Commercial uses

- Flower arrangement
- For sale in packet
- Loose flowers
- Flower arrangement
- Packing in storage room
- Dye purpose
- Hair adornments



- Flower bouquet
- Collages
- Wedding card
- Pomanders
- Sweet smelling pot-porris

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SESAME

THE QUEEN OF OIL SEEDS

Plants play an essential role in human health maintenance. In earlier days, humans preferred plant-based medications to treat various ailments and diseases that are considered threatening to human life. Among the many multipurpose plant species used for nutritional, medicinal and industrial purposes, sesame (*Sesamum indicum L.*) is an important and very ancient oilseed crop that occupy 51% of the total oilseed crops cultivation. It is a significant cash crop for small and marginal farmers in some developing countries. According to FAOSTAT (2019), India is the leading producer

of sesame worldwide, followed by Sudan and China. It is a Kharif crop in arid and semi-arid tropics and a rabi crop in cooler areas. The seed of the crop is the most-utilized part, which yields delicious nutty oil. It has the highest oil content than any other oil seeds and yields unique chemical constituents, for which it is known as the Queen of oilseeds.

A sesame seed are common ingredient in cuisines across the globe and is traditionally used for various culinary and medicinal purposes, in addition to its use as a dietary supplement. The seeds of sesame are the reservoir of many nutritional

components; the major bioactive components include minerals, vitamins, polyunsaturated fatty acids (PUFA), and unique natural antioxidants such as lignans (sesamin and sesamol). The natural antioxidant present in the seeds help to increase the keeping quality of seed oil. Moreover, the seeds are excellent source of sulphur-containing amino acid methionine, which is rare in other plant proteins. The oil extracted from seeds serves as a solvent, skin softeners and an ingredient in the production of soaps and margarine (Anilakumar et al., 2010). It is also industrially used as a lubricant, lamp oil, biodiesel and an ingredient in

Sesame cultivation



cosmetics and pharmaceuticals. Medicinal value of the species is evidenced from the use of leaves for the treatment of inflamed membranes of the mouth, diarrhoea, dysentery, catarrh, acute cystitis, dandruff, rabies, diabetes, malaria and bladder ailments and roots for cough and asthma, tuberculosis, eye diseases, backache, migraines, ulcers, snake bites, constipation, cough, burns, boils, promote menstruation, induce lactation, as a purgative, galactagogue, demulcent and as an antitussive (Hegde, 2012). The seed oil is remarkably stable due to the presence of lignans, which helps in lowering cholesterol levels and hypertension in humans, neuroprotective against hypoxia or brain damage and reducing the incidence of certain cancers. The meal-based sesame products are suitable for people with diabetes as they contain fewer carbohydrates and high protein.

It is an annual flowering plant belonging to the family Pedaliaceae and is distributed in tropical Africa, Madagascar, Arabia, India, Ceylon, tropical Australia and a few of the eastern islands of the Malayan Archipelago (Joshi, 1961). The genus is thought to be originated from Africa as it contains many wild species.

Though the genus is represented by 36 species, in Kerala only six species viz., *S. radiatum*, *S. malabaricum*, *S. alatum*, *S. laciniatum*, *S. prostratum* and *S. indicum* were

reported. Of these, *S. indicum* is the only cultivated species, commonly known as sesame (internationally), Til, Gingelly, *Simsim* and Gergelim, while in Kerala and Tamil Nadu it is popularly known as "Ellu". This self-pollinated plant is having tubular or funnel-shaped white flowers with pink or purple markings.

The fruits are capsules, with 50 or more small, ovate, slightly flattened seeds with a variety of colours, including shades of brown, black, gray, and white, depending on the cultivar. Wild relatives of sesame are considered as a good source of many desirable traits in terms of yield, resistance to biotic, and abiotic stresses. These wild species can be efficiently used for the genetic improvement of cultivated sesame. Despite its traditional uses, limited research works have been carried out in this crop. It is largely considered as a crop of underclass, poor man's crop, forgotten, ignored, neglected, and rejected crop, but in the light of its limitless traditional uses, it is an indispensable food crop. It has tremendous potential in curing many life-threatening diseases. In future, it can be consumed as a supplement for protein-rich food due to its high nutritional value. Appropriate information on its economic value will enormously enhance its use worldwide.

The Department of Botany, University of Kerala,

has explored various research activities on this crop including Reproductive biology, Genetic diversity analysis and Nutritional analysis.

It was for the first time the wild species, *S. alatum* Thonn was reported from Kerala by the researchers, Akhila and Beevy, in 2013. Currently, stress tolerance efficiency of wild sesame germplasm being evaluated for the development of drought resistant varieties. Further research on related aspects will lead to the development of superior sesame genotypes with high market value.

REFERENCES

- Akhila, H., & Beevy, S. S. (2013). *Sesamum alatum* Thonn (Pedaliaceae)-A new record for the flora of Kerala. *The Journal of Indian Botanical Society*, 92(1 and 2), 104-106.
- Anilakumar, K. R., Pal, A., Khanum, F., & Bawa, A. S. (2010). Nutritional, medicinal and industrial uses of sesame (*Sesamum indicum* L.) seeds-an overview. *Agriculturae Conspectus Scientificus*, 75(4), 159-168.
- Food and Agriculture Organization Statistical Division (FAOSTAT). (2019). Available online at <http://www.fao.org/faostat/en/?#data/QC>
- Hegde, D. M. (2012). Sesame. In *Handbook of herbs and spices* (pp. 449-486). Woodhead Publishing.
- Joshi, A. B., Narayanan, E. S., & Vasudeva, R. S. (1961). *Sesamum*.

Introduction

A wetland is wet land (i.e. land which is wet)! But not all wet land results in a wetland. A wetland is found where the land is wet enough (i.e. saturated or flooded) for a period long enough to be unfavourable to most plants but are favourable to plants adapted to anaerobic soil conditions. Wetlands are defined as 'lands transitional between terrestrial and aquatic eco-systems where the water table is usually at or near the

surface or the land is covered by shallow water (Mitsch and Gosselink, 1986).

On 18th May 1974, Combourg Peninsula in the N-territory of Australia was designated as the World's first wetland of International importance under Ramsar convention. Now the total number of wetlands exceeds 2200. Country with largest number of Ramsar sites is UK (170) and Bolivia has the largest area with 148000 km². Under

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VANISHING WETLANDS

A THREAT TO ECOLOGICAL BALANCE



NWCP 115 wetlands have been identified in India which requires urgent protection.

The extent of wetlands in India is around 58.3 m ha, of which paddy fields account for nearly 71 per cent of area (Parikh and Parikh 1999). District wise distribution of wetlands in Kerala showed that 4 districts can be called as wetland rich. Alappuzha has the highest concentration with 26079 ha area under wetland. This is mainly due to the location of famous Vembanad Kole. The other 3 districts are Erankulam, Kollam and Thrissur. Wayanad district has the lowest area under wetlands.

Wetlands are considered to have unique ecological features which provide numerous products, and services including biodiversity maintenance, carbon sequestration, flood control, groundwater recharge, nutrient removal, pollution abatement and climate regulation. Freshwater wetlands are among the most heavily used and exploited ecosystems. In Asia alone, about 5000 km² of wetlands are lost annually to agriculture, dam construction and other uses.

Ramsar Convention

The Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat is an international treaty for the conservation and sustainable use of wetlands. It is also known as the Convention on Wetlands. It is named after the city of Ramsar in Iran, where the Convention was signed in 1971. In 1981, the Government of India identified two sites, Chilika lake (Orissa) and Keoladeo National Park

(Rajasthan), as Ramsar Wetlands of International Importance (Ministry of Environment and Forests, 2012). Over the years, the number of designated Ramsar Sites has increased to 27. In Kerala, Ashtamudi, Vembanad- Kole Wetland and Sasthamkotta Lake are declared as Ramsar sites in 2002.

Ecological significance

Wetlands are considered to have unique ecological features which provide numerous products and services to humanity (Prasad et al., 2002). Ecosystem goods provided by the wetlands mainly include water for irrigation, fisheries, non-timber forest products, water supply and recreation. Major services include carbon sequestration, flood control, groundwater recharge, nutrient removal, toxics retention and biodiversity maintenance (Turner et al., 2000).

Threats to wetland ecosystems

Scientific estimates show that 64 % of the world's wetlands have disappeared since 1900. In some regions, notably Asia, the loss is even higher. Inland wetlands are disappearing at a faster pace than coastal ones, but the overall trend is clear. In Asia alone, about 5000 km² of wetland area are lost annually to agriculture, dam construction and other uses. As a result many wetland dependent species including 21% of bird species, 37% of mammal species and 20% of freshwater fish species are either extinct or globally threatened (MEA, 2005). The main causes of wetland loss

have been urbanization, land use changes, drainage to agricultural use, infrastructure development, pollution from industrial effluent and agricultural runoff and climate change.

Management and conservation of wetlands

The 2016-2024 mission, refers to 4th Ramsar strategic plan was approved at the 12th Conference of the Contracting Parties. This mission has 4 goals for management of wetlands. They are:

i) Addressing the drivers of Wetland loss and degradation:

Invasive alien species and pathways of introduction and expansion are identified and prioritized, priority invasive alien species are controlled or eradicated, management responses are prepared and implemented to prevent their introduction and establishment.

ii) Effectively conserving and managing the Ramsar site network:

The ecological character of Ramsar sites is maintained or restored, through effective planning and integrated management.

iii) Wisely using all Wetlands:

Wetland functions, services and benefits are widely demonstrated, documented and disseminated. The traditional knowledge, innovations and practices of indigenous people and local communities relevant for the wise use of wetlands.

iv) Enhancing implementation:

Scientific guidance and technical methodologies at global and regional levels are developed on relevant topics and are

available to policy makers and practitioners in an appropriate format and language.

Institutional strategies for wetland conservation in India

Till the early 2000s, policy support for wetland conservation in India was virtually nonexistent. In 1981, the Government of India identified two sites, Chilika lake (Orissa) and Keoladeo National Park (Rajasthan), as Ramsar Wetlands of International Importance (Ministry of Environment and Forests, 2012). Thereafter, in 1985–86, National Wetland Conservation Programme (NWCP) was launched in close collaboration with the concerned state governments.

Initially, only designated Ramsar Sites were identified for conservation and management under this programme. Subsequently, in 1993, the

National Lake Conservation Plan (NLCP) was formulated to focus on lakes, particularly those located in urban and periurban areas which are subjected to anthropogenic pressures. Initially, only 10 lakes were identified for conservation and management under this plan. There is also a National River Conservation Plan (NRCP), operational since 1995, which aims to improve the water quality of the major Indian rivers through the implementation of pollution abatement works.

The new National Water Policy, 2012, of India also recognizes the need for conservation of river corridors and water bodies (including wetlands) in a scientifically planned manner. Over the years, the number of designated Ramsar Sites has increased to 26 (Ramsar Convention on Wetlands, 2012), the number of

rivers under NRCP has increased to 39 and the number of wetlands covered by the NWCP and NLCP has increased to 115 and 61, respectively.

The National Environmental Policy 2006 and National Forest Commission (2006) suggested on framing of a National Wetland Conservation Act and establishment of a National Wetland Inventory and Monitoring Programme in order to develop a sustained and serious programme for monitoring wetlands. Based on the directives of National Environment Policy, 2006, and recommendations made by National Forest Commission, the Central Government notified the Wetlands (Conservation and Management) Rules, 2010.

Kerala is the only state that has formulated Kerala Conservation of Paddy Land and Wetland Act, 2008. This



Act prohibits the conversion or reclamation of existing paddy land and wetlands for other economic purposes.

Conclusion

Wetland ecosystems support diverse and unique habitats and are distributed across various topographic and climatic regimes. They are considered to be a vital part of hydrological cycle and are highly productive systems in their natural forms. Wetlands not only support large biological diversity but also provide a wide array of ecosystem goods and services. The world's wetlands are under threat today. Half of them have been destroyed in the

past 100 years alone. Wetland habitats are among the most heavily impacted and degraded of all ecosystems, worldwide. In India and Kerala the decrease in wetland area during past decades was alarming which resulted in consequent negative impacts on ecosystem and food production. Wetland conservation has to be taken up as a crusade at district, state, national and global levels for the welfare of present and future generations.

References

Mitsch, W. I. and Gosselink, I. G. 1986. *Wetlands*. Van Nostrand Reinhold, New York, 132p.

Parikh, J. and Parikh,

K. 1999. *Sustainable Wetland. Environmental Governance – 2*, Indira Gandhi Institute of Development Research, Mumbai, 27p.

Prasad, S. N., Ramachandra, T. V., Ahalya, N., Sengupta, T., Kumar, A., Tiwari, A. K., and Vijayan, L. 2002. Conservation of wetlands of India-a review. *Tropical Ecol.* 43(1):173-186.

Turner, R. K., Van Den Bergh, J. C., Söderqvist, T., Barendregt, A., Van Der Straaten, J., Maltby, E., and Van Ierland, E. C. 2000. Ecological-economic analysis of wetlands: scientific integration for management and policy. *Ecol. Econ.* 35(1): 7-23





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LOTUS

*An Eloquent
Source of Vegetable*

Lotus (*Nelumbo nucifera*) is a herbaceous perennial, belonging to Nelumbonaceae family of aquatic plants. Lotus plants are adapted to grow in the flood plains of slow-moving rivers and delta areas. Stands of lotus drop hundreds of thousands of seeds every year to the bottom of the pond. While some sprout immediately, and most are eaten by wildlife, the remaining seeds can remain dormant for an extensive period of time as the pond silts in and dries out. During flood conditions, sediments containing these seeds are broken open, and the dormant seeds rehydrate and begin a new lotus colony. The plant have a very wide native distribution. The lotus flower and human connection goes back well beyond thousands of years, and crosses numerous cultural and geographical boundaries even from ancient times. The lotus is even revered in a spiritual way by several cultures of the world. Still today, lotus is a widely known and popular water garden plant that can be found in about any water garden center. The lotus flower has achieved truly an iconic status with its familiar large flower head.

Lotus flower is the National flower of India and Vietnam. All parts of the lotus have been used in medicines for several ailments. It has been used as an antidote for mushroom poisoning as well as teas, tonics and astringents. Though the

plant have ornamental beauty and used as sacred offering in temples, the potency of the plant as a vegetable is yet to be exploited to the fullest in India. Almost every part of lotus is edible viz.

- Lotus leaves are sometimes used as biodegradable wrappers to wrap rice for steaming so that the rice develops the subtle aroma of the leaf.
- The seeds from a lotus seed head can be eaten when they are green and they will have a sweet flavor and can be eaten like peas. If you wait until the seeds begin to turn brown, the seeds will have a nuttier taste. The seeds can be ground into paste and used to make pastries. Seeds can also be ground into flour for use in baking. In addition to peeling off and discarding the skin before eating, the green sprouts inside the seeds also need to be removed as they are bitter.
- After popping out all the seeds, the mature lotus pods can also be dried out and used for decoration. Dried seeds can be boiled in syrup and used along with crushed ice as a sweet.
- The lotus flower stem (not the leaf stem which is too fibrous) can be eaten raw as side vegetable. They can also be cut into small pieces and can be used after simple stir fry or as classic coconut-based soup.

- The lotus root / tuber is similar to sweet potatoes. The tubers can be used in a multiple of ways, sliced, pickled, cooked, candied or stir-fried. Space Lotus 36 is an excellent lotus for producing tubers.
- Lotus pollen are being used in many countries to make home-made herbal medicine for treating hair loss and skin related problems.
- The petals, stamens and roots of certain varieties have medicinal values.
- Inside of each lotus kernel, a light green plumule (green embryo) exists in between the two cotyledons. This lotus plumule is the embryonic shoot of the lotus plant. The plumule consists of two prominent inwardly rolled leaves with the attendant stem. Farmers separate these embryos from the kernel by gently pulling them up using fingers as they have a bitter taste. These plumules are dried in the sun to use in medicines and tea.

NUTRITIONAL COMPOSITION

All the parts of lotus have variable nutritional composition. Nutritional components in lotus seeds and tubers are much prevalent considering health cuisine.

Nutritional Composition of Lotus Seeds

Fresh as well as dried lotus seeds can be eaten raw and cooked. Dry seeds are

Principle	Nutrient Value	% of RDA
Energy	332 Kcal	17
Carbohydrates	64.47 g	49
Protein	15.41 g	27
Total fat	1.97 g	10
Cholesterol	0 mg	0
Vitamins		
Folates	104 µg	26
Niacin	1.60 mg	10
Pantothenic acid	0.851 mg	17
Pyridoxine	0.629 mg	48
Riboflavin	0.150 mg	11.5
Thiamin	0.640 mg	53
Vitamin A	50 IU	1.66
Vitamin C	0 mg	0
Electrolytes		
Sodium	5 mg	< 1
Potassium	1368 mg	29
Minerals		
Calcium	163 mg	16
Copper	0.350 µg	39
Iron	3.53 mg	44
Magnesium	210 mg	52
Manganese	2318 mg	100
Phosphorous	626 mg	89
Zinc	1.05 mg	9.5

soaked in hot water to soften, like red beans before using them in cooking. The seeds can be ground into powder and used in bread making, and popped like popcorn. 100 g dried lotus seeds contains the following nutrients:

- Raw, fresh lotus seeds are sweet and chewy, while dry seeds are crunchy, and delicious only after baked. Fresh raw seeds carry just 89 calories per 100 g; while dry kernels hold 332 calories per 100 g.
- Lotus seeds energy chiefly comes from carbohydrates and proteins unlike as in

other tree nuts whose high calorific value is mainly because of fats.

- The seeds are also packed with fibre, vitamins, minerals, and numerous health-promoting antioxidants.
- Dry lotus seeds contain 15.4 g or 27% daily required levels of protein. Phenylalanine, tyrosine, leucine and lysine were the essential amino acids in them. Studies revealed that the lotus seed protein is nutritionally well-balanced protein and might be of significant importance in the formulation of diets for

humans.

- Like other dicotyledonous plant seeds, lotus seeds too are free from gluten protein. They can be safely used in the gluten-free food preparations as a healthy alternative in patients with the wheat gluten allergy, and celiac disease.
- Fresh as well as dry lotus kernels are excellent source of folates. 100g seeds provide 104 µg or 26% of folates. Folate along with vitamin B-12 is one of the essential components of DNA synthesis and cell division. Adequate folate diet during pregnancy may help prevent neural-tube defects in the newborns.
- Lotus kernels are also an excellent source of the B-complex group of vitamins such as thiamin (53% of RDA/100g), riboflavin (11.5% of RDA/100 g), niacin, pantothenic acid and vitamin B-6 (48% of RDA//100 g). These vitamins work as cofactors for various enzymes during cellular substrate metabolism in the human body.
- Moreover, the seeds contain excellent amounts of minerals like manganese (100% of RDA//100g), potassium (29% of RDA/100g), calcium, iron (44% of RDA//100 g), magnesium, zinc and selenium. Manganese is an all-important co-factor for antioxidant enzyme,

Principle	Nutrient Value	% of RDA
Energy	74 Kcal	3.7
Carbohydrates	17.23 g	13
Protein	2.60 g	5
Total fat	0.10 g	0.5
Cholesterol	0 mg	0
Dietary fibre	4.9 g	13
Vitamins		
Folates	13 µg	3
Niacin	0.400 mg	2.5
Pantothenic acid	0.377 mg	7.5
Pyridoxine	0.258 mg	28
Riboflavin	0.220 mg	17
Thiamin	0.160 mg	13
Vitamin A	0 IU	0
Vitamin C	44 mg	73
Electrolytes		
Sodium	40 mg	3
Potassium	556 mg	12
Minerals		
Calcium	45 mg	4.5
Copper	0.257 µg	29
Iron	1.16 mg	14
Magnesium	23 mg	6
Manganese	0.261 mg	1
Selenium	0.7 µg	1
Zinc	0.39 mg	3.5

superoxide dismutase. Together with other antioxidants like vitamin A, consumption of lotus kernels may help in boosting immunity to fight against infectious agents and scavenge harmful oxygen-free radicals.

Nutritional Composition of Lotus Root

Each rhizome segment features a smooth, gray-white tube measuring about 10-20 cm

in length, 3-7 cm in diameter. Internally, the root has white, crunchy flesh with a mildly sweet, water-chestnut-like flavor. On cross-section, the lotus root reveals a visually appealing display of symmetrically arranged air canals (holes) traversing all along its length. 100g of raw lotus roots contains the following nutrients:

- Lotus root is one of the moderate calorie root-vegetable. 100g root-stem

provides about 74 calories. Nevertheless, it is composed of many health-benefiting phytonutrients, minerals and vitamins.

- Lotus rhizome is an excellent source of dietary fibre. Dietary fibre, together with slow-digesting complex carbohydrates, helps reduce blood cholesterol, sugar, obesity and constipation conditions.
- Fresh lotus root is an excellent source of vitamin C. 100g root provides 44mg or 73% of daily-recommended values. Vitamin C is a powerful water-soluble antioxidant that is essential for collagen synthesis inside the human body.
- Collagen is the main structural protein inside the body that maintains the integrity of blood vessels, skin, organs, and bones. Regular consumption of foods rich in vitamin C helps the body protect from scurvy, develop resistance against viral infections, boosting of immunity, wound healing, and to scavenge cancer causing harmful free radicals from the body.
- Further, the root contains moderate levels of some of the valuable B-complex group of vitamins such as pyridoxine (vitamin B6), folates, niacin, riboflavin, pantothenic acid, and



Lotus as vegetable

thiamin. Pyridoxine (vitamin B6) works as a coenzyme in the neurochemical synthesis inside the human brain which influences mood and thought. Adequate pyridoxine levels help control nervous irritability, headache, and tension. It also cuts heart attack risk by decreasing harmful homocysteine toxin levels in the blood.

- In addition, the root provides healthy amounts of some essential minerals like copper, iron, zinc, magnesium, and manganese. Copper along

with iron, is also required for the production of red blood cells.

- Crunchy, neutral yet delicate flavor of root lotus is because of its optimum electrolyte balance at an agreeable ratio of sodium to potassium at a ratio of 1:4. While sodium gives a sweet taste to the root, potassium counters the adverse effects of sodium by regulating heart rate, and blood pressure.

HEALTH BENEFITS OF LOTUS ROOTS

- **IMPROVES IMMUNE**

SYSTEM HEALTH – The prominent Vitamin C content goes a long way towards improving and strengthening the immune system. It also serves to neutralize free radicals, resulting in stronger organs, skin, and blood vessels.

• IMPROVES BLOOD CIRCULATION AND REGULATES BLOOD PRESSURE

- The combination of copper and iron serves to improve blood circulation in the body. They also serve to reduce the risk of developing symptoms relating to anemia, as well as



Lotus bud

improve energy. The potassium in lotus root also serves to help regulate blood pressure. Potassium helps to relax blood vessels, balance the levels of fluids in your body, and improve blood flow.

• **IMPROVES DIGESTION** – The high dietary fiber content helps to improve the digestion process and reduce constipation. It's also a low-calorie food that helps to maintain and lose weight while still getting a large amount of protein and nutrients in the diet.

• **HELPS TO REDUCE STRESS AND IMPROVE HEART HEALTH** - Vitamin B contains pyridoxine, which helps to improve mood and relax mind. It even helps to reduce headaches, and serves to lower stress. It's another reason the lotus flower is associated with peace and tranquility. Pyridoxine also helps to lessen the risk of a heart attack and improve heart health overall.

REFERENCES

Li, Z. 2008. Nutrient value and processing of lotus

seed. Acad. Period. Agric. Prod. Process. 2008: 42–43.

Pulok K. Mukherjee, Debajyoti Mukherjee, Amal K. Maji, S. Rai and Michael Heinrich. 2010. "The sacred lotus (*Nelumbo nucifera*) – phytochemical and therapeutic profile". Journal of Pharmacy and Pharmacology. 61 (4): 407–422.

Zheng, B., Zheng, J. and Zeng, S. 2003. Analysis of the nutritional composition in Chinese main lotus seed varieties. Acta. Nutr. Sin. 25:153–156.

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The Tree Melon And Its Seed



Fruits and vegetables are an important part of a healthy diet. In this regard, *Carica papaya* (papaya) also known as “Tree Melon” is one of them, owing to its numerous benefits such as antioxidant, antibacterial, anticancer activity, anti-fertility agent, anti-inflammatory, antiulcer, antidiabetic, hepatoprotective and many more due to the presence of phenolics, flavonoids and alkaloids as the key phytochemicals.

A Mexican and North American origin fruit found its way to India in the mid 1500 through sea voyagers, till then papaya hold its roots firmly in Indian soil. According to the FAO (2020), global production of papaya is

estimated to rise by 2.1 percent each year, up to 16.6 million tonnes in 2029 (FAO 2020). India is the largest producer of papaya, unsurprisingly it's also one of the easiest fruits to find, and its share of world production is expected to rise from 59% to 61% by 2029.

Research available shows that papaya have many disease curing capability and it's used in many traditional medicines in many countries. In Nigeria, it is used for the treatment of diabetes, malaria and fungal infections by traditional doctors. It is also used in an antimalarial herbal mixture with other herbs in Cameroon, decoctions of leaf reported as anticancer remedies by aboriginal from Australian (Nguyen 2016). Apart from the medical and pharmaceuticals uses papaya is rich source of the digestive enzyme papain, which has applications in cosmetics, brewing industries, tenderizing meat, corrosion inhibitor, multi dye degradation (Jain et al., 2020), biodiesel / diesel blends (Devarajan et al., 2020) and nano-particle fabrication (Singh et al., 2020) and so on.

Fruit of papaya is consumed preferably as fresh and offering many products and by-products through industrialization. Interestingly seed papaya are either under exploited or potentially less explored moreover, 15% – 20% of the wet weight of the fruit contains the seeds. Papaya seeds contain fatty acids, crude protein, crude fibre, papaya oil, carpaine, caricin, glucotropaeolin, benzyl glucosinolates, benzyl thiourea,

hentriacontane, β -sitostrol, caressing and an enzyme myrosin. Seed extracts have profound bactericidal activity. The seeds of unripe fruits are rich in benzyl isothiocyanate, a sulphur containing chemical that has been reported to be an effective germicide and insecticide. These substances are important for plant natural defense mechanisms (El Moussaoui et al., 2001). Medicinal uses of papaya seed are carminative, anti-fertility agent in males, counter irritant, as a paste in the treatment of ringworm, psoriasis, emmenagogue, vermifuge, liver cirrhosis and abortifacient. Seed juice is used for bleeding piles, enlarged liver and pectoral properties. Seed paste is used as anthelmintic, stimulation of menstruation or abortion. *Carica papaya* seeds were approved and confirmed in some studies for their effective anthelmintic properties against nematodes found in animals. Study also proved the anti-fertility, anti-implantation and abortifacient properties of extracts from papaya seeds (Chinoy et al., 2006). It has been established in males that the seeds of *C. papaya* are potential anti-fertility drugs. Papaya seeds are used to produce an indigenous Nigerian food condiment called 'daddawa', which is a fermented condiment food. Papaya oil may contain 4.0–23.3 mg/g—1 benzylisothiocyanate, which is anticarcinogenic a potential inhibitor of carcinogens of the breast, lungs and liver.

Studies were conducted to substantiate the health benefits

of papaya oil were also carried on rats and yield a very significant result. Rats that received a diet containing 10% papaya oil showed an increase in brain weight but a decrease in body weight. In addition, there was an increase in reduced glutathione in the erythrocytes. A decrease in cholesterol and phospholipids was registered in the brain. Further the oil may have a damaging effect on the brain. It should not therefore be used as food, but as a medicine, so that the intake can be controlled (Afolabiet et al. 2011).

Papaya seeds have the potential to produce 30%–34% oil with a reddish yellow in color and smell pungently caustic, similar to cress. The nutritional and functional properties of the oil were highly similar to olive oil. The papaya oil has high content of oleic acid, but it contains less linoleic acid and linolenic acid than olive oil. This results in higher stability against oxidation processes and rich in palmitic, linoleic, and stearic acids were the principal fatty acids and the proportion of unsaturated fatty acids was greater than the saturated fatty acids. It contains 72% of monounsaturated fatty acids with 71% of oleic acid representing a very promising new source of special plant oil for different applications (Nguyen and Tarandjiiska, 1995).

To extract the oil for scientific and research purpose, the seeds are washed and air-dried for 10 days. In order to remove the rough shell (sarcotesta) from the endosperm, they are soaked in water

overnight. Subsequently, they are dried again, and then ground, and the oil is finally extracted using a Soxhlet extractor. However, for pharmaceuticals and commercial purposes different extraction methods (i.e., solvent extraction, aqueous enzymatic extraction and extrusion expelling process) have been examined for the recovery of papaya seed oil. Papaya seeds are characterized by high moisture content (70–80%) and so, the drying operation is fundamental to allow a good processing (Nguyen and Tarandjiiska, 1995).

Biodiesels are attracting increasing attention worldwide due to their excellent environmental friendly attributes. Biodiesel is an oxygenated, renewable, sulphur-free, biodegradable and non-toxic fuel. The papaya seed oil was characterized for viscosity, density, specific gravity, saponification value and iodine value. The viscosity of the crude papaya seed oil was found to be 8-9 times higher than the conventional diesel. The acid value was determined as 0.98 mg KOH/g which indicates that only transesterification process is needed for biodiesel production (Nguyen and Tarandjiiska, 1995).

Thus papaya seed oil serves as promising feedstock for producing biodiesel from non-edible oil and it was found that all the physicochemical properties of the oil met the ASTM D6751 standards. These values are closer to the physicochemical

properties of petroleum diesel. Further, The papaya seed oil biodiesel can be blended with petroleum diesel.

Papaya is a popular and important fruit tree in tropical and subtropical parts of the world. The fruit is consumed worldwide as fresh fruit and vegetable or used as processed product. The fruit is healthy and delicious and the whole plant parts including fruit, root, bark, peel, seeds and pulp are also known to have medicinal properties.

Adding the diesel yielding capacity and medicinal properties of seed, papaya move to one of the high valued crops among fruits. Considering the productivity of papaya and culminating its benefits papaya could be new king in fruits in future.

References

Afolabi, I. S., Akuiyibo, S. M., Rotimi, S. O., and Adeyemi, A. O. 2011. In Vivo Evaluation of Lipid and Antioxidants Qualities of *Carica Papaya* Seed Oil. *Eur. J. Lipid Sci. Technol.* 4:125–135.

Chinoy, N. J., Dilip, T., and Harsha, J. 2006. Effect of *Carica papaya* seed extract on female rat ovaries and uteri. *Phytother. Res.* 9(3):169-165.

Devarajan, Y., Beemkumar, N., Ganesan, S., and Arunkumar, T. 2020. An experimental study on the influence of an oxygenated additive in diesel engine fuelled with neat papaya seed biodiesel/diesel blends. *Fuel*, 268: 117254.

El Moussaoui, A., Nijs,

M., Paul, C., Wintjens, R., Vincentelli, J., and Azarkan, M. 2001. Revisiting the enzymes stored in the laticifers of *Carica papaya* in the context of their possible participation in the plant defence mechanism. *Cell. Mol. Life Sci.* 58:556-570.

FAO [Food and Agriculture Organisation] 2020 Major Tropical Fruits Preliminary Results 2019[on-line]. Available: <http://www.fao.org/publications/card/en/c/CA7566EN/> [8 Jan. 2021].

Jain, A., Ahmad, F., Gola, D., Malik, A., Chauhan, N., Dey, P., and Tyagi, P. K. 2020. Multi dye degradation and antibacterial potential of Papaya leaf derived silver nanoparticles. *Environmental Nanotechnology, Monitoring & Management*, 14:100337.

Nguyen, H. and Tarandjiiska, R. 1995. Lipid Classes, Fatty Acids and Triglycerides in Papaya Seed Oil. *Eur. J. Lipid Sci. Technol.* 97(1): 20–23.

Nguyen, T.T., Parat, M.O., Shaw, P.N., Hewavitharana, A.K., and Hodson, M.P. 2016. Traditional aboriginal preparation alters the chemical profile of *Carica papaya* leaves and impacts on cytotoxicity towards human squamous cell carcinoma. *PLoS One*, 11(2): 0147956.

Singh, P. G., Madhu, S. B., Shailasreesekhar, Gopenath, T. S., Basalingappa, K. M., and Sushma, B.V. 2020. In vitro antioxidant, anti-inflammatory and anti-microbial activity of *Carica papaya* seeds. *Glob. J. Med. Res.* 20, 19–38.

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